



CORE

Public Health Functions for BC

Evidence Review:
**Healthy Infant and
Child Development**

**Population and Public Health
BC Ministry of Healthy Living and Sport**

This paper is a review of the scientific evidence for this core program. Core program evidence reviews may draw from a number of sources, including scientific studies circulated in the academic literature, and observational or anecdotal reports recorded in community-based publications. By bringing together multiple forms of evidence, these reviews aim to provide a proven context through which public health workers can focus their local and provincial objectives. This document should be seen as a guide to understanding the scientific and community-based research, rather than as a formula for achieving success. The evidence presented for a core program will inform the health authorities in developing their priorities, but these priorities will be tailored by local context.

This Evidence Review should be read in conjunction with the accompanying Model Core Program Paper.

Evidence Review prepared by:

Reiter Enterprises, Debbie Leach, and Kristen Yarker-Edgar

Evidence Review accepted by:

Population and Public Health, Ministry of Healthy Living and Sport (May 2007)

Core Functions Steering Committee (May 2009)

TABLE OF CONTENTS

Executive Summary	i
1.0 Overview/Setting the Context.....	1
1.1 An Introduction to This Paper.....	1
2.0 Methodology.....	2
3.0 Early Childhood Development: Core Concepts.....	4
3.1 The Determinants in Child Health and Development.....	4
3.2 Business Case for Investment in Early Childhood:	5
4.0 Public Health Strategies, Approaches and Settings	6
4.1 Introduction.....	6
4.2 The Evidence	7
4.2.1 General.....	7
4.2.2 Home Visiting Programs.....	8
4.2.3 Peer/Paraprofessional 1:1 Interventions	10
4.2.4 Telephone Interventions.....	10
4.2.5 Internet	11
4.2.6 Surveillance.....	11
4.2.7 Child Care Settings	11
4.3 Key Findings.....	14
5.0 Parenting	16
5.1 Introduction.....	16
5.2 The Evidence	16
5.2.1 Limitations	16
5.2.2 Parenting Experiences.....	16
5.2.3 Parenting Styles	16
5.2.4 Parent Attitudes and Behaviours.....	16
5.2.5 Parenting and Ethnicity/Culture.....	17
5.2.6 What Parents Need to Know	19
5.2.7 Fathers.....	20
5.2.8 Teen/Young Family Parenting.....	22
5.2.9 Parenting Prevention Services and Interventions	25
5.3 Key Findings.....	32
6.0 General Development	34
6.1 Developmental Screening and Surveillance	34
6.1.1 Screening Tools	34
6.1.2 Developmental Surveillance and Screening	35
6.1.3 Eliciting Parental Concerns About Child Development	37
6.2 Developmental Dysplasia of the Hip	38
6.3 Key Findings.....	38
7.0 Physical Health and Development: Prenatal Influences	39
7.1 The Evidence	39
7.1.1 Parental Use of Alcohol.....	39
7.1.2 Preterm/Low Birth Weight	41
7.2 Key Findings.....	42
8.0 Physical Health and Development: Physical Activity and Motor Development.....	43

Core Public Health Functions for BC: Evidence Review

Healthy Infant and Child Development

8.1	The Evidence	43
8.1.1	Physical Activity	43
8.2	Motor Development	45
8.3	Key Findings	46
9.0	Physical Health and Development: Physical Growth and General Health	47
9.1	The Evidence	47
9.1.1	Physical Growth	47
9.1.2	Failure-to-Thrive	48
9.1.3	Obesity	49
9.2	General Health and Well-Child Care	55
9.3	Key Findings	56
10.0	Physical Health and Development: Nutrition and Breastfeeding	58
A)	Breastfeeding for Early Childhood Health and Development	58
10.1	The Evidence	59
10.1.1	Initiation and Duration	59
10.1.2	Health Benefits of Breastfeeding	60
10.1.3	Risks of Artificial Baby Milk	60
10.1.4	Promoting, Supporting and Protecting Breastfeeding	61
10.2	Key Findings	63
B)	Nutrition (Beyond Breast Milk) and Early Childhood Development	64
10.3	The Evidence	64
10.3.1	Food Habits	64
10.3.2	Food Allergies	66
10.4	Key Findings	67
C)	Nutritional Deficiencies and Supplements	68
10.5	The Evidence	68
10.5.1	Vitamin D	68
10.5.2	Iron	69
10.5.3	Multiple Vitamin and Mineral Supplements	70
10.6	Key Findings	71
D)	The Feeding Relationship	72
10.7	The Evidence	72
10.7.1	Early Eating Behaviour Leads to Lifelong Habits	72
10.7.2	Influences on Eating Behaviour	72
10.7.3	Picky Eating/Neophobia	73
10.7.4	Interventions	74
10.7.5	Family Meals	74
10.7.6	Disordered Eating	75
10.8	Key Findings	75
E)	Nutrition Programs	76
10.9	The Evidence	76
10.9.1	Food Assistance and Meal Programs	76

Core Public Health Functions for BC: Evidence Review

Healthy Infant and Child Development

10.9.2	Nutrition Education Initiatives.....	76
10.9.3	Nutrition Screening/Assessment.....	79
10.10	Key Findings.....	80
F)	Food Insecurity	81
10.11	The Evidence	81
10.11.1	Infant Feeding Issues	82
10.11.2	Iron-Deficiency Anemia	82
10.11.3	Weight Issues.....	82
10.11.4	Implications.....	82
10.12	Key Findings.....	83
G)	Nutrition for Preterm and Low Birth Weight Infants	84
10.13	The Evidence	84
10.13.1	Breastfeeding	84
10.13.2	Specialized Formula with Long Chain Polyunsaturated Fatty Acids (LCPUFA).....	84
10.13.3	Solids.....	85
10.13.4	Support and Education.....	85
10.14	Key Findings.....	85
H)	Marketing Food to Children/Television Viewing.....	86
10.15	The Evidence	86
10.15.1	Interventions	87
10.16	Key Findings.....	88
11.0	Physical Health and Development: Hearing Screening.....	90
11.1	The Evidence	90
12.0	Physical Health and Development: Vision Screening	93
12.1	The Evidence	93
12.2	Key Findings.....	94
13.0	Dental.....	95
14.0	Injury Prevention	95
15.0	Physical Health and Development: Environmental Health	96
15.1	The Evidence	96
15.1.1	Children’s Vulnerability	96
15.1.2	Second-hand Smoke Exposure	96
15.1.3	Other Environmental Contaminants	98
15.2	Key Findings.....	102
16.0	Physical Health and Development: Sexual Health and Development.....	103
16.1	The Evidence	103
16.2	Key Findings.....	105
17.0	Physical Health and Development: Child Abuse/Neglect	106
18.0	Emotional/Mental Health and Development: Prenatal/Parental Influences	107
18.1	The Evidence	107
18.1.1	Parental Mental Health	107
18.1.2	Preventing Parental Mental Illness	108

Core Public Health Functions for BC: Evidence Review

Healthy Infant and Child Development

18.1.3	Interventions to Reduce the Impact of Parental Mental Illness on Children.....	109
18.2	Key Findings.....	110
19.0	Emotional/Mental Health and Development: Child Mental Health and Attachment.....	111
19.1	The Evidence	111
19.1.1	Mental Health.....	111
19.1.2	Attachment.....	114
19.1.3	Resilience.....	115
19.1.4	Parenting Skills	115
19.2	Key Findings.....	115
20.0	Speech, Language and Communication Development.....	117
20.1	The Evidence	117
20.1.1	Factors Influencing Language Development.....	117
20.1.2	Outcomes of Speech/Language Impairments	118
20.1.3	Screening, Identification and Assessment	119
20.1.4	Prevention	121
20.2	Key Findings.....	122
References	124
Glossary	183

Appendices

Appendix 1: Core Programs Evidence Papers.....	185
Appendix 2: Key Words Searched.....	187
Appendix 3: Practitioner Role in Supporting Child Health and Development.....	189
Appendix 4: Canadian Growth Monitoring Recommendations	190
Appendix 5: Nutrition in Healthy Term Infants	192
Appendix 6: Invest in Kids Parenting Skills.....	197

EXECUTIVE SUMMARY

Early experiences can exert a powerful influence in making children physically strong and emotionally healthy. This paper summarizes the primordial, primary and early secondary prevention evidence for early childhood health and development from a public health perspective. Several limitations presented themselves in analyzing conclusions from the early childhood health and development literature from a public health perspective. A program may appear successful, but it may not have been evaluated, or the evaluation was not published. A program may be effective, but only in a targeted population, making generalization difficult. As well, much of the literature originates from countries outside of Canada and thus generalization is difficult. Most of the research has been completed in the Caucasian population versus multicultural populations. There is limited “public health” literature (versus “health” or social science literature) on many of the topics. However, despite these limitations, current research reveals key areas of focus for public health services.

The research in this paper has been categorized as follows:

Type 1 – at least one good systematic review (including at least one randomized controlled trial).

Type 2 – at least one good randomized controlled trial (RCT).

Type 3 – an interventional study without randomization.

Type 4 – an observational study.

Type 5 – expert opinion: influential reports and studies, national guidelines/policies.

Public Health Strategies, Approaches and Settings

Types 1 and 2

- There is strong evidence to support early childhood development programs for their effectiveness in preventing delay in cognitive development and increasing readiness to learn.
- The effectiveness of preschool prevention programs for disadvantaged children are greatest for those that have a direct teaching component in preschool, have a follow-through educational component in elementary school and are longer in duration.
- There is good evidence to support professional or professional/paraprofessional home visiting programs to improve maternal/family and child outcomes. Programs that offer home visiting services in conjunction with centre-based early childhood education appear to produce larger and longer lasting results than programs that offer home visiting services alone.
- Telephone use as a method of providing health care interventions (in the context of other services such as home visiting or educational materials) has demonstrated positive impacts on health, knowledge, behaviours and health resource utilization.
- Child care settings are an important venue to influence child and parental health. Positive outcomes are found for education of staff and parents around a number of topics (e.g., infection control, nutrition, speech/language).

Type 5

- Studies demonstrate that early childhood prevention programs aimed at decreasing the incidence of childhood problems are more successful over the long term if they involve the parents, begin early in the child's life and address multiple risk factors.
- The Internet is a growing source of information, but has not been adequately studied for the early childhood population.
- There are gaps in health surveillance for the early childhood population.
- There was limited literature found on public health services in group settings.

Parenting

Types 1 and 2

- There is clear evidence that parent education and support programs are effective in creating positive changes in children's behaviour as well as changes in parents' behaviours and relationships with their children.
- There is consensus among researchers that effective parenting education and support programs share a number of common characteristics.
- There is some support for the use of group-based parenting programs to improve the emotional and behavioural adjustment of children under the age of 3 years. However, there is insufficient evidence to reach any firm conclusions regarding the role that such programs might play in the primary prevention of such problems. Furthermore, there are limited data available concerning the long-term effectiveness of these programs. There is currently insufficient evidence to reach any firm conclusions regarding the role of parenting programs in the primary prevention of mental health problems.
- There is limited good literature on services to support father involvement in parenting. There is some evidence that if interventions involve active participation with or observation of the father's own child, the intervention may be effective in enhancing both the father's interactions with the child and a positive perception of the child.
- The author was unable to find Type 1 and 2 evidence on parenting and ethnicity/culture or teen/young parenting services.

Types 3 and 4

- Immigrant parents are at particularly high risk of alienation from systems of health care and support services that are available to low-income and other vulnerable populations.

Type 5

- The literature identifies key areas of parenting that parents need to know.

- While literature on cultural competency still requires further development, there is some evidence of positive outcomes for culturally competent care.
- There are scant long-term evaluations and good research on child and youth programming for First Nations and Inuit children.
- There have been mixed results on teen parenting and teen-tot programs. Group-based intervention for adolescent parents has shown to be both more supportive and more cost-effective than individual intervention. Intervention needs to take into account the parents' own developmental and social needs. Programs should incorporate adults living with the parenting youth.
- Physicians are the top group that parents turn to for information and advice. However, it is unknown whether parents change their parenting based on physicians' advice.
- Regardless of method of parenting education/support delivery, standardized written information or instructions provided in combination with other activities, such as video-taped vignettes, role-play or facilitated discussion appear to be most effective at achieving lasting behaviour changes.
- Although there is a plethora of books and magazines on parenting, there is limited information on what parents are reading about and the impact on parenting.
- The effectiveness of parenting and preschool television programs, giving verbal information or telephone advice without other interventions, use of electronic mail, CDROMS and the World Wide Web has not been established.
- Best practices for the development of parent health education resource material have been identified, but systematic reviews could not be found.

General Development

Types 1 and 2

- The current evidence is insufficient to recommend routine screening for developmental dysplasia of the hip in infants as a means to prevent adverse outcomes.

Types 3 and 4

- Systematically eliciting parental concerns about development has been identified as an important method of identifying infants and young children with developmental problems.

Type 5

- Although a number of reputable organizations recommend developmental screening and surveillance, there is lack of sound, current evidence on the broad use of developmental screening and surveillance for the 0 to 5 years population.

Physical Health and Development: Prenatal Influences

There is limited research on the preventive needs and services required for preterm/low birth weight and fetal alcohol spectrum disorder (FASD) infants and their families once they are discharged to the community and ongoing into early childhood.

Type 5

- Modest intervention-related differences for heavier low birth weight premature children have been found in the Infant Health and Development Program (USA). This program is designed to reduce the developmental and health problems of low birth weight premature infants.
- Community-based programs for vulnerable families have identified “good practices” for reducing harms associated with substance use during pregnancy (e.g., using a grass-roots, bottom-up approach in program development).
- Referral, screening, case management, outreach, education, counselling, consultation, advocacy and policy development are all important components for families of children with FASD.

Physical Health and Development: Physical Activity and Motor Development

The importance of physical activity is well documented in the literature, but there is a lack of sound research addressing preventive services to support physical activity in the early childhood population.

Type 5

- Guidelines have been developed on healthy, active living and physical activity, but they are not specific to the early childhood population.

Physical Health and Development: Physical Growth and General Health

Type 1

- Even though current Canadian recommendations include growth monitoring at regular intervals from birth to preschool, there is little information to evaluate the benefits and harms of growth monitoring.
- There is limited evidence on the effectiveness of obesity prevention interventions in children.

Types 4 and 5

- Research shows that parents value well-child care and parent-clinician communication, but there is limited research regarding what services promote good outcomes including optimal frequency of these services.

- There is a lack of evidence and consensus regarding the role of public health preventive services in the identification and management of failure to thrive.
- Home visiting programs and pre/post-natal nutrition programs for vulnerable families have shown some positive outcomes on birth outcome and maternal and child nutrition.
- Fetal development, genetics, breastfeeding, parental control versus self-regulation of eating habits, caregiver attitudes and knowledge of nutrition, physical activity, and television viewing have all been implicated as risk or protective factors.
- It has been suggested that public health obesity prevention strategies should target early childhood via multiple avenues.

Physical Health and Development: Nutrition and Breastfeeding

A) Breastfeeding for Early Childhood Health and Development

Type 1

- Infants should be exclusively breastfed for 6 months.
- Breastfeeding is a public health strategy for improving infant and child health, improving maternal morbidity, controlling health care costs and conserving natural resources.
- Breastfeeding helps to prevent respiratory, intestinal and ear infections, allergies, cardiovascular disease and obesity. There is emerging evidence that breastfeeding helps to prevent diabetes, inflammatory bowel disease and cancer.
- Errors made in reconstituting formula put infants' health at risk.
- Providing free formula decreases the rate of exclusive breastfeeding.
- Face-to-face breastfeeding interventions are effective but it is not clear whether interventions should involve education or support or a combination of both education and support.

Type 5

- Creating breastfeeding-friendly environments is a public health strategy to promote breastfeeding. An example is the Baby-Friendly Initiative.

B) Nutrition (Beyond Breast Milk) and Early Childhood Development

There is a lack of Canadian data on determinants of healthy eating and dietary behaviours in children.

Type 1

- Food allergy prevalence is between 4 and 6 per cent of the population and is increasing.

Type 4

- The diet of preschoolers is high in total fat, saturated fat, added sugar and carbonated soft drinks, and low in vegetables and fruit. This is concerning because of the increased risk of obesity, heart disease, certain cancers and asthma.

Type 5

- The American Academy of Pediatrics and the European Society of Pediatric Allergy and Clinical Immunology and the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition differ in their definitions of infants who are at risk for allergy, delayed introduction of solid foods, and pregnancy/lactation allergen avoidance.

C) Nutritional Deficiencies and Supplements

Type 1

- Micronutrient shortages in early childhood have serious adverse consequences that may be only partly reversible.
- Immigrant populations are particularly vulnerable to micronutrient shortages in early childhood.
- Iron-deficiency anemia in early childhood is associated with poor cognitive and motor development and depressed school achievement in middle childhood. However, poverty confounds this relationship. These effects may not be reversible.
- The evidence is mixed regarding whether there are neurodevelopmental and growth benefits to supplementing formula with long chain polyunsaturated fatty acids, similar to those found in breast milk.

Type 5

- The current recommendation to supplement all breastfed infants with 400IU of vitamin D is controversial. It has been recommended that the role of the primary care professional is to understand the vitamin D dilemma, promote breastfeeding and prevent vitamin D deficiency rickets.
- There are three primary intervention strategies suggested to prevent iron-deficiency anemia: offering more foods with high-bioavailable iron, fortifying foods targeted to young children, and supplementing mother and/or child.

D) The Feeding Relationship

Type 1

- While parents play an important role in determining eating habits and weight development of their children through their behaviours, attitudes and feeding styles, the complexity of child feeding problems is unlikely to be explained solely by parental behaviours or genetic tendencies.

- Viewing television has an enormous potential influence on children’s eating behaviours that can overshadow familial influences.

Type 4

- Children with the strongest preferences for high-fat foods and highest total fat intakes have heavier parents than children with lower scores, and children’s vegetable and fruit intake is associated with parental vegetable and fruit intake.
- Children have been found to accept or reject food based on qualities of the food (taste, texture, smell, temperature or appearance) as well as environmental factors such as the setting, presence of others and the anticipated consequences of eating or not (including more time to play).
- There appears to be an interplay of infant temperament and parental responses shaping picky eating behaviours. Parents of picky eaters often limit exposure to new foods and foods children dislike. It is recommended that caregivers be provided with information about methods for dealing with picky eating because children may experience “learned safety” which lessens neophobia.

Type 5

- Mealtimes can be viewed in the context of family rituals where interactions, traditions and celebrations reinforce identity, a shared sense of belonging, and a vehicle to transmit family values, attitudes, culture and goals, thus providing children with a sense of security.
- Expert opinion supports a division of responsibility in feeding where parents provide appropriate food and feeding structure/limits on negative behaviours and children decide whether or not to eat and how much to eat.

E) Nutrition Programs

Type 1

- Nutrition counselling during the first year of life improves maternal and professional practices in child nutrition and feeding. Nutrition education should be focused upon identifying and decreasing barriers to good nutrition for children aged 1 to 5 years and their caregivers, including social and physical factors.
- The US Special Supplemental Nutrition Program for Women, Infants and Children (WIC) has beneficial effects on infant birth weight, low birth weight rates, preventing preterm delivery, children’s nutrient intakes, and decreasing health care costs. There is no national Canadian food assistance/meal program like WIC with such a strong body of associated research.

- Best practice guidelines promoting healthy eating patterns use one or more of the following components: small group activities, goal setting, social support, interactive food-related activities (e.g., cooking) and family participation and assisting clients to assess and access community resources (e.g., referral to resources, promotion of low-cost physical activity options).

Type 5

- Health professionals have identified the importance of nutrition screening of preschool children, yet there is currently no clear process for identifying nutrition problems in this population. However, a nutrition screening tool for 3-5 year olds, NutriSTEP, is been under development for caregivers, child care providers and nutrition and health professionals across Canada.

F) Food Insecurity

Type 1

- Breastfeeding provides total food security for infants.

Types 4 and 5

- Food insecurity has health implications for young children.
- Since food security is a social determinant of health, a population health approach is needed to address food insecurity.
- Strategies have been identified for public health professionals to enhance the effectiveness of community food security work.

G) Nutrition for Preterm and Low Birth Weight Infants

Type 1

- The preferred food for premature infants is fortified milk from the infant's own mother, or alternatively, a formula designed for premature infants. Infants who are fed their mother's milk early in life have greater visual acuity, language skills and developmental outcomes than comparable groups of infants fed cow's milk-based infant formula.
- LCPUFA-added formula supports early visual system development but it is not known whether such formulas result in a lasting advantage across the lifespan.

Type 4

- Low birth weight and preterm delivery are associated independently with small, but measurable, delays in motor and social development through early childhood.
- The timing of introducing complementary foods varies among caregivers of preterm infants and compliance with guidelines is poor.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Preterm infants need to be followed closely from birth—parents appear to benefit from ongoing supportive guidance and appropriate goal setting for feeding achievements from a well-coordinated interdisciplinary care team.

H) Marketing Food to Children/Television Viewing

Type 1

- There is a positive correlation between time spent watching television and being overweight or obese.

Type 4

- Pressure from society and peers, bad weather, having multiple children and tension between parents are identified as barriers to appropriate preschooler screen time. Parents are not concerned about their child’s screen time.
- Low-income and minority children watch more television and are exposed to more commercials advertising low nutrient food.

Type 5

- There is strong public support for interventions aimed at reducing overweight and obesity among children and adolescents, particularly prohibiting advertising for fast food and less healthy foods.
- The Canadian Paediatric Society recommends limiting television watching to one hour or less for preschoolers and two hours or less for school-aged children. The American Academy of Pediatrics recommends that children should have no televisions in their bedrooms, viewing should be limited to no more than 1 to 2 hours per day of educational, non-violent programs, and children under the age of 2 years should not watch television.

Physical Health and Development: Environmental Health

Types 1 and 2

- The evidence suggests that certain interventions are effective in reducing children’s exposure to second-hand smoke. There is emerging evidence that a theoretically-based, multi-component intervention of sufficient intensity, provided during the postpartum period, can have a modest effect on patterns of smoking relapse at six months postpartum.
- There is fair evidence for targeted lead exposure screening of high-risk children, but there is insufficient evidence to recommend for or against universal screening.
- Many health promotion interventions used to increase public awareness of environmental health risks or adoption of risk reduction behaviours appear to be effective.

Type 5

- There is limited good evidence on intervention strategies for the primary prevention of asthma.
- There is a risk of Bisphenol A contaminants in baby bottles, as the chemical is released from plastic when boiling water contacts the bottle.

Physical Health and Development: Sexual Development

There has been very little focus on the sexual health and development of children under the age of 5 in both the formal research literature and other reports. The literature review revealed scant information on the role of public health in promoting sexual health for children under 5 years old. A number of studies have agreeing results that behaviours that appear to imitate adult sexuality are very uncommon in observations of normal groups of children, but are more common among children who have been the victims of abuse.

Emotional/Mental Health and Development: Prenatal/Parental Influences

Type 2

- The few programs studied specifically addressing parent education and support for parents with a mental illness have not yet provided evidence that they produce long-term benefits.

Types 4 and 5

- The research shows that a number of preventive interventions are successful in preventing new cases of parental mental disorders. These include group sessions, parenting sessions and counselling.
- Breastfeeding can act as a protective mechanism for both mother and baby in moderating the altered interactions that are seen to occur when mothers are depressed. Stable breastfeeding patterns, even in depressed mothers, led to more positive dyadic interactions, and less likelihood of highly reactive infant temperament.
- A number of tools for the identification/screening of parents for mental illness have been studied.

Emotional/Mental Health and Development: Child Mental Health and Attachment

Types 1 and 2

- There is little research evidence to show that universal early childhood developmental programs can improve mental health and developmental outcomes in disadvantaged populations of children and families.
- Home visiting by professionals and/or paraprofessionals has some positive mental health outcomes, but its impact on promoting positive parent-child interactions or positive child development is inconsistent. Families at highest risk benefit most from the interventions.

- Prevention programs for child mental health are more effective if they are started early, carried out in multiple domains in the lives of children, are intensive, are long-term, employ skilled teachers, train parents to use reinforcement effectively and empower parents.
- Two generation programs that provide services similar to early childhood care and education programs as well as a variety of services for parents (e.g., linking them with job training) have mixed effects on child outcomes and no effect on parental outcomes.
- Efficacious prevention programs have been reported for conduct, anxiety and depressive disorders in children. Psychological interventions for the prevention of depression in children and adolescents are effective immediately after the programs are delivered. There is a significant reduction in scores on depression rating scales for targeted, but not universal interventions. There is no evidence of effectiveness for educational interventions (providing information only) for preventing depressive disorders.
- Programs modifying the school environment, supporting individually focused mental health promotion efforts and attempting to help children negotiate stressful transitions yield significant effects (systematic review in 2-year-old to 18-year-old population).
- A number of preventive interventions to enhance parental sensitivity and infant attachment have been found to be effective
- There is evidence to support a number of specific skills for parents in order to promote infant/child emotional development and secure attachment.

Type 5

- Best practice approaches to mental health and well-being of Aboriginal children have been established, but sound research is limited.

Speech, Language and Communication Development

Types 1 and 2

- Several aspects of speech screening have been inadequately studied to determine optimal methods, including which instrument to use, the age at which to screen and which interval is most useful. Use of risk factors (e.g., familial history), to guide selective screening is not supported by studies. Recent studies have shown the predictive nature of parental report for speech/language delays.

Types 3, 4 and 5

- Programs that support daily reading/storytelling to a young child have a positive effect on speech and language development.

Type 5

- Speech/language assessment tools and protocols designed for monolingual populations are generally not appropriate for multilingual populations.

- The “late talker” literature is inconclusive. There is insufficient evidence to predict which late talkers will catch up and which ones will continue to experience varying levels of difficulty. The impact of language intervention on linguistic outcomes of late talkers has not been addressed in longitudinal studies.

1.0 OVERVIEW/SETTING THE CONTEXT

In 2005, the British Columbia Ministry of Health released a policy framework to support the delivery of effective public health services. The *Framework for Core Functions in Public Health* identifies healthy infant and child development as one of the 21 core programs that a health authority provides in a renewed and comprehensive public health system.

The process for developing performance improvement plans for each core program involves completion of an evidence review used to inform the development of a model core program paper. These resources are then utilized by the health authority in their performance improvement planning processes.

This evidence review was developed to identify the current state of the evidence-based on the research literature and accepted standards that have proven to be effective, especially at the health authority level. In addition, the evidence review identifies best practices and benchmarks where this information is available.

1.1 An Introduction to This Paper

Healthy early childhood development is a powerful determinant of health (Federal/Provincial/Territorial Advisory Committee on Population Health, 1999). Early experiences can exert a powerful influence in altering well-being, building coping abilities and competencies and helping make children physically strong and emotionally healthy (Government of Canada, 2003). Ensuring children's optimal physical, emotional and social health pays off through increased school success, increased future productivity and reduced cost of health and public services (Ministry of Health [MOH], 2003). Investments in early childhood health and development are long-term commitments, with outcomes that will be realized over time (MOH, 2003).

Public health services play a role in enhancing the health of children. The purpose of this paper is to summarize the primordial, primary and early secondary prevention evidence for early childhood health and development from a public health perspective. The evidence focuses on the child from 7 days of age to preschool and encompasses the following topics: prenatal/maternal physical and emotional influences on early childhood health and development; physical/gross motor development; physical growth; general health; nutrition/breastfeeding; environmental health; sexual health/development; parenting practices; mental health; and speech/language/communication. Several other Ministry of Health core program papers will address other aspects of early childhood health and development (see Appendix 1). It is important for readers of this document to consider the content in the context of these other papers, particularly the reproductive health evidence review, which covers the period from prenatal to early postpartum (seven days). For the purposes of this core program paper, early childhood is defined as 7 days of age up to the 6th birthday (5 years 364 days).

2.0 METHODOLOGY

The criteria utilized for defining core programs in British Columbia are based upon the following (MOH, 2003 & 2005):

1. They are primordial, primary or early secondary prevention. Primordial prevention involves actions and measures that inhibit the emergence and establishment of environmental, economic, social and behavioural conditions, cultural patterns of living, etc., known to increase the risk of disease (Last, 2001). Primary prevention includes the protection of health by personal and communal efforts, such as enhancing nutritional status, immunizing against communicable diseases and eliminating environmental risks, such as contaminated drinking water supplies (Last, 2001). Secondary prevention includes “a set of measures available to individuals and communities for the early detection and prompt intervention to control disease and minimize disability (e.g., by the use of screening programs) (Last, 2001).
2. They improve the overall health and resilience of the population or part of the population.
3. There is reasonable evidence of their effectiveness in the scientific literature or in reviews of “best practices”.
4. There is reasonable evidence of their cost-effectiveness.
5. Indicators are available or can be developed that will measure their impact.
6. They fall within the mandate of the health authorities and/or the Ministry of Healthy Living and Sport and the Ministry of Health Services.

The levels of evidence used to categorize the literature in this paper are as follows (MOH, Population Health and Wellness [PHW], 2006):

- Type 1 – at least one good systematic review (including at least one randomized controlled trial).
- Type 2 – at least one good randomized controlled trial (RCT).
- Type 3 – an interventional study without randomization.
- Type 4 – an observational study.
- Type 5 – expert opinion (influential reports and studies, national guidelines and policies).

These levels are identified by the appropriate numbers (Type 1, 2, 3, 4 or 5) after the citations throughout the paper. Key guidelines and policies from reputable organizations are indicated as such, under Type 5. The authors focused primarily on literature from 2000 to present day and on Type 1 and Type 2 levels of evidence, with the understanding that evaluating multi-faceted, community-based prevention programs can be a complex process. Randomized controlled trials are frequently too restrictive to be feasible in community settings, thus a wide spectrum of evaluation methods and measures must be used to establish evidence of effectiveness (McEwan, Hua & Shepherd, 2002). Evaluating the impact of large-scale public health programs is difficult because the interventions are usually multiple and their pathways to impact are complex. True evidence-based public health must rely on a variety of types of evidence. Thus, where Type 1 and Type 2 evidence was not available, the “gray literature” was used to supplement the discussion.

Sources of literature included:

- Major library electronic databases such as Medline, CIHNAL, Pubmed, HealthEvidence.ca, Cochrane Collaboration, EbscoHost, Scholar Google and EBM, with key words from each section used in the search (See Appendix 2).
- Manual searches of major public health/child health journals including: *the Canadian Journal of Public Health, the American Journal of Public Health, Public Health Nursing, Annual Review of Public Health, Australian and New Zealand Journal of Public Health, BMC Public Health, the European Journal of Public Health, Pediatrics, Pediatric Nursing, Journal of Pediatric Nursing and Child: Care, Health & Development.*
- Manual searches of key websites, such as the Centre of Excellence for Early Childhood Development, Zero to Three, Human Early Learning Partnership, Canadian Paediatric Society.
- Key experts.
- Mining bibliographies.

Several limitations presented themselves in analyzing conclusions from the early childhood health and development literature from a public health perspective:

- A program may appear to be effective, but it may not have been evaluated, or the evaluation was not published.
- A program may be effective, but only in a targeted population, making generalization difficult.
- Much of the literature originates from countries outside of Canada and thus generalization is difficult.
- Much of the research has been completed in the Caucasian population, versus multicultural populations.
- There is limited “public health” literature (versus “health” or social science literature) on many of the topics.
- Many of the studies have methodological flaws.

Other limitations of this review include the following:

- Only the formal literature was reviewed. There are many reports and informal pieces of literature that can only be sought through key informant interviews, which were outside the scope of this review.
- There are few systematic reviews and meta-analysis within the literature for this age group.

Although there are limitations with the current early childhood health and development literature, the current research reveals key areas of focus for public health services.

3.0 EARLY CHILDHOOD DEVELOPMENT: CORE CONCEPTS

Analysis of data from the National Longitudinal Study on Children and Youth (NLSCY) revealed that “at least 23 per cent of the children in the 4 to 11 age group in British Columbia are vulnerable for poor human development in the future. This represents about 90,000 vulnerable children” (Mustard & Picherack, 2002, p. iv). This represents a large portion of children in the province and warrants a look at the role of public health in addressing the domains of early childhood development. These domains are

- Physical health and motor development.
- Emotional health.
- Social knowledge and competence.
- Cognitive learning.
- Language and communication.

Research shows that the “emotional, social, and cognitive development of infants and children contributes to their lifelong achievement and long-term health and social outcomes” (Health Officers Council of BC, 2008).

Children pass through critical periods along the developmental pathway. In these critical periods, there are specific windows of opportunity during which support and intervention can enhance their development. There is consensus that early childhood, from conception to the beginning of school at age five or six, is the most critical of these periods (Human Resources Development Canada, 1997)

In this paper, early childhood health and development areas have been analyzed in isolation for ease of readability and interpretation. It must be noted that the above domains are not mutually exclusive and that many areas discussed in this paper overlap.

3.1 The Determinants in Child Health and Development

Early childhood development is considered both a determinant and something that is affected by other determinants of health. Profound influences on early childhood health and development are found in the environments where children grow up, live and learn. These environments, in turn, are strongly influenced by socio-economic, civic and family conditions. In Canada, inequalities in child development emerge in a systematic fashion over the first five years of life according to well-recognized factors: family income, parental education, parenting style, neighbourhood safety and cohesion, neighbourhood socio-economic character, and access to quality child care and developmental opportunities. Threats to healthy child development are found across the entire socio-economic spectrum, though at increasing intensity as one goes from high to low levels (Hertzman et al., 2006). Research reveals a consistent finding: higher socio-economic standing is associated with better health. This is called the “gradient effect” and has been found in all wealthy societies, regardless of whether income, education, occupation or a combination of these measures is used to define socio-economic status (Hertzman, 2000). At a societal level, focusing on children in the poorest social environments will affect about 10 per cent of the

population in difficulty (Hume et al., 2005). This suggests that vulnerability is a more valuable “marker” for deciding where to direct resources than is targeting resources solely on the basis of risk profiles or income. It also suggests that policies and funding practices that support a range of child and parental supports, such as child care, parenting education and support programs are required (Hume et al., 2005).

In reading the following sections on the evidence, the preceding information must be kept in mind. Although some public health prevention services may affect child health outcomes, ultimately, large systematic changes focusing on the determinants of health will make the most significant differences.

3.2 Business Case for Investment in Early Childhood:

It is estimated that \$1 invested in the early years saves between \$3 and \$9 in future spending on the health and criminal justice systems, as well as on social assistance (Grunewald & Rolnick, 2005).

4.0 PUBLIC HEALTH STRATEGIES, APPROACHES AND SETTINGS

4.1 Introduction

There are a number of public health strategies, approaches and settings focused on child health and development. Some public health strategies focus on universal service delivery whereas others are targeted to select groups or individuals. The following section summarizes a number of programs and strategies related to early childhood health.

Universal versus Targeted Interventions

Universal interventions are defined as interventions where all children in a geographic area or setting receive the intervention. Targeted interventions are defined as interventions where individuals are singled out for the intervention, not necessarily because they already have a disorder, but because they are at high risk for developing one.

Children can be identified for targeting in two ways: the identifying characteristics can lie outside the children (socio-economic) or the children themselves can have distinguishing characteristics (developmental delay) (Keating & Hertzman, 1999).

The report by the Health Disparities Task Group of the Federal/Provincial/Territorial Advisory Committee on Population Health and Health Security (December 2004) indicated that “a balanced mix of targeted interventions for some and universal programs for all is more likely to work in a country as vast and complex as Canada.”

The Invest in Kids 2007 report indicated that

if all programs are targeted to disadvantaged groups, we will miss the actual majority of vulnerable children and their families. Findings from the National Longitudinal Survey of Children and Youth (NLSCY) present the most convincing arguments to support shifting resources into programs and support for all parents. These findings show that “vulnerable” children are not restricted to high-risk populations that are identified using the demographic or socio-economic criteria. (Russell, 2007).

Keating and Hertzman (1999) indicated the following for determining the optimal mix of universal versus targeted interventions. These include:

- Prevalence of the disorder in the absence of any prevention.
- Risk factors for the disorder or condition.
- Whether screening procedures are available.
- Extent to which an intervention does more good than harm.
- Extent to which the intervention reaches those who need it.

- Rate of compliance with the intervention among those who need it.
- Cost of the intervention as compared to the costs to the individual with the disorder. This includes costs associated with leaving the disorder untreated, and costs associated with ineffective treatment.

4.2 The Evidence

4.2.1 General

The Task Force on Community Preventive Services (Anderson et al., 2003, Type 1) reviewed several early childhood programs. Programs reviewed were primarily American-focused and included: the Perry Preschool, Head Start, Carolina Abecedarian Project, South Carolina implementation of High/Scope preschool curriculum, Smart Start, and various early childhood programs that served “at-risk” children. The authors concluded that early childhood development programs are recommended on the basis of strong evidence of their effectiveness in preventing delay of cognitive development and increasing readiness to learn. Evidence was insufficient to determine the effects of these programs on social cognition and social risk behaviours, because only the Perry Preschool program results were available. Evidence was also insufficient to determine the effect of early childhood development programs on child health screening outcomes and family outcomes, because too few comparative studies examined these outcomes.

Gray and McCormick (2005, Type 1) reviewed the long-term outcomes and effectiveness of early childhood intervention programs in the United States. Most programs have been targeted to vulnerable children. The authors summarized findings of their review, recommending that programs should

- Employ more centre-based or mixed-centre-based and home visiting models.
- Monitor standards of quality.
- Become more family focused and culturally competent.
- Broaden the focus of their evaluations.

Nelson, Westhues and MacLeod (2003, Type 1) completed a meta-analysis on the effectiveness of preschool prevention programs for disadvantaged children. The results were greatest for those programs that had a direct teaching component in preschool, that had a follow-through educational component in elementary school and that were longer in duration. Cognitive impacts were greatest during the preschool period, but still evident during elementary school.

Normand, Vitaro and Charlebois (2000, Type 5) found that many studies demonstrate that early childhood prevention programs, aimed at decreasing the incidence of childhood problems, are more successful over the long term if they involve the parents, begin early in the child’s life and address multiple risk factors. They suggest a range of strategies/measures aimed at maximizing efforts to facilitate the active participation of parents in early prevention programs.

4.2.2 Home Visiting Programs

Home visitation is defined as a program that includes visitation of parents and children in the home by trained personnel who provide information and training, and/or offer support (Holden, 2007).

Studies report mixed effects of home visiting programs on families with young children. In the research, important details emerge once results are no longer generalized across populations, goals and services (Holden, 2007, Type 5). These details include the following:

- Programs targeting specific populations, such as at-risk families, families with children with disabilities, teen parents, or specific ethnic groups, reportedly have better results than universal programs.
- Programs with highly trained home visitors produce greater outcomes with higher risk families.
- Programs with specific goals generate more positive outcomes.
- Programs that are a blended model of professionals and peer/lay/paraprofessionals, or that are entrenched within a multi-faceted, comprehensive program, produce better results for some populations.

A synopsis on home visiting (prenatal and postnatal) programs indicated that “better outcomes are achieved when home visiting programs are based on theories of development and behaviour change, target empirically derived risk factors, employ more highly trained visitors (such as nurses) and follow a well-constructed curriculum across the series of visits” (Encyclopedia on Early Childhood Development, 2007, Type 5).

Kitzman (2004) indicated that home visiting can be an effective strategy to improve the health and developmental outcomes of children from socially disadvantaged families.

Bull, McCormick, Swann and Mulvihill (2004, Type 1) completed a systematic review of reviews on ante and postnatal home visiting programs. Outcomes are summarized below.

1. Effects of home visiting on child health outcomes:

- Child abuse: incomplete evidence. Where positive effects have been found, they tend to be measures of parenting rather than direct measures of abuse.
- Childhood injury: good evidence regarding reducing rates.
- Intellectual development: some evidence to support this outcome. Appears to be most apparent among children with identified problems associated with low birth weight or failure to thrive.
- Immunization and hospital rates: insufficient evidence to determine the effect of home visiting on these outcomes.
- Breastfeeding: some evidence to support.
- Children’s diets: weak evidence to support.

2. Effects of home visiting on the quality of parenting:
 - Good evidence to suggest that home visiting can produce positive effects on various dimensions of parenting or mother-child interaction.

3. Effects of home visiting on outcomes for mothers:
 - Postpartum depression: some evidence to support a positive effect.
 - Access to social support: insufficient evidence to prove any long-term benefits.
 - Maternal life course development (e.g., participation in education or employment): insufficient evidence to prove any long-term benefit.

4. Best delivery models of home visiting programs:
 - Home visiting interventions that are restricted to the pursuit of only a narrow range of outcomes are less effective than those with a more comprehensive approach, in which the multiple needs of families are addressed.
 - Some evidence to suggest that more intensive programs of home visiting have greater impact than others, but there is no clear answer to the exact prescription for the intensity and duration of home visiting programs.
 - Current evidence is not clear on the issue of whether home visiting is more effective when professionals rather than lay people provide the service.

Drummond, Weir and Kysela (2002, Type 1) provided a literature review of the key elements of programs that use home visitation for at-risk young families as the major delivery method. They found issues around the use of appropriate measures in the studies, retention of participants, differential effects by program site and questions regarding overall impact.

Gomby (2005, Type 5) reviewed the home visiting literature. She found that the popularity of home visiting has been driven by the results of a few studies (e.g., Nurse-Family Partnership). There are very few long-term studies of home visiting programs. Results of these studies vary widely across program goals, program models, program sites implementing the same model, and families within a single program site. Home visiting programs can produce benefits for children and parents, but, with a few exceptions, most programs produce benefits that are modest in magnitude. Home visiting services appear to be most beneficial for families where either the initial need is greatest and/or where parents perceive that their children need the services (e.g., because their children are born low birth weight, have special needs, or have behavioural problems which the parents are trying to address). Programs that offer home visiting services in conjunction with centre-based early childhood education appear to produce larger and longer lasting results than programs that offer home visiting services alone.

The most well-documented randomized controlled trials on home visiting are the Nurse-Family Partnership projects led by David Olds (O'Brien, 2005, Type 2). The focus of the intervention was on high-risk, first-time pregnant and parenting mothers and included extensive nurse home visitation using protocols. There were positive intervention effects related to birth weight,

preterm delivery, injuries, hospital/physician visits, behavioural issues, child IQ, maternal returning to school, employment, subsequent pregnancies, antisocial behaviour, welfare use, arrests and alcohol/drug use.

The Centers for Disease Control and Prevention (CDC) estimates that 43 per cent of all births could benefit from receiving home visiting services. On the basis of strong evidence of effectiveness, the CDC Task Force on Community Prevention Services (2003, Type 5) recommends early childhood home visitation for prevention of child abuse and neglect in families at risk for maltreatment, including disadvantaged populations and families with low-birth weight infants.

Holden (2007, Type 5) concluded that “the relative costs and benefits of home visiting studied under optimal research conditions suggest that the benefits of home visiting outweigh the costs (Type 5).

Solnit (1983, Type 5) wrote that

evidence for the effectiveness of home visiting programs is as good or better than the evidence for the effectiveness of many other programs which exist to serve children and families. We should move ahead to a time in which non-stigmatizing and supportive services for families, including home visiting, are available in every community.

4.2.3 Peer/Paraprofessional 1:1 Interventions

The Public Health Research, Education and Development (PHRED) program (Wade et al., 1999, Type 1) completed a systematic review to determine the evidence for the effectiveness of peer/paraprofessional 1:1 interventions in promoting positive maternal (parental) and/or child health and developmental outcomes. Results of the review were as follows:

- The evidence suggests that peers/paraprofessionals can have a positive impact on child development and parent-child interaction, particularly when the intervention is high in intensity (weekly or bi-weekly visits for at least one year) and part of a multi-faceted intervention that includes professionals.
- There is no evidence, as yet, for the positive impact for peer/paraprofessional 1:1 interventions, in which the peer/paraprofessional is the only intervener in preventing child abuse and neglect.

There are a number of limitations with this literature, including variable definitions, a focus on high-risk populations only, many confounding factors and the lack of longitudinal studies.

4.2.4 Telephone Interventions

The PHRED program (Cava et al., 1999, Type 1) found that the use of telephones as a method of providing health care interventions demonstrated a positive impact on physical health, psychosocial health, knowledge, health-related behaviours and health resource utilization. Confounding factors could have affected the results.

4.2.5 Internet

Invest in Kids (Russell, 2002, Type 5) reviewed hundreds of websites devoted to parenting and child development with the following results:

- The Internet is crowded with parenting websites.
- Most are designed to appeal to mothers, but a growing number have special sections for fathers.
- Most have the appearance of being “expert-driven”, citing research and experts that are well-known.
- Most devote only a small proportion of their space to the early years.
- Many provide an interactive FAQ format, but almost none are comprehensive in the early childhood period. Few websites address social, emotional and intellectual development.
- Many of the sites that have credibility are presented at too high a level for most parents or are not attractive to parents (e.g., dense text, no illustrations).
- There are very few early childhood sites with Canadian content or resources

It is unknown how many parents use the Internet to help them with parenting and child health/development questions, why they use it and which parents use it.

4.2.6 Surveillance

Surveillance in early childhood is more challenging as this population is dispersed (unlike the school age population) and health care is often a joint effort between multiple providers and health/social programs (Williams & Holinshead, 2004, Type 5). Hinman, Saarias & Ross (2004, Type 5) suggest a vision for child health information systems. This vision includes developing stakeholders to promote integration of separate child health information systems within the context of ongoing national initiatives; developing business and policy cases for an integrated system; developing an agreement on standards for collecting and transferring information; and communicating the importance of an integrated system.

4.2.7 Child Care Settings

Use of child care is the norm for Canadian families. In 2002/2003, 49 per cent of BC children aged six months to five years were in some form of child care. About 30 per cent of these children attended group day care centres (Statistics Canada, 2006, Type 5). Half of the highest income families in Canada use non-parental care for their children aged newborn to five years, compared to one-quarter of those at lowest incomes (Norris, Brink, & Mosher, 1999, Type 5).

Infection Control

Children attending child care centres suffer more chronic or recurrent health problems (Mantymaa et al., 2003). The PHRED program (Mann, Buffett, Campbell, Lee, & O'Donnell, 1999, Type 1) completed a review on the effectiveness of child care centre infection control

interventions. The following interventions were found to be successful in improving infection control within child care centres:

- Educational sessions with frequent reinforcement of practices (e.g., three sessions in three weeks) enhanced short-term infection control knowledge and behaviour of handwashing among day care centre staff.
- Immunization status monitoring and follow-up by public health nurses increased the rate of adequate protection.
- Exclusion and treatment policies were effective in controlling *Giardia* infections in children attending day care centres; however, a strict exclusion and treatment policy was found to be no more effective in preventing *Giardia* infections in children attending day care centres than two other less stringent exclusion and treatment policies.

Nutrition

Child care centres have been identified as appropriate settings for nutrition education and the promotion of healthy eating. The majority of evidence in this area consists of observational studies and expert opinion/guidelines. The American Dietetic Association (2005, Type 5) practice guidelines recommend that child care programs achieve benchmarks for meeting children's nutrition and nutrition education needs to support healthy growth and development. Gupta, Shuman, Taveras, Kulldorff, and Finkelstein (2005, Type 4) found that almost 90 per cent of parents and child care directors believed that health promotion activities would improve the nutrition knowledge and eating behaviour of preschool children.

A nutrition and physical activity curriculum for child care settings resulted in increased physical activity as well as increased knowledge about movement and nutrition (Dunn et al., 2006, Type 3). Williams, Strobino, Bollella, and Brotanek (2004, Type 3) found that a preschool heart health intervention was effective in reducing serum cholesterol of preschoolers. Cason (2001, Type 4) found that a child care healthy eating teaching strategy resulted in increased willingness to taste different foods; increased knowledge of healthier choices; increased consumption of healthy food group choices; and decreased consumption of fats and sweets among preschool children.

Strategies that promote nutrition education and healthy eating include

- Parental involvement in the program – identified as the most important component in the success of nutrition programs for child care (Sharaga Swadener, 1994, Type 1).
- Programs are developmentally appropriate for the children (Sharaga Swadener, 1994, Type 1).
- Teaching is activity-based (Sharaga Swadener, 1994, Type 1).
- Teaching activities are food-based (Sharaga Swadener, 1994, Type 1).
- Teaching activities may be brain-based (Anderson & Herz-Braun, 2001, Type 3) or play-based (Levy & Cooper, 1999, Type 3; Matheson, Spranger, & Saxe, 2002, Type 4).

- Use of multiple intelligence teaching strategies (Cason, 2001, Type 4).
- Strategies based on reward should be used cautiously (Gupta et al., 2005, Type 4; Story, Kaphingst, & French, 2006, Type 5; Tedstone, Aviles, Shetty, & Daniels, 2002, Type 3).

Barriers to nutrition education and the promotion of healthy eating in child care settings include:

- Lack of knowledge of food and nutrition issues among child care providers (Alderton & Campbell-Barr, 2005; Nahikian-Nelms, 1997, Type 4).
- Lack of training in food and nutrition for child care providers (Buadoo & Seabrooks, 2005, Type 5).
- Child care providers displaying behaviours at mealtimes that are inconsistent with their beliefs and expert recommendations (Nahikian-Nelms, 1997) (Type 4). Such behaviours include rushing eating time, missing opportunities for nutrition teaching, and missing opportunities to encourage children to taste different foods (Gable & Lutz, 2001, Type 4).

There has been a call for support and training for child care providers for nutrition education and healthy eating promotion (Moore et al., 2005; Ziegler, Briefel, Clusen, & Devaney, 2006, Type 4). Studies have found that providing training for child care providers resulted in the child care providers implementing and sharing these activities with children and parents (Buadoo & Seabrooks, 2005, Type 5; Fontaine, Torre, Grafwallner, & Underhill, 2006, Type 4; Roths, Fees, Bailey, & Fitzgerald, 2002, Type 4; Fletcher & Branen, 1999, Type 5). The specific content of training has included

- Awareness of child care providers as role models (Roths et al., 2002, Type 4; Fletcher & Branen, 1999, Type 5).
- Advice on nutritionally appropriate food and drink choices for under-fives (Fletcher & Branen, 1999, Type 5).
- Adults should eat with children (Fletcher & Branen, 1999, Type 5).
- Division of responsibility for feeding: Adults set the environment for feeding, including what is offered, when and how it is presented; children decide what to eat from what is offered, how much to eat and whether to eat (Fletcher & Branen, 1999, Type 5).
- Children should serve themselves (Fletcher & Branen, 1999, Type 5).

A nutrition and physical activity self-assessment instrument for child care settings is being pilot-tested (Benjamin, Ammerman, Sommers, & Ward, 2005, Type 5).

Other recommendations related to nutrition in child care settings:

- Child care facilities should support and facilitate continued breastfeeding and breast-milk feeding (World Health Organization, 2003, Type 5).
- No peanuts, peanut butter or peanut-containing foods should be allowed in settings where children may be allergic to peanuts (Canadian Allergy, Asthma and Immunology Foundation, 1997, Type 5).

Speech, Language and Communication

Caregiver use of responsive language in preschool and child care settings has been determined to impact children's use of language. Girolametto and Weitzman (2002) (Type 4) found that caregiver strategies, including use of child-oriented utterances, interaction-promoting utterances and language modeling, were significantly correlated with measures of preschoolers' language production. Girolametto, Weitzman and Greenberg (2003, Type 3) studied the outcome of in-service training for day care providers involving language facilitation strategies. The Hanen Centre's Learning Language and Loving It program was provided by a trained speech-language pathologist. Children in the experimental group were found to produce more utterances, produce longer utterances and to talk to peers more as compared to the control group. A number of other studies (cited in Girolametto et al., 2003) support the recommendation that in-service education should be offered to early child care educators to promote an interaction style that facilitates the children's participation in conversations with their caregivers and their peers (Ogilvy, 1992; Roberts, Bailey, & Bube Nychka, 1991; Weitzman, 1994).

General Health Needs

Alkon and Boyce (1999, Type 4) completed a study to identify preschool children's health needs in child care centres as perceived by parents and staff. The majority of parents and staff reported that onsite health services were needed at least once a week. Helpful areas were identified as: screening exams for respiratory illnesses/other illnesses, developmental problems and children with special needs. The most commonly identified child health problems were colds and ear infections. The authors conclude that efforts to protect the health of preschool children in child care centres might best begin with health services focused on prevention, such as screening children for illnesses and providing information on infection control.

Group Settings

There was limited formal literature found on public health services in group settings (e.g., mother-baby groups). Kruske, Schmied, Sutton, & O'Hare (2004, Type 4) found that a group approach (facilitated by a family health nurse) appeared to promote group relationships and to empower mothers as a group by de-emphasizing the power and expertise of the professional.

4.3 Key Findings

Types 1 and 2

- There is strong evidence to support early childhood development programs for their effectiveness in preventing delay in cognitive development and increasing readiness to learn.
- The effectiveness of preschool prevention programs for disadvantaged children are greatest for those that have a direct teaching component in preschool, have a follow-through educational component in elementary school and are longer in duration.
- There is good evidence to support professional or professional/paraprofessional home visiting programs to improve maternal/family and child outcomes. Programs that offer home visiting services in conjunction with centre-based early childhood education appear

to produce larger and longer lasting results than programs that offer home visiting services alone.

- Telephone use as a method of providing health care interventions (in the context of other services such as home visiting or educational materials) has demonstrated positive impacts on health, knowledge, behaviours and health resource utilization.
- Child care settings are an important venue to influence child and parental health. Positive outcomes are found for education of staff and parents around a number of topics (e.g., infection control, nutrition, speech/language).

Type 5

- Studies demonstrate that early childhood prevention programs aimed at decreasing the incidence of childhood problems are more successful over the long term if they involve the parents, begin early in the child's life and address multiple risk factors.
- The Internet is a growing source of information, but has not been adequately studied for the early childhood population.
- There are gaps in health surveillance for the early childhood population.
- There was limited literature found on public health services in group settings.

5.0 PARENTING

5.1 Introduction

Parenting plays a significant role in the health and development of the young child. By supporting positive parenting skills, public health services can help to support positive protective factors for children, reduction of risks, positive family functioning, healthy development, school readiness and resilience. The goal is to prevent problems with children's social, physical and emotional well-being.

5.2 The Evidence

5.2.1 Limitations

There are a number of limitations in the parenting literature (Russell, 2002, Type 5). There is minimal research on whether timing interventions to specific times of life (e.g., prenatal) influences the effectiveness of the intervention. There is a lack of understanding about non-responders (e.g., those not engaging in the research, those who do not respond to questionnaires as part of the research methodology) and a lack of interventions focusing on fathers. No attempt has been made to test a combination of effective programs. Much more investigation is needed on the community's intervening relationship with families and children. There has been minimal research on how to take effective research programs to large-scale, community-wide effectiveness trials. Formal literature (particularly systematic reviews and meta-analysis) on parenting in multicultural communities has not been well studied.

5.2.2 Parenting Experiences

Nystrom and Ohrling (2003, Type 1) reviewed the literature on parenthood experiences during the child's first year. Mothers were concerned about being overwhelmed, lack of confidence, limited time for oneself and fatigue. The following issues were found for fathers: being confident as a father and as a partner, living up to the new demands, being prevented from achieving closeness to the child and being the protector/provider of the family.

5.2.3 Parenting Styles

The BC Parenting Task Force completed a parenting support and education literature review (Hume, Hubberstey, & Rutman, 2005). From their report, research has consistently shown that an authoritative style of parenting—responsive and loving but with clear expectations—is optimal. In Canada, about one-third of parents are authoritative, about one-quarter are authoritarian (i.e., demanding, but not responsive), one-quarter are permissive (i.e., responsive, but without expectations or guidelines for behaviour) and one-sixth are neglectful (Hume et al., 2005, Type 1). Competent parents are perceptive, responsive and flexible in their child-rearing practices (Hume et al., 2005, Type 1). Adults who are the most effective as parents are those who respond to the particular characteristics, capabilities and needs of each child and situation.

5.2.4 Parent Attitudes and Behaviours

A survey of Canadian parents (Russell, 2002, Type 5) found that parents realize the importance of the early years and their role, but knowledge about child development is not high. Parents also

do not feel confident in their parenting skills. Parents know little about social and emotional development, yet think they have the most influence in these areas. Often, parents do not feel supported in their role. Parents want to know more, but high levels of information-seeking do not appear to contribute to greater knowledge or confidence.

Russell (2007, Type 5) indicated that “30 per cent of Canadian infants and young children have a social, emotional or learning problem and that many of these problems are related to a lack of positive parenting practices.”

A study by Landy and Tam (1998, Type 4) examined how parenting practices and social support contributed to resiliency and positive child development outcomes. Their analysis of data from the first cycle of the National Longitudinal Survey of Children and Youth (NLSCY) showed that child problems increase as risk factors increase, though there were noted differences of effect for risk exposure at different ages in infancy and early childhood. Researchers found five risk factors to be independently and significantly associated with child problems: single-parent family, parental depression, low level of parent education, low family income, and family dysfunction. Findings were consistent with a number of other research studies, especially with regard to the significant deleterious impact of maternal depression and family dysfunction. The authors conclude that findings speak to the value of general prevention strategies in high-risk neighbourhoods, with specialized services provided in cases of multiple risk factors, maternal depression and hostile family situations.

5.2.5 Parenting and Ethnicity/Culture

Child-rearing practices are organized within culturally distinct frameworks (Melendez, 2005). Culture and family mediate both resilience and vulnerability in the development of infants and young children, and support the achievement of particular developmental tasks (Sameroff & Fiese, 2000). The author was unable to find Type 1 and 2 evidence on parenting and ethnicity/culture. Callister (2005, Type 5) reviewed the literature on culturally competent care for women and children. She found that while databased literature on cultural competency still requires further development, there is evidence of positive outcomes of culturally competent care, including significant improvements in the health and well-being of women and children.

Melendez (2005, Type 5) suggests that of particular concern in the work with culturally diverse families are practices pertaining to sleep, feeding and soothing, since their routine but intimate nature is deeply embedded in values and they are more congruent with parenting goals that were adaptive in the culture of origin. It is not uncommon for these practices to be in direct opposition to the recommendations of the host society or even considered potentially dangerous, and, therefore, to have great potential for being labelled as deviant or in need of modification. “Intervention efforts that are based on solid knowledge of the particular values and practices of parents and caregivers are gaining more and more recognition for their effectiveness” (Melendez, 2005, p. 142). Service providers need to systematically revisit and clarify their understanding of the family’s parenting goals and values and periodically update (together with the child’s caregivers) the issues being addressed through the intervention process (Melendez, 2005, Type 5). Practitioners need to understand the demands inherent to transition and change that can lead parents to cling to traditional practices (Melendez, 2005, Type 5).

McEvoy et al. (2005, Type 4) found that universal concepts in parenting philosophies and practices exist among culturally diverse families. They suggest that providers may approach anticipatory guidance by addressing global parenting concerns that transcend culture. They found a number of universal parenting themes under the following headings: parenting philosophies (e.g., children need to be taught values and respect for elders); influence of American culture and perceived opportunities for children (e.g., television and the media are viewed as positive educational resources for children); and parenting practices (e.g., health care providers have significant credibility regarding the medical care for children).

Bernstein, Harris, Long, Ilda, and Hans (2005, Type 4) found that different aspects of the parent-child relationship may be especially salient and important for child development in different cultural settings: affective responsiveness and closeness for Latin- American dyads; compliance and parental control for African-American dyads; and compliance, parental discipline and teaching for Chinese dyads. The picture is less clear for the Anglo-American dyads.

Yu, Huang, Schwalberg, and Kogan (2005, Type 4) found that immigrant parents are at particularly high risk of alienation from systems of health care and support services that are available to low-income and other vulnerable populations. They found that compared to American-born citizens, non-citizens were at the highest risk of not being aware of health and community resources. The services that non-citizens were most likely to be unaware of were places to get help for family discord, child care issues and family violence.

A Canadian exploratory research project was conducted with parents of children aged 0–5 years in order to identify, support and validate similarities and differences in attachment beliefs, values and practices used by immigrants and refugees (Reebye, Ross, & Jamieson, 1999; St. Joseph's Women's Health Centre & Parkdale Parents' Primary Prevention Program, 1999) (Type 5). Results showed that:

- There are similarities as well as differences in attachment beliefs, values and practices among mothers from different countries of origin. The similarities reinforce the notion that the infant-caregiver attachment relationship and mothers' desire for securely attached children is universal.
- When families migrate to Canada, their experiences of loss of home, family and community, trauma, culture shock, and the process of acculturation, have a large impact on mothers and children and thus provide challenges to their attachment relationships. At the same time, mothers and families tend to focus their energy on creating a better future for their children, and in doing so, maintain effective attachment practices.
- Agencies can help immigrant and refugee mothers and families to create a “better” future for their children by offering support to them in overcoming the great challenges in promoting attachment within a different context than that in which they were raised. Agencies can improve their overall service delivery by learning from and building on the strengths apparent in a group that is upholding strong values, maintaining positive practices and incorporating new ideas in promoting attachment with their children.

There are gaps in the literature on the health of First Nations and Inuit children and youth.

The lack of detailed, longitudinal health data is perhaps the most obvious example. Notwithstanding the empirical research in the First Nations and Inuit Regional Health Surveys, focused research on specific issues (eg: FAS/FAE and its prevalence) and particular sub-populations (e.g., age- or sex-specific studies) is still not being done. Long-term evaluations of existing child and youth programming are also missing from the literature. Moreover, the literature focuses enormous attention on a limited range of 'high-profile' issues (such as breast-feeding), while showing relatively little interest in identifying and addressing emerging problems and concerns (Dion Stout & Kipling, 1999).

Letourneau, Hungler and Fisher (2005, Type 4) utilized the NCATS tool to assess parenting interactions with low-income Aboriginal and non-Aboriginal parents. They found that although low-income Canadian Aboriginal parents may be less verbal with their children in interactions, the overall interaction quality is not different from that of other low-income parents. The sample size in this study was small (n=60). Bent, Josephson and Kelly (2004, Type 4) studied the effects of an Aboriginal cultural enrichment initiative on the self-concept of teenage girls who are pregnant or parenting. They concluded that it is highly beneficial to incorporate a cultural component into services for Aboriginal youth.

Ball (2008) wrote that mainstream programs for Aboriginal children should draw from a multicultural approach, and support inclusion, mutual respect and holism. Services should be community-based, with Aboriginal providers wherever possible supporting cultural relevance and decision-making. Of vital importance is investment in programs that help prepare Aboriginal young people for parenthood, thus promoting stimulating, safe environments for infants and young children.

5.2.6 What Parents Need to Know

There are a variety of parenting areas deemed important in the literature (Russell, 2002, Type 5): major cues and signals of newborns and very young infants; capabilities of children at various ages and stages, including the wide variations of "normal"; child temperament; and practical, effective parenting strategies, including effective discipline. The Canadian Paediatric Society has a position statement on the components of effective discipline (Canadian Paediatric Society, 2004, Type 5).

The development and support of self-regulation (e.g., for sleep, toilet training, feeding) is important for parents to know. Although self-regulation has a hereditary basis, it develops rapidly in the first four years of life, with marked improvements occurring in the third year. Individual differences in self-regulation, although due partly to heredity, are also associated with the quality of mother-child interactions. Warm, supportive parenting, rather than cold, directive parenting, appears to predict higher levels of self-regulation. Individual differences in self-regulation that emerge during the first five years of life have been linked to higher levels of adjustment, social competence, committed compliance and conscience, concurrently and in the future (Eisenberg, 2005, Type 5). Raver (2004, Type 5) reviewed the self-regulation literature

and found that emotional regulation is influenced by differing income, risk and sociocultural contexts.

Parents need improved knowledge, skills and confidence, regardless of their age, income, education, marital status, gender or working status. Most parents have very limited knowledge about how children grow and develop. Too many parents fail to use the positive parenting practices that promote healthy social, emotional and intellectual development (Russell, 2007, Type 5).

5.2.7 Fathers

The Father Involvement Initiative in Ontario reviewed the literature on the effects of father involvement on their children and themselves (Allen & Daly, 2002, Type 5). The literature was not graded by type. Results of this review showed that infants/children of involved fathers

- Are more cognitively competent at 6 months and score higher on the Bayley Scales of Infant Development. Infants are also more likely to be securely attached to their fathers, are better able to handle strange situations, are more resilient, more curious, relate more maturely to strangers, react more competently to complex stimuli and are more trusting in branching out in their explorations.
- Are more likely to demonstrate more cognitive competency on standardized intellectual assessments and are more likely to become educationally mobile young adults with higher levels of economic and education achievement, career success, occupational competency and psychological well-being.
- To a greater extent, experience overall life satisfaction.
- Demonstrate a greater tolerance for stress and frustration, have superior problem-solving and adaptive skills, are more playful, resourceful, skillful and attentive when presented with a problem, and are better able to manage their emotions and impulses.
- Are more likely to demonstrate a greater internal locus of control, have a greater ability to take initiative, use self-direction and control and display less impulsivity.
- Have greater overall social competence, maturity and capacity for relatedness with others. They are more likely to have positive peer relations and to have pro-social sibling interactions.
- Are more likely to grow up to be tolerant and understanding, be well socialized and successful adults, have long-term successful marriages, have supportive social networks and adjust well to college.
- Are less likely to engage in delinquent behaviour associated with less substance use among adolescents, less drug use, truancy and stealing and lower frequency of externalizing and internalizing symptoms such as acting out.

There are benefits to fathers as well. Men who are involved fathers

- Feel more self-confident and effective as parents, find parenthood more satisfying, feel more intrinsically important to their child and feel encouraged to be even more involved.
- Are more likely to see their interactions with their children positively, be attentive to their children's development, better understand and be accepting of their children and enjoy closer, richer father-child relationships.
- Are more likely to exhibit greater psychosocial maturity, be more satisfied with their lives, feel less psychological distress and are more able to understand themselves, empathically understand others and integrate their feelings in an ongoing way.
- Report fewer accidental and premature deaths, less than average contact with the law, less substance abuse, fewer hospital admissions and a greater sense of well-being overall.
- Are more likely to participate in the community, do more socializing, serve in civic or community leadership positions and attend church more often.
- Some evidence suggests that involved fathering is correlated with marital stability and is associated with marital satisfaction in midlife. They are more likely to feel happily married ten or twenty years after the birth of their first child and be more connected to their family.

Research with community samples has demonstrated that certain aspects of fathers' parenting quality have significant effects on child outcomes (Amato & Rivera, 1999, Type 1). Authoritative parenting by the father is associated with fewer child behaviour problems. Gavin et al. (2002, Type 4) showed that fathers' involvement with the infant during the first 2 months after birth was strongly predicted by the quality of the marital relationship and by the father's relationship with the maternal grandmother. Harrison, Magill-Evans and Sadoway (2001) reviewed the literature as part of a study comparing use of the NCATS tool with mothers and fathers. There are differences in responsiveness between fathers and mothers with results varying between cultures.

There is less literature and evaluation on services to support father involvement. There is some evidence that if interventions involve active participation with or observation of the father's own child, the intervention may be effective in enhancing both the father's interactions with and perception of the child (Magill-Evans, Harrison, Rempel & Slater, 2006, Type 1). There is less information on how interventions influence child development. Fagan and Iglesias (1999, Type 3) found that an intervention designed to increase father/father figure involvement in Head Start showed positive results. Saleh, Buzi, Weinman and Smith (2005, Type 4) found that for young fathers, becoming more involved with their children is a process that can be facilitated by participating in a fatherhood program. Paternal intervention programs may be an effective means of reducing the perceived parental stress fathers experience as they attempt to become more actively involved in raising their children (McBride, 1991, Type 3).

Factors significantly associated with fathers' involvement in their children's health care include attending well-child visits, attending the child's delivery, younger child age, older father age and having more than one child (Moore & Kotelchuck, 2004, Type 4). Fagerskiold (2006, Type 4)

identified what expectations fathers of infants have for child health care. Findings included that fathers may feel slighted at child health clinics if the nurse turns only to the mother. Many fathers want to share the infant care and desire more communication with the nurse.

5.2.8 Teen/Young Family Parenting

The author was not able to find any Type 1 or 2 evidence on teen/young family parenting services.

Dilworth (2006, Type 5) completed a literature review (evidence not graded) on poverty, homelessness and teenage pregnancy. The research suggests that young parents face a life of poverty, have lower levels of education and have less opportunity in the workplace than non-parenting teens. When there is research on teen pregnancy prevention, it usually focuses on negative aspects of being a teen parent. For example:

- There is a close correlation between dropping out of school, early pregnancy and poverty.
- Children of teenage parents are more likely to have problems and to become teenage parents themselves, thus perpetuating the cycle of poverty begun by a teenage birth.
- Teen mothers often find themselves to be undereducated, underemployed and underpaid, (promoting a generational cycle of disadvantaged families).
- Early child-bearing holds a risk of delaying emotional development, of high stress and potentially abusive environments, and of the reduction of life opportunities for both mother and child.
- The costs of adolescent parenthood for society are numerous. The mother's education is often interrupted or terminated, leading to a loss of or reduction in future earning power, and a life of poverty.

The Centre for Community Child Health, Royal Children's Hospital (2004, Type 5) completed a literature review on parenting, which includes a section on parenting in adolescent/young families (see report for citations). There are a number of methodological problems in the literature, including a rarity of longitudinal studies, measurement issues and small sample sizes. However, reviews have concluded that there are no differences in cognitive or social development in the first two years of life for children born to adolescents. There is, however, some research that suggests that children of adolescents are more likely to experience health complications (e.g., low birth weight, prematurity, illness). Small but consistent differences in cognitive development and psychosocial functioning have been found during the preschool to early school years. Children of adolescent parents experienced lower school achievement, more misbehaviour, conduct disorder and school problems. Children of adolescent parents were more likely to become teenage parents themselves. As adults, the offspring of adolescent parents perform lower than children of older parents on measures of education, mental health, financial independence, deviant behaviour and substance use.

Negative outcomes for children of adolescents are not inevitable. The following factors can predict positive long-term outcomes for the children of adolescents (Centre for Community Child Health, Royal Children's Hospital, 2004, Type 5):

- Being at grade level at time of pregnancy.
- Having a high level of education.
- Attending schools that have a program for pregnant girls.
- Holding aspirations for further education during pregnancy.
- Finishing high school.
- Having fewer children.
- Growing up without welfare assistance.

Research has also examined parenting knowledge, style and behaviour of adolescent mothers (Centre for Community Child Health, Royal Children's Hospital in Melbourne, 2004).

Adolescent parents have been found to

- Be less knowledgeable about child development.
- Be more likely to rely on less reliable sources of parenting information, such as family and friends, rather than books and training programs.
- Have a greater number of passive face-to-face interactions with their children.
- Stimulate their infants less through interaction and provide less stimulating environments.
- Smile and talk to their infants less.
- Be less responsive and have fewer positive physical and eye contacts.
- Perceive their infants to be more difficult, and hold unrealistic expectations for their development.
- Underestimate and overestimate the age at which children will reach particular developmental milestones.
- Be more disengaged, restrictive, physically intrusive and punitive.
- Engage in fewer elaborative and descriptive responses to their infants.
- Be less committed and satisfied with the parenting role.
- Be more likely to maltreat and neglect children.

Adolescent parents have also been found to lack knowledge of child development (Centre for Community Child Health, Royal Children's Hospital, 2004). The majority of adolescent pregnancies are unplanned. Therefore, in addition to minimal prior experience with children, the typical adolescent parent possesses limited knowledge of child development and behaviour, and

does minimal research or preparation for the child. Thus, it may be that the parenting deficits seen among adolescents can be attributed in part to lack of experience.

Less than optimal parenting and higher levels of developmental and psychosocial problems in the children of adolescents cannot, however, be attributed to the effect of parental age alone. The social conditions in which many adolescent parents live are in themselves significant risk factors. Teenage mothers are more likely to be less educated, live in poverty, have less earning potential, receive welfare, have larger families, live in more crowded homes, experience physical health problems during pregnancy and childbirth, and have limited social support. Psychological and emotional problems associated with teen parenting—low self-esteem, stress, depression and substance abuse—are also likely to exert direct affects on children's development. The higher rates of depression in adolescent mothers may be associated with, among other things, the cumulative stresses associated with becoming a mother, being an adolescent, adjusting to change, and living in financial difficulty.

Families headed by adolescent parents are a high-risk group that warrants systematic early intervention and support (Centre for Community Child Health, Royal Children's Hospital, 2004, Type 5). Group-based intervention has been shown to be both more supportive and more cost-effective than individual intervention. Intervention needs to take into account the parents' own developmental and social needs, with an important goal being to help adolescent mothers stay at school. Programs should incorporate other adults (for example, grandparents) living with the child. Dropout from parenting programs is high among adolescent parents, and specific strategies are needed to engage and maintain their involvement (for example, home-based programs, programs in the school setting, multiple services from one contact point). Letourneau (2001, Type 2, but small sample size) found that the following factors affected attrition rates in a teen parenting program: infants who were admitted to the NICU, mothers who had partner difficulties and mothers/infants who were visited for less than 60 minutes per week as part of the program intervention.

Other researchers have studied teen parenting programs and other supports. Williams and Sadler (2001, Type 4) found that there were positive outcomes (e.g., improvement in grades, no repeat births) for offering child care and social support services to teen parents and for implementing high school-based child care centres as alternative sites for these services. Lennon, Aber and Blum (1998, Type 5) analyzed the outcomes of three teenage parenting programs: the New Chance Demonstration; the Learning Earning, and Parenting (LEAP) Program; and the Teenage Parent Demonstration (TPD) Program. All three programs target disadvantaged teen populations. All programs increased school attendance, but none of the programs resulted in higher rates of high school graduation. None of the programs affected reading levels or increased employment or wages or rates of pregnancy and subsequent births. The programs had mixed effects on parenting and child outcomes.

Gepkens and Gunning-Schepers (1996, Type 5) provided a review of published evaluations of teen-tot programs. They reported moderate success in preventing repeat pregnancies, helping teen mothers continue their education, and improving teen and infant health over a 6- to 18 month period. However, the evaluations had limitations. Koniak-Griffin et al. (2003, Type 2) evaluated two-year post-birth infant health and maternal outcomes of an early intervention

program (home visiting by public health nurses) for adolescent mothers. Pregnancies and use of marijuana in the first 24 months post-birth were significantly lower in the intervention group. Percy and McIntyre (2001, Type 4) completed a pilot study (small sample size) on using Touchpoints to promote parental self-competence in low-income, minority, pregnant and parenting teen mothers. There was a significant increase in parenting self-confidence. A review of 53 teen parenting programs in New Mexico found positive outcomes in promoting educational attainment and employment (Philliber et al., 2003, Type 5). The research literature indicates that family support is particularly important to teenage mothers and has been found to have a positive influence on parenting behaviours and practices. Families, partners and peers tend to provide different, but complementary, forms of support for teenage mothers, which appear to contribute to more positive outcomes (Bunting & McAuley, 2004, Type 5). Forer and Holden (2004, Type 5) completed a British Columbia study that examined how young parents (youth) and their children are valued and supported in the province. They found fragmentation of services for this population and lack of evaluation of programs due to lack of resources.

5.2.9 Parenting Prevention Services and Interventions

What Health Care Providers Need to Do

David, Goouch, Powell and Abbott (2003, Type 5) summarize a literature review on what “practitioners need to be able to do” to support healthy child development. Examples include understanding attachment and understanding the importance of a child being special to at least one significant person in order to promote resilience, and being informed about young children’s development. A complete list is found in Appendix 3.

Parent Education and Support

There is strong consensus that parents matter in how their children develop and function. Parent support programs seek to influence children’s outcomes by motivating changes in parents through a variety of social and practical support, including case management that links families with services, education on child development and parenting practices, and social support through relationships with service staff and with other parents (Dillon Goodson, 2005, Type 5).

There is clear evidence that parent education and support programs are effective in creating positive changes in children’s behaviour as well as changes in parents’ behaviours and relationships with their children (Hume et al., 2005; McCain & Mustard, 1999) (Type 1). The evidence also indicates that “intensity matters”—that the more issues a family presents, the more a multi-modal program is required (e.g., one that includes a variety of strategies such as parent training, home visits and parenting groups, along with connections to other health and social services) (Hume et al., 2005, Type 1).

”Programs with stronger effects on children’s social and emotional development share three characteristics. The programs:

- Target children with a specific need that has been identified by the parents, such as behavioural or conduct disorder or developmental delay,
- Use professional rather than paraprofessional staff, and

- Provide opportunities for parents to meet together and provide peer support as part of the service delivery approach” (Dillon Goodson, 2005, Type 5).

Regardless of method of parenting education/support delivery, standardized written information or instructions provided in combination with other activities, such as videotaped vignettes, role-play or facilitated discussion appear to be most effective at achieving lasting behaviour changes (Centre for Community Child Health, Royal Children’s Hospital, 2004, Type 1). Overall, there is consensus among researchers that effective parenting education and support programs share the following characteristics (Hume et al., 2005; Moran, Ghate, & van der Merwe, 2004; Centre for Community Child Health, Royal Children’s Hospital, 2004) (Type 1):

- Have a strong theoretical base and a clearly articulated model of how the program interventions lead to change.
- Use social learning theory whereby participants have an opportunity to observe behaviour and attitudes of others (e.g., through role modeling, videos).
- Offer principles for supporting and reinforcing children’s positive behaviour rather than teaching specific techniques.
- Tend to be of fixed duration, usually 5–15 weeks.
- Emphasize interventions that are highly scripted (e.g., have defined curriculum) and delivered by well-trained staff who receive ongoing support and supervision.
- Emphasize interventions that have measurable objectives.
- Provide program handouts or “tip sheets” to reinforce verbal program messages. Written material needs to be simple, readable, culturally sensitive and at an appropriate literacy level (Grade 8 or lower).
- Are accessible and allow families to enter from a variety of referral sources.
- Use more than one intervention strategy and allow for longer duration/follow-up for higher risk families.
- Offer parallel and joint interventions with children, parents and families.
- Provide a range of universal and targeted interventions.

There is sufficient evidence to support the use of parenting programs with diverse groups of parents (Barlow, Coren & Stewart-Brown, 2001; Thomas et al., 1999; Barlow, Parsons & Stewart-Brown, 2005; Barlow & Parsons, 2003) (Type 1). The following components have been found to be effective (Thomas et al., 1999; Centre for Community Child Health, 2004; Russell, 2003) (Type 1):

- Behavioural programs based on parental empowerment models.
- Uses role play or discussion of videotaped interactions versus just discussion alone.
- Provides handouts for reinforcement at home.

- Uses a specific time-limited curriculum directed at improving parent-child relationships and child behaviour through changing parental behaviour.
- Presents an easy-to-understand overarching framework of child development and parenting and adapts it to each family/home situation.
- Includes very practical parenting strategies.
- Teaches parents the basics of development through infant ages and stages; newborn cues and signals to communicate and how parents can respond appropriately; the basics of temperament and what is typical; and the fundamentals of balancing parental warmth or supportiveness with control.
- Demonstrates the fun and playful side of parenting children without being artificial.
- Begins in pregnancy and continues through the toddler years.
- Includes incentives such as child care and reimbursing transportation costs.

There is some support for the use of group-based parenting programs to improve the emotional and behavioural adjustment of children under the age of 3 years (Barlow et al., 2005; Barlow & Parsons, 2003) (Type 1). However, there is insufficient evidence to reach any firm conclusions regarding the role that such programs might play in the primary prevention of such problems. Furthermore, there are limited data available concerning the long-term effectiveness of these programs (Barlow & Parsons, 2003, Type 1). There is currently insufficient evidence to reach any firm conclusions regarding the role of parenting programs in the primary prevention of mental health problems (Barlow et al., 2005; Barlow & Parsons, 2003) (Type 1). Limitations of the literature include applicability to less than 18 months old, issues with recruiting methods and lack of identification of ethnicity.

A Cochrane review indicated “there is insufficient evidence to support the use of parenting programs to treat physical abuse or neglect (i.e., such as the incidence of child abuse using reports of child abuse/injuries or children on the children protection register). There is, however, limited evidence to show that some parenting programs may be effective in improving some outcomes that are associated with physically abusive parenting (Barlow, Johnston, Kendrick, Polnay & Stewart-Brown, 2006, Type 5).

A Cochrane review of parent-training programs for improving maternal psychosocial health including anxiety, depression and self-esteem (Barlow et al., 2001, Type 1) found that they can make a difference in the psychosocial health of mothers, but there is a lack of evidence regarding maintenance over time. Most studies did not discern what type of program it was (cognitive versus behavioural) or how the program was delivered. Lack of methodological rigor, interpretability of the outcome measures, reporting bias and drop-out rate were all limitations.

Cambridge, Lexington, Hadley and Bethesda (2001, Type 5) found that family support programs have small but statistically-significant effects in all outcome domains. They found that programs have larger effects on children’s cognitive outcomes if parents are provided with opportunities for peer support; programs for children at biological risk are least effective in

producing positive change in children's health and physical development; programs targeting teenage parents with young children that combine case management with parent-child activities are more effective in protecting children from accidental injury, abuse or neglect; programs that use professional staff to help parents be effective adults and that provide opportunities for parents to meet in support groups, are more effective in producing positive outcomes for parents.

Waddell, Godderis, Wong and Garland (2004, Type 1) reviewed parenting programs related to children's mental health. The Incredible Years program has been found to be appropriate for use with toddlers and preschool children and has been demonstrated to improve children's behaviour in a cost-effective manner. Programs such as Triple P have demonstrated that outcomes for children can be improved when parent training is supplemented by addressing co-occurring family problems such as marital conflict and parental depression (Sanders, 2003, Type 5). Video modelling, practice with parents and self-directed approaches have been demonstrated to contribute to the success of Triple P. Right from the Start is another example of a successful behavioural family intervention program that focuses on attachment issues with parents of children under two years. Nobody's Perfect, implemented extensively throughout Canada, is currently undertaking a national evaluation of outcomes. A 2003/2004 evaluation in Ontario found positive effects for those who completed the program (Peterborough County-City Health Unit, 2005). The Parent-Child Mother Goose Program is used in Ontario, Alberta and British Columbia and focuses on language and cognitive development through rhythm, rhyme and storytelling. Preliminary evaluation results show that it has a positive impact on parents, the parent-child relationship and child development (Joshi, 2006).

Researchers investigating the costs of providing an evidence-based parenting intervention program that blends universal and targeted components (Triple P–Positive Parenting Program) found that costs were justified when comparing costs associated with the effects of child maltreatment. Additionally, it is postulated that the investment in training and program delivery would work synergistically throughout the community served, adding to and reinforcing the benefits received by an individually targeted child. With a public health approach, the costs of training would drop with each child served by the program. Though full economic analysis of a Triple P Trial is recommended, Foster, Prinz, Sanders & Shapiro (2008, Type 5) conservatively estimate that costs of the program would be recovered by a modest 10 per cent reduction in cases of maltreatment in a single year.

Physicians

Physicians are the top group that parents turn to for information and advice (Russell, 2002, Type 5). However, parents generally visit their children's physicians only a few times a year and usually about physical health issues. It is unknown whether parents change their parenting based on physicians' advice. O'Brien Caughy, Huang, Miller, and Genevro (2004, Type 2) studied the outcomes of the Healthy Steps for Young Children Program, which was designed to provide support for new parents through the pediatrician's office. The intervention group had greater security of attachment and fewer child behaviour problems.

Verbal Information

While the available research suggests that clear, standardized verbal suggestions are effective in delivering information, all the studies identified used specific and relatively simple content. To achieve profound behavioural change or for teaching complicated skill sequences, effectiveness research suggests that verbal information alone is insufficient. Thus, for altering parent-child behaviours, verbal suggestions are best accompanied by other education methods (Centre for Community Child Health, Royal Children's Hospital, 2004, Type 5).

Telephone Information/Advice

Telephone information alone has not been shown to have an impact on parenting skills and child functioning; however, it can be a useful part of a multi-media parent training package or combined with other strategies (Centre for Community Child Health, Royal Children's Hospital, 2004, Type 5). The delivery of standardized instructions appears to be more effective than ad hoc information.

Electronic Mail

Very little research is available on the use of email communication for delivering parenting information (Centre for Community Child Health, Royal Children's Hospital, 2004, Type 5). While it appears that it may have advantages for administrative staff in reducing telephone contact time with families, there are medicolegal and privacy issues to be considered.

Books and Magazines

Books and magazines typically authored by child development and parenting experts are generally regarded as a source of sound and practical information for parents (Russell, 2002, Type 5). Parents less than 25 years of age with children under 3 and those who have more than a high school education are more likely to read books and magazines. There is limited information on what parents are reading about and the impact on parenting (Russell, 2003).

World Wide Web

Given the wealth of information available via the World Wide Web and the relatively easy accessibility to families it could be an effective resource, provided families have the skills and resources to identify reputable websites and accurate information (Centre for Community Child Health, Royal Children's Hospital, 2004). There is limited evidence on using this method to affect parenting outcomes.

Television

Almost all families with young children have television in their homes. Television industry surveys have found that 30 percent of children watch television with an adult in the same room. This implies that programming on parenting and child development could reach some parents through this source (Russell, 2002, Type 5). The effectiveness of parenting and preschool television programs on improving parenting, including the kinds of information that parents want to receive, has not been established (Russell, 2002, Type 5).

The Centre for Community Child Health, Royal Children's Hospital (2004, Type 5) has reviewed the literature on the use of television in affecting parenting outcomes. The use of mass media remains a controversial area due to a number of factors. These include justifying the costs of large campaigns given the difficulty in measuring effectiveness of the mass media impact on the population in terms of increased knowledge and behavioural changes. Most campaigns appear to be effective in achieving a significant increase in knowledge regarding health education issues, but the retention of this knowledge following cessation of the intervention is variable or often not known in the long term. Behavioural changes are much more difficult to achieve and measure, although they are more likely to be achieved through sustained mass media campaigns involving several strategies. These could include television programs and additional support systems such as telephone help lines, resource centres and support groups. Cost benefits of programs are also difficult to determine and many studies do not even attempt to include this aspect in their analyses, although several have reported negative costs associated with dramatic increases in utilization of existing health services.

The Triple P program in Australia conducted a study regarding the impact of those who watched 13 televised installments of the program Families, which contained segments on Triple P. Those who watched the series as part of a controlled study (Type 2) reported an increase in parenting confidence, a reduction in their children's disruptive behaviour, a decrease in poor parenting practices and high levels of consumer satisfaction with the program (Hume et al., 2005). These results were achieved under ideal conditions whereby the participants watched all 13 episodes and were provided with Triple P fact sheets that supported the media presentations.

Parent Health Education Resource Material

Lilley and Price (2005, Type 5) summarized the literature on parent health education resource material for those at-risk with children between 0–3 years old. Key findings included:

- Parent health education resource material can improve the confidence, knowledge, attitudes and practices of parents in certain populations.
- Only a limited number of concepts should be provided at any one time.
- A variety of formats have demonstrated their effectiveness in modifying parents' knowledge, attitudes and behaviours; however, no single, comprehensive book appears to have done so.
- For comprehensive resources, two formats have demonstrated effectiveness: age-paced bulletins and a parenting kit made up of a collection of resources, including videos and booklets.
- Effective health education resources for vulnerable parents are either written to a grade 5 level (or lower) or use a combination of both videos and written material.

There have been no studies completed on the utility and efficacy of the BC government's parenting book: *Toddlers First Steps: A Best Chance Guide to Parenting Your 6- to 36-Month-Old Child*.

The Centre for Community Child Health, Royal Children's Hospital (2004, Type 5) reviewed the literature on print materials. Informational handouts can be effective educational tools, particularly when they are accompanied by a personalized approach and advice. A personalized approach generally substantially increases people's recall of the material presented, and its effectiveness in achieving its desired outcomes. In particular, it helps to engage parents' interest and motivation, an essential step if handouts are to be effective teaching tools. Written material needs to be readable and readily understood. Informational literature should consider literacy level. The text should be simple, direct and focused. An understanding of cultural differences, particularly as they relate to parenting and early childhood, is critical to providing effective services in a multicultural society. Differences in family expectations, communication and learning styles need to be identified and understood, and assessments, instructions and information adapted in culturally appropriate ways. Further research is needed to ascertain the most effective ways to achieve culturally sensitive family interventions.

CD-ROMS

The few studies to date that have contrasted technology-based education with traditional methods have tended to focus on students in higher education courses rather than parent education. Results have shown similar outcomes to traditional methods (Centre for Community Child Health, Royal Children's Hospital, 2004). Of those studies that involved parents, very few were long-term or they contrasted various methods of instruction. Additional research is needed before conclusions can be drawn on the efficacy of CD-ROMS.

Parent-held Records

While parents express high levels of satisfaction with parent-held health records, research is limited to studies of satisfaction and deployment rates (Centre for Community Child Health, Royal Children's Hospital, 2004). It is not yet clear whether the record's content relevant to developmental promotion is effective in guiding parenting skills and preventing or intervening with problematic child behaviours and development.

Videotape

Instructional videotapes have been effective in producing short-term increases in client knowledge when shown on specific topics in situations such as clinic waiting rooms. However, whether this increase is maintained over time is not known, as studies have focused on immediacy of information recall (Centre for Community Child Health, Royal Children's Hospital, 2004). A combination of video series and verbal discussion groups appears to be most effective in achieving such learning.

Role Playing and Modeling

The Centre for Community Child Health, Royal Children's Hospital (2004, Type 5) has reviewed the literature on role playing and modeling. Role playing and modeling are effective methods for imparting to parents not only knowledge about child-rearing, but also useful skills. When visual imagery is accompanied by verbal instructions and/or opportunities for discussion such as role-play, it helps parents to learn and construct their own knowledge base, and this is consolidated through trial and error, mutual feedback and identifying opportunities for practice

in their daily routines. This practice appears to be particularly important in the area of promoting effective mother-child interaction, but has also been seen to be a useful component of parent training behaviour management programs.

Group Parent and Child Visits

The Centre for Community Child Health, Royal Children's Hospital (2004, Type 5) has reviewed the literature on group parent and child visits. Group parent and child visits have tremendous potential as a mechanism for assisting parents in child-rearing, triaging families with special prevention and intervention needs to more intense services, and offering culturally sensitive and relevant care to minority groups. One of the ways in which group visits appear to work is by engendering networks among families who, in turn, provide each other with ongoing support and guidance.

5.3 Key Findings

Types 1 and 2

- There is clear evidence that parent education and support programs are effective in creating positive changes in children's behaviour as well as changes in parents' behaviours and relationships with their children.
- There is consensus among researchers that effective parenting education and support programs share a number of common characteristics.
- There is some support for the use of group-based parenting programs to improve the emotional and behavioural adjustment of children under the age of 3 years. However, there is insufficient evidence to reach any firm conclusions regarding the role that such programs might play in the primary prevention of such problems. Furthermore, there are limited data available concerning the long-term effectiveness of these programs. There is currently insufficient evidence to reach any firm conclusions regarding the role of parenting programs in the primary prevention of mental health problems.
- There is limited good literature on services to support father involvement in parenting. There is some evidence that if interventions involve active participation with or observation of the father's own child, the intervention may be effective in enhancing both the father's interactions with the child and a positive perception of the child.
- The author was unable to find Type 1 and 2 evidence on parenting and ethnicity/culture or teen/young parenting services.

Types 3 and 4

- Immigrant parents are at particularly high risk of alienation from systems of health care and support services that are available to low-income and other vulnerable populations.

Type 5

- The literature identifies key areas of parenting that parents need to know.
- While literature on cultural competency still requires further development, there is some evidence of positive outcomes for culturally competent care.
- There are scant long-term evaluations and good research on child and youth programming for First Nations and Inuit children.
- There have been mixed results on teen parenting and teen-tot programs. Group-based intervention for adolescent parents has shown to be both more supportive and more cost-effective than individual intervention. Intervention needs to take into account the parents' own developmental and social needs. Programs should incorporate adults living with the parenting youth.
- Physicians are the top group that parents turn to for information and advice. However, it is unknown whether parents change their parenting based on physicians' advice.
- Regardless of method of parenting education/support delivery, standardized written information or instructions provided in combination with other activities, such as video-taped vignettes, role-play or facilitated discussion appear to be most effective at achieving lasting behaviour changes.
- Although there is a plethora of books and magazines on parenting, there is limited information on what parents are reading about and the impact on parenting.
- The effectiveness of parenting and preschool television programs, giving verbal information or telephone advice without other interventions, use of electronic mail, CD-ROMS and the World Wide Web has not been established.
- Best practices for the development of parent health education resource material have been identified, but systematic reviews could not be found.

6.0 GENERAL DEVELOPMENT

The Canadian National Longitudinal Survey of Children and Youth (Cycle 1 1994/1995 and Cycle 2 1996/1997) showed that 14 per cent of young Canadian children are affected by poor development attainment (To et al., 2004, Type 5). The findings suggested that living in a low-income household, with a mother who has low education and/or a mother who is an immigrant increases the risk of poor development attainment in children. This illustrates the critical importance of the determinants of health in early childhood health and development. Identifying children at risk for developmental delays is important, as early intervention programs for these children are effective (King & Glascoe, 2003).

6.1 Developmental Screening and Surveillance

The best approach to identifying those children at risk or with developmental delays has not been well studied. Developmental screening involves identifying children who may need more comprehensive assessment (American Academy of Pediatrics, 2001). Developmental surveillance includes eliciting and attending to parental concerns, obtaining relevant developmental history, making accurate and informative observations of children and sharing concerns with other relevant professionals (American Academy of Pediatrics, 2001).

Developmental screening has been used as a way to determine developmental delays. The author could not find any current systematic reviews and meta-analysis on the broad use of developmental screening tools for the 0 to 5 population. Review of the literature on individual screening tools was outside the scope of this paper.

6.1.1 Screening Tools

Criteria for analyzing the effectiveness of screening tools include the following (Butler & Geber, 1998; Glascoe, 2000a) (Type 5):

- Screening tools should be brief, simple to measure, easy to interpret and inexpensive.
- In selecting a developmental screening tool, it is important to ask the following questions:
 - Were norm-referenced measures developed on the population, including children like the ones to be screened?
 - Are the measures valid and reliable?
 - Are the measures sensitive, correctly identifying children possibly at risk?
 - Are the measures specific, correctly excluding others from further assessment?
- Screening tools should be reviewed for culture, language and gender bias.
- Good screening tests should have materials that are interesting to the child.
- Screening procedures should sample broadly what children know and can do in situations in which they are comfortable.

- Screening procedures should be done periodically rather than on a one-time basis.
- Screening should include a broad developmental focus—language, intellectual and perceptual functioning and gross/fine motor coordination. Screening tools should have adequate sensitivity to psychosocial problems.
- Screening must be accurate in the general community (valid and reliable).
- The screening tool manual should include training exercises and should specify the amount of training required to administer and score the test accurately.
- The directions for item administration should be easy to locate during testing.
- Scoring procedures should be simple and clear to minimize errors.
- Directions for interpreting test results must be included.
- Accepted criteria should be in place before screening instruments are chosen.
- Users should be aware of potential health messages bias (e.g., the use of a baby feeding bottle as the standard method for infant feeding).

The literature identifies inherent limitations in developmental screening tools, which have led to controversy regarding their use. Developmental screening tests have limited ability to predict future functioning. Good developmental screening tests have sensitivities and specificities of 70-80 per cent. This leads to over-detection and under-detection. Developmental screening tools often have a cost associated with administration (cost for use of the certain tools, time to administer and interpret results). Other issues that diminish the effectiveness of developmental screening include inappropriate screening practices, high thresholds for referral, misplaced concerns about causing parental anxiety and unfamiliarity with local resources (King & Glascoe, 2003).

Several advantages of developmental screening have been identified (American Academy of Pediatrics, 2001, Type 5). It is a valid and reliable way to assess current skills in a variety of domains with the norms being stated explicitly. Screening acts as a reminder to observe development and it is an efficient way to record observations. Screening also helps the practitioner identify more children with delays. Even though false positives are a concern, Glascoe (2001, Type 4) found that children with false-positive scores performed significantly lower on a number of measures than did children with true-negative scores. Thus, these children are an at-risk group for whom diagnostic testing may be a beneficial and needed service that can help focus intervention efforts.

6.1.2 Developmental Surveillance and Screening

An American Academy of Pediatrics guideline (2001, Type 5) provides recommendations regarding developmental surveillance and screening in infants and young children.

Recommendations for practitioners relevant to public health services include:

- Maintain and update knowledge about child development, risk factors, screening techniques and community resources.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Acquire skills in the administration and interpretation of reliable and valid developmental screening techniques.
- Develop a strategy to provide periodic screening, including
 - Recognizing abnormal appearance and functions.
 - Recognizing risk factors while obtaining a history.
 - Listening carefully to parental concerns and observations about the child's development during all encounters.
 - Recognizing troubled parent-child interaction.
 - Performing periodic screenings of all infants and young children during preventive care visits.
- Recognize that screening procedures and processes should be culturally sensitive and appropriate to the population.
- Present the results of the screening to the family using a culturally sensitive, family-centred approach.
- With parental agreement, refer children in a timely fashion to the appropriate early intervention and early childhood education programs and other community-based programs.
- Maintain links with community-based resources and coordinate care with them.
- Increase parents' awareness of developmental disabilities and resources for intervention by such methods as display and distribution of educational materials.

The Canadian Task Force on Preventive Health Care (1993, Type 1) found that there is fair evidence to exclude the Denver Developmental Screening Tool (DDST) from the periodic health exam of children aged 3-5 years old, but there was insufficient evidence to include or exclude other developmental screening tools. This review has not been updated. Cadman et al. (1987, Type 2) conducted a large randomized controlled trial of a public health and education screening program aimed at 4- to 5-year-old children. Children received either the DDST with a community health intervention program for positive screens, the DDST with no intervention for positive screens, or no screening test. At the end of the third school year, no differences were found between positive screens in the community health intervention group and the "no intervention" group. However, parents of intervention program children had more worry about their child's school progress, suggesting a potentially harmful labelling effect.

The American Academy of Neurology's guideline (Blackwell, 2001, Type 5) recommends developmental surveillance at all well-child visits from infancy through school-age. Indications for further evaluation of the child include the failure to acquire developmental milestones that are associated with high probability of a developmental disability, including no babbling by 12 months, no gesturing (e.g., pointing, waving goodbye) by 12 months, no single words by 16

months, no two-word spontaneous phrases by 24 months and any loss of any language or social skills at any age.

The New York State Department of Health initiated the development of six evidence-based clinical practice guidelines for children under three years of age (Romanczyk et al., 2005, Type 5). The guidelines emphasize the importance of routine developmental surveillance where health care providers use both clinical clues and developmental milestones as signals for further focused screening and in-depth assessment to detect possible developmental conditions. They suggest that

Given the wide variation in timing for reaching specific milestones seen among typically developing children, the use of developmental milestone tables alone may miss opportunities for early identification, which may result in unnecessary "wait and see" recommendations to parents. The use of disorder-specific clinical clues may offer a more efficient and accurate method of developmental surveillance that facilitates earlier identification of infants and young children with developmental disabilities who may benefit from early intervention services (Romanczyk et al., 2005, p. 212).

A community-based developmental surveillance program has been implemented in Connecticut (McKay, Shannon, Vater, & Dworkin, 2006, Type 5). The program has not been rigorously studied, but the authors suggest that the service is addressing a critical gap in service delivery.

6.1.3 Eliciting Parental Concerns About Child Development

Systematically eliciting parental concerns about development has been identified as an important method of identifying infants and young children with developmental problems (King & Glascoe, 2003, Type 5; Janson & Squires, 2004, Type 4). Parental concerns about language, fine-motor, cognitive and emotional-behavioural development are highly predictive of true problems (Glascoe, 1997; Glascoe, 2000b; Squires, Nickel & Eisert, 1996). Glascoe and Dworkin (1995, Type 5) reviewed the literature and found that parents' concerns and good quality, standardized parent report measures, such as the Child Development Inventories, capitalize best on parents' observations and insights into their children. In combination, these two types of parental information offer an effective method for the early detection of behavioural and developmental problems in primary care settings. Henderson and Meisels (1994, Type 4) found that combining a standardized parent questionnaire with an individually administered developmental screening instrument (Early Screening Inventory) led to fewer misclassifications, thus increasing the predictive accuracy of the developmental screening process. An older Canadian study with a large sample size (Cadman et al., 1988, Type 4) found that preschool histories (on health, development and behaviour) completed by a community health nurse was found to predict later school problems, regardless if a DDST was or was not completed.

It is important to note that studies addressing parental concerns as a method of identifying developmental delays are based on validated parent questionnaires (versus just asking if parents have concerns about their child's development). As well, the nature of a parent's concerns does not always correlate with the nature of a child's delays (King & Glascoe, 2003, Type 5). Several

parental surveys have found that many parents want their pediatric practitioners to provide more guidance on how to promote their children's development (King & Glascoe, 2003, Type 5).

6.2 Developmental Dysplasia of the Hip

The US Preventive Services Task Force (2006, Type 1) examined the evidence to determine the benefits and harms of routine screening for developmental dysplasia of the hip (DDH) from birth through 6 months and for interventions up to 12 months in otherwise normal infants. They concluded that the evidence is insufficient to recommend routine screening for developmental dysplasia of the hip in infants as a means to prevent adverse outcomes. The Canadian Task Force on Preventive Health Care (2001, Type 1) reviewed the evidence on the screening and management of developmental dysplasia of the hip in newborns. They concluded that there is fair evidence to include serial clinical examination of the hips by a trained clinician in the periodic health examination of all infants until they are walking independently, and there is fair evidence to exclude selective screening for DDH in high-risk infants. Their recommendations have not been modified to reflect the newer US Preventive Services Task Force recommendations discussed earlier.

6.3 Key Findings

Types 1 and 2

- The current evidence is insufficient to recommend routine screening for developmental dysplasia of the hip in infants as a means to prevent adverse outcomes.

Types 3 and 4

- Systematically eliciting parental concerns about development has been identified as an important method of identifying infants and young children with developmental problems.

Type 5

- Although a number of reputable organizations recommend developmental screening and surveillance, there is lack of sound, current evidence on the broad use of developmental screening and surveillance for the 0 to 5 years population.

7.0 PHYSICAL HEALTH AND DEVELOPMENT: PRENATAL INFLUENCES

A number of prenatal influences can affect the ongoing physical health and development of infants and children. These include smoking, substance use and poor nutrition. Sequelae of these influences may include fetal alcohol spectrum disorder and low birth weight/preterm. This paper will address these issues from an early childhood perspective.

7.1 The Evidence

7.1.1 Parental Use of Alcohol

There are a number of risks for children who experience substance use in the home. Young children exposed to alcohol abuse in the home are more likely to have more knowledge of alcohol than other children (Zucker, Kincaid, Fitzgerald, & Bingham, 1995, Type 4) and spatial learning deficits (Schandler, Thomas, & Cohen, 1995, Type 4). Children with difficult temperaments reared in alcoholic families are at a high-risk for the development of behaviour problems (Jansen, Fitzgerald, Ham, & Zucker, 1995, Type 4). Maternal heavy drinking is related to negative parenting practices and children's behavioural and emotional problems (Government of Canada, 2003).

The most common disorder with prenatal alcohol use is fetal alcohol spectrum disorder (FASD). Children with FASD have a wide range of physical, mental, behavioural and/or learning disabilities that put them at risk (Caley, Kramer, & Robinson, 2005; Jacobson & Jacobson, 2003) (Type 5). These include cognitive impairment, learning disabilities, cranio-facial abnormalities, socio-emotional and behavioural disorders (Cone-Wesson, 2005, Type 5; Jacobson & Jacobson, 2002, Type 5; O'Conner, Kogan, & Findlay, 2002, Type 4; Willford, Leech, & Day, 2006, Type 4).

There was no formal literature found on public health services for children with FASD and their families. In reviewing the literature, Coles (2003, Type 5) found that specific behavioural and educational interventions for the treatment of disorders associated with FAS and for the prevention of secondary disabilities are rare and those that do exist have not yet been effectively evaluated. Guidelines for service in the postpartum and early childhood timeframes primarily focus on physicians.

The Public Health Agency of Canada (Leslie & Roberts, 2001, Type 5) reviewed "what works" in community-based programs (Community Action Program for Children, Canada Prenatal Nutrition Program and Aboriginal Head Start) for vulnerable families in reducing the harms associated with substance use during pregnancy. Many of these programs provide support into the postpartum/early childhood periods. Foundational program characteristics deemed as "good practice" included

- Using a grass-roots, bottom-up approach in program development, with multiple sources of funding in order to ensure that the program has a broad basis, including strong associations with other community groups and working in partnership with families.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Providing a seamless, integrated program with substance use and pregnancy as one component of a more comprehensive service.
- Incorporating the cultural, linguistic and social values of the communities where they are located.
- Using a multi-pronged, flexible approach to meet families where they are, as opposed to a packaged program with one way to work with all families.
- Developing a trusting, non-judgmental relationship with women (Leslie & Roberts, 2001, p. 57).

The British Columbia Reproductive Care Program's (BCRCP) provincial guideline Alcohol Use in the Perinatal Period and Fetal Alcohol Spectrum Disorder (2005, Type 5) states that

with postpartum mothers it is recommended that physicians continue to educate and monitor alcohol and other substance use by mothers in this period and continue to support changes in alcohol, tobacco and related health areas that will support the health of mothers and infants (p. 7).

Further, the BCRCP guideline on Discharge Planning Guide for Substance Using Women and Their Newborns (1999, Type 5) outlines the steps in discharge planning and the potential role of the community health nurse as part of the multidisciplinary team in ongoing follow-up.

The Canadian Medical Association has published guidelines on the diagnosis of FASD (Chudley et al., 2005, Type 5). The American Academy of Pediatric's policy statement on fetal alcohol syndrome (2000, Type 5) makes the following recommendations (as related to the mandate of this paper):

- High-quality education programs about the deleterious consequences of alcohol for the unborn child are needed for all school curricula and adult learning centres.
- Health care professionals who provide care for women and their newborns should increase their own awareness and that of their patients about FASD, alcohol-related neurodevelopmental disorder (ARND) and alcohol-related birth defects (ARBD) and their prevention. When a child with problems related to maternal alcohol consumption is identified, alcohol treatment and prevention resources should be offered to the family and affected child.
- Parents of children given a diagnosis of FAS, ARBD or ARND should receive appropriate support services for themselves and their children, including careful anticipatory guidance directed toward preventing similar problems in the future.

Caley, Shipkey, Winkelman, Dunlap and Rivera (2006, Type 5) reviewed the evidence of nursing interventions to prevent secondary disabilities in FASD. Only expert opinion was found in the literature. Referral was the most common nursing intervention. Nursing-specific case management included the coordination of services, discharge planning and assuring access to care and continuity of services. Screening as an intervention to prevent secondary disabilities included screening of women to identify an infant at risk for FASD and screening infants for

delay or physical abnormalities. Case finding interventions included locating individuals and families with identified risk factors and connecting them to resources. Outreach to the community (through education), teenagers, women in homeless shelters and women with drinking problems was found in the literature as well as outreach to professionals, specifically obstetrical and pediatric physicians. A number of references recommended specific types of health teaching for parents who have a child with FASD. The most frequently mentioned example was teaching parents strategies that work with children with FASD. Counselling interventions were also noted in a number of articles. Recommendations for families included crisis management and group sessions. For children, counselling was recommended to help them deal with feelings and fears and to strengthen coping strategies. Consultations with experts and specialists were mentioned a few times. A number of studies recommended advocacy as a nursing intervention (e.g., advocacy for families to find information and services, advocacy for more treatment centres and comprehensive family services). Many articles made recommendations for nurses to become involved in policy development to prevent FASD.

There is limited research on the use of universal screening for FASD. Burd and Juelson (2003, Type 4) described a year-long application of the Early Periodic Screening Diagnostic Testing Program (designed for low-income families) in North Dakota, where nurses screened 2,800 children. The result was the identification of 28 cases of previously undiagnosed FAS-ARND (fetal alcohol and alcohol-related neurodevelopmental disorder).

7.1.2 Preterm/Low Birth Weight

Children who are born prematurely and with low birth weight are generally at higher risks for developmental delays and behaviour problems (Liaw, Meisels, & Brooks-Gunn, 1995; Bhutta, Cleves, Casey, Cradock, & Anand, 2002) (Type 1). Very little literature was found on public health services for preterm/low birth weight infants. Pridham et al. (2006, Type 2) explored the feasibility, usefulness and outcomes of a pilot program to support mothers in developing competencies for managing health problems of very low birth weight infants. Outcomes did not differ significantly between the intervention and control group. Invest in Kids provided summaries of a number of studies addressing the Infant Health and Development Program (Russell, 2002, Type 5). This program is designed to reduce developmental and health problems of low birth weight premature infants. Between birth of a premature child and the age of three, program families receive service such as home visits, enrolment at a child development centre and parent group meetings, in addition to service referrals and developmental assessments. The preventive intervention is provided from neonatal discharge through age three. The Invest in Kids review found that there were modest intervention-related differences in cognitive and academic skills of heavier low birth weight premature children. The intervention mothers were employed more months and returned to the work force earlier. The use of health care services was more frequent in the intervention group.

7.2 Key Findings

There is limited research on the preventive needs and services required for preterm/low birth weight and fetal alcohol spectrum disorder (FASD) infants and their families once they are discharged to the community and ongoing into early childhood.

Type 5

- Modest intervention-related differences for heavier low birth weight premature children have been found in the Infant Health and Development Program (USA). This program is designed to reduce the developmental and health problems of low birth weight premature infants.
- Community-based programs for vulnerable families have identified “good practices” for reducing harms associated with substance use during pregnancy (e.g., using a grass-roots, bottom-up approach in program development).
- Referral, screening, case management, outreach, education, counselling, consultation, advocacy and policy development are all important components for families of children with FASD.

8.0 PHYSICAL HEALTH AND DEVELOPMENT: PHYSICAL ACTIVITY AND MOTOR DEVELOPMENT

Physical activity is a key component of energy balance and is promoted in children and adolescents as a lifelong positive health behaviour (Kohl & Hobbs, 1998). Physical activity is encouraged among children based largely on the assumption that the behaviour will become part of the person's life and carry into adulthood, where it will help to lower the risk of several chronic diseases as well as premature mortality (Kohl & Hobbs, 1998). See Section 10.0 on nutrition for more information.

Motor development is defined as “a progressive change in motor control and motor behaviour brought about by the interaction of both maturation and experience” (Gallahue, 1982, p. 19). Children's motor control and coordination can have an important influence on their cognitive and socio-emotional development as well as their academic achievement (Brown et al., 2004).

8.1 The Evidence

8.1.1 Physical Activity

Irwin, He, Sangster Bouch, Tucker and Pollett (2005) report that two-thirds of Canadian children aged 5–17 are not active enough to promote good health (from the Canadian Fitness and Lifestyle Research Institute). Physical activity is affected by a number of factors (Kohl & Hobbs, 1998, Type 5):

- Physiologic/developmental factors: growth, physical fitness and physical limitations.
- Environmental factors: facilities/equipment access, competing attentions, seasonality and safety.
- Psychological/social/demographic factors: self-efficacy, knowledge/attitudes, parental influences, role modeling, peer influences, education, socio-economic status, gender and age.

Physical activity has positive effects on growth and maturation in children. Higher scores on motor, strength and cardiovascular fitness tests are generally observed among active children compared with their inactive peers (Malina, 1994, Type 5 – consensus statement). It has been shown that time spent outdoors is strongly related to physical activity (Baranowski, Thompson, DuRant, Baranowski, & Puhl, 1993, Type 4). In addition to having decreased potential for overweight and obesity, children who are regularly physically active also tend to experience attitude and behavioural improvements and some researchers have identified a positive correlation between exercise and academic achievement (American College of Sports Medicine, 2000; Canadian Paediatric Society, 2002; Irwin et al., 2005; Ritchie et al., 2001). Exercise, either alone or as part of a more comprehensive regimen, yields moderate improvements in self-esteem in children and adolescents (Ekeland, Heian, Hagan, Abbott, & Nordheim, 2004, Type 1). Parents' activity patterns are closely associated with those of their offspring (Moore et al., 1991, Type 4; Ritchie et al., 2001, Type 1).

In an article summarizing content and research recommendations from a Pediatrics Research Summit, Fowler et al. (2007, Type 5) emphasize the importance of physical activity in physically disabled children (in this case children affected by cerebral palsy), for long-term prevention of chronic disease. Though higher quality research is needed to determine optimal types and intensity of exercise, it is evident that “findings lead to an understanding of the importance of accessible and engaging fitness programs that will involve these children in physical activity at a young age with the potential for forming a lifelong commitment to improved health and fitness.”

Although the benefits of physical activity have been well documented, there is limited literature on preventive services to support physical activity for the early childhood population. Rice and Howell (2000, Type 4) found that data to support the type and level of physical activity necessary for health benefits in children and for later prevention of disease as adults are not available. Irwin et al. (2005, Type 5) completed ten focus groups on parents’ perspectives regarding their preschoolers’ physical activity level. Parents in the study identified physical activity as critical for emotional and physical health of their preschoolers. Resources, safety concerns, role of child care providers and the weather were the factors that either facilitated or hindered activities. Interventions that target environmental (e.g., safety on the streets) and psychosocial determinants of physical activity behaviour may have a greater chance of success than those targeted toward biological and physiologic factors, many of which are unmodifiable (Irwin et al., 2005).

There is research on physical activity in other age groups (other than 0–5 years) and community interventions to support it. The US Task Force on Community Preventive Services conducted a systematic review of community interventions to increase physical activity (US Task Force on Community Preventive Services, 2001; Kahn et al., 2002) (Type 1). Some of these interventions may affect the 0–5 age group (e.g., increasing places for physical activity). Two informational interventions (“point-of-decision” prompts to encourage stair use and community-wide campaigns) were effective, as were three behavioural and social interventions (school-based physical education, social support in community settings, and individually-adapted health behaviour change). One environmental and policy intervention was effective—creation of or enhanced access to places for physical activity combined with informational outreach activities. Evidence was insufficient to assess the following:

- Classroom-based health education focused on information provision, and family-based social support (because of inconsistent findings).
- Mass media campaigns and college-based health education and physical education (because of an insufficient number of studies).
- Classroom-based health education focused on reducing television viewing and video game playing (because of insufficient evidence of an increase in physical activity).

The Canadian Paediatric Society (2002, Type 5) has a position statement on healthy active living for children and youth. The statement does not identify a specific age group. Recommendations relevant to physical activity include

- Physicians and health care professionals are encouraged to promote healthy active living for all family members by:

- Inquiring about nutritional intake and physical activity levels of all children and youth at regular health care visits.
- Encouraging children and adolescents to increase the time that they spend on physical activities and sports by at least 30 minutes/day, with at least 10 minutes involving vigorous activities. Vigorous activities are those that increase the heart rate and respiratory rate and increase body temperature. To get added benefit, they should review their activity patterns every month and progressively increase their efforts.
- Counselling families to reduce sedentary activities by limiting exposure to television and video and/or computer games. An achievable first step is to reduce these activities by 30 minutes/day, and subsequently decreasing sedentary activities by 5 minutes/month, allowing up to 90 minutes/day for these activities.
- Encouraging parents to be positive role models for their children and incorporate physical activities that family members of all ages can do together. Families should take part in activities safely by wearing appropriate protective equipment (bicycle helmets).
- Advising parents to enroll their children in age- and developmentally appropriate sports and recreational activities.
- Promoting and using Canada's Physical Activity Guide (<http://www.paguide.com>) as a tool to encourage children and youth to be more active.
- Health care professionals should advocate for
 - Comprehensive community sport and recreation programs in which the use of community and school facilities after hours may make more recreation programs available to all children at reasonable costs. Access to these facilities should be equally available to both sexes.
 - The construction of safe recreational facilities, playgrounds, parks, bike paths, sidewalks and roads.

8.2 Motor Development

Delays in motor development can affect a child's performance in school, and have been linked to lack of concentration, behaviour problems, low self-esteem and poor social confidence (Brown et al., 2004). Problems with motor coordination have been associated with loneliness and poor peer interactions, especially among young boys (Brown et al., 2004). Infants born preterm or low birth weight are at increased risk of developing motor, cognitive and behavioural impairments (Spittle, Orton, & Boyd, 2005, Type 1). See Section 6.0 for more information.

8.3 Key Findings

The importance of physical activity is well documented in the literature, but there is a lack of sound research addressing preventive services to support physical activity in the early childhood population.

Type 5

- Guidelines have been developed on healthy, active living and physical activity, but they are not specific to the early childhood population.

9.0 PHYSICAL HEALTH AND DEVELOPMENT: PHYSICAL GROWTH AND GENERAL HEALTH

The overall physical growth and health of the child are important components of child development. Public health efforts focus on the prevention of nutritional disorders, failure to thrive, growth disturbances and obesity. Outcomes desired include optimal physical growth, healthy lifestyle, optimal nutrition and an optimal feeding relationship. See Section 10.0 on nutrition for more information.

9.1 The Evidence

9.1.1 Physical Growth

Growth Monitoring

In 2004, the Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada and Community Health Nurses Association of Canada released the public policy statement *The Use of Growth Charts for Assessing and Monitoring Growth in Canadian Infants and Children (2004, Type 5)*. The organizations made the following statements regarding growth and health:

- Optimal growth depends on genetic constitution, normal endocrine function, adequate nutrition, absence of chronic disease and a nurturing environment. Fetal, infant, environmental and maternal factors can interact to impair intrauterine and postnatal growth.
- For healthy children, the most important aspect of growth is that it is regular and consistent.
- Disturbances in health and nutrition almost always affect growth.

The statement identified that growth monitoring strives to improve nutrition, reduce the risk of inadequate nutrition, educate caregivers, and produce early detection and referral for conditions of growth disorders. Growth monitoring is used in assessment and monitoring of individual children and in screening whole populations. At the population health level, cross-sectional surveys of anthropometric data help define health and nutritional status for the purposes of program planning, implementation and evaluation.

The statement described growth monitoring as consisting of serial assessments of both weight and height measurements over time so that growth velocity can be assessed. The most common physical measurements used for evaluating growth are recumbent length (birth to age 2 or 3) and standing height (children age 2 and older who are able to stand), weight, and head circumference (until age 2). Identified as fundamental to growth tracking were reliable measurements and sound clinical judgment. Accurate measurements have three components: a standardized measurement technique, quality equipment that is regularly calibrated and trained measurers who are reliable and accurate.

The statement identified that there is limited research to support a prescribed frequency for performing anthropometric measurements. Serial measurements of height, weight and head

circumference as part of scheduled well-baby and well-child health visits are suggested. The ideal number of health maintenance visits for children was not established, but the statement recommended that they be organized according to the immunization schedule with additional visits (within one to two weeks of birth and at one, two, four, six, nine, 12, 18, 24 months and four to six years).

See Appendix 4 for more detailed growth monitoring recommendations from the Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada and Community Health Nurses Association of Canada.

Growth charts are utilized to graphically present the body measurements. The Dietitians of Canada and the other organizations (2004) recommended using the American Centers for Disease Control and Prevention growth charts. However, new growth charts have been developed by the World Health Organization. The growth of the children in the World Health Organization charts can be considered optimal for all children to achieve because the individuals included in the charts were raised in the best conditions for growth and health (World Health Organization, 2006). The current Canadian statement will be revised to reflect these charts and current evidence.

A 1999 Cochrane review (Panpanich & Garner, 1999, Type 1) found that there is very little information to evaluate the benefits and harms of growth monitoring. While growth charts may be used by health care professionals for assessing growth, parents/caregivers may not use them. For example, in one study, mothers used teasing about weight and limitations in physical activity as indicators for overweight (Jain et al., 2001, Type 4).

9.1.2 Failure-to-Thrive

Failure-to-thrive (FTT) is described as a failure of the infant to grow in weight and height along an expected growth pattern. Diagnosis of FTT is a plot of weight measurements on a centile chart showing a consistently low weight or a weight increase that does not keep up with the expected pace (Bell, 2004, Type 5). The Centers for Disease Control and Prevention report that prevalence of failure-to-thrive in developed countries has decreased from 1.6 per cent in 1965 to 0.9 per cent in 2002 (de Onis, Blossner, Borghi, Frongillo, & Morris, 2004, Type 5).

Failure-to-thrive may result from underfeeding or food refusal (Tanner & Finn-Stevenson, 2002, Type 5). FTT has normally been classified as either organic or non-organic. Organic refers to FTT due to an underlying disease. Non-organic refers to an imbalance of energy intake versus energy requirements due to reasons other than underlying illness (e.g., abuse and neglect). It has been recommended that differentiating organic versus non-organic FTT is no longer necessary (Locklin, 2005, Type 5) since studies have shown no differences in patterns of attachment, level of acute malnutrition, maternal sensitivity, social support or life stress between groups (Ward, Kessler, & Altman, 1993, Type 4).

The literature contains mixed results regarding whether failure-to-thrive has neurodevelopmental effects. Infants with feeding disorders and failure-to-thrive can have underlying oral motor, oral sensory, regulatory or other developmental problems—i.e., “organic” FTT (Benoit, 2004, Type 5). Studies have found lower mental development in children with FTT (Chatoor et al., 2004,

Type 4). Other literature has questioned the neurodevelopmental effects with two reviews finding little evidence of effects with FTT (Corbett & Drewett, 2004; Rudolf & Logan, 2005) (Type 1). It is difficult to determine whether there are neurodevelopmental effects from FTT because FTT can encompass underlying disease states as well as psychosocial factors. Neurodevelopmental effects may be due to psychosocial factors (e.g., mother-toddler interactions), an underlying disease and/or nutritional status (Chatoor et al., 2004, Type 4). One study, which identified toddlers with infantile anorexia—i.e., FTT due to neither psychosocial factors nor underlying disease—found lower cognitive development scores among toddlers with infantile anorexia versus controls (Chatoor et al., 2004, Type 4).

Because of its potential effect on neurodevelopment, the Ontario College of Family Physicians (2004, Type 5) recommended that failure-to-thrive requires careful investigation. However, Rudolf and Logan (2005, Type 1) disagree, stating that aggressive identification and management of FTT needs to be reassessed considering the limited changes in IQ that it results in.

From those who believe in investigation and intervention, the following recommendations were made:

- Health professionals need to be aware of, refer to, and collaborate with appropriate health providers based on findings from assessments (Schlenker & Ward, 1999, Type 4).
- Close follow-up of FTT is required from a multidisciplinary team, including home visitors (Block & Krebs, 2005, Type 4).
- A multidisciplinary growth and nutrition clinic with weekly home visits for one year by lay home visitors, supervised by a community health nurse, is recommended. In one study, such a program showed significant improvements in weight for age, weight for height for age, receptive language and more child-oriented home environments (Black, Dubowitz, Hutcheson, Berenson-Howard, & Starr, 1995, Type 2).
- Aggressive multidisciplinary intervention is recommended for infants with FTT who are suspected victims of abuse and neglect (Block & Krebs, 2005, Type 4).

9.1.3 Obesity

Childhood obesity is defined as a body mass index (BMI) >95th percentile; and overweight as a BMI >85th percentile.

Prevalence

Statistics Canada reports that in 2004, 6 per cent of children aged 2–5 years were obese, plus 15 per cent were overweight (Shields, 2005, Type 4). The prevalence of obesity and overweight has been increasing since the 1970s in child populations throughout the world, and more markedly among those from lower socio-economic strata (Burke et al., 2005; Hedley et al., 2004; Kuepper-Nybelen et al., 2005; Sherry, Mei, Scanlon, Mokdad, & Grummer-Strawn, 2004; Stamatakis, Primatesta, Chinn, Rona, & Falaschetti, 2005; Tremblay & Willms, 2000) (Type 4). In Canada's Aboriginal communities, the prevalence of overweight is significantly higher: for 2- to 19-year-

olds the rate is 27.7 per cent for boys and 33.7 per cent for girls (Hanley et al., 2000, Type 4). The rate of overweight and obesity is 41 per cent for off-reserve Aboriginal children 2 to 17 years of age (Shields, 2005, Type 4).

Consequences

The recent epidemic of childhood obesity has raised concerns because of the possible clinical and public health consequences (Ebbeling, Pawlak, & Ludwig, 2002, Type 5). The Centre of Excellence for Early Childhood Development has summarized expert opinion on the impact of obesity on child development. Obesity has adverse consequences for the obese child, and in the longer term, for the adult who was obese as a child (Reilly et al., 2003, Type 1). Obese children are exposed to psychosocial effects such as weight stigma, isolation and depression and physical problems including obstructive sleep apnea, orthopedic problems, hyperandrogenism, type 2 diabetes and cardiovascular disease (Chaput & Tremblay, 2006, Type 5). A review in the Encyclopedia on Early Childhood Development stated that obesity by age four to five years is a concern because it tends to persist. Persistence is strongest when obesity is especially severe, and where at least one parent is obese. However, some obese young children will “grow into their weight” and become non-obese in the absence of intervention programs (Reilly, 2006, Type 5).

Causes

Obesity results from reduced physical activity and/or increased food intake. The risk factors for early childhood obesity are complex. Fetal development, genetics, breastfeeding, parental control versus self-regulation of eating habits, caregiver attitudes and knowledge of nutrition, physical activity, and television viewing have all been implicated as risk or protective factors.

- ***Fetal Development:*** Infants who are at the highest end of the distribution for weight or body mass index or who grow rapidly during infancy are at increased risk of obesity later in life (Baird et al., 2005, Type 1).
- ***Genetic Factors:*** Genetic factors may increase susceptibility to weight gain, but after age three, parental obesity is a stronger predictor of a child’s future obesity than their current weight (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997, Type 4).
- ***Breastfeeding:*** Breastfeeding may be a protective factor against later obesity (Arenz, Ruckerl, Koletzko, & von Kries, 2004; Butte, 2001; Owen et al., 2005; Swinburn, Caterson, Seidell, & James, 2004; World Health Organization, 2003) (Type 1). Exclusive or partial breastfeeding (dose dependent) is associated with a small, but consistent protective effect against obesity risks in later childhood, reducing risk by 22 per cent (Arenz et al., 2004, Type 1). Longitudinal data on over 175,000 four-year olds from low-income families confirm this relationship among non-Hispanic whites, but not blacks or Hispanics (Grummer-Strawn, Mei, & Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System, 2004, Type 4). Breastfeeding may protect against later obesity through biological and/or behavioural processes (Dewey, 2003, Type 1; Dietz, 2001, Type 5; Gillman et al., 2001, Type 4). Possible mechanisms:
 - Breast milk composition and metabolic programming may result in differences in adiposity and rate of weight gain.

- Breastfeeding may lead to more internal control of energy intake by the child, compared to more parental control over formula feeding (Lederman et al., 2004, Type 5). Parent and family behaviours and attitudes may be confounding factors in the effect of breastfeeding on obesity risk (Arenz et al., 2004, Type 1; Dewey, 2003, Type 4).
- Before ever tasting solid food, breastfed babies experience the flavours of foods eaten by the mother, which could lead them to like a more varied diet (Mennella, Jagnow, & Beauchamp, 2001, Type 4).
- Mothers who breastfeed their infants for at least 12 months use lower levels of control in feeding (see following section) (Fisher, Birch, Smiciklas-Wright, & Picciano, 2000; Taveras et al., 2004) (Type 4).
- Genetics, family dietary and family physical activity patterns may all be stronger contributors than breastfeeding is protective for obesity in late adolescence or adulthood (Butte, 2001; Hediger, Overpeck, Ruan, & Troendle, 2002) (Type 4). There is a need for well-designed longitudinal studies to confirm the link between breastfeeding and prevention of obesity in childhood and adolescence (Pérez-Escamilla, 2005, Type 5).
- **Self-Regulation of Food Intake:** Children between 2.5 and 5 years of age show much clearer evidence for caloric compensation than do adults (Birch & Deysher, 1986, Type 3). Children who eat less often during the day consume larger-than-average portion sizes than those who eat more often (Fox, Devaney, Reidy, Razafindrakoto, & Ziegler, 2006, Type 4). Fox et al. (2006, Type 4) found that as the energy density of the diet decreased, children consumed larger-than average portions and vice-versa, confirming the presence of energy self-regulation among infants and young toddlers.
- **Parental Control of Food Intake:** There is consistent, observational evidence that imposing stringent parental control limits children's acceptance of a variety of foods and disrupts children's regulation of intake by altering their responsiveness to internal cues of hunger and satiety. There are significant correlations between children's relative weight and parental prompts to eat, parental food offers and parental encouragement to eat (Fisher & Birch, 1999; Klesges et al., 1983; Shunk & Birch, 2004) (Type 4). Pressure-to-eat feeding practices may have negative impacts on children's ability to self-regulate their food intake and their weight status (Birch & Fisher, 2000; Faith et al., 2004; Francis, Hofer, & Birch, 2001; Klesges, Stein, Eck, Isbell, & Klesges, 1991; Lee, Mitchell, Smiciklas-Wright, & Birch, 2001; McKenzie et al., 1991; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002) (Type 4). Mothers who breastfeed their infants for at least 12 months use lower levels of control in feeding, toddlers have higher nutrient intakes and those toddlers with the highest intakes at 18 months are the taller and leaner children (Fisher et al., 2000, Type 4). Children whose parents make greater attempts to control their child's diets report higher intakes of both healthy and unhealthy high-fat, energy-dense foods. The more parents withhold access to individual foods, the more likely children desire these foods and overeat when finally allowed access (Birch, Birch, Marlin, & Kramer, 1982; Birch & Fisher, 1998; Brown & Ogden, 2004; Fisher & Birch,

1999; Li et al., 2004; Orlet Fisher, Rolls, & Birch, 2003) (Type 4). Less controlling feeding styles and more responsiveness to infant hunger and satiety cues allows greater child self-regulation of energy intake (Fisher et al., 2000; Taveras et al., 2004) (Type 4).

- **Caregiver Nutrition Attitudes and Knowledge:** There is a correlation between childhood overweight/ obesity and the attitudes and knowledge of caregivers about nutrition (Fuller, Keller, Olson, & Plymale, 2005, Type 4).
- **“Junk” Food:** Regular consumption of high-energy dense food (e.g., French fries, sweets) and sweetened drinks have been implicated in obesity development (Agras & Mascola, 2005, Type 4).
- **Physical Activity:** Lower levels of physical activity in infants and preschool children are associated with higher levels of body fat (Wells & Ritz, 2001, Type 4). For young children in particular, the family environment plays an important role in determining their level of physical activity (Lobstein, Baur, Uauy, & IASO International Obesity Task Force, 2004, Type 1). Refer to Section 8.0 on physical activity for further evidence.
- **Television Viewing:** The quantity of time children spend watching television is positively associated with obesity (Dennison, Erb, & Jenkins, 2002; Proctor et al., 2003; Rapp, Schick, Bode, & Weiland, 2005) (Type 4). Possible mechanisms are that television displaces physical activity and/or reduces resting metabolic rate and/or it increases calorie consumption prompted by advertising (Robinson, 2001, Type 1). Refer to Section 10.15 on marketing food to children/television viewing for further evidence.

Obesity Prevention

Preventing (and treating obesity) in childhood and adolescence has been identified as a critical public health issue and an important determinant of health (Canadian Paediatric Society, 2002, Type 5; Olshansky et al., 2005, Type 4). Identified reasons to emphasize obesity prevention in early childhood include fat cell physiology, adiposity rebound and the limited potential for reversing metabolic changes associated with overweight (Daniels et al., 2005, Type 5). At the same time, several groups have identified that obesity, disordered eating, hazardous weight loss, nutrient deficiencies, size discrimination and body hatred are interrelated and need to be addressed to “do no harm” (Barlow & Dietz, 2002, Type 4; Berg, Buechner, Parham, & Weight Realities Division of the Society for Nutrition Education, 2003, Type 5; O’Dea, 2005, Type 5).

Prevention is identified as being critical since treatment for childhood obesity remains largely ineffective (Ebbeling et al., 2002, Type 5).

There is limited evidence on the effectiveness of obesity prevention interventions in children (Ells et al., 2005; Registered Nurses’ Association of Ontario, 2005; Sherry, 2005; Summerbell et al., 2005) (Type 1). Those individual-based approaches that have been evaluated have only modest long-term success (Daniels et al., 2005; Nestle & Jacobson, 2000) (Type 5). Potential population health strategies have not been evaluated (Daniels et al., 2005; Nestle & Jacobson, 2000) (Type 5). Continued evaluation is needed to identify optimal strategies (Olshansky et al., 2005, Type 4).

Given the current lack of clear evidence, the following recommendations have been made:

1. The United States Surgeon General suggests that environmental modifications provide the best opportunity for obesity prevention (US Department of Health and Human Services, 2001, Type 5). An ecological approach toward promoting healthy behaviours on multiple levels is expected to have maximum impact. Guidelines for childhood obesity prevention programs developed in the United States encourage a health-centred approach emphasizing living actively, eating in normal and healthy ways and creating nurturing environments to help children recognize their own worth while respecting cultural foodways and family traditions.
2. The Registered Nurses' Association of Ontario (2005, Type 1) identified best practice approaches. These include promoting healthy eating and physical activity throughout the lifecycle at population, community, family and individual levels by planning, implementing and evaluating interventions that
 - Are tailored to the strengths and needs of the client and are developmentally appropriate, culturally and linguistically relevant and gender-specific.
 - Are affordable and accessible.
 - Are focused on behaviour change.
 - Maximize the effectiveness of healthy lifestyle interventions through interactions that are of sufficient intensity and duration to effect behaviour change.
 - Support a family-centred approach to promote healthy eating and physical activity.
3. Use public health policy approaches such as prohibiting food advertisement and marketing directed at children as well as taxing fast food and soft drinks (Ebbeling et al., 2002, Type 5). Nestle and Jacobson (2000, Type 5) suggest that an obesity prevention campaign might be funded, in part, with revenues from small taxes on “empty calorie” products such as soft drinks, or products that reduce physical activity, such as automobiles.
4. Both Daniels et al. (2005) and Nestle and Jacobson (2000) recommend population approaches because they have the broadest reach for the lowest cost (Type 5). They recommend these approaches for reaching the least-advantaged population segments. Community-wide approaches include coordinated interventions in multiple settings and may include mass media components (Daniels et al., 2005, Type 5).
5. A recommended approach is to target institutions that provide access to groups of children—community and early learning programs and child care health care settings where growth and weight status are routinely monitored (Daniels et al., 2005; Nestle & Jacobson, 2000) (Type 5). Fitzgibbon et al. (2005, Type 2) found that a 14-week Head Start Program for minority children aged 3 to 5 years was effective in reducing increases in body mass index at one- and two-year follow-up. This finding is in contrast to the results of the Nutrition Education Aimed at Toddlers (NEAT) study, which assessed the effectiveness of an intervention (four

nutrition lessons and structured reinforcements over six months) aimed at enhancing parent-toddler feeding practices in low-income families. The intervention group had significantly higher knowledge scores concerning toddler feeding, but there were no statistically significant differences in child and parent mealtime behaviours. The authors of the NEAT study commented that the findings reiterate the need to focus on avenues other than nutrition education to enhance parents' ability to feed toddlers appropriately (Horodynski & Stommel, 2005, Type 3).

6. The Encyclopedia on Early Childhood Education has stated that programs targeting the prevention of early childhood obesity are needed for prenatal/postpartum women and preschool children. These need to address maternal overweight, smoking and diabetes as well as low birth weight and catch-up growth and lack of breastfeeding (VanVrancken-Tompkins & Sothorn, 2006, Type 5). Pregnancy Outreach Programs (POPs) and the Canada Prenatal Nutrition Program (CPNP), which address these issues for high-risk families, are well-established in British Columbia. These programs have been effective at increasing breastfeeding initiation rates. A recent national evaluation of CPNP shows that 81 per cent of participants report eating better as a result of learning and food supplements (Health Canada, 2004, Type 4). Community Action Programs for Children (CAPC) deliver programs that address the health and development of vulnerable children (0–6 years). In the United States, participation in Women, Infant and Children programs was associated with improved birth outcomes, breastfeeding rates, and a positive effect on preschoolers' diets (Bitler & Currie, 2005; Chatterji & Brooks-Gunn, 2004; Siega-Riz et al., 2004) (Type 4).
7. Home visiting programs have met with some success. A public health home visiting program for high-risk families was effective at improving nutrition and reducing energy intake to more appropriate levels (Worobey, Pisuk, & Decker, 2004, Type 4). A home visiting program designed to reduce the prevalence of obesity in preschool-aged Native American children resulted in children gaining less weight (Harvey-Berino & Rourke, 2003, Type 4).
8. Weight monitoring has been recommended by several groups. VanVrancken-Tompkins & Sothorn (2006, Type 5) identified that very early monitoring of children's weight status is imperative, since a child who reaches 24 months at a healthy weight is less likely to become overweight at a later age. Conversely, infants who are identified as obese or who grow rapidly during their first year, are more likely to be obese as children, adolescents and young adults (Baird et al., 2005, Type 1). Nichols & Livingston (2002, Type 1) recommended that treatment should be initiated when patterns of weight gain exceed established percentiles. However, O'Brien, Holubkov and Reis (2004) and Riley, Bass, Rosenthal and Merriman (2005) found that childhood obesity is under-recognized and under-treated by pediatric primary care providers (Type 4).

In addition, representative groups have identified roles for various health professionals in childhood obesity prevention and intervention:

- Family physicians have a role in promoting preventive measures, including discussing prevention of obesity with parents at every well-child visit (Plourde, 2006, Type 5).

- Nurses play a key role in collaborating with other health care providers, communities and governments to address childhood obesity (Registered Nurses' Association of Ontario, 2005; Ells et al., 2005; Sherry, 2005; Summerbell et al., 2005) (Type 1).
- Ritchie, Welk, Styne, Gerstein and Crawford (2005, Type 5) recommend that dietetics professionals, physicians and other health care professionals assist parents in their efforts to prevent pediatric overweight by providing information and supporting key behaviours while working to create environments that support healthy lifestyles.
- Since families provide the primary environment for healthy eating and physical activities, Baranowski, Cullen, Nicklas, Thompson and Baranowski (2002, Type 5) recommend that parents be involved in prevention strategies.

9.2 General Health and Well-Child Care

Well-child care is intended to prevent disease or injury and promote health for individual children. Moyer and Butler (2004, Type 1) reviewed the literature on the effectiveness of well-child interventions. Well-child visits provide an opportunity for health professionals to promote healthy lifestyle choices, provide age-appropriate counselling and anticipatory guidance and monitor children for physical and behavioural issues. More detailed information is needed regarding what and when services are provided at well-child visits, but research shows that parents value well-child care and parent-clinician communication, desire more information about development and rate clinicians higher when they provide more anticipatory guidance and discuss developmental topics. No single standard exists, but many guidelines for providing services at well-child visits have been published (e.g., American Academy of Pediatrics). A Commonwealth Fund analysis concluded that improvement of developmental assessment of children will require enhanced training of physicians, accountability systems to track quality care and alterations in health plans to include screening and assessment, developmental health promotion, general developmental interventions and care coordination (Center for Child Health Research, 2004, Type 1).

Moyer and Butler (2004, Type 1) reviewed the well-child care literature to determine the evidence base for commonly recommended clinical preventive services for children. The review focused primarily on behavioural counselling and screening. Limited direct evidence was found to support these preventive interventions. The authors found that costs and potential adverse effects of well-child care have not been evaluated adequately. Jansson, Isacson, Kornfalt and Lindholm (1998, Type 4) found that parents described the following as important quality indicators for well-child care by public health nurses: kind treatment, competence, time, support, a comprehensive review, the individual perspective and home visits to primipara parents.

The Canadian Task Force on Preventive Health Care reviewed the evidence for well-baby care in the first two years of life. Although this evidence is Type 1, it is dated 1994. They found that

- There is good evidence to
 - Include counselling to reduce risk factors in the home.
 - Support anticipatory guidance for night-time crying.

- Support repeated examination of the hips (this is a dated recommendation; see Section 6.2 on developmental dysplasia of the hip), eyes and hearing—especially in the first year of life.
- Include recommendations for child care or preschool programs for poor children during the periodic health exam.
- There is fair evidence to
 - Support enquiries about the achievement of milestones at each visit;
 - Include serial measurements of height, weight and head circumference.
- There is poor evidence to include or exclude specific manoeuvres for poor children.
- There is insufficient evidence to recommend for or against home-based parenting programs.

Rourke, Leduc and Rourke (2006) have developed an evidence-based infant/child health maintenance guide that is supported by the Canadian Medical Association and the College of Physicians and Surgeons. The guide covers the following topics for well-child visits between one week and 4–5 years old: growth, parental concerns, nutrition, education/advice (includes injury prevention, behaviour/family issues and other issues such as second-hand smoke), development, physical examination, problems and plans and immunization.

9.3 Key Findings

Type 1

- Even though current Canadian recommendations include growth monitoring at regular intervals from birth to preschool, there is little information to evaluate the benefits and harms of growth monitoring.
- There is limited evidence on the effectiveness of obesity prevention interventions in children.

Types 4 and 5

- Research shows that parents value well-child care and parent-clinician communication, but there is limited research regarding what services promote good outcomes including optimal frequency of these services.
- There is a lack of evidence and consensus regarding the role of public health preventive services in the identification and management of failure to thrive.
- Home visiting programs and pre/post-natal nutrition programs for vulnerable families have shown some positive outcomes on birth outcome and maternal and child nutrition.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Fetal development, genetics, breastfeeding, parental control versus self-regulation of eating habits, caregiver attitudes and knowledge of nutrition, physical activity, and television viewing have all been implicated as risk or protective factors.
- It has been suggested that public health obesity prevention strategies should target early childhood via multiple avenues.

10.0 PHYSICAL HEALTH AND DEVELOPMENT: NUTRITION AND BREASTFEEDING

The link between nutrition and child development has been identified for over 60 years (Center on Hunger, Poverty and Nutrition Policy, 1995; Tanner & Finn-Stevenson, 2002) (Type 4). A recent summary of critical outcomes that defined “optimal nutrition” during early life included physical growth, mental development, sleep development, enhanced immunity, prevention of allergies, prevention of altered food behaviour leading to anorexia and obesity and the prevention of chronic disease (Uauy & Castillo-Duran, 2005, Type 1).

Under-nutrition along with environmental factors associated with poverty can permanently retard physical growth, brain development and cognitive functioning. The longer a child’s nutritional, emotional and educational needs go unmet, the greater the likelihood of cognitive impairments. Improved nutrition and environmental conditions can modify the effects of early under-nutrition. Once under-nutrition occurs, its long-term effects may be reduced or eliminated by a combination of adequate food intake and environmental support (Cravioto & Delicardie, 1976; Hoorweg & Stanfield, 1976; Lozoff, 1989; Osuntokun, 1972, 1973) (Type 1).

The public health goal is to prevent a number of conditions such as failure-to-thrive, sudden infant death syndrome, infectious diseases, nutrient deficiencies, dental health problems, food allergies, asthma, development problems, foodborne illness, disordered eating, obesity and chronic diseases. Expected outcomes include exclusive breastfeeding for 6 months, vitamin D supplementation for breastfed infants and other supplements as required, breastfeeding for 2 years and beyond, Baby-Friendly facilities and communities, introduction of quality foods, food allergen avoidance, healthy feeding relationships, household and community food security, media literacy about food, a safe food supply and high standards for day care nutrition. A number of these topics are covered in more depth in companion evidence reviews on reproductive health, dental health, food safety and food security.

A) Breastfeeding for Early Childhood Health and Development

Breastfeeding related to newborn health is also addressed in companion evidence reviews on reproductive health, prevention of disabilities and food security. The role of breastfeeding in the prevention of obesity is addressed in Section 9.0 on physical growth. Appendix 5 outlines guidelines for breastfeeding and other fluids for infant feeding, taken from Nutrition for Healthy Term Infants (Canadian Paediatric Society, Dietitians of Canada and Health Canada, 2005).

Exclusive breastfeeding is “the practice of feeding only breast milk (including expressed breast milk) and allows the baby to receive vitamins, minerals or medicine. Water, breast milk substitutes, other liquids and solid foods are excluded” (Health Canada, 2004a, Type 5).

Exclusive breastfeeding is recommended for the first six months of life for healthy term infants, as breast milk is the best food for optimal growth. Infants should be introduced to nutrient-rich, solid foods with particular attention to iron at six months with continued breastfeeding for up to two years and beyond (Health Canada, 2004a, Type 5).

Breastfeeding provides total food security for infants. There is no more readily available, affordable and nutritious food source than breast milk, a complete food for infants up to six months of age. Breastfeeding continues to provide the growing child with essential nutrients and energy, helping to prevent malnutrition and micronutrient deficiencies in the second year of life and beyond, along with other foods (World Alliance for Breastfeeding, n.d.).

10.1 The Evidence

10.1.1 Initiation and Duration

Practice guidelines have recently been updated to extend the duration of exclusive breastfeeding from the former range of 4-6 months to 6 months (Berg, 2004; Habicht & WHO Expert Consultation, 2004; Kramer & Kakuma, 2004) (Type 1). Current World Health, Canadian and American guidelines are to promote, support and protect exclusive breastfeeding for the first six months of life for healthy term infants; to introduce nutrient-rich, solid foods with particular attention to iron at six months, with continued breastfeeding for up to two years and beyond (Canadian Paediatric Society, Dietitians of Canada and Health Canada, 2005; James, Dobson, & American Dietetic Association, 2005; World Health Organization [WHO], 2001) (Type 5).

British Columbia has high breastfeeding initiation rates. In 2003, 93.3 per cent of BC women initiated breastfeeding their newborns; 55 per cent breastfed for at least 6 months and 28.8 per cent did so exclusively (Statistics Canada, 2003, Type 4). No provincial-level data is available for rates of breastfeeding at 12 and 24 months. For women at risk for poor pregnancy outcomes enrolled in Canada Prenatal Nutrition Programs, the initiation rate is 83 per cent and 34 per cent of women exclusively or partially breastfeed their infants at 6 (Health Canada, 2004b, Type 4).

The incidence and duration of breastfeeding for term infants in Canada, the United States, Europe and Australia were recently reviewed (Callen & Pinelli, 2004, Type 4). Rates were partly attributed to determinants of health including the social, economic and cultural environment. Europe and Australia reported higher initiation and duration rates than North America. Europe had the highest initiation and Australia the longest duration for breastfeeding. Six reviews consistently showed that women who initiated breastfeeding were older, married, better educated and had higher family incomes. A Canadian review concluded that longer breastfeeding occurred when women had more preventative health orientations, had infants of normal weight and gestational age and were less likely to have suffered from depression (Callen & Pinelli, 2004, Type 1).

In the United States,

a minimum of \$3.6 billion would be saved if breastfeeding were increased from current levels (64 percent in-hospital, 29 percent at 6 months) to those recommended by the U.S. Surgeon General (75 and 50 percent). This figure is likely an underestimation of the total savings because it represents cost savings from the treatment of only three childhood illnesses: otitis media, gastroenteritis, and necrotizing enterocolitis (Weimer, 2001, Type 5).

This analysis, which has considered only direct medical costs, underestimates substantially the burden to society as a whole associated with our low level of exclusive breastfeeding. The family with a formula-fed infant incurs direct costs for care, if uninsured, or for co-payments if insured, as well as non-medical costs such as family care and transportation to and from the doctor's office. Parental absence from work is expensive for both employee and employer. If a parent misses 2 hours of work for the excess illness attributable to formula-feeding, >2,000 hours—the equivalent of 1 year of employment—are lost per 1,000 never-breastfed infants. Insufficient breastfeeding also is expensive for the federal government through the Women, Infants and Children Supplemental Food Program (WIC). In 1991, the cost of formula through WIC was estimated at \$404 million. Costs to support a breastfeeding mother through WIC is approximately 55 per cent that of a formula-feeding mother. Costs borne by families who purchase formula out of their own pockets are substantial, averaging \$855 for the first 6 months of life. Other countries, such as Canada, have recognized potential savings to the economy from breastfeeding and provide a subsidy to low-income mothers for each month of breastfeeding (Ball & Wright, 1999).

10.1.2 Health Benefits of Breastfeeding

The Canadian Paediatric Society, Dietitians of Canada and Health Canada, in the document *Nutrition for Healthy Term Infants* (2005, Type 5), as well as the American Dietetic Association (James et al., 2005, Type 1) have identified breastfeeding as a public health strategy for improving infant and child health, improving maternal morbidity, controlling health care costs and conserving natural resources.

The evidence suggests that breast milk or breastfeeding has been linked to prevention of health problems in children and later in life. These include respiratory, intestinal and ear infections, allergies, cardiovascular disease and obesity (Bachrach, Schwarz, & Bachrach, 2003; Fewtrell, 2004; Fiocchi et al., 2003; Gartner et al., 2005; Gdalevich et al., 2001a, 2001b; Heinig, 2001; Martin et al., 2005; Martin, Gunnell, & Smith, 2005; Martin et al., 2004; Owen, Whincup, Odoki, Gilg, & Cook, 2002) (Type 1).

The evidence is more controversial for the benefits of breastfeeding regarding diabetes, inflammatory bowel disease and cancer (Davis, 2001; Fewtrell, 2004; Guise, Austin & Morris, 2005; Klement, Cohen, Boxman, Joseph, & Reif, 2004; Kwan, Buffler, Abrams, & Kiley, 2004; Martin, Gunnell, Owen & Smith, 2005) (Type 1). There is some evidence that breastfed babies have higher IQs and a lower risk of developing behaviour/mental health problems than their formula-fed counterparts (Anderson, Johnstone, & Remley, 1999, Type 1) (Jain, Concato, & Leventhal, 2002; Woodward & Liberty, 2005) (Type 5). Confounding factors are maternal socio-economic status, health, education and nurturance.

10.1.3 Risks of Artificial Baby Milk

In addition to not having the health benefits of breast milk, formula is associated with risks (Minchin, 2000) (Type 5). A systematic review of studies on formula preparation showed risks associated with incorrect reconstitution that impacted the health of babies. Only five studies were either adequate quality or size. All found errors in reconstitution, with a tendency to over-

concentrate foods, although under-concentration did occur (Renfrew, Ansell, & Macleod, 2003, Type 1).

Risks of feeding artificial breast milk substitutes include:

- Gastrointestinal infection from contamination during reconstitution (WHO, 2001).
- Bacterial contamination of powdered formula because with current technology, it is not feasible to sterilize it (WHO, 2001).
- Exposure to bisphenol A migrating from the lining of cans into liquid infant formula and migrating from the polycarbonate baby bottles into the liquid inside following the addition of boiling water (Government of Canada, 2008).

10.1.4 Promoting, Supporting and Protecting Breastfeeding

The *Encyclopedia on Early Childhood Development* acknowledge the benefits of establishing breastfeeding practices as well as providing the social, economic, workplace, nutritional, lactation management and moral support women need to meet their breastfeeding objectives (Grenier, 2004, Type 5). Comprehensive advice to public health decision-makers on policies and programs to achieve optimal infant feeding has been provided by the Global Strategy for Infant and Young Child Feeding (WHO, 2001, Type 5), the Innocenti Declaration (WHO/UNICEF, 1990, Type 5), the WHO evidence for the 10 steps to successful breastfeeding (WHO, 1998, Type 5) and The Baby-Friendly™ Initiative in Community Health Services: A Canadian Implementation Guide (Breastfeeding Committee for Canada, 2002, Type 5). A Community Action Plan for Children (CAPC)/Canada Prenatal Nutrition Program (CPNP) Think Tank representing 38 projects from across Canada identified factors that contribute to increased breastfeeding in the at-risk population. These success factors are a continuum of strategies to deliver support, education and training as well as community enhancement to develop a breastfeeding culture (Public Health Agency of Canada, 2001, Type 4). Mass media and peer counselors are examples of components of the comprehensive approaches most likely to be effective to increase the initiation of breastfeeding (Fairbank et al., 2000; Protheroe, Dyson, Renfrew, Bull, & Mulvihill, 2003; Tedstone, Aviles, Shetty, & Daniels, 2002) (Type 1).

The Registered Nurses' Association of Ontario (2005, Type 5) and others (Hector & King, 2005; Scott, 2005) (Type 5) have proposed creating “breastfeeding friendly” environments in health and day-care facilities, “mother and baby” areas for breastfeeding, public breastfeeding areas, 24-hour help for families having difficulties in breastfeeding; and promoting community action in breastfeeding.

The International Code of Marketing of Breast-Milk Substitutes and World Health Assembly Resolutions form the backbone of efforts to protect breastfeeding given pharmaceutical company promotional activities. It is difficult to evaluate the impact of worldwide efforts to monitor and uphold the Code given the scope of work through the WHO, UNICEF and Baby-Friendly Networks. A Cochrane review found that commercial hospital discharge packs given to women that containing artificial formula or promotional materials reduce the numbers who exclusively breastfeed at 6 and 13 weeks. The packs have no significant effect upon the earlier termination of

non-exclusive breastfeeding (Donnelly, Snowden, Renfrew, & Woolridge, 2000, Type 1). The United States Women, Infants and Children (WIC) program provides free infant formula to low-income mothers who do not breastfeed their infants. Women enrolled in WIC are less likely to initiate breastfeeding or to continue breastfeeding to 6 months (Callen & Pinelli, 2004, Type 1).

The Baby-Friendly Hospital Initiative was launched in 1991, as a joint initiative of UNICEF and the WHO to improve breastfeeding rates worldwide, and includes Ten Steps to Successful Breastfeeding (Scott, 2005, Type 5). One trial modeled on the Baby-Friendly Hospital Initiative increased the duration and exclusivity of breastfeeding in the first year of life (Kramer et al., 2001, Type 2). In October 2003, British Columbia's Deputy Minister of Health wrote to the chief executive officers of the six health authorities encouraging them to work with the BC Baby-Friendly Network "to create an environment conducive to breastfeeding in BC." In the fall of 2004, the Network and the BC Reproductive Care Program surveyed and received responses from 14/63 maternity units and 18/57 community health agencies regarding progress with the Baby-Friendly Initiative. This report indicated that a significant change in the priorities of the health authorities is necessary before health care organizations in BC can be designated Baby-Friendly (British Columbia Baby-Friendly Network, 2005, Type 5).

The International Labour Organization (ILO) has passed three Maternity Protection Conventions with a recommendation for 18 weeks of paid leave that would give working women the opportunity for exclusive breastfeeding. Although Canada has not (to date) ratified the Convention, maternity leaves can be extended to 12 months.

There is no consensus regarding best practice for one-to-one breastfeeding interventions. Several groups have determined that the most successful one-to-one breastfeeding interventions are long-term, spanning prenatal and postnatal periods with multiple contacts (individual and group) provided by professional breastfeeding promoters and peer counselors (Bonuck, Trombley, Freeman, & McKee, 2005; Tedstone, Duncie, Aviles, Shetty, & Daniels, 2002; de Oliveira, Camacho, & Tedstone, 2001, Type 1). De Oliveira et al. (2001, Type 1) identified that strategies to help extend breastfeeding duration need to combine information, guidance and support. They also determined that strategies with no effect are characterized by no face-to-face interaction, contradicting messages, and small-scale interventions (de Oliveira et al., 2001, Type 1). However, Guise et al. (2003, Type 1) did not believe that there was sufficient evidence to determine whether the combination of education with support is more effective than education alone in primary care-based breastfeeding-promotion interventions. Sikorski, Renfrew, Pindoria, Wade (2002, Type 1) concluded that professional support is effective at increasing the duration of breastfeeding, although the strength of its effect on the rate of exclusive breastfeeding is uncertain.

The Registered Nurses' Association of Ontario (2005, Type 5) identified that it is best practice to include performing a comprehensive breastfeeding assessment of mother/baby/family (prenatally and postnatally) to facilitate intervention and the development of a breastfeeding plan. The Association identified that key components of the prenatal assessment should include

- Personal and demographic variables that may influence breastfeeding rates.
- Intention to breastfeed.

- Access to support for breastfeeding, including significant others and peers.
- Attitude about breastfeeding among health care providers, significant others and peers; and physical factors, including breasts and nipples, that may affect a woman's ability to breastfeed.

Peer counselling has achieved dramatic results on exclusive breastfeeding rates in some developing countries. In industrialized countries, outcomes of peer-counsellor evaluations have been more mixed (Grenier, 2004, Type 5). Sikorski et al. (2002, Type 1) found that lay support is effective in continuing exclusive breastfeeding but its effect on any breastfeeding (i.e., non-exclusive) was not statistically significant. Labarere et al. (2005, Type 2) found that routine, preventive outpatient visits with peer support was effective in longer breastfeeding duration, longer exclusive breastfeeding and fewer breastfeeding problems. Dennis (2002, Type 3) found that both mothers and peer volunteers perceived their breastfeeding intervention experiences positively.

10.2 Key Findings

Type 1

- Infants should be exclusively breastfed for 6 months.
- Breastfeeding is a public health strategy for improving infant and child health, improving maternal morbidity, controlling health care costs and conserving natural resources.
- Breastfeeding helps to prevent respiratory, intestinal and ear infections, allergies, cardiovascular disease and obesity. There is emerging evidence that breastfeeding helps to prevent diabetes, inflammatory bowel disease and cancer.
- Errors made in reconstituting formula put infants' health at risk.
- Providing free formula decreases the rate of exclusive breastfeeding.
- Face-to-face breastfeeding interventions are effective but it is not clear whether interventions should involve education or support or a combination of both education and support.

Type 5

- Creating breastfeeding-friendly environments is a public health strategy to promote breastfeeding. An example is the Baby-Friendly Initiative.

B) Nutrition (Beyond Breast Milk) and Early Childhood Development

This section addresses the food and nutrition needs of early childhood beyond breastfeeding. For purposes of discussion, subsequent sessions focus on inter-related topics of the feeding relationship, nutritional deficiencies/supplements, food insecurity, obesity, and failure-to-thrive.

10.3 The Evidence

Nutrition practice guidelines have been developed with the outcome goal being growth in weight and length (height). Nutrition recommendations have been outlined in the following publications:

- *Nutrition for Healthy Term Infants* (Canadian Paediatric Society et al., 2005). See Appendix 5.
- *Weaning from the Breast: Position Statement* (Canadian Paediatric Society, 2004b).
- *Promoting Nutritional Health During the Preschool Years* (Health Canada, 1989).
- *Canada's Food Guide to Healthy Eating: Focus on Preschoolers* (Health Canada, 2002).
- Position of the American Dietetic Association: Dietary Guidance for Healthy Children Ages 2 to 11 Years (Nicklas, Johnson, & American Dietetic Association, 2004).
- *Dietary Recommendations for Children and Adolescents: A Guide for Practitioners. Consensus Statement from the American Heart Association* (Gidding et al., 2005).

In addition to adequate growth in weight and length (height), goals for good nutrition include

- Preventing chronic diseases.
- Preventing micronutrient deficiencies.
- Preventing overweight/obesity.
- Preventing dental caries.
- Preventing and avoiding food allergy (Nicklas et al., 2004, Type 5).

10.3.1 Food Habits

There is a lack of Canadian data on determinants of healthy eating and dietary behaviours in children (Taylor, Evers, & McKenna, 2005, Type 5). However, the American Heart Association has identified a gap between current dietary practices and recommended diets for infants and children in the United States (Gidding et al., 2006, Type 1). In the United States, mothers with college education are significantly more likely to

- Follow juice recommendations.
- Follow recommendations for the introduction of complementary foods.
- Provide more servings of fruit.

Core Public Health Functions for BC: Evidence Review

Healthy Infant and Child Development

- Provide fewer servings of sweetened beverages, desserts and candy (Hendricks, Briefel, Novak, & Ziegler, 2006, Type 4).

The comprehensive Feeding Infants and Toddlers Study (FITS) showed that preschoolers in the United States receive a majority of energy and nutrients from relatively few foods. During early childhood, ten foods provide 60 per cent of their calories (Fox, Pac, Devaney, & Jankowski, 2004; Fox, Reidy, Novak, & Ziegler, 2006) (Type 4).

The diet quality of preschoolers (including low income children) is considered to pose an obesity concern because of the high amounts of total fat, saturated fat, added sugar and lack of vegetables and fruit (Knol, Haughton, & Fitzhugh, 2005; Kranz, Siega-Riz, & Herring, 2004) (Type 4). See Section 9.0 on physical growth for more information.

Vegetables and Fruit:

Longitudinal research shows that eating vegetables and fruit during childhood may have a positive impact on long-term health outcome from heart disease (Ness et al., 2005, Type 4), certain cancers (Law, 2000, Type 4) and asthma (Nja, Nystad, Lodrup Carlsen, Hetlevik, & Carlsen, 2005, Type 4). In the FITS study, up to one-third of toddlers ate no vegetables or fruit servings and french fries were the most common vegetable by 15–18 months (Fox et al., 2004; Fox, Devaney, Reidy, Razafindrakoto, & Ziegler, 2006) (Type 4).

Vegetable and fruit intake is far lower than recommended, suggesting that a greater diversity could be attained by increasing awareness through exposure to a wider range of fruit and vegetables (Cockroft, Durkin, Masding, & Cade, 2005, Type 4). A number of factors have been found to influence vegetables and fruit consumption. Ethnicity is a significant factor, especially for the consumption of fruit, while family mealtimes are associated with higher intake of vegetables. Parental consumption, breastfeeding and early introduction to vegetables and fruit are related to intake of both vegetables and fruit (Cooke et al., 2004, Type 4). A longitudinal study followed mother-child pairs aged 2–24 months to 6–8 years. Vegetable variety in school age children was predicted by mother's vegetable preferences and fruit eating variety was predicted by breastfeeding duration and either early variety or exposure to fruit during infancy (Skinner, Carruth, Bounds, Ziegler, & Reidy, 2002, Type 4).

High-Fat and High-Sugar Foods:

In the FITS study, by 19–24 months, most toddlers ate baked desserts and candy (Fox et al., 2004; Fox, Reidy, et al., 2006) (Type 4). And, foods high in added fats and sugars provided approximately 19 per cent of the total energy in diets of toddlers (Fox et al., 2004; Fox, Reidy, et al., 2006) (Type 4). Children aged 4–19 who eat fast food consume more total energy, more energy per gram, more total fat, carbohydrate, sugars and sweetened beverages. They drink less milk and eat fewer fruits and non-starchy vegetables (Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004, Type 4). Research has shown that children prefer energy-dense foods to similar foods that are lower in fat and/or sugar (Birch & Deysher, 1986; Birch & Fisher, 1998) (Type 4). It has been suggested that health promotion practitioners need to look at sweet eating behaviours in terms of the wider cultural context, including children's popular culture (Albon, 2005, Type 5).

Beverages:

Beverages provide 84 per cent of total daily food energy for infants 4–6 months of age; this decreases to 36 per cent at ages 19–24 months. Juices, fruit drinks and carbonated beverages appear to displace milk in toddlers' diets (Fox, Reidy, et al., 2006; Skinner, Ziegler, & Ponza, 2004) (Type 4). The FITS study showed that by the end of the second year of life, more than 11 per cent of toddlers drink carbonated soft drinks (Fox et al., 2004, Type 4). There is evidence that soft drink consumption contributes to the incidence of overweight among school-aged children (James, Thomas, Cavan, & Kerr, 2004; Ludwig, Peterson, & Gortmaker, 2001) (Type 4). Recommendations regarding fruit juice (Committee on Nutrition, 2001, Type 5) and other sweetened drinks reflect concerns about their contribution to either failure-to-thrive or excess weight gain. There is conflicting evidence whether 100 per cent juice intake is associated with short stature or overweight (Dennison, Rockwell, & Baker, 1997; Skinner & Carruth, 2001) (Type 4).

Note: Benzene, a chemical linked to leukemia, can form in soft drinks containing ascorbic acid and either sodium benzoate or potassium benzoate, triggered by heat or light exposure. Health Canada is aware of recent reports of benzene in soft drinks sold in the United States and is investigating the situation in Canada. Based on the limited information currently available, Health Canada is not recommending that consumers change their consumption habits (Health Canada, 2006, Type 5). No meta-analysis was found on this topic.

The current recommendation in *Nutrition for Healthy Term Infants* (Appendix 5) for higher fat milk until two years of age may need to be revisited. One study showed no differences in growth or body composition (height, weight and percent body fat) from age 12 to 24 months between toddlers consuming 2% milk versus whole milk (Wosje, Specker, & Giddens, 2001, Type 2).

10.3.2 Food Allergies

Experts believe that food allergy prevalence is between 4 and 6 per cent of the population and is increasing (Ebo & Stevens, 2001, Type 1). “Emerging” food allergens include tropical fruits, sesame seeds, psyllium, spices and condiments that are frequently a cross-allergy to pollens or natural rubber latex (Ebo & Stevens, 2001, Type 1).

There are differences between the American Academy of Pediatrics' recommendations and the joint recommendations of the European Society of Pediatric Allergology and Clinical Immunology and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition regarding the definition of “high risk” for allergies and their prevention (Zeiger, 2003, Type 5). The American Academy of Pediatrics defines a high-risk infant as having two immediate family members (parents or sibling) with allergies (Zeiger, 2003, Type 5). The Europeans define a high-risk infant as having one family member with allergies (Zeiger, 2003, Type 5). The American Academy of Pediatrics recommends exclusive breastfeeding for the first 6 months, while the Europeans recommend it until 4–6 months (Zeiger, 2003, Type 5). The American Academy of Pediatrics promotes avoidance of allergenic foods and recommends adding cow's milk at 12 months, egg yolk at 24 months, and peanut, tree nut and fish at 3 years (Zeiger, 2003, Type 5). The Europeans do not recommend the delay of any specific foods (Zeiger, 2003, Type 5). The American Academy of Pediatrics recommends peanuts as the only

pregnancy or lactation allergen avoidance recommended for high-risk infants (Zeiger, 2003, Type 5). The Europeans recommend none (Zeiger, 2003, Type 5). Both groups recommended trials of maternal allergen avoidance during lactation if allergy is suspected from an infant's symptoms (Zeiger, 2003, Type 5).

An association between extra vitamin supplementation and increased risk of allergic sensitization is shown in two studies. Vitamin use at 3 years of age was associated with increased risk for food allergies but not asthma in both breastfed and exclusively formula-fed infants (Milner, Stein, McCarter, & Moon, 2004; Nja et al., 2005) (Type 4).

Special hydrolyzed formulas are appropriate alternatives to breast milk for allergy prevention in infants at risk (Fiocchi et al., 2003, Type 1). The risk of infants experiencing asthma or wheeze during the first year of life is reduced compared to standard cow's milk-based formula (Ram, Ducharme, & Scarlett, 2002, Type 1). Family history of atopic dermatitis may modify the preventive effect of the hydrolysates (Hays & Wood, 2005; von Berg et al., 2003) (Types 1 and 2).

10.4 Key Findings

There is a lack of Canadian data on determinants of healthy eating and dietary behaviours in children.

Type 1

- Food allergy prevalence is between 4 and 6 per cent of the population and is increasing.

Type 4

- The diet of preschoolers is high in total fat, saturated fat, added sugar and carbonated soft drinks, and low in vegetables and fruit. This is concerning because of the increased risk of obesity, heart disease, certain cancers and asthma.

Type 5

- The American Academy of Pediatrics and the European Society of Pediatric Allergy and Clinical Immunology and the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition differ in their definitions of infants who are at risk for allergy, delayed introduction of solid foods, and pregnancy/lactation allergen avoidance.

C) Nutritional Deficiencies and Supplements

10.5 The Evidence

The Dietary Reference Intakes provide the best current estimates of the nutrition needs of different population groups. Practice guidelines are highlighted in *Nutrition for Healthy Term Infants* in Appendix 5 (Canadian Paediatric Society et al., 2005).

Micronutrient deficiencies result in a complex syndrome of growth retardation, developmental delay, impaired immune function, reduced cognitive function and metabolic disturbances leading to increased risk of obesity and hypertension (Branca & Ferrari, 2002, Type 5).

Nutrition Reviews has profiled studies documenting low intakes of iron, zinc, calcium, and vitamins A and B6 in young children in the United States. Micronutrient shortages in early childhood have serious adverse consequences that may be only partly reversible (Roberts & Heyman, 2000, Type 1). The Centre for International Child Health has identified immigrant populations as particularly vulnerable to micronutrient shortages in early childhood (Tomkins, 2001, Type 1).

Although Canadian data is lacking, the American Feeding Infants and Toddlers Study (FITS) found many young children at risk for inadequate intakes of some vitamins and minerals. FITS found promising evidence to warrant recommending adequate levels of minerals, vitamins, essential fatty acids and other nutrients in children's diets to improve learning and behaviour (Dani, Burrill & Demmig-Adams, 2005, Type 4). Children studied at home and in child care centres showed low intakes of iron, zinc, calcium and other micronutrients (Roberts & Heyman, 2000, Type 4). Nolan, Schell, Stark & Gomez (2002, Type 4) found that infants from low-income urban families had inadequate intakes of vitamin D, zinc, and iron, especially at 1 and 8 months.

It has been recommended that education for caregivers should include promoting foods rather than nutrients and the importance of early feeding practices for developing lifelong eating habits. Caregivers should be encouraged to avoid relying on fortified foods and supplements to meet nutrient needs. Caregivers also require information on the potential risk of excessive intakes - especially vitamin A, zinc and folate used in the fortification of foods (Briefel, Hanson, Fox, Novak & Ziegler, 2006; Fox, Reidy, et al., 2006) (Type 5).

10.5.1 Vitamin D

Recent studies provide evidence that vitamin D deficiency rickets continues to be a public health problem in Canada. Issues in establishing vitamin D recommendations for infants and children include the fact that deficiency includes more than just rickets; adequate sunlight exposure cannot be accurately determined; ultraviolet B light exposure is associated with skin cancer; and older children are consuming less vitamin D-fortified food (Greer, 2004, Type 5). The Canadian Paediatric Society and Health Canada recommendations (Health Canada, 2004c) are incorporated into the online version of *Nutrition for Healthy Term Infants*. During two years of surveillance in Canada, 104 cases of vitamin D deficiency rickets were confirmed. Most cases were infants and toddlers with darker skin who had been exclusively breastfed without vitamin D

supplementation at the recommended levels. The results reinforce current Canadian Paediatric Society recommendations (Canadian Paediatric Society, 2004a, Type 5). Vitamin D appears to be a protective factor against diseases other than rickets. Harris (2005) found that doses of 2,000 IU/day of vitamin D had a strong protective effect against Type 1 diabetes. In areas of high multiple sclerosis prevalence, dietary supplementation of vitamin D in early life may reduce the incidence of multiple sclerosis (Chaudhuri, 2005, Type 4). Considering all of this, the current recommendation from the Canadian Paediatric Society to supplement all breastfed infants with vitamin D is controversial. It has been recommended that the role of the primary care professional is to understand the vitamin D dilemma, promote breastfeeding and prevent vitamin D deficiency rickets (Henderson, 2005, Type 5).

10.5.2 Iron

In Canada, 4 to 5 per cent of non-Aboriginal preschool children suffer from iron-deficiency anemia compared with a prevalence of between 14 and 24 per cent in First Nations preschoolers (Zlotkin, Ste-Marie, Kopelman, Jones & Adam, 1996; Willows, Dewailly & Gray-Donald, 2000; Willows, Morel & Gray-Donald, 2000) (Type 4). In the United States, the incidence of iron-deficiency anemia has decreased in recent years (Centers for Disease Control and Prevention, 2002, Type 4).

In children, iron deficiency develops slowly and produces few acute symptoms. Low iron status at 1 and 2 years of age has been associated with slower growth up to 6 years of age (Gunnarsson, Thorsdottir & Palsson, 2005, Type 4). Numerous studies indicate that anemia in early childhood is associated with poor cognitive and motor development and depressed school achievement in middle childhood (Grantham-McGregor & Ani, 2001, Type 1) (Lozoff, Jimenez, Hagen, Mollen & Wolf, 2000, Type 3) although Grantham-McGregor and Ani (2001, Type 1) found no causal relationship and poverty was a confounding factor. Breastfeeding for 25 weeks or longer may be associated with decreased iron deficiency (Altucher, Rasmussen, Barden & Habicht, 2005, Type 4).

Environmental factors influence iron deficiency. Differences in behaviour and development are associated with multiple stressful events (Deinard, List, Lindgren, Hunt & Chang, 1986, Type 2). Mother-infant interactions and infant development may be altered by maternal iron-deficiency anemia. This indicates that iron-deficient mothers may be less in tune with their babies (Beard et al., 2005; Perez et al., 2005) (Type 2).

Intervention studies addressing reversing anemia in infants diagnosed with iron deficiency suggested that the potential for reversal of associated developmental impairments is limited (Roberts & Heyman, 2000, Type 1). Iron supplementation improves mental development scores modestly. In children under two years, short-term iron supplementation fails to produce benefits. Anemic older children catch up in cognition with treatment, but not in school achievement (Grantham-McGregor & Ani, 2001, Type 1). The effect is particularly apparent for intelligence tests above 7 years of age and in initially anemic or iron-deficient anemic subjects. There is no convincing evidence from a review of randomized control trials that iron treatment has an effect on mental development in children below 27 months of age or on motor development (Sachdev, Tarun & Nestel, 2005, Type 1).

Because of the ineffectiveness of reversing the damage done by iron deficiency, prevention is key. There are three primary intervention strategies to prevent iron-deficiency anemia (Zlotkin, 2003) (Type 5):

1. **Offering a wide variety of foods with more bioavailable iron:** Introduction of meat as an early complementary food for exclusively breastfed infants is feasible and associated with improved iron and zinc intake (Krebs et al., 2006, Type 2). A food-based approach in a northern community with infants at risk for iron-deficiency anemia positively contributed to improved intake of complementary food iron (Verrall & Gray-Donald, 2005, Type 3).
2. **Fortifying foods targeted at young children:** Many factors, such as bioavailability of the iron, would need to be considered when embarking on this strategy. For example, iron-deficiency anemia among 9-month-old infants is not explained by failure to introduce iron-fortified infant cereals (Innis, Nelson, Wadsworth, MacLaren & Lwanga, 1997, Type 4). Beinner, Lamounier and Tomaz (2005, Type 3) found that an intervention in day care facilities serving iron-fortified drinking water was an effective, simple and inexpensive means of reducing and controlling for moderate and severe anemia in preschool children.
3. **Supplementing the mother and/or child:** Prevention and treatment of even mild maternal anemia may prevent iron-deficiency anemia among high-risk children (Geltman et al., 2004, Type 2; Savoie & Rioux, 2002, Type 5). However, multivitamins with iron are not effective in preventing iron deficiency or anemia in 9-month-old infants (Geltman et al., 2004, Type 2). Gera and Sachdev (2002, Type 1) found that iron supplementation had no apparent harmful effect on infectious illness in children but did increase the risk of developing diarrhea. Evidence needs to be generated on the relative merits of selective (anemic) versus general supplementation and daily versus weekly supplementation (Nagpal, Sachdev, Sing & Mallika, 2004, Type 2).

A screening tool used by health care professionals to predict at-risk children has been recommended as a major advance because of the late appearance of symptoms of iron-deficiency in children (Innis, Derkson & Harrison, 2006, Type 5).

10.5.3 Multiple Vitamin and Mineral Supplements

A growing number of double-blind, placebo-controlled studies have considered the influence of micronutrient supplementation on the intelligence of children. Studies have compared the impact of supplementation on either verbal or non-verbal measures of intelligence with a positive response found in the majority of studies. The children that responded to supplementation were those whose diet offered low levels of micronutrients (Benton, 2001, Type 1).

There are no Canadian recommendations for these supplements for 0- to 5-year-olds (Dietitians of Canada, 2006b, Type 5). One American study indicated that for the first 2 years of life, most children obtained adequate nutrients from diet alone (Eichenberger Gilmore, Hong, Broffitt & Levy, 2005, Type 4) although Stang (2006, Type 4) found that American caregivers appear to compensate for lack of variety and poor nutritional quality by using multivitamin/mineral supplements. FITS showed that by 4 to 5 months, 8 per cent of infants received vitamin/mineral

supplements; this increased to 19 per cent by 6 to 11 months and 31 per cent among toddlers 12 to 24 months old (Briefel et al., 2006, Type 4).

Fatty Acid Supplements

The role of essential fatty acids on early childhood development is a popular topic. A meta-analysis of animal and human studies on docosahexanoic acid (DHA) during the perinatal period of “brain growth spurt” showed that changes in brain concentrations of DHA and n-3 long-chain polyunsaturated fatty acid (LCPUFA) are positively associated with changes in cognitive or behavioural performance (McCann & Ames, 2005, Type 1). LCPUFA provide beneficial effects on growth and appear to have a beneficial effect on neurodevelopmental outcome up to 4 months of age (Hadders-Algra, 2005, Type 1). Hellend, Smith, Saarem, Saugstad and Drevon (2003, Type 2) found that maternal supplementation with fatty acids DHA and eicosapentaenoic acid (EHA) during pregnancy and lactation augmented children’s IQ at 4 years of age.

Breast milk contains LCPUFA, DHA and arachidonic acid (ARA). When solids replace breast milk, the levels of LCPUFA in breastfed infants decrease. A dietary supply of DHA throughout the first 12 months was found to accelerate neural development and maturation of visual acuity (Hoffman et al., 2004, Type 2).

Infant formulas have been developed that mimic the fatty acids of breast milk. There is a lack of consensus and it is not yet clear what the effects are of such LCPUFA-supplemented formulas. The Practice-Based Evidence in Nutrition (PEN) site reviewed studies comparing supplemented and non-supplemented formulas. PEN concluded that infants fed LCPUFA-supplemented formulas had levels of DHA and ARA comparable to levels seen in breastfed reference infants (Dietitians of Canada, 2006a, Type 1). However, PEN found no evidence that LCPUFA supplemented formulas influenced growth in healthy term infants and found little evidence that LCPUFA-supplemented formulas provided visual or developmental benefits in term infants (Dietitians of Canada, 2006a, Type 1). Lucas et al. (1999, Type 2) agreed, stating that adding LCPUFA to infant formula during the first 6 months had neither beneficial nor adverse effect on cognitive development, motor development, or growth up to 18 months. However, Auestad et al. (2003, Type 1) concluded that providing LCPUFA-supplemented formulas until 12 months of age supported visual and cognitive development through 39 months of age.

10.6 Key Findings

Type 1

- Micronutrient shortages in early childhood have serious adverse consequences that may be only partly reversible.
- Immigrant populations are particularly vulnerable to micronutrient shortages in early childhood.
- Iron-deficiency anemia in early childhood is associated with poor cognitive and motor development and depressed school achievement in middle childhood. However, poverty confounds this relationship. These effects may not be reversible.

- The evidence is mixed regarding whether there are neurodevelopmental and growth benefits to supplementing formula with long chain polyunsaturated fatty acids, similar to those found in breast milk.

Type 5

- The current recommendation to supplement all breastfed infants with 400IU of vitamin D is controversial. It has been recommended that the role of the primary care professional is to understand the vitamin D dilemma, promote breastfeeding and prevent vitamin D deficiency rickets.
- There are three primary intervention strategies suggested to prevent iron-deficiency anemia: offering more foods with high-bioavailable iron, fortifying foods targeted to young children, and supplementing mother and/or child.

D) The Feeding Relationship

10.7 The Evidence

10.7.1 Early Eating Behaviour Leads to Lifelong Habits

It is believed that feeding and eating experiences early in life shape dietary preferences and ultimately the quality of nutrition throughout childhood (Fox et al., 2004, Type 4); (Lederman et al., 2004; Stang, 2006) (Type 5). The Young Finns study showed that food behaviour and concrete food choices are established in childhood or adolescence and may significantly track into adulthood (Mikkila, Rasanen, Raitakari, Pietinen & Viikari, 2005, Type 4).

Food neophobia and enjoyment of food have been found to be strongly related to the consumption of fruit and vegetables. Parental intake and child food neophobia independently predicted intake of both foods. Fruit consumption was affected by breastfeeding and early introduction of fruit. Vegetable consumption related to child's gender and enjoyment (Cooke et al., 2004, Type 4).

10.7.2 Influences on Eating Behaviour

The development of eating behaviours is believed to be a complex process influenced by social, cultural, biological (hunger and satiety cycles), ecological and personal factors (Stang, 2006, Type 5). In the first three years of life, a child's feeding abilities and needs change with motor, cognitive and social development (Liu & Stein, 2005, Type 5). Exposure, Pavlovian conditioning and social learning shape the relationship between internal and external factors, food liking and eating behaviour (Eertmans, Baeyens & Van den Bergh, 2001, Type 1). Liking for the sensory aspects of food appears to be at the centre of developing, maintaining and changing dietary patterns (Eertmans et al., 2001, Type 1).

Expert opinion supports a division of responsibility in feeding where parents provide appropriate food and feeding structure/limits on negative behaviours and children decide whether or not to eat and how much to eat. The focus in feeding should not be getting food into the child, but

rather on the feeding relationship, helping the child learn eating skills and positive eating behaviours (Satter, 1986b, 1995) (Type 5). There is no evidence to support the concern that many parents have that children will not get enough calories for growth if they self-feed (i.e., children need to be spoon-fed). Most children who self-feed at an earlier age (7 to 14 months) have been found to have higher intakes of energy and nutrients than those who are fed. By 15 to 18 months, most children have comparable self-feeding skills whether they self-fed earlier or later (Carruth, Ziegler, Gordon & Hendricks, 2004, Type 4). This finding led Carruth et al. (2004) to conclude that “assuming a variety of nutritious foods are offered to infants and toddlers, caregivers may encourage self-feeding without concern for jeopardizing energy and nutrient adequacy.”

The literature is mixed regarding whether inappropriate parental reactions may result in poor growth, problematic feeding behaviours, stressed feeding interactions and family conflicts. (Ramsay, 2004, Type 5). Some indicate that parents play an important role in determining eating habits and weight development of their children through their behaviours, attitudes and feeding styles (Patrick & Nicklas, 2005, Type 1) (Fisher & Birch, 1995; Spruijitt-Metz, Lindquist, Birch, Fisher & Goran, 2002) (Type 4). Evidence exists for the following patterns:

- Children with the strongest preferences for high-fat foods and highest total fat intakes have heavier parents than children with lower scores (Fisher & Birch, 1995, Type 4).
- Parental vegetable and fruit consumption is associated with children’s vegetable and fruit consumption (Fisher, Mitchell, Smiciklas-Wright & Birch, 2002; Wardle, Carnell & Cooke, 2005) (Type 4).
- Food insecurity/low income affects the nature of foods available in the physical environment, which in turn influences children’s diets. Barriers to healthy eating for low-income caregivers of toddlers include work schedules, cost of food, and inadequate time to shop, plan and prepare nutritious meals (Omar, Coleman & Hoerr, 2001, Type 4).

One selective review of the literature found no consensus about the links between parent eating problems and children’s food selection and rejection, including child feeding difficulties. Coulthard, Blissett and Harris (2004, Type 1) have concluded that the complexity of child feeding problems is unlikely to be explained by only parental behaviours or genetic tendencies.

Viewing television has an enormous potential influence on children’s eating behaviours, which can overshadow familial influences (Taylor, Kacmar, Nothnagle, & Lawrence, 2005, Type 1). Refer to Section 10.15 on marketing food to children/television viewing for more a more detailed discussion of this subject.

10.7.3 Picky Eating/Neophobia

Both picky eating and neophobia are common eating problems among toddlers and preschoolers that when carried to extremes may cause refusal to eat and failure-to-thrive. Picky eaters eat fewer foods and less variety, specifically avoiding vegetables. Parents of picky eaters often limit exposure to new foods and foods children dislike (Jacobi, Agras, Bryson & Hammer, 2003, Type 4).

Caregivers across genders, ethnicities and incomes perceive children as picky eaters. The percentage of picky eaters increases from infancy into toddlerhood. An American random sample of over 3,000 children identified 19 per cent as picky eaters at 4 months and 50 per cent at 24 months (Carruth et al., 2004, Type 4).

There appears to be interplay of infant temperament and parental responses shaping these behaviours. Children have been found to accept or reject food based on qualities of the food (taste, texture, smell, temperature or appearance) as well as environmental factors such as the setting, presence of others and the anticipated consequences of eating or not (including more time to play) (Jacobi et al., 2003, Type 4).

Flavour is the primary dimension by which young children determine food acceptance. Prenatal (in utero) and early postnatal (in breast milk) exposure to flavour enhances the infants' enjoyment of that flavour in solid foods during weaning (Mennella, Jagnow & Beauchamp, 2001, Type 2). Gerrish and Mennella (2001, Type 2) found that exposure to a variety of flavours also enhanced food acceptance in formula-fed infants.

Increasing familiarity and positive associations with food increases the likelihood of acceptance (Black, 2003; Westenhoefer, 2001) (Types 5 and 1) and children may experience "learned safety", which lessens neophobia (Birch, McPhee, Shoba & Steinberg, 1987, Type 4).

10.7.4 Interventions

Byrne and Nitzke (2002, Type 4) found that presenting a novel vegetable in a positive, interactive manner increased the willingness of children to taste new foods.

A successful blend of educational and social marketing strategies is recommended to include a narrow, behaviour-based "try new foods" message, multiple nutrition education activities and repeated opportunities to taste novel foods (Young, Anderson, Beckstrom, Bellows & Johnson, 2004, Type 4). Parents need to know to provide many more repeated exposures (e.g., 8 to 15 times) to enhance food acceptance (Carruth et al., 2004, Type 4). It is recommended that caregivers be provided with information about methods for dealing with picky eating (Matheson, Spranger & Saxe, 2002, Type 4).

10.7.5 Family Meals

There is a growing body of literature showing the social value of family meals and their contribution to children's dietary quality, psychosocial health and learning. Mealtimes can be viewed in the context of family rituals where interactions, traditions and celebrations reinforce identity, a shared sense of belonging and a vehicle to transmit family values, attitudes, culture and goals (Story, 2005, Type 5). Rituals provide young children with a sense of security and how families work together (Wolin & Bennett, 1984, Type 5). One study looked at the role mealtime conversations played in language acquisition in young children in 65 families followed over 15 years. The conversations around the family table taught children more vocabulary and forms of discourse than they learned through reading. Improved vocabularies led to better reading and school performance (Snow & Beals, 2006; Wolin & Bennett, 1984) (Type 4).

10.7.6 Disordered Eating

Restrained eating or “refusal to eat” in infancy has been studied to determine if this contributes to lifelong disordered eating. Results have been mixed (Jacobi et al., 2003; Rydell & Dahl, 2005) (Type 4). A Cochrane review of interventions to prevent eating disorders in children and adolescents (the review did not focus strictly on the preschool population) made no firm conclusions (Pratt & Woolfenden, 2002, Type 1). The development and refinement of prevention programs is complicated by a lack of knowledge about risk factors associated with eating disorders (Pratt & Woolfenden, 2002, Type 1). Satter (1986a, Type 5) states that childhood eating disorders can be a misuse of feeding in an attempt to solve or camouflage family problems.

Park et al. (2003, Type 1) found that maternal eating disorders may increase the risk of parenting difficulties and adverse developmental outcomes for children, although a significant proportion of children are unaffected by their mothers’ eating disorder.

10.8 Key Findings

Type 1

- While parents play an important role in determining eating habits and weight development of their children through their behaviours, attitudes and feeding styles, the complexity of child feeding problems is unlikely to be explained solely by parental behaviours or genetic tendencies.
- Viewing television has an enormous potential influence on children’s eating behaviours that can overshadow familial influences.

Type 4

- Children with the strongest preferences for high-fat foods and highest total fat intakes have heavier parents than children with lower scores, and children’s vegetable and fruit intake is associated with parental vegetable and fruit intake.
- Children have been found to accept or reject food based on qualities of the food (taste, texture, smell, temperature or appearance) as well as environmental factors such as the setting, presence of others and the anticipated consequences of eating or not (including more time to play).
- There appears to be an interplay of infant temperament and parental responses shaping picky eating behaviours. Parents of picky eaters often limit exposure to new foods and foods children dislike. It is recommended that caregivers be provided with information about methods for dealing with picky eating because children may experience “learned safety” which lessens neophobia.

Type 5

- Mealtimes can be viewed in the context of family rituals where interactions, traditions and celebrations reinforce identity, a shared sense of belonging, and a vehicle to transmit family values, attitudes, culture and goals, thus providing children with a sense of security.
- Expert opinion supports a division of responsibility in feeding where parents provide appropriate food and feeding structure/limits on negative behaviours and children decide whether or not to eat and how much to eat.

E) Nutrition Programs

The American Dietetic Association's position is that children should have access to food and nutrition programs including food assistance and meal programs, nutrition education initiatives, nutrition screening and assessment followed by appropriate nutrition intervention and anticipatory guidance (Stang, Taft Bayerl & Flatt, 2003, Type 1).

10.9 The Evidence

10.9.1 Food Assistance and Meal Programs

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) is a national food assistance program in the United States that provides at-risk pregnant, postpartum, and breastfeeding women and infants and children under the age of 5 years from families with low incomes with vouchers for the purchase of nutritious supplemental food. Many studies have reported positive effects from WIC, leading to the American Dietetic Association to state that "WIC ensures that infants and children from families with low incomes have access to nutritious foods and nutrition education during the most critical years of growth and development, and its role in promoting health and preventing chronic illness cannot be underestimated" (Stang, Taft Bayerl & Flatt, 2006, p. 1471). Studies have shown that WIC has beneficial effects on infant birth weight, low birth weight rates, preventing preterm delivery, children's nutrient intakes, and decreasing health care costs. (Stang et al., 2003, Type 1).

There is no national Canadian food assistance/meal program like WIC with such a strong body of associated research. Pregnancy Outreach Programs in BC were last evaluated in 2004-2005. 93 per cent of participants received food vouchers, meals and/or vitamins. Participants reported that information was the primary reason for participating. Other important reasons for participating were the support of staff, the food supplies, the health of the baby and the social support (MOH, 2005, Type 5).

10.9.2 Nutrition Education Initiatives

Valle, Santos and Gigante (2004) (Type 1) found that nutrition counselling during the first year of life improved maternal and professional practices on child nutrition and feeding. Experts have advocated for the promotion of healthy feeding habits to primary caregivers through intervention

Core Public Health Functions for BC: Evidence Review

Healthy Infant and Child Development

at multiple levels and by various health professionals including public health nurses (Benoit, 2004; Black, 2003) (Type 5).

Target

It has been recommended that initiatives to improve infant and toddler feeding practices should focus on assisting mothers who have less than a college education, who are unmarried, whose child is in day care or in programs for disadvantaged women, infants and children (Hendricks et al., 2006, Type 4).

Content

Nutrition education should be focused upon identifying and decreasing barriers to good nutrition for children aged 1 to 5 years and their caregivers (Tedstone, Aviles et al., Type 1). Education aimed at improving children's nutrition need to address the variety of social and physical factors that influence children's eating patterns (Patrick & Nicklas, 2005, Type 1). Parents from high-income suburbs are more likely to discuss food and health in technical terms. Those in low-income suburbs discuss food in terms related to children's outward appearance or functional capacity (Coveney, 2005, Type 4). Research and expert opinion indicates that parents and caregivers can benefit from guidance about

- The importance of breastfeeding through the first year of life (Briefel, Reidy, Karwe & Devaney, 2004, Type 5).
- The introduction of developmentally-appropriate, micronutrient-rich first solids (Briefel et al., 2004, Type 5).
- The importance of foods (rather than just nutrients) in promoting health (Fox, Devaney et al., 2006, Type 4).
- The importance of eating habits and mealtime feeding practices in the development of lifelong eating habits (Horodynski, Hoerr & Coleman, 2004, Type 3) (Fox, Devaney et al., 2006; Spruijt-Metz et al., 2002) (Type 4).
- Providing a wide variety of fruit, vegetables and whole grains as well as foods naturally rich in iron (Fox, Devaney et al., 2006, Type 4).
- A smaller proportion of parents and caregivers require guidance on delaying the introduction of juices until six months of age and cow's milk until one year of age (Briefel et al., 2004, Type 5).

Methods

Health professionals are viewed as a major information/advice source for feeding children in the first three years (Carruth & Skinner, 2001, Type 4). There are multiple opportunities and avenues for educators to disseminate nutrition information (Stang, 2006, Type 4); (Carruth & Skinner, 2001, Type 5). The 2002 Feeding Infants and Toddlers Study (FITS) identified the following opportunities (Stang, 2006, Type 4):

- Encouraging pregnant women to choose a variety of foods.

- Promoting breastfeeding to foster early exposure to a variety of food flavours.
- Teaching caregivers how to recognize developmental milestones that signal the appropriate time to introduce solid foods in the proper order.
- Explaining how and why children learn to prefer certain foods and beverages.
- Emphasizing the importance of repeated exposures to novel foods as well as the need for variety and diversity.
- Encouraging caregivers to offer lower added fat and added sugar food selections.

The following are characteristics of effective education targeting children aged 1 to 5 years and their caregivers (Tedstone, Aviles et al., 2002, Type 1):

- Traditional, video or computer-based teaching methods are successful in increasing nutrition knowledge, including parent's enhanced effectiveness.
- The use of rewards is not successful in changing behaviour once rewards are removed.
- For mothers, needs-focused, one-to-one diet counselling is successful in improving diet quality and food-related organizational skills. Nutrition education workshops and related newsletters have positive effects on children's diets.

The most effective education for increasing vegetable and fruit consumption for children 4 years and older (Public Health Research, Evaluation and Development Program, 1999, Type 1):

- Give clear messages about eating more vegetables and fruit.
- Incorporate behavioural theories and goals, providing a consistent framework for implementation and evaluation.
- Provide longer and more intensive interventions rather than one or two contacts.
- Actively involve influential people such as family members.
- Have a greater impact on those whose knowledge or intake is lower at the beginning.

Best practice guidelines promoting healthy eating patterns use one or more of the following components (Registered Nurses' Association of Ontario, 2005, Type 1): small group activities, goal setting, social support, interactive food-related activities (e.g., cooking) and family participation and assisting clients to assess and access community resources (e.g., referral to resources, promotion of low-cost physical activity options).

Reed (1996, Type 4) found that desirable features of nutrition education programs for low-income mothers included specific nutrition topics and information on stages of child development, age-appropriate food-related activities and family communication skills plus a variety of delivery methods targeting home and neighbourhood environments. In another study, parental self-efficacy for practicing mealtime responsibilities among at-risk families was improved when nutrition educators suggested solutions (Hoerr, Utech & Ruth, 2005, Type 4).

Setting behavioural targets for families is suggested, such as increasing consumption of vegetables and fruit (“5-a-day”), and preparing and eating family meals at home (Daniels et al., 2005, Type 5).

10.9.3 Nutrition Screening/Assessment

Experts in early childhood development recommend providing nutrition assessment and support (Federal/Provincial/Territorial Advisory Committee on Population Health, 1999, Type 5). Health professionals have identified the importance of nutrition screening of preschool children, yet there is currently no clear process for identifying nutrition problems in this population (Rysdale, 2004a, Type 5).

Various groups have identified factors to be included in nutrition screening/assessment. Emphasis in the past has been on anthropometric measurement, body composition and energy expenditure of children at risk for malnutrition (Zemel, Riley & Stallings, 1997, Type 5). However, growth monitoring and promotion programs (based largely on growth charts) do not meet the performance criteria of a screening program (Roberfroid, Kolsteren, Hoeree & Maire, 2005, Type 1). A composite index of measurements (anthropometric, biochemistry and dietary intake) is thought to be more comprehensive as it includes more than one dimension of growth and development (Talwar, 1975, Type 5). The US Preventive Services Task Force agrees, concluding that the evidence is insufficient to recommend for or against routine screening for overweight children and adolescents (aged 6–19 years) as a means to prevent adverse health outcomes (Whitlock, Williams, Gold, Smith & Shipman, 2005, Type 1).

Examples of recommendations for factors to include in screening/assessment include the following:

1. The American Heart Association has a schedule for the early identification of risk factors for cardiovascular health to be assessed in primary care for children 2 to 6 years of age (Williams et al., 2002, Type 5).
2. The Ontario College of Family Physicians (2004, Type 1) identified the following factors:
 - Weight growth curve is not following expected pattern (see Section 9.0 on physical growth).
 - Medical problems that make eating or drinking a problem such as swallowing, gagging, choking.
 - Health problems such as iron-deficiency anemia, constipation.
 - Unsafe practices (e.g., herbal products, unpasteurized milk, choking hazards).
 - Feeding problems such as significant food refusal.
 - Family has problems with adequate food or facilities.

No validated tools have been found to assess these varied factors to determine nutritional status of 0–5 year olds. Since 2001, a nutrition screening tool for 3–5 year olds, NutriSTEP, has been under development for caregivers, child care providers and nutrition and health professionals across Canada (Rysdale, 2004b, Type 5).

There is no evidence to determine the best location for nutrition screening/assessment. Flynn (2003, Type 1) found that growth assessment and parental education at preschool public health vaccination clinics enabled public health and primary care professionals to contribute to obesity prevention. This method appeared satisfactory to stakeholders and maximized use of existing resources to establish a surveillance program.

10.10 Key Findings

Type 1

- Nutrition counselling during the first year of life improves maternal and professional practices in child nutrition and feeding. Nutrition education should be focused upon identifying and decreasing barriers to good nutrition for children aged 1 to 5 years and their caregivers, including social and physical factors.
- The US Special Supplemental Nutrition Program for Women, Infants and Children (WIC) has beneficial effects on infant birth weight, low birth weight rates, preventing preterm delivery, children’s nutrient intakes, and decreasing health care costs. There is no national Canadian food assistance/meal program like WIC with such a strong body of associated research.
- Best practice guidelines promoting healthy eating patterns use one or more of the following components: small group activities, goal setting, social support, interactive food-related activities (e.g., cooking) and family participation and assisting clients to assess and access community resources (e.g., referral to resources, promotion of low-cost physical activity options).

Type 5

- Health professionals have identified the importance of nutrition screening of preschool children, yet there is currently no clear process for identifying nutrition problems in this population. However, a nutrition screening tool for 3-5 year olds, NutriSTEP, is been under development for caregivers, child care providers and nutrition and health professionals across Canada.

F) Food Insecurity

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Agriculture and Agri-Food Canada, 1998, Type 5). Food insecurity can be experienced at the individual, household and community level.

10.11 The Evidence

Poor child health outcomes are associated with household food insecurity. In BC, the cost of food rose 38 per cent between 1989 and 2003, and residents living on low incomes could not afford a healthy diet after paying for shelter expenses (Dietitians of Canada, 2005, Type 5). Foods with little nutritional value are more affordable than high quality, nutrient-rich food. Foods with high fat and high sugar content are among the least expensive foods (Drewnowski, 2000, Type 5). Secondary data analysis of the 1996 Family Food Expenditure Survey conducted by Statistics Canada showed that access to milk products, fruit and vegetables are constrained in low-income Canadian families (Kirkpatrick & Tarasuk, 2003).

Across Canada, children in this age group are the most likely to live in food-insecure households (Che & Chen, 2001, Type 5). Children living in single-parent households are at increased risk. The 2000/2001 Canadian Community Health Survey found that one-third of lone female parents reported food insecurity (Ledrou & Gervais, 2005, Type 5). Aboriginal people are at high risk for food insecurity and poor nutritional status (Riches, 2004) (Type 5) In Vancouver, inner city households with preschool children experienced food insecurity at dramatically higher rates than other areas of the city. Food options are limited because of lack of full-service grocery stores, appliances and cooking skills (Broughton, Janssen, Hertzman, Innis & Frankish, 2006, Type 4).

The United States Household Food Security Scale showed a dose-response relationship between fair/poor health status and severity of food insecurity. After adjusting for confounders, food-insecure children have odds of "fair or poor" health nearly twice as great and odds of being hospitalized almost one-third greater than food-secure children (Cook et al., 2004, Type 4). Inadequate nutrition during early childhood may lead to permanent cognitive damage or problems such as aggression, anxiety and irritability (Alaimo, Olson & Frongillo, 2002, Type 4) and reduced quality of life (Casey et al., 2005, Type 4).

The American Dietetic Association position's is that food insecurity negatively affects children's health, psychological and cognitive functioning and their academic achievement (Olson & Holben, 2002, Type 1). Hunger is one result of food insecurity. Another is the potential risk of undiagnosed micronutrient deficiencies from food with little or no nutritional value (MOH, PHW, 2006b, Type 5). Health implications of food insecurity in young children were reviewed and add to these findings issues of impaired social interaction skills, increased vulnerability to poor physical health, depression, feelings of anxiety, family dysfunction, social exclusion and decreased involvement in social activities after controlling for income (McKeown, 2006, Type 1).

10.11.1 Infant Feeding Issues

A population-based longitudinal study in Canada showed that breastfeeding initiation, duration and its exclusivity improve with mother's age, education and socio-economic status. The odds of following the recommendations of being breastfed at birth, being fed complementary food at 4 months or later and cows' milk at 9 months or later are 2 to 3 times higher living in a family with the highest socio-economic status (Dubois & Girard, 2005, Type 4).

10.11.2 Iron-Deficiency Anemia

The association between child-level food insecurity and iron status in young children was examined using community-based data from the Children's Sentinel Nutrition Assessment Program in the United States. Food-insecure children up to 36 months of age were significantly more likely to have iron-deficiency anemia compared to food-secure children (Skalicky et al., 2005, Type 4). Willows, Iserhoff, Napash, Leclerc and Verrall (2005, Type 4) found that one out of five mothers in northern First Nations communities were anxious about their food supply. This anxiety was positively associated with anemia and smoking during pregnancy and with bottle-feeding at 9 months postpartum.

10.11.3 Weight Issues

Food insecurity has been linked to both underweight and overweight in the preschool population. Results from the Early Childhood Longitudinal Study show that approximately 11 per cent of kindergarten children are overweight and those from food-insecure households are 20 per cent likely to be overweight. Positive predictors of overweight status included low physical activity, television watching for over two hours a day, high birth weight and low income (Rose & Bodor, 2006, Type 4). Broughton et al. (2006, Type 4) found that one-third of preschool children in inner city Vancouver are overweight or obese.

10.11.4 Implications

There are strong arguments for improving food security among households with young children. Analysis of data from the United States National Health and Nutrition Examination Survey (NHANES III) demonstrated negative academic and psychosocial outcomes associated with family-level food insufficiency and provides support for public health efforts to address food security (Alaimo, Olson & Frongillo, 2001, Type 5). Food security is also a public health concern since many chronic diseases are diet-related and are found to have a higher prevalence in food-insecure populations. Nutrition education alone is insufficient to change eating habits of young children, as shown by the Nutrition Education Aimed at Toddlers (NEAT) project for rural, low-income families (Horodyski et al., 2004, Type 3).

Food security issues for families with young children cannot be separated from broader issues of community food security (McKeown, 2006, Type 5). Community food security has been defined as "a situation in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes self-reliance and social justice" (Hamm & Bellows, 2003, Type 5). Since food security is a social determinant of health, the Dietitians of Canada's position is that a population health approach is needed to address individual and household food insecurity (Dietitians of Canada, 2005, Type 5).

Upstream health promotion approaches are required to address issues of who controls the food supply and influences the food choices of individuals and communities (Caraher & Coveney, 2004, Type 5). Rationales for a systematic community food security approach in public health indicators for health authorities have been identified (Community Nutritionists Council of BC, 2004; Desjardins et al., 2002; Ostry & Rideout, 2004; MOH, PHW, 2006a) (Type 5).

There are interventions that health services, either alone or in collaboration with other agencies, can use to reduce inequalities in health. Characteristics of successful interventions specifically aimed at reducing health differentials include systematic and intensive approaches to delivering effective health care; improvement in access and prompts to encourage the use of services; strategies employing a combination of interventions and those involving a multi-disciplinary approach; ensuring interventions address the expressed or identified needs of the target population; and the involvement of peers in the delivery of interventions (Arblaster et al., 1996, Type 5).

Strategies for health units and dietetic professionals to enhance the effectiveness and scale of community food security work have been identified. These include the following (Arblaster et al., 1996; Desjardins et al., 2002; Dietitians of Canada, 2005; Fournoy & Treuhaft, 2005; Olson & Holben, 2002; Registered Nurses' Association of Ontario, 2005) (Type 5):

- Professional development on the issues and processes to achieve food security through social change.
- Working in coalitions with others, including community-based organizations.
- Conducting and publicizing research supporting policies to address determinants of health and to promote population health.
- Using empowering strategies in community-based food programming (such as community kitchens and community gardens) and structuring these programs to include the most marginalized.

10.12 Key Findings

Type 1

- Breastfeeding provides total food security for infants.

Types 4 and 5

- Food insecurity has health implications for young children.
- Since food security is a social determinant of health, a population health approach is needed to address food insecurity.
- Strategies have been identified for public health professionals to enhance the effectiveness of community food security work.

G) Nutrition for Preterm and Low Birth Weight Infants

The Canadian Paediatric Society has identified the nutrient needs and best practices for the feeding of premature infants (Canadian Paediatric Society, 1995, Type 1). American journals have recently published recommendations for feeding preterm and very low/extremely low birth weight infants (Carver, 2005; Gregory, 2005) (Type 5). See the evidence review on reproductive health and Section 7.0 in this paper on prenatal influences.

10.13 The Evidence

Children who are born early and have low birth weight face unique nutrition challenges. Over 30 per cent of infants cared for in the neonatal intensive care units experience feeding difficulties in their first year of life (Burklow, McGrath, Valerius & Rudolph, 2002, Type 5). Preterm infants are vulnerable to sub-optimal early nutrition in terms of their cognitive performance (notably language-based skills) at 7.5 to 8 years—an age when cognitive scores are highly predictive of adult ones (Lucas, Morley & Cole, 1998, Type 1). Low birth weight and preterm delivery are associated independently with small, but measurable, delays in motor and social development through early childhood (Hediger, Overpeck, Ruan & Troendle, 2002, Type 4). Data from BC indicated that lower cognitive scores and behavioural problems mean that preterm children would be twice as likely to be enrolled in special education classes (Innis, 2003, Type 1).

10.13.1 Breastfeeding

Premature infants appear to derive more benefits in cognitive development from breast milk than do full-term infants (Anderson et al., 1999; Lucas, Bishop, King & Cole, 1992; Lucas et al., 1998) (Type 1).

The Canadian Paediatric Society guideline suggests that the preferred food for premature infants is fortified milk from the infant's own mother, or alternatively, a formula designed for premature infants. This recommendation applies to infants who are 500-2000g at birth born between 24–38 weeks (Canadian Paediatric Society, 1995, Type 1). Note: Preterm mother's milk is not nutritionally complete and requires fortification with energy, protein, calcium, phosphorus, sodium, and vitamins A, D and B2. Infants who are fed their mother's milk early in life have greater visual acuity, language skills and developmental outcomes that can be measured up to 9 years of age than comparable groups of infants fed cow's milk-based infant formula (Atkinson, 2003, Type 1). Breast milk consumption by children born prematurely is associated with lower blood pressure later in life (Singhal, Cole & Lucas, 2001, Type 2). Further research is needed to determine if benefits are linked to psychosocial or environmental factors or to selective factors in human milk (Atkinson, 2003, Type 1).

10.13.2 Specialized Formula with Long Chain Polyunsaturated Fatty Acids (LCPUFA)

There are significant differences in visual acuity at 2 and 4 months of age for infants consuming LCPUFA-added formula, supporting the efficacy of LCPUFA intake in early visual system development. Whether LCPUFA intake confers a lasting advantage across the lifespan is still to be determined (SanGiovanni, Parra-Cabrera, Colditz, Berkey & Dwyer, 2000, Type 1).

While children fed a nutrient-supplemented preterm formula perform better than those fed standard formula milk on various developmental measures (Lucas et al., 1992; Lucas et al., 1998) (Type 2), an effect specifically due to LCPUFA has not been demonstrated (Fewtrell et al., 2002, Type 2).

10.13.3 Solids

Recent reviews of the literature are inconclusive regarding early introduction of solids. One review shows that introducing solids to preterm infants prior to or at 12 weeks of age (post-term) does not result in accelerated growth (Morgan, Lucas & Fewtrell, 2004, Type 1). Introducing solid foods at 13 weeks of postnatal age versus 17 weeks (and at least 3.5 kg versus 5 kg) has a beneficial impact on growth in length and iron status without disadvantaging weight and head circumference (Marriott, Foote, Bishop, Kimber & Morgan, 2003, Type 2). However, Morgan et al. (2004, Type 4) found that early introduction of a diverse range of solid foods may predispose the preterm infant to eczema development by 12 months post-term.

The timing of introducing complementary foods varies among caregivers of preterm infants, and compliance with guidelines is poor (Norris, Larkin, Williams, Hampton & Morgan, 2002, Type 4). Burklow et al. (2002, Type 4) found that introducing cow's milk before one year corrected age may lead to iron deficiency, a higher incidence of allergies and long-lasting diminished intestinal mucosa activity.

10.13.4 Support and Education

Families of preterm low birth weight infants identify a need for more information regarding nutritional care (Kennedy et al., 2000, Type 4). Preterm infants need to be followed closely from birth—parents appear to benefit from ongoing supportive guidance and appropriate goal setting for feeding achievements from a well-coordinated interdisciplinary care team (Burklow et al., 2002, Type 4). Premature children needing breathing assistance demonstrate difficulty at the time of introduction to solids. Medically complex children, especially those with an early need for respiratory support, benefit from ongoing oral-motor feeding intervention (Burklow et al., 2002, Type 5).

Agrasada, Gustafsson, Kylberg and Ewald (2005, Type 2) found that post-natal peer counselling was a successful intervention in order to achieve six months of exclusive breastfeeding among term low birth weight infants. Using “guided participation” on premature infant and maternal feeding competencies was examined for 12 months post-term age. Despite limitations in power and sensitivity to detect effects, findings indicated that further study of the guided participation intervention was merited (Pridham et al., 2005, Type 2).

10.14 Key Findings

Type 1

- The preferred food for premature infants is fortified milk from the infant's own mother, or alternatively, a formula designed for premature infants. Infants who are fed their mother's milk early in life have greater visual acuity, language skills and developmental outcomes than comparable groups of infants fed cow's milk-based infant formula.

- LCPUFA-added formula supports early visual system development but it is not known whether such formulas result in a lasting advantage across the lifespan.

Type 4

- Low birth weight and preterm delivery are associated independently with small, but measurable, delays in motor and social development through early childhood.
- The timing of introducing complementary foods varies among caregivers of preterm infants and compliance with guidelines is poor.
- Preterm infants need to be followed closely from birth—parents appear to benefit from ongoing supportive guidance and appropriate goal setting for feeding achievements from a well-coordinated interdisciplinary care team.

H) Marketing Food to Children/Television Viewing

10.15 The Evidence

Screen time includes television, video and computer games, the Internet, and movies. Busy parents with young children use television/screen time for educational purposes, as babysitters and as a coping mechanism. In 2004, BC children aged 2–11 years watched an average of 14.4 hours of television per week (Statistics Canada, 2006, Type 4). Other types of screen time were not measured.

Focus groups in Canada with parents of preschoolers show that most parents are not concerned about the amount of screen viewing their children engage in or the risk of obesity. Pressures from society and peers, bad weather, having multiple children and tension between parents are identified as barriers to appropriate preschooler screen time (He, Irwin, Sangster Bouck, Tucker & Pollett, 2005, Type 4).

Developmentally, young children are less capable than adults of distinguishing between program content and advertising and to critically evaluate persuasive intent of advertisements (Finkelstein, French, Variyam & Haines, 2004, Type 5).

Marketing channels include television advertising; product placements in television shows, movies and video games; and toys/products with brand logos (Story & French, 2004, Type 5). Channels also include advergames on the Internet (Moore, 2006, Type 4). Convenience/fast foods and sweets comprise 83 per cent of foods advertised during television programs children watch most (Harrison & Marske, 2005, Type 4).

Low income and minority children watch more television and are exposed to more television commercials advertising low nutrient food (Kumanyika & Grier, 2006, Type 4). Burdette, Whitaker, Kahn and Harvey-Berino (2003, Type 4) found that there is an association between television viewing time in low-income preschool children and maternal obesity as well as depressive symptoms.

Screen time has been found to influence several factors related to healthy early childhood development:

1. **Choices:** A study of 46 children aged 2 to 6 years enrolled in a Head Start program showed that those who viewed cartoons without embedded commercials were less likely to choose advertised items (Borzekowski & Robinson, 2001, Type 2).
2. **Eating habits:** From a cross-sectional study of 560 families from 3 distinct socioeconomic areas, increased television viewing in 5- to 6-year-old children was associated with increased energy intake, increased sweet snack and high-energy drink consumption and decreased vegetable intake (Campbell, Crawford & Ball, 2006, Type 4). Marquis, Filion and Dagenais (2005, Type 5) found that by age 10, 18 per cent of girls and over 25 per cent boys ate in front of the television every day. All food choices deteriorated with increasing frequency of eating in front of the television.
3. **Physical activity:** Watching television replaces more vigorous activities (Caroli, Argentieri, Cardone & Masi, 2004, Type 1).
4. **Overweight/Obesity:** There is a positive correlation between time spent watching television and being overweight or obese in populations of different ages (Caroli et al., 2004, Type 1). Lumeng, Rahnama, Appugliese, Kaciroti and Bradley (2006, Type 4) found that viewing two or more hours of television per day was associated with an increased risk of overweight at both 36 and 54 months.

10.15.1 Interventions

There are two types of restrictions on food advertising targeting children: industry self-regulation and prohibitions.

In Quebec, the *Consumer Protection Act* prohibits television advertising directed to children under the age of 13. In the rest of Canada, the industry is self-regulated by the Broadcast Code for Advertising to Children. The Code was updated with the following in September 2007:

Advertising of food products should not discourage or disparage healthy lifestyle choices or the consumption of fruits or vegetables, or other foods recommended for increased consumption in Canada's Food Guide to Healthy Eating, and Health Canada's nutrition policies and recommendations applicable to children under 12.

The Self-Regulatory Guidelines for Children's Advertising (2004) guide advertising on television and the internet to children under 12 years in the United States. The Guidelines state:

Representation of food products should be made so as to encourage sound use of the product with a view toward healthy development of the child and development of good nutritional practices. Advertisements representing mealtime should clearly and adequately depict the role of the product within the framework of a balanced diet. Snack foods should be clearly represented as such, and not as substitutes for meals (National Advertising Review Council, 2004).

The United Kingdom, through their regulator for the United Kingdom communications industries, has implemented a prohibition of advertisements for foods high in fat, salt or sugar in or around programs made for, or of particular interest to, children/youth (ages 4 to 15). These restrictions were phased in by January 1, 2009.

There is strong public support for interventions aimed at reducing overweight and obesity among children and adolescents, particularly prohibiting advertising for fast food and less healthy foods and increasing taxes on these foods (Evans, Finkelstein, Kamerow & Renaud, 2005, Type 5).

The Canadian Pediatric Society (1999) (Type 5) recommends limiting television watching to one hour or less for preschoolers and two hours or less for school-aged children. The American Academy of Pediatrics (2001, Type 5) position is that children should have no televisions in their bedrooms and viewing should be limited to no more than 1 to 2 hours per day of educational, non-violent programs. Children under the age of 2 years should not watch television (American Academy of Pediatrics, 2001, Type 5).

Media literacy is a critical component of nutrition education for parents and caregivers to help them understand the persuasive techniques of commercials and to distinguish between truths and claims in advertising. Television viewing and advertisements for low nutritive food and beverages are linked to potential health risks so parents need to be advised to limit screen time and limit their preschooler's exposure to television advertisements (Borzekowski & Robinson, 2001; Caraher & Cowburn, 2005; Wadsworth & Thompson, 2005) (Type 3).

A statewide campaign to reduce television viewing among participants in women, infant and children's programs showed success at changing viewing habits (Johnson, Birkett, Evens & Pickering, 2005, Type 4). A preschool-based intervention (7 sessions in rural child care centres) led to reductions in young children's television/video viewing (Dennison, Russo, Burdick & Jenkins, 2004, Type 2). A four-week media literacy nutrition intervention with Head Start parents significantly affected their understanding of television advertising, outcome expectations, self-efficacy, television mediation behaviours and understanding of food labels (Hindin, Contento & Gussow, 2004, Type 3).

10.16 Key Findings

Type 1

- There is a positive correlation between time spent watching television and being overweight or obese.

Type 4

- Pressure from society and peers, bad weather, having multiple children and tension between parents are identified as barriers to appropriate preschooler screen time. Parents are not concerned about their child's screen time.
- Low-income and minority children watch more television and are exposed to more commercials advertising low nutrient food.

Type 5

- There is strong public support for interventions aimed at reducing overweight and obesity among children and adolescents, particularly prohibiting advertising for fast food and less healthy foods.
- The Canadian Paediatric Society recommends limiting television watching to one hour or less for preschoolers and two hours or less for school-aged children. The American Academy of Pediatrics recommends that children should have no televisions in their bedrooms, viewing should be limited to no more than 1 to 2 hours per day of educational, non-violent programs, and children under the age of 2 years should not watch television.

11.0 PHYSICAL HEALTH AND DEVELOPMENT: HEARING SCREENING

Screening is a public health service in which members of a defined population, who do not necessarily perceive they are at risk of, or are already affected by, a disease or its complications, are asked a question or offered a test, to identify those individuals who are more likely to be helped than harmed by further tests or treatment to reduce the risk of a disease or its complications (UK National Screening Committee, n.d.).

11.1 The Evidence

The US Preventive Services Task Force reported that there is good evidence that newborn hearing screening leads to earlier identification and treatment of hearing losses (Helfand et al., 2001). Universal newborn screening is effective in increasing the percentage of all children with bilateral, permanent congenital hearing loss (>40 decibel hearing level) aged 7 to 9 years who were referred for hearing assessment before 6 months of age.

In March 2005, the BC government announced support for the implementation of a universal newborn hearing screening program as part of a province-wide hearing, vision and dental early childhood screening program for every child under age six. Universal newborn hearing screening is a population-based, preventative health care practice that enables the identification of children who are born with or at risk of acquiring permanent hearing losses. There is evidence indicating that children who are deaf and hard of hearing lag behind their same-aged peers in their communication and language development. For example, in a 2003–2004 survey of 36, 953 deaf and hard-of-hearing children and youth in the United States, 69.5 per cent were reported to have one or more functional limitations, with most limitations being in expressive and receptive communication, thinking or reasoning, maintaining attention to classroom tasks, and social interaction/classroom behaviour (Gallaudet Research Institute, 2005). With universal newborn hearing screening, it may be possible to reduce delays significantly in identifying and providing services to children diagnosed with hearing losses and to develop strategies to improve their developmental outcomes.

A goal of early hearing detection and intervention (EHDI) programs is to improve the developmental outcomes of deaf and hard-of-hearing children by identifying children with hearing loss by 3 months of age and providing appropriate intervention services before 6 months of age (Joint Committee on Infant Hearing, 2000). The United States has legislated universal newborn hearing screening in 39 states as a component of early hearing detection and intervention programs and has implemented voluntary programs in 5 additional states (American Speech-Language Hearing Association, 2005). The United Kingdom has implemented a multi-phase, national newborn hearing screening program, through which it was screening approximately 70 per cent of all births as of February 2005 (Clark, 2005). Canada has implemented provincial newborn hearing screening programs in Ontario, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, and some major birthing centres in Alberta. In provinces without provincial screening programs such as BC, the average age of diagnosis of permanent hearing loss is 44 months of age, an age of diagnosis significantly beyond the 3 months of age recommended by the Joint Committee on Infant Hearing (Early Hearing Detection and Intervention, BC Steering Committee, 2004).

In Thompson et al.'s (2001) systematic review of the evidence for universal newborn hearing screening, findings from one large-scale, highly-rated study indicated that the otoacoustic emissions and auditory brainstem response techniques that are commonly used in newborn hearing screening protocols have high levels of sensitivity and specificity, 98 per cent and 90 per cent, respectively, when detecting permanent profound hearing losses (see Norton et al., 2000). Universal newborn hearing screening programs were also found to increase the chances that children would receive diagnosis, treatment, and intervention before 6 months of age. In the Wessex Universal Neonatal Hearing Screening Trial (1998) in the United Kingdom,¹ 71 more infants per target population of 100,000 were identified with moderate to severe permanent, congenital hearing loss and were referred for treatment before 6 months of age during periods of universal newborn hearing screening than during periods without. Universal newborn hearing screening was reported to identify between 19 and 42 percent more infants with permanent hearing losses than through high-risk screening alone.

There exists a growing body of evidence that early hearing loss identification and intervention is associated with improved developmental outcomes for deaf and hard-of-hearing children. In England's national newborn hearing screening program, the median age of identification of hearing loss and enrollment in an early support program was 10 weeks of age, and the median age for hearing aid fitting was 16 weeks of age, which is a significant difference from the 32 months of age average for hearing aid fittings in the United Kingdom before implementation of newborn hearing screening (Uus & Bamford, 2006). Children who have been fitted with amplification sooner have been found to produce speech that is more intelligible (Markides, 1986) and to have better communication skills than children who were fitted with amplification later (Ramkalawan & Davis, 1992). In a study based in Colorado, where more than 97 per cent of 68,418 annual births are screened, it was found that, after taking into account differences in non-verbal cognitive skills, 43 children whose hearing losses were identified before 6 months of age were found to have better vocabulary and expressive and receptive language at 3 years of age than 63 children whose hearing losses were identified after 6 months (Yoshinaga-Itano, Sedey, Coulter & Mehl, 1998). It should be noted, however, that systematic reviews of the evidence have indicated a number of limitations in the research, such as un-blinded selection of participants and assessment of outcomes, use of convenience samples, potential for baseline differences between compared groups, unclear criteria for selection of participants, and limited empirical attention to the investigation of children's developmental outcomes over time.

In light of these reviews, more recent studies have attempted to address some of these limitations. For example, a follow-up study with a population-based sample of children, which included the Wessex cohort, involved investigation of the language ability of 120 children with bilateral, permanent hearing losses at a mean age of 7.9 years (Kennedy et al., 2006). Expressive and receptive language scores of children with hearing losses who were born during periods with and without newborn hearing screening were compared. Children at mid-childhood whose hearing losses were identified prior to nine months of age or during periods of universal newborn hearing screening were found to have significantly higher scores for receptive language than the children whose hearing losses were identified after nine months or during periods without

¹ The Wessex Trial was deemed through systematic review from the United States Preventive Services Task Force (2001) to be a good quality, controlled, non-randomized trial.

exposure to universal newborn hearing screening. Scores obtained from parent and professional reports of expressive language did not indicate significant differences; direct measurement involving analysis of audiotaped samples of speech is currently being performed.

The Canadian Working Group on Childhood Hearing (CWGCH, 2005), a subgroup of the Health Surveillance and Epidemiology Division in Health Canada, suggested the need for further prospective, well-controlled studies, which attempt to consider, as much as possible, the many number of factors that may influence the development of children with permanent, congenital hearing losses, such as degree of hearing loss, extent of parental or family involvement, presence of additional disabilities, and quality of care and intervention provided. The group also concluded that the effectiveness of EHDI programs must be determined through longitudinal and population-based studies of universal newborn hearing screening, as well as comparative analysis of the diverse outcomes of early hearing identification and early intervention with historical controls. Such studies should also include inception cohorts; monitoring of outcomes in all possible patients and loss-to-follow-up rates (Thompson et al., 2001); and monitoring the development of deaf and hard-of-hearing children over time, including their speech, language, social-emotional and academic outcomes (CWGCH, 2005).

Bamford et al. (2007) indicate that “there is no clear evidence to support the discontinuation of school entry screening at this time in the presence of universal newborn hearing screening.” These authors report that the prevalence of permanent childhood hearing impairment continues to increase through infancy. This means that 2/1,000 additional children require identification after the newborn screen and by school entry. Children with late-onset, acquired and progressive sensorineural hearing loss develop hearing loss after birth, so that newborn screening programs will not identify these children with hearing loss (Bamford et al., 2007).

The purpose of school-entry screening is to capture those children at risk for late-onset hearing loss that have not been identified by early hearing programs. Bamford et al. (2007) indicate that just under 20 per cent of permanent moderate or greater bilateral, mild bilateral and unilateral hearing impairments in children aged 6 years old or older, were still not identified around the time of school entry.

School-entry screening may also identify significant numbers of children with persistent middle ear disorders (i.e., middle ear effusions) not otherwise identified (Bamford et al., 2007).

There is a lack of good quality evidence on the effectiveness of school-entry screening on long-term educational, language and social outcomes. There are no good quality published studies that assess the cost-effectiveness of school-entry screening. However, using a decision-analytic model approach, school-entry screening with pure tone sweep audiometry was cost-effective compared with all other school-entry screening programs evaluated and with no school-entry screening (Bamford et al., 2007).

12.0 PHYSICAL HEALTH AND DEVELOPMENT: VISION SCREENING

In 2005 and 2006, the Ministry of Health conducted two evidence review papers to evaluate the published evidence on the clinical and cost-effectiveness of vision screening for children under the age of six. The overall objective of these reviews was to assist in informing policy-making through a concise presentation of available evidence, thereby improving the provincial infrastructure for early detection of vision disorders in children.

These reviews looked at published literature from 1996 to present. Researchers reviewed any studies related to vision screening for children under 6 years of age, particularly around amblyopia (lazy eye) and strabismus.

The purpose of early childhood vision screening is to detect possible vision disorders such as refractive errors, amblyopia and strabismus at an early age (less than 6 years) (Canadian Agency for Drugs and Technologies in Health, 2006). Literature defines these three conditions as:

- **Amblyopia:** The failure of proper visual development due to any phenomenon that makes one eye preferred by the brain. This condition affects approximately 2 per cent to 4 per cent of the population.
- **Strabismus:** Misalignment of the eyes; it is the most common cause of amblyopia. Strabismus affects approximately 4 per cent of the population.
- **Refractive errors:** Include myopia (nearsightedness) and hyperopia (farsightedness).

Research indicates that amblyopia can be corrected if detected in infancy or early childhood. If left untreated, refractive errors and amblyopia may affect the ability to play sports, as well as affect development and school performance.

Improved detection and treatment of visual deficits in preschool children may lead to better vision and related health, social, academic and athletic benefits during school years and in later adult life.

12.1 The Evidence

There is generally a consensus among review groups that the available research evidence, though flawed and incomplete, provides a reasonable basis, on balance, for recommending preschool vision screening. However, there are serious discrepancies among recommendations on how to best configure preschool screening programs. Recommendations vary on basic features such as: the optimal age range to target; type of personnel to employ for screening; specific tests to use; and testing protocols.

A direct cause and effect relationship between a preschool screening protocol and better long-term health outcomes has not been conclusively established on the basis of randomized clinical trials (the gold standard for evidence of effectiveness).

A 2005 report by C Green Health Info (Type 5) on preschool vision screening suggests that there is a basis for recommending preschool vision screening, even though research evidence is lacking.

12.2 Key Findings

(Type 5)

- There is a wide range of preschool vision screening practices across Canada, the United States and Europe.
- Different configurations of preschool vision screening programs result from different interpretations of the indirect research evidence.
- The US Preventive Services Task Force assessed vision screening for children under the age of 5 years, and found fair evidence to suggest that screening tests could detect amblyopia, strabismus and refractive error with “reasonable accuracy”.
- While numerous studies have been published examining different tests to detect vision defects in preschool children, no single test or group of tests has been shown to be superior for preschool vision screening.
- Systemic reviews indicate that indirect evidence is compelling enough to recommend preschool vision screening. The indirect evidence is:
 - Visual impairments are important.
 - Difficult to detect without testing.
 - Treatable.
- Researchers found evidence that health care systems with programs of vision screening for preschool children followed by treatment reduce the prevalence of important conditions during school years. However the reviewers indicate that research is needed to measure health outcomes, as well as academic and social impacts.
- While no Canadian studies have assessed the cost-effectiveness of preschool vision screening, studies suggest that universal eye exams for preschool children have a relatively low cost per quality-adjusted life years.
- A 1994 Canadian Task Force on Preventive Health Care also recommended visual acuity testing of preschoolers.

The US Preventive Services Task Force found that visual acuity can be improved by early detection of amblyogenic risk factors. These recommendations are “B level”, which indicates that fair evidence was found that the outcomes of preschool vision screening can outweigh the harms, and this service should be provided (Calonge, 2004).

The benefit-to-cost ratio for screening programs exceeded 1.0, indicating that the benefits of screening outweighed the costs (Joish, Malone & Miller, 2003).

A preschool vision screening program meets most of the general criteria to consider when assessing a screening program. Although the prevalence of vision defects is relatively low, they do cause disability and an earlier age of detection is an undeniable benefit for treatment of amblyopia. No studies showed harms associated with screening, the tests can detect the defects they are meant to detect, and there are effective treatments for these vision defects.

13.0 DENTAL

Please refer to the core programs document: *Evidence Review: Dental Public Health* (Ministry of Health, 2006).

14.0 INJURY PREVENTION

Please refer to the core programs document: *Evidence Review: Unintentional Injury Prevention* (Ministry of Health, 2007).

15.0 PHYSICAL HEALTH AND DEVELOPMENT: ENVIRONMENTAL HEALTH

The physical environment, including both the natural and built environments, is an important determinant of health and plays a crucial role in healthy child development (Canadian Partnership for Children's Health and Environment, 2005).

The Ministry of Health is developing public health evidence papers on environmental health programs including water quality, air quality, food safety, community sanitation and environmental health. This section of the paper focuses on these topics in relation to early childhood development.

15.1 The Evidence

Full scientific certainty about the effects of most environmental exposures is not possible since it would require carefully controlled scientific experiments on children, which is not possible or ethical (Canadian Partnership for Children's Health and Environment, 2005). Scientific understanding is incomplete about the exact nature and effects of low-level environmental exposures. Strong evidence exists only about the circumstances of exposure and any health effects for a relatively small number of substances. Full understanding about most substances is rare (Canadian Partnership for Children's Health and Environment, 2005), and measurement of exposure to most pollutants of concern is limited (Toronto Public Health, 2005, Type 1).

15.1.1 Children's Vulnerability

Recent scientific evidence indicates that children are more vulnerable to environmental hazards than adults because of their unique patterns of exposure behaviours, as well as their rapid development (Goldman, 2005, Type 1; Government of Canada, 2003, Type 5). On a weight-for-weight basis, children eat more food, drink more water and breathe more air due to their high metabolic rate (Government of Canada, 2003, Type 5). Children's behaviours can also increase their exposure, and rapid growth is also a factor—cells that are growing and dividing rapidly are more likely to be affected by environmental contaminants (Government of Canada, 2003, Type 5). The blood-brain barrier of children is more permeable and they have immature immune and detoxification systems; thus, they are less able to cope with environmental exposures. Children living with underlying disease or living in poverty are especially vulnerable.

Outdoor air, water, food, soil/dust and indoor air can have effects on child health and development including infant mortality (Glinianaia, Rankin, Bell, Piess-Mullooli & Howel, 2004, Type 1), asthma, neurodevelopmental disorders, cancer and other multiple health effects (Canadian Partnership for Children's Health and Environment, 2005, Type 5).

15.1.2 Second-hand Smoke Exposure

Environmental tobacco smoke (ETS) is the most harmful of all indoor air pollutants, with the main impact on child health including increased risk of middle ear infections, asthma, bronchiolitis, low birth weight, sudden infant death syndrome and burns (Brown et al., 2004, Type 5; Government of Canada, 2003, Type 5). In 2001, 21 per cent of Canadian children under

12 years of age were exposed to environmental tobacco smoke on a regular basis in their homes (Government of Canada, 2003, Type 5). In an epidemiological review of data available from cohort and cross-sectional studies worldwide, Peat Keena, Harakeh and Marks (2001, Type 1) found that between 500 and 2,500 excess hospitalizations and between 1,000 to 5,000 excess diagnoses per 100,000 young children result from respiratory infections directly attributed to parental smoking.

Observations are sufficient to make the firm conclusion that ETS exposure both prenatally and postnatally has an adverse influence on wheezing illnesses (Global Initiative for Asthma, 2004, Type 1). The PHRED program reviewed the postpartum smoking prevention literature (Edwards, Aubin & Morrison, 2000, Type 1). Postpartum smoking relapse is an issue with 60 per cent of women who stop smoking during their pregnancy. Relapse usually occurs before their infant is six months of age. Women who resume smoking have an increased risk of the direct long-term health effects of smoking. Infants whose parents smoke are more likely to be exposed to ETS in the home, which increases the infant's risk of developing illnesses. Among infants and young children with asthma, exposure to ETS increases the risk of more frequent and more severe asthmatic attacks. Women who smoke are less likely to breastfeed their infant and more likely to introduce solid food early than either non-smokers or women who quit during pregnancy/postpartum.

Large population-based case-control studies in several countries consistently confirm that along with prone infant sleeping positions, exposure to tobacco products during and after pregnancy are "potent risk factors for SIDS."

Effective counselling to prevent maternal smoking should begin at the onset of pregnancy, and ideally, well before that.

- Mothers who smoke during their pregnancy should be informed that their infant has a greater risk of SIDS.
- Passive exposure to environmental tobacco smoke is also associated with an increased risk of SIDS.
- When there is exposure to cigarette smoking, pre- or postnatally, the risk of SIDS is further increased with bedsharing (Community Paediatrics Committee, Canadian Paediatric Society, 2004).

Prevention Interventions

The US Preventive Services Task Force (2003, Type 1) found good evidence that brief smoking cessation interventions, including screening, brief behavioural counselling (less than 3 minutes) and pharmacotherapy delivered in primary care settings, are effective in increasing the proportion of smokers who successfully quit smoking and remain abstinent after 1 year.

Gehrman and Hovell (2003, Type 1) summarized evidence for reducing residential environmental tobacco smoke in children. They found that most studies have investigated minimal contact, physician office-based interventions, although some have been conducted in

homes and have been more intensive. The evidence suggested that interventions can be effective in reducing children's exposure. The most promising results were found in those studies with more rigorous study designs, interventions of greater intensity and duration and those based on sound behaviour change theory. The authors specified elements to be incorporated into a model for ETS interventions: a stepped-care approach, including initial advice and follow-up; intervention components, including shaping and reinforcement; and the target should be ETS reduction rather than cessation exclusively. The Center for Reviews and Dissemination, National Library for Health (2005) ,advised that this review may not be reliable and should be interpreted with caution due to flaws in the method of reviewing the literature (i.e., the validity of studies included was not formally assessed, and only two research databases were used).

The PHRED program reviewed the literature on postpartum smoking relapse prevention strategies (Edwards et al., 2000, Type 1). The review showed that a theoretically-based, multi-component intervention of sufficient intensity, provided during the postpartum period, can have a modest effect on patterns of smoking relapse at six months postpartum. There is no evidence to suggest that relapse prevention strategies that lack an appropriate theoretical base, consist of brief and infrequent interventions, and are provided in an antenatal clinic setting, reduce postpartum smoking relapse rates. Teaching women how to resist urges to smoke and how to avoid situations where they are tempted to smoke does not equip them to maintain cessation status during pregnancy or postpartum. The optimum timing (early, mid or late pregnancy, and/or postpartum) and frequency mix of postpartum smoking relapse prevention strategies have not yet been determined. Research has consistently identified the presence of a smoking partner as a strong determinant of postpartum smoking relapse. However, an examination of relapse prevention strategies targeting both women and their partners is absent from the literature.

The Cochrane Collaboration (Waters, Polnay, Campbell, Webster & Spencer, 2005, Type 1) reviewed the evidence on family and caregiver smoking control programs for reducing children's exposure to ETS. They found that brief counselling interventions, successful in the adult health setting when coming from physicians, cannot be extrapolated to adults in the setting of child health. There is limited support for more intensive counselling interventions. There is no clear evidence for differences between the respiratory, non-respiratory ill child, well child and peripartum settings as contexts for reduction of children's ETS exposure.

Emmons et al. (2001, Type 1) reviewed the literature evaluating interventions designed to reduce ETS exposure among young children. They found a lack of randomized studies and found that none of the studies have yielded significant reductions in objective measures of children's exposure. They also reported on a randomized control trial (Type 2) called Project KISS, which targeted low-income parents of young children. Baseline data from the project illustrates that women who smoke and have young children face a number of other challenges such as high rates of depressed mood, frequent stressors related to low income, high rates of unemployment and low levels of educational attainment.

15.1.3 Other Environmental Contaminants

The Canadian Partnership for Children's Health and Environment (2005, Type 5) provides a primer on child health and the environment. Key areas for environmental childproofing include healthy living and healthy eating; handwashing and dustbusting; healthy indoor air; outdoor air

pollution reduction; toxic use reduction; safe at play; safe renovations; special measures in rural and northern settings (e.g., water supply, backyard burn bins, use of pesticides, molds); and informed/involved consumers. It is suggested that there is an urgent need to improve surveillance of exposures and health impacts of Canadian children (Toronto Public Health, 2005, Type 5).

A telephone survey of 450 parents in Toronto was conducted to assess what parents know about environmental risks to children and where the knowledge gaps exist (Toronto Public Health, 2005, Type 5). Results indicated variability in concerns, awareness and practices. Of particular importance was the need to enhance education and health promotion activities that support high-risk, low-income families in reducing their children's exposures. The report recommended that public health programs pursue opportunities within existing programs to integrate environmental awareness and supportive, preventive practices for parents-to-be, pregnant/nursing women, infants and children, with particular emphasis on those with increased risk. Further recommendations included developing education resources for parents and caregivers and disseminating resources through key organizations involved in promoting the health of children (e.g., community health centres).

The American Academy of Pediatrics (2004, Type 5) has produced a policy statement on ambient air pollution and health hazards to children. They suggest an advocacy role in environmental health, including working with community coalitions to support strong pollution-control measures and informing local and national representatives and policy-makers about the harmful effects of the environment on children. In communities with poor air quality, education for children with asthma and their families about the harmful effects of air pollution is warranted. Families can be counselled that ozone levels tend to be highest in the afternoon and it may be possible to decrease children's exposure by scheduling outdoor activities earlier in the day.

Best Start: Ontario's Maternal, Newborn and Early Child Development Resource Centre and the Canadian Partnership for Children's Health and Environment (2006, Type 1) have produced a report for service providers on strategies to reduce environmental risks from preconception to early childhood. Considerations discussed include using a health promotion approach; using a precautionary approach (prevention of harm, participatory decision making, examination of a full range of activities); dissemination of messages about child health and the environment being built into existing programs; having a sound messenger; and using adult education techniques.

Prevention of Asthma

A number of organizations have produced guidelines on asthma, but the focus has been primarily on asthma management versus prevention (e.g., Global Initiative for Asthma, 2004; Registered Nurses Association of Canada, 2004). The Global Initiative for Asthma (2004) suggests that

intervention strategies for the primary prevention of asthma remain in the realm of speculation and hypothesis, yet primary prevention may well be achievable if targets for intervention can be identified. Secondary prevention measures, such as those related to reducing exposure to known allergens and environmental insults, require continued examination in carefully controlled clinical investigations, in several different populations and socioeconomic settings, to determine their impact on reducing asthma symptoms and acute exacerbations (p. 178).

Increasing evidence indicates that allergic sensitization is the most common precursor to the development of asthma. Since sensitization can occur antenatally, much of the focus of primary prevention will likely be on perinatal interventions (Global Initiative for Asthma, 2004). Secondary prevention is currently being investigated in asthma and is likely to focus very specifically on the first year or two of life (Global Initiative for Asthma, 2004).

The Canadian Medical Association has produced recommendations on the prevention of asthma (Becker et al., 2004, Type 5). With conflicting data on early life exposure to pets, no recommendation could be made with regards to avoiding pets for primary prevention of allergy and asthma. However, families with biparental atopy should avoid having dog or cats in the home. There are conflicting and insufficient data to recommend for or against breastfeeding—specifically for the prevention of asthma, but breastfeeding should be recommended for other benefits (see Section 10.1 on breastfeeding). Health care professionals should continue to recommend the avoidance of tobacco smoke in the environment. For those sensitized to house dust mites, recommendations for appropriate environmental control should be given. In infants and children who are atopic, but do not have asthma, data are insufficient to recommend other specific preventive strategies.

Prevention of Lead Exposure

The prevalence of neurotoxic lead levels in asymptomatic children in Canada is unknown (Feldman & Randel, 1994). The Centers for Disease Control and Prevention (2006, Type 5) suggest that significant progress has been made in reducing overall rates childhood lead exposure. Prevention strategies include removing lead from household substances, education and screening. They recommend testing every child at 12 months of age, and if resources allow, at 24 months. Screening should start at 6 months if the child is at risk of lead exposure (for example, if the child lives in an older home built before 1960, which has peeling or chipping paint). Decisions about further testing should be based on previous blood-lead test results, and the child's risk of lead exposure. The Canadian Task Force on Preventive Health Care (1994, Type 1) states that there is fair evidence for targeted lead exposure screening for high-risk children, but there is insufficient evidence to recommend for or against universal screening to detect lead exposure in the general population. This recommendation has not been updated since 1994.

Environmental Awareness Interventions

The PHRED program completed a review of the effectiveness of environmental awareness interventions (Campbell et al., 1999, Type 1). They found that many health promotion interventions used to increase public awareness of environmental risks to health or adoption of risk reduction behaviours appear to be effective. However, only a limited variety of hazards have been examined, with short follow-up of outcomes. This limits the strength of the conclusion. Interventions that produced the greatest positive behavioural shifts were relatively intensive interventions where there were multiple events/means by which the intervention was delivered in various settings. Evidence was not available on common interventions related to the mass distribution of printed materials (e.g., posters, fact sheets) since all evaluation studies of this intervention type were weak in methodology. Evidence was not available on the effectiveness of interventions related to policy, advocacy or involvement in networks or coalitions.

Risk Assessment

Landrigan, Kimmel, Correa and Eskenazi (2004, Type 5) highlighted the central elements needed for the development of a child-protective approach to risk assessment. These included improved quantitative assessment of children's exposures; development of new approaches to toxicity testing of chemicals; development of new toxicodynamic and toxicokinetic models that account for the unique physiologic characteristics of infants and children; development of new approaches to assessment of outcomes; and application of uncertainty and safety factors in risk assessment that specifically consider children's risks.

Surveillance

The Commission for Environmental Cooperation (2006, Type 5), which includes Canada, Mexico and the United States, has developed indicators for children's health and the environment that fall within three priority areas:

1. Asthma and Respiratory Disease

- Percentage of children living in areas where air pollution levels exceed relevant air quality standards.
- Measure of children exposed to environmental tobacco smoke.
- Prevalence of asthma in children.

2. Effects of Exposure to Lead and Other Toxic Substances

- Blood-lead levels in children.
- Children living in homes with a potential source of lead.
- Pollutant release and transfer register data on industrial releases of lead and 153 other chemicals.
- Pesticide residues on foods

3. Waterborne Diseases

- Percentage of children (households) without access to treated water.
- Percentage of children living in areas served by public water systems in violation of local standards.
- Percentages of children (households) that are not served with sanitary sewers.
- Morbidity: Number of cases of childhood illnesses attributed to waterborne diseases.

15.2 Key Findings

Types 1 and 2

- The evidence suggests that certain interventions are effective in reducing children's exposure to second-hand smoke. There is emerging evidence that a theoretically-based, multi-component intervention of sufficient intensity, provided during the postpartum period, can have a modest effect on patterns of smoking relapse at six months postpartum.
- There is fair evidence for targeted lead exposure screening of high-risk children, but there is insufficient evidence to recommend for or against universal screening.
- Many health promotion interventions used to increase public awareness of environmental health risks or adoption of risk reduction behaviours appear to be effective.

Type 5

- There is limited good evidence on intervention strategies for the primary prevention of asthma.
- There is a risk of Bisphenol A contaminants in baby bottles, as the chemical is released from plastic when boiling water contacts the bottle.

16.0 PHYSICAL HEALTH AND DEVELOPMENT: SEXUAL HEALTH AND DEVELOPMENT

Sexual health is a state of physical, emotional and mental being related to sexuality (Health Canada, 2003). From the moment of birth, children begin to learn about love, touch and relationships. Their experience, impressions and observations form the foundation of their future sexual attitudes and decisions (Health Canada, 2003).

16.1 The Evidence

There has been very little focus on the sexual health and development of children under the age of five in the formal research literature. The literature review revealed scant information on the role of public health services in promoting sexual health for children under 5 years old.

Literature on child sexuality has previously been based on theoretical assumptions on child sexual development, and was primarily obtained from small case studies, often based on clinical material, or anecdotal evidence of child behaviour. Large studies on child sexual behaviour have been conspicuous by their absence, possibly partly due to ethical difficulties in directly observing such behaviour (linked to the prevailing taboo on child sexuality). Those studies that do exist have primarily investigated the age at which playing with the sexual organs/masturbation starts and the date of first orgasm for boys and girls (Larsson, 2001, Type 5). Western society continues to view children as innocent and pure, lacking any sexual desires, thoughts or interests (Heiman, Leiblum, Cohen & Pallitto, 1998). These beliefs are embedded deep within the culture. Heinman et al. (1998, Type 5) noted the discrepancy within our society, which openly displays eroticism and yet exhibits great reluctance in discussing private sexual practices. Children are repeatedly exposed to sexual images in our society, yet parents are reluctant to discuss sex with their children (Hornor, 2004, Type 5). Few studies of the potential effects of the media on children have gone beyond documenting that portrayals exist (Brown & Witherspoon, 2002).

Children develop very basic values about sexuality during the first few years of life. Newborn babies enter the world equipped with an acute ability to experience sensations and to react to them. Newborns and infants quickly learn a sense of self-awareness by the way in which they are held, cuddled and cared for. These very experiences and reactions to the world comprise the earliest stages of childhood sexual learning. In addition, the types of touch they receive, the toys that children are given, and the interactions and relationships they observe around them, all serve to lay a foundation for future sexual learning and development (Early Childhood Sexuality Education Task Force, 1995, Type 5).

Sexual behaviour is widespread among children with variance in the frequency with which specific sexual behaviours are observed (Sandfort & Cohen-Kettens, 2000; Sandnabba, Santtila, Wannas & Krook, 2003, Type 4). Before the age of five, children realize that boys are different from girls; they have questions about childbirth; they may engage in genital and sexual play; or they may experiment with and mimic sexual language. From a very early age, young children are curious about their bodies and their bodily functions. Adult attitudes about sexuality and normal childhood sexual behaviour will affect how the adult responds to a child's sexual behaviour (Heiman et al., 1998, Type 5). Many children are spending increasing amounts of time in non-

family settings like preschool and child care centres. As a result, caregivers other than family members have greater responsibilities in early childhood sexuality education, such as responding to the questions of young children and setting guidelines for appropriate behaviours outside the home (Early Childhood Sexuality Education Task Force, 1995, Type 5).

A number of studies have agreeing results concerning child sexuality:²

1. Children are naturally curious about their own bodies and those of others and can take part in sexual investigations of their own body and in games with other children. Children vary in their interest in sexuality.
2. Behaviours that appear to imitate adult sexuality are very uncommon in observations of normal groups of children but are more common among children who have been the victims of abuse.
3. Problematic sexual interaction between children seems to be characterized by force, threats, dominance, violence, aggression and compulsiveness, unlike sex play, which is spontaneous, good-humoured and mutual in nature.

There is very little published literature on the role of public health in supporting healthy sexual development in children under five years old. Health Canada (2003, Type 5) has developed *Guidelines for Sexual Health Education*. The target age group for the guidelines is not identified in the report, but the majority of content is focused on school-based education, although there are basic principles that could be utilized for services focusing on the sexual health of children under 5 years old. The principles and guidelines statements are intended to provide guidance to the various sources of formal and informal sexual health education in Canada, including public health. The Early Childhood Sexuality Education Task Force (1995, Type 5) developed guidelines for sexuality issues in children birth to five years. The guidelines are targeted primarily at preschools, with the key concepts and topics divided into age groups covering human development, relationships, personal skills, behaviours, health and society/culture.

Professionals' attitudes and beliefs about childhood sexuality are critical since their judgments of age-inappropriate sexual knowledge and behaviour is a key criterion used to assess allegations of sexual abuse (Heiman et al., 1998). The age of the child and the type of sexual behaviour influences professionals' perception of acceptability. Heiman et al. (1998, Type 5) completed an observational study of health care providers on what constitutes "normal" child sexual development. There was almost no consensus among professionals as to what constitutes normal, healthy and typical child sexual behaviours. However, behaviours that appear to resemble adult sexual activity are observed in low frequency across all ages of children and these behaviours occur more frequently in children who are sexually abused. There were a number of limitations with this study.

² Cohn, 1991; Cosentino et al., 1995; Everson & Boat, 1990; Fitzpatrick, Deehan & Jennings, 1995; Friedrich et al., 1991; Friedrich et al., 1992; Gil & Cavanagh Johnson, 1993; Haugaard, 1996; Haugaard & Tilly, 1988; Jampole & Weber, 1987; Kendall-Tackett, Williams & Finkelhor, 1993; Lamb & Coakley, 1993; Lindblad, Gustafsson, Larsson & Lundin, 1995; Phipps-Yonas, Yonas, Turner & Kauper, 1993; Sivan, Schor, Koepl & Noble, 1998; Smith & Grocke, 1995.

16.2 Key Findings

There has been very little focus on the sexual health and development of children under the age of 5 in both the formal research literature and other reports. The literature review revealed scant information on the role of public health in promoting sexual health for children under 5 years old. A number of studies have agreeing results that behaviours that appear to imitate adult sexuality are very uncommon in observations of normal groups of children, but are more common among children who have been the victims of abuse.

17.0 PHYSICAL HEALTH AND DEVELOPMENT: CHILD ABUSE/NEGLECT

See the separate evidence papers on primary prevention of physical abuse and additional strategies to prevent child maltreatment and abuse (supplement to the core programs evidence review on prevention of physical harm).

In Canada, the Canadian Incidence Study of Reported Child Abuse and Neglect (CIS) estimated that there were 135,573 child maltreatment investigations in Canada in 1998—a rate of almost 22 investigations for every 1,000 children in Canada. Child welfare workers were able to confirm that the abuse had occurred in almost half (45 per cent) of all cases. In addition, the General Social Survey on Victimization (GSS) found children in approximately half a million households had either heard or witnessed a parent being assaulted during the five years prior to the survey. The costs of the impacts from abuse, neglect and exposure to violence have led many to conclude that childhood trauma may be the single largest public health problem in the United States. Abuse, neglect and exposure to violence among children are considered to be the largest single preventable cause of mental illness. Developmentally, these events can alter brain anatomy and physiology. Individuals who have experienced childhood trauma are significantly more likely to experience a range of negative mental health outcomes including alcoholism, drug abuse, suicide/suicide attempts, and depression. There are also multiple long-term effects on physical health (Harris, Lieberman & Marans, 2007).

18.0 EMOTIONAL/MENTAL HEALTH AND DEVELOPMENT: PRENATAL/PARENTAL INFLUENCES

The emotional well-being of parents affects early childhood health and development (Government of Canada, 2003). The goal is to support positive parental mental health in order to prevent early childhood social, emotional and behavioural problems and to provide interventions that reduce the impact of parental mental illness on children.

The World Health Organization recommends prevention as the key means for reducing the lifetime burden of mental illness, and, given the increased recognition that mental disorders arise in childhood, upstream investment in public health programs to reduce mental disorders is important. In Canada, costs arising from the impact of mental illness have been estimated at \$14-15 billion annually. “Preventing mental disorders requires placing children at the centre of a public mental health strategy” (Waddell, McEwan, Peters, Hua & Garland, 2007).

18.1 The Evidence

18.1.1 Parental Mental Health

Children of parents with mental illnesses experience a level of psychological disorder that is in excess of that experienced by the general population (Devlin & O’Brien, 1999, Type 5). This can be attributed to variables such as genetic factors, the stress caused by the parental mental illness, disruption to parenting and parental dysfunctional temperament or personality traits. Factors that enhance psychosocial resilience in children who have a parent with a mental illness include the ability to sustain psychological separation from parental illness; the ability to over-identify with the ill parent; social and intellectual competence; and a low-risk temperament (Devlin & O’Brien, 1999, Type 5). Family resilience factors include effective parenting practices; child having a good relationship with at least one parent; presence of a supportive, non-ill “other” parent; warm/emotionally supportive family; and intact family. Other factors include: parental symptomatology does not involve the child; the illness is mild, brief or transient; there is an external adult role model; quality peer relationships; an extended support system; and compensatory social activity.

An Invest in Kids survey of parents of young children found that 27 per cent of parents reported experiencing elevated depressive symptoms (Russell, 2002, Type 5), including 18 per cent of fathers, 28 per cent of married mothers and 48 per cent of single mothers. Depressive symptoms are important because they impede high quality parenting and affect child development (Russell, 2002, Type 5). Maternal depression is a key determinant of childhood vulnerability—particularly for behaviour and learning problems (Government of Canada, 2003). The infant of a depressed mother is at risk for developing insecure attachment, negative affect and dysregulated attention/arousal. Older children are at risk for poor verbal skills, poor social skills, difficulty in cognitive functioning, behaviour problems and psychopathology (Canadian Paediatric Society, 2004, Type 5; Moran, Ghate & van der Merwe, 2004, Type 1).

The rate of depression during pregnancy in British Columbia was found to be 17 per cent in 2003/2004 (Oberlander et al. 2006, Type 4). Depression in pregnancy frequently continues on

into postpartum depression (Evans et al., 2001, Type 4). Pregnancy is a time when women visit health care providers, and this allows for an early opportunity to identify and treat maternal depression. The importance of early identification and treatment of perinatal depression in British Columbia has been outlined in the document *Addressing Perinatal Depression: A Framework for BC's Health Authorities* (BC Reproductive Mental Health Program, BC Women's Hospital & Health Centre, 2006, Type 5).

Evidence supports promotion, initiation and maintenance of stable breastfeeding (mental health protective mechanism for both mother and infant). Stable breastfeeding patterns, even in depressed mothers, led to more positive dyadic interactions, and less likelihood of highly reactive infant temperament (Jones, McFall & Diego, 2004, Type 4).

Children of depressed parents have more medical office and emergency room visits, are at greater risk of having sleep problems (Chung, McCollum, Irma, Helen & Culhane, 2004, Type 4) and may be more aggressive in peer play—particularly in boys (Hipwell, Murray, Ducournau & Stein, 2005, Type 4). Chung et al. (2004, Type 4) found that maternal depressive symptoms persisting from the prepartum to postpartum periods were associated with increased risks of infant hospitalization and use of corporal punishment, not having a smoke alarm and not using the back sleep position. Tammentie, Tarkka, Astedt-Kurki, Paavilainen and Laippala (2004, Type 4) found that mothers having depressive symptoms reported more negative family dynamics compared with other families. A small group of studies has examined the role of father involvement in moderating the effects of maternal depression on child outcomes (Hossain, Field, Gonzalez, Malphurs & Delvalle, 1994; Mezulis, Shibley, Hyde & Clark, 2004) (Type 4).

18.1.2 Preventing Parental Mental Illness

Cuijpers, Van Straten and Smit (2005, Type 1) provide a meta-analysis of the effects of preventive interventions on the incidence of mental disorders (two studies focused on postpartum depression). Interventions included group sessions, parenting sessions and counselling. Results showed that through these interventions, prevention of new cases of mental disorders seems possible. The interventions for the two studies focusing on postpartum depression included six sessions on psychoeducation and coping skills in one study (primiparous women at risk for depression, sample size 200, randomized) (Brugha et al., 2000, Type 2) and four weekly group sessions of interpersonal therapy in the other study (pregnant women at risk for depression, sample size 35, randomized) (Zlotnick, Johnson, Miller, Pearlstein & Howard, 2001, Type 2). Remission of maternal depression after three months of medication treatment was significantly associated with reductions in children's depressive, anxiety and disruptive behaviour disorders and symptoms (Weissman et al., 2006, Type 3).

Davey, Dziurawiec & O'Brien-Malone (2006, Type 3) reported on men's experiences of postpartum depression (PPD) and of participation in a six-week group treatment program specifically designed for male partners. The men experienced their partners' PPD as overwhelming, isolating, stigmatizing and frustrating. Coping with PPD was assisted by participation in the men's group. Men reported lowered levels of depression and stress, and higher levels of social support, as a result of their participation. The men highly valued the opportunity to share experiences with peers, to hear strategies for engaging in their relationship, and to gain factual information.

Identification of parents who are depressed has been addressed in a number of studies. Silver, Heneghan, Bauman and Stein (2006, Type 4) studied whether simple questions about parenting competence and the adequacy of maternal social support might be useful to providers in determining which inner-city mothers were likely to be depressed. Negative ratings of parenting competence, low perceived social support, and presence of health-related activity restrictions were found to be useful markers of likely depression among inner-city mothers of young children. These factors are often assessed during routine pediatric visits and may help in identifying mothers needing further evaluation or treatment by mental health specialists. Roy et al. (2005, Type 4) tested the construct validity of a brief questionnaire that assessed major depression in parents as part of the Longitudinal Study of Child Development in Quebec. Depression was twice as common in mothers as in fathers and the instrument used was found to be valid.

18.1.3 Interventions to Reduce the Impact of Parental Mental Illness on Children

Few programs and services include early intervention and prevention strategies targeted to children of parents with a mental illness. Most parent training programs target families where the child has behavioural problems or are generic health promotion programs for the whole population. The few programs that specifically address parent education and support for parents with a mental illness have not yet provided evidence that they produce long-term benefits (Craig, 2004, p. 923).

Craig (2004, Type 5) describes several parenting programs for women with mental illness, but none have been empirically studied. Craig concludes that parenting skills training for women with mental illness may be a useful selective preventive intervention, but it is unlikely that generic programs will be suitable. Interventions for women with a mental illness need to address the commonly experienced parenting problems as well as more specific needs of women with mental illness.

Sanford et al. (2003) (Type 2) completed a Canadian pilot study to assess the feasibility and efficacy of a parent-education group for families with young children, including a parent with depression. The experimental group reported more improvements in family functioning, parenting sense of competence and family/parent conflict than did the control group. Retention was an issue with more severely depressed subjects. Results are not generalizable due to the small sample size. Dennis (2003, Type 2) completed a pilot randomized controlled trial in British Columbia and found that telephone-based peer support may effectively decrease depressive symptomatology among new mothers.

See Section 19.0 on child mental health/attachment for evidence on protective factors.

18.2 Key Findings

Type 2

- The few programs studied specifically addressing parent education and support for parents with a mental illness have not yet provided evidence that they produce long-term benefits.

Types 4 and 5

- The research shows that a number of preventive interventions are successful in preventing new cases of parental mental disorders. These include group sessions, parenting sessions and counselling.
- Breastfeeding can act as a protective mechanism for both mother and baby in moderating the altered interactions that are seen to occur when mothers are depressed. Stable breastfeeding patterns, even in depressed mothers, led to more positive dyadic interactions, and less likelihood of highly reactive infant temperament.
- A number of tools for the identification/screening of parents for mental illness have been studied.

19.0 EMOTIONAL/MENTAL HEALTH AND DEVELOPMENT: CHILD MENTAL HEALTH AND ATTACHMENT

Mental health of the child is important to overall health and development. The goal is to support optimal mental health for children by encouraging positive infant-parent attachment and developing child resilience in order to prevent child mental health disorders and disorganized attachment. “Mental health” may be broadly defined to include all aspects of human development and well-being affecting emotions, learning and behaviour (Larun, Nordheim, Ekeland, Hagen & Heian, 2003).

19.1 The Evidence

19.1.1 Mental Health

Mental health disorders are the leading health problems that Canadian children face (Waddell, 2005, Type 5). At any given time, 14 per cent of children aged 4 to 17 years experience clinically important mental disorders, but fewer than 25 per cent of these children receive specialized treatment services (Waddell, 2002, Type 5). Child mental disorders permeate every aspect of development and functioning, including family relationships, school functioning, peer relationships and eventual adult productivity and functioning in the community (Waddell, McEwan, Hua & Shepherd, 2002, Type 5).

Research now shows that many challenges for adults (e.g., mental health issues, obesity, heart disease, criminality, low literacy) have roots in early childhood. Providing children with environments that are stimulating, supportive and include positive parental involvement—particularly during the first six years of life—can influence health (e.g., by mitigating poor health outcomes in later life) (Irwin, Siddiqi & Hertzman, 2007).

Progress has been made in identifying risk and protective factors that may play a role in the onset of mental health problems in children (Waddell et al., 2002, Type 5). Long-term studies have shown the following protective factors associated with resilience: long-term supports from at least one consistent caregiving adult, good learning abilities, good social skills, easy temperament, few siblings, sense of skill or competency and positive beliefs about the larger world (Waddell et al., 2002; Waddell, McEwan, Shepherd, Offord, Hua, 2005). Risk factors for child mental disorders involve individual characteristics (e.g., genetic predisposition), family characteristics (e.g., quality of parenting) and community characteristics (e.g., neighbourhood violence) (Waddell et al., 2005). Harland et al. (2002, Type 4) found that family characteristics and recent life events were more strongly associated with children’s risks of behaviour and emotional problems than other demographic characteristics; this was particularly true for children who had experienced parental unemployment and recent divorce or separation.

Most prevention initiatives aim to reduce risk and/or increase protective factors, thereby enhancing development and preventing or reducing the impact of mental disorders (Waddell et al., 2002). The Mental Health Evaluation and Community Consultation Unit at the University of British Columbia reviewed the literature with a focus on population health and clinical service considerations for children and youth mental health (Waddell et al., 2002, Type 1). Limitations

included the fact that most research in child and youth mental health have been conducted in ideal versus usual settings—interventions have not been studied with diverse populations and in a variety of settings. They suggested that many promising interventions have yet to be rigorously evaluated, but this does not necessarily mean that they should not be used. The review found that mental health programs can be delivered at three levels: universal programs for all children, targeted programs for children at risk and clinical programs for individual children with established mental health conditions. There is no ideal approach, so a balance between all three is needed. They found little research evidence to show that universal early childhood development programs will improve mental health outcomes for the entire population. Targeted early childhood development programs can improve mental health and developmental outcomes in disadvantaged populations of children and families.

The Children's Mental Health Policy Research Program, University of British Columbia, found that efficacious prevention programs have been reported for conduct, anxiety and depressive disorders (2004a, 2004b, 2004c) (Type 1). The most effective prevention programs for conduct disorder start early in a child's life, before problems become deep-rooted. Programs that aim to help high-risk families, such as home visits by public health nurses, were found to be particularly promising, as were programs that provided early childhood education and support to children. The most effective prevention programs for anxiety disorders and depression use cognitive-behavioural therapy (CBT) approaches. These approaches help children and youth to modify their thinking patterns and are best used with groups. CBT approaches are effective when provided to all children, or specifically to children at risk. Involving parents helps young people to apply what they have learned. Nurse home-visitation programs targeted to high-risk families have been shown to reduce poor parenting, a causal risk factor for conduct disorder and to prevent long-term antisocial behaviour in children (See Section 4.2 – the work of David Olds). To be most effective, prevention programs need to start early, continue long-term and involve multiple domains in a child's life. Several approaches show promise, particularly if prevention programs are started early and carried out in multiple domains in the lives of children—at home, at school, with peers and in the community. All key related services and programs need to be significantly better coordinated, including public health and primary care, early child development, child protection, addictions, youth justice, adult mental health, hospitals and crisis and residential services. There needs to be a continuum of care with more emphasis on prevention and early intervention throughout the system. A critical concern is the ability to identify and assess mental disorders in children.

The PHRED program completed a review entitled *Community-based Interventions to Improve Child Mental Health: Review of Reviews* (Thomas, Boyle, Micucci & Cocking, 2002, Type 1). Results included the following:

- Home visiting by professionals and/or paraprofessionals had some positive outcomes, but its impact on promoting positive parent-child interactions or positive child development was inconsistent. Families at highest risk benefited most from the interventions.
- Early childhood care and education programs that were intensive (e.g., daily), long-term (2–4 years), employed skilled teachers and had low student teacher ratios (>1:7) had the most positive long-term effects on child cognitive and social-emotional development into elementary and secondary school.

- Behavioural programs that trained parents to use reinforcement effectively and that empowered parents were most effective.
- Two generation programs that provide services similar to the early childhood care/education programs for children as well as a variety of services for parents (e.g., linking them with job training) had mixed effects on child outcomes and no effect on parental outcomes. The authors suggest that these mixed outcomes may be related to program quality and integrity rather than the potential benefits of these types of programs.

A Cochrane review (Merry, McDowell, Hetrick, Bir & Muller, 2004, Type 1) of interventions for the prevention of depression in children and adolescents, found that psychological interventions (focus on cognitive behavioural therapy) were effective immediately after the programs were delivered. There was a significant reduction in scores on depression rating scales for targeted, but not universal interventions. There was no evidence of effectiveness for educational interventions (providing information only). The authors concluded that currently there is insufficient evidence to warrant the introduction of depression prevention programs and that further study is warranted. They further concluded that most studies have focused on psychological interventions, while the potential effectiveness of educational interventions has not been fully investigated. There were limitations with many of the studies, including poor methodology and the focus on older children/adolescents versus early childhood.

Durlak and Wells (1997, Type 1) completed a meta-analysis on primary prevention mental health programs for children and adolescents (ages 2 to 18). Significant results were seen in programs that modified the school environment, that supported individually focused mental health promotion efforts and that attempted to help children negotiate stressful transitions. Most of the studies focused on school-based interventions, with the mean age of participants being 9.3 years. The majority of studies were focused on children under 13 years old, but the number of studies focused on those 5 years old and under was not identified in the research report.

Key informant interviews and an examination of published and unpublished literature were used to identify approaches to mental health for Aboriginal children (Mussell, Cardiff & White, 2004, Type 5). The authors looked primarily at community-based approaches since there was a consensus that individual approaches are not highly relevant or effective in Aboriginal communities. Based on their review the following opportunities for action were identified:

- Recognize the role that culture plays in determining health.
- Focus on implementing ecological, community-level interventions.
- Promote local leadership and develop high quality training.
- Provide mentoring and support.
- Foster links within and between communities.
- Support ongoing capacity building.

19.1.2 Attachment

Secure attachment to a significant adult is the best predictor for a child to become a healthy, productive adult (Federal/Provincial/Territorial Advisory Committee on Population Health, 1999, Type 5). The goals are to promote positive attachment and prevent dysfunctional attachment.

In the first year of life, most infants develop an organized strategy to deal with the strains and stresses of separations, strange environments, illness and other stressful events (Bakermans-Kranenburg, Van Ijzendoorn & Juffer, 2005, Type 1). Several studies have shown that disorganized attachment in infancy is predictive of problematic stress management, an elevated risk of externalizing behaviour problems, lower emotional health at school age and dissociation in adolescence. Disorganized attachment processes are early predictors of both internalizing and externalizing forms of psychopathology from the preschool period onward (Hennighausen & Lyons-Ruth) (2005, Type 5). A comprehensive meta-analysis (Van Ijzendoorn, Schuengel & Bakermans-Kranenburg, 1999, Type 1) documented significant effects of disorganized attachment on infants' physical stress reactions and externalizing problems in school-aged children. Associations between specific family phenomena (e.g., maltreatment of children, marital discord, parental depression) and later infant disorganization have been established in several studies (see Van Ijzendoorn et al., 1999).

Grossmann and Grossmann (2005, Type 5) found that certain factors support positive psychosocial development. Parental acceptance and responsiveness to their child's attachment/exploration needs start a pathway of positive psychosocial development in the child. If, during interactions with the parents, the child experiences acceptance, sensitive responsiveness to distress and appropriate challenges during exploration and cooperation, a secure model of a relationship is carried forward to other relationships in life. Otherwise, an insecure model will predominate. Changes in parental responsiveness or disruption of the family can alter the pathway in either direction.

Mantymaa et al. (2003, Type 4) found that interactional issues between a mother and her infant were related to the child's subsequent physical health during a two-year follow-up. They concluded that children with recurrent or chronic health problems may have relationship difficulties with which they need help. This study had a small sample size (n=120) and no objective assessment of the children regarding chronic illness was completed (mother's report only).

Several studies have been completed on preventive interventions that enhance parental sensitivity and infant attachment security (Bakermans-Kranenburg, Van Ijzendoorn & Juffer, 2003, Type 1). Less broad interventions that only focus on sensitive maternal behaviour appear successful in improving insensitive parenting as well as infant attachment insecurity. Fewer parental contacts were somewhat more effective and interventions involving fathers appeared to be more effective than those focusing on mothers only. Limitations included methodological flaws, including small sample sizes.

Preventive interventions for disorganized infant attachment have also been studied (Bakermans-Kranenburg et al., 2005, Type 1). The majority of interventions analyzed took place in the

home. It was found that effective interventions to prevent disorganized attachment started after six months. Sensitivity-focused interventions (well-defined, modest aims) appeared to be more effective than interventions with a broader focus.

19.1.3 Resilience

Resilience is a process reflecting relatively positive adaptation despite experiences of significant risk or trauma (Luthar, 2005). There are many pathways to resilient adaptation, but a core theme is the presence of a strong, supportive relationship with at least one adult (Luthar, 2005, Type 5). Children's own strengths also contribute to resilient adaptation (e.g., easygoing temperament, social skills) and there is accumulating evidence regarding the contribution of genetic factors (Luthar, 2005, Type 5). Resilience research indicates that during the early childhood years, it is important for children to have good quality of care and opportunities for learning, adequate nutrition and community support for families, in order to facilitate positive development of cognitive, social and self-regulation skills (Masten & Gewirtz, 2006, Type 5).

19.1.4 Parenting Skills

Invest in Kids (Russell, 2003, Type 5) reviewed the literature regarding skills parents require to promote infant/child emotional and social development, secure attachment and to build the strengths of their child's temperament. A list of these skills is found in Appendix 6.

19.2 Key Findings

Types 1 and 2

- There is little research evidence to show that universal early childhood developmental programs can improve mental health and developmental outcomes in disadvantaged populations of children and families.
- Home visiting by professionals and/or paraprofessionals has some positive mental health outcomes, but its impact on promoting positive parent-child interactions or positive child development is inconsistent. Families at highest risk benefit most from the interventions.
- Prevention programs for child mental health are more effective if they are started early, carried out in multiple domains in the lives of children, are intensive, are long-term, employ skilled teachers, train parents to use reinforcement effectively and empower parents.
- Two generation programs that provide services similar to early childhood care and education programs as well as a variety of services for parents (e.g., linking them with job training) have mixed effects on child outcomes and no effect on parental outcomes.
- Efficacious prevention programs have been reported for conduct, anxiety and depressive disorders in children. Psychological interventions for the prevention of depression in children and adolescents are effective immediately after the programs are delivered. There is a significant reduction in scores on depression rating scales for targeted, but not universal interventions. There is no evidence of effectiveness for educational interventions (providing information only) for preventing depressive disorders.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Programs modifying the school environment, supporting individually focused mental health promotion efforts and attempting to help children negotiate stressful transitions yield significant effects (systematic review in 2-year-old to 18-year-old population).
- A number of preventive interventions to enhance parental sensitivity and infant attachment have been found to be effective
- There is evidence to support a number of specific skills for parents in order to promote infant/child emotional development and secure attachment.

Type 5

- Best practice approaches to mental health and well-being of Aboriginal children have been established, but sound research is limited.

20.0 SPEECH, LANGUAGE AND COMMUNICATION DEVELOPMENT

Speech and language development is a useful early indicator of a child's overall development. Children must learn to use language to describe feelings and to engage in intrapersonal emotional and behavioural regulation and interpersonal functioning. Early language experiences have a significant effect on long-term outcomes for children (Herrero & Hechtman, 1994). Factors that influence speech and language development include the child's physical and mental development, (including the learning of other skills) and the child's environment at home (Downey et al., 2002). See previous sections on parenting, development, growth, mental health and nutrition for relevance to speech, language and communication in early childhood.

20.1 The Evidence

20.1.1 Factors Influencing Language Development

Research has repeatedly shown that the rate of speech and language development is at its highest during the critical period between birth and age 5 years (from Downey et al., 2002). Johnston (2005, Type 5) reviewed the literature on factors influencing language development. Children come to the task of language learning with perceptual mechanisms that function in a certain way and with finite attention and memory capacities. These cognitive systems will influence what is noticed in the language input, and may well be central to the learning process. Similarly, children's prior experience with the material and social world provides the early basis for interpreting the language they hear. Later, they will also make use of language cues. The course of language acquisition is not, however, driven exclusively from within. The structure of the language to be learned and the frequency with which various forms are heard will also have an effect. Language skills reflect knowledge and capabilities in virtually every domain and cannot be viewed in an insular fashion.

Children in poverty, middle class or professional backgrounds have the same kinds of everyday language experiences, but there are significant differences in the quality, frequency and intensity of these experiences (Hart & Risley, 1995). Several studies show that children from impoverished backgrounds have an increased risk of language problems (High, LaGasse, Becker, Ahlgre & Gardner, 2000; Hodge & Downie, 2004; Huaquing & Kaiser, 2004; Nancollis, Lawrie & Dodd, 2005; Qi & Kaiser, 2004; Walker, Greenwood, Hart & Carta, 1994) (Type 4).

Complex processes are involved in the acquisition of language and literacy skills in second language (L2) contexts. The available research states that it is possible to diagnose reading difficulties in L2 children early (Geva, 2006, Type 5). There are no overall disadvantages to bilingualism, but there can be significant disadvantages regarding children's loss of a home/heritage language, which is often deeply intertwined with family, emotions and identity (Nicoladis, Charbonnier & Popescu, 2006, Type 5).

Parenting plays a significant factor in children speech/language development. One study showed that maternal use of responsive language input had a significant impact on language development for toddlers and new word learning (Girolametto, Weitzman, Wiigs & Steig Pearce, 1999, Type 3). Maternal use of imitation and expansion were significantly correlated with children's number of utterances and number of different words respectively. Maternal rate of speech was negatively

correlated with children's vocabulary size. Girolametto and Weitzman (2002, Type 4) cite numerous studies that support the role of linguistic responsiveness in facilitating children's language development in typically developing children and children at risk. See Section 5.0 on parenting for more information.

20.1.2 Outcomes of Speech/Language Impairments

“Phonological disorders are among the most prevalent communication disabilities diagnosed in preschool and school-aged children, affecting 10 per cent of this population. Children with phonological disorders are also at risk for reading and writing disabilities” (Gierut, n.d.).

In a recent community study, Horwitz, Irwin, Briggs-Gowan, Heenen, Mendoza, and Cartee (2003) estimated the prevalence of expressive language disorder in young children 18 to 39 months of age. Prevalence rates were 13.5% at 18 to 23 months, 15% at 24 to 29 months, and 18% at 30-39 months. The 24-month value is within the range of values reported for that age by Rescorla et al. (1993) using various criteria. The 36-month value is higher than those of earlier studies that employed more stringent criteria at this age (Law et al., 2000).

Two community studies provided estimates of the prevalence of language disorders in 5-year-old children. Beitchman, Nair, Clegg, and Patel (1986) found a prevalence of 12.6% for language disorders, using a definition that did not exclude other developmental disabilities or require nonverbal intelligence within the normal range. Tomblin et al. (1997) reported a prevalence of 7.4% for specific language disorders (i.e., with exclusion of other disabilities and a requirement for nonverbal intelligence in the normal range). For 6- and 7-year-old children, Law et al. (2000) noted median prevalence estimates of 5.5% and 3.1%, respectively (Johnson, 2007).

Common communication disorders in children are articulation disorders, voice problems, stuttering and language difficulties (Canadian Association of Speech-Language Pathologists and Audiologists, 2005). Research has shown that children with speech/language impairments have difficulties in social relational skills, with links between level of language impairment and overall social competence (citations in La Paro, Justice, Skibbe & Pianta, 2004). They are more likely to have poor social skills and fewer peer relationships relative to typically developing peers of similar age (La Paro et al., 2004). Warr-Leeper (2001) refers to a number of studies that report a higher incidence of psychiatric disorders in language-impaired children compared to their peers with normal language (studies cited include Cantwell and Baker, 1991; Waller, Sollod & Sander, 1983; Warr-Leeper, Wright & Mack, 1994) (Toppelberg & Shapiro, 2000) (Type 1), (Beitchman et al., 2001).

Studies of children identified as speech and language impaired have consistently verified that these children are at risk for reading and writing problems (Catts, Fey & Tomblin, 2002; Catts, Fey, Zhang & Tomblin, 1999; La Paro et al., 2004; Law & Durkin, 2000; Lewis & Freebairn, 1992; Menyuk et al., 1991; Snowling, Adams, Bishop & Stothard, 2001) (Type 4). Hodge and Downie (2004) list multiple studies that have demonstrated the importance of strong language

skills on literacy acquisition. Low literacy levels in adulthood contribute to the propagation of the cycle of poverty (Hodge & Downie, 2004).

It is important to note that children with a history of language impairment whose difficulties are resolved by school entry may be less likely to experience the host of problems associated with speech/language impairment (Nelson, Nygren, Walker & Panoscha, 2006, Type 1).

Late Talkers

A number of studies in the literature address “late talkers”. These represent children under 24 months who indicate delayed acquisition of language milestones (Paul, Hernandez, Taylor & Johnson, 1996; Paul, Murray, Clancy & Andrews, 1997; Rescorla, 2005; Rescorla, Roberts & Dahlsgaard, 1997) (Type 4). Kelly (1998, Type 5) provided a synthesis of the late talker literature. There are three linguistic outcomes for late talkers: 1) a small number of children “catch up” with their normally developing peers; 2) a substantial number of children perform within the mean or about the 10th percentile on some global measure of expressive language, but their verb use and narrative skills do not approximate those of their same peers at 3 and 4 years of age; and 3) a substantial number of children continue to exhibit significant impairments in their expressive language. Currently, there is insufficient evidence to predict which late talkers will catch up and which ones will continue to experience varying levels of difficulty. Furthermore, the impact of language intervention on linguistic outcomes of late talkers has not been addressed in longitudinal studies.

Kelly (1998, Type 5) identifies several caveats in the late talker literature, including the following: the majority of late talkers included in the studies reviewed are 24 months or older, making generalizing to younger children difficult; it is not clear if receptive language status is a defining feature in this population; few investigators provide individual information on the children included in the studies; and the majority of late talkers used in the studies have come from middle class or professional socio-economic levels.

20.1.3 Screening, Identification and Assessment

Screening

A 2006 systematic evidence review for the US Preventive Services Task Force (Nelson et al., 2006, Type 1) evaluated the strengths and limits of evidence about the effectiveness of screening and interventions for speech and language delay in preschool children. Conclusions of the review included the following:

- Use of risk factors (e.g., familial history) to guide selective screening is not supported by studies.
- Several aspects of screening have been inadequately studied to determine optimal methods, including which instrument to use, the age at which to screen and which interval is most useful.
- Trials of interventions demonstrate improvement in some outcome measures, but conclusions and generalizability are limited.

- Data are not available addressing other key issues, including the effectiveness of screening in primary care settings, role of enhanced surveillance by primary care physicians before referral for diagnostic evaluation, and adverse effects of screening and interventions.

Another review found that while there is good evidence that interventions for speech/language problems lead to substantial gains, there is, as yet, insufficient evidence to support the introduction of a universal screening program on the grounds that there is little consensus as to which proportion of the population needs to be identified (Law, Garrett & Nye, 2005, Type 1). The National Health Service Centre for Reviews and Dissemination (1998, Type 1) found that a significant number of preschool children show signs of speech and language delay, and that a delay that would not spontaneously improve can be effectively treated. However, it is not yet clear how to identify children who will fail to progress without treatment.

Pickstone, Hannon and Fox (2002, Type 5) provided an overview of language screening/assessment instruments for preschool children. They identified two types of screening: surveying language development in communities to assess trends and screening for language difficulties at the individual level for referral to a speech/language specialist. See Section 8.0 on physical activity and motor development for more information on developmental screening.

Identification

The observations of parents or caregivers of an infant's social communication behaviours are important to determine a delay (from Downey et al., 2002). These behaviours include how a child requests or rejects objects and activities, greets others, imitates sounds and actions, plays, expresses feelings and emotions and generally interacts within the environment. Rannard, Lyons and Glenn (2005, Type 5) found that in many cases, parents are the first to realize that there is something wrong with the speech and language development of their child. Parents reported that health professionals tended to underestimate speech and language problems and failed to take parental views into account.

Adequate assessment of “normal variation” versus “abnormal status” is particularly difficult for clinicians working with young children who are under 5 years of age and who present with slow language development (Law et al., 2000). Findings suggest that processing markers, particularly non-word repetition, have the potential for indicating speech/language risk (Law et al., 2000, Type 1). In particular, children who fall in the bottom quarter of the normal distribution in non-word repetition (performance below the 25th centile) appear to be at risk of speech/language problems. In one study, some risk factors (pre-and perinatal problems, ear/nose/throat problems, and sucking habits and positive family history) distinguished speech-disordered from normally speaking control populations (Fox, Dodd & Howard, 2002, Type 4). Oller, Eilers, Neal and Schwartz (1999, Type 5) found that late onset of canonical babbling predicted delay in the onset of speech production and that infants with delayed babbling had smaller production vocabularies even at 30 months of age. Canonical babbling was effectively identified by parents during an interview. Gathering a careful history—one that examines familial, cultural and social environment—is important as these may be important indicators of language delay and learning disorders (Downey et al., 2002, Type 5).

In the United Kingdom, the Royal College of Speech and Language Therapists (2005, Type 1–5 research) have developed evidence-based guidelines for a number of age-groups and conditions. Assessment must take into account the following: communication skills, interaction, attention, object concept, comprehension, expression, oromotor structure/function and phonology.

Conducting assessments of language and learning disabilities in multilingual populations is challenging as generally, assessment protocols and tools are designed for monolingual populations (Paradis, 2005). There are few resources in which to determine whether a bilingual child is progressing adequately in his or her language development (Paradis, 2005). Paradis (2005, Type 4) completed a study in Edmonton where the accuracy and error types of English as a Second Language (ESL) children in several grammatical morphemes were assessed. Results indicated that using tests that have been standardized on monolingual English native speakers with early ESL children does not represent good practice and could easily result in misdiagnosis. A policy statement from the Canadian Association of Speech-Language Pathologists and Audiologists (Crago & Westernoff, 1997) (Type 5) states that the identification of disorders is optimally made in the first language combined with assessment in the second language. The assessment must be culturally and linguistically appropriate; be naturalistic, holistic and include nonstandardized approaches; consider societal factors that may be impeding language proficiency; and include assessment reports that are descriptive. In the identification of language disability, there needs to be a distinction between: a) clients who are not appropriately proficient in their second language despite full language potential; and b) clients who are not fully proficient in their first and second languages resulting from a communication disorder. In the former, “speech-language pathologists and their collaborators providing services to children should play a consultative role by providing information on programming strategies and environments which promote both the master of primary and secondary language skills. This role may have preventative benefits” (Crago & Westernoff, 1997, p. 3).

20.1.4 Prevention

The experiences, attitudes and materials pertaining to literacy that a child encounters and interacts with at home compose a child’s home literacy environment (Roberts, Jurgens & Burchinal, 2005). A number of studies have reported relationships between the home literacy environment (in particular, shared book reading interactions) and children’s later language and literacy skills (de Jong & Leseman, 2001; Haden, Reese & Fivush, 1996; Senechal & LeFevre, 2002; van Kleeck, Gillam & Hamilton, 1997; Weitzman, Roy, Walls & Tomlin, 2004) (Type 4). Roberts et al. (2005, Type 4) found that the global measure of overall responsiveness and support in the home environment was the strongest predictor of children’s language and early literacy skills. A survey of disadvantaged families in Australia revealed that more than half of the parents found there was not enough information available to support them in their child’s literacy development (Raban & Nolan, 2005, Type 5). Kuo, Franke, Regalado & Halfon (2004, Type 5) investigated the predictors and frequency of book-sharing activities and examined the extent to which parents report that pediatric health care providers are addressing early literacy activities. The study analyzed data from the 2000 National Survey of Early Childhood Health in the United States. Results indicated that parents are reading to their young children less frequently than is optimal with lower frequency rates found in parents with fewer family resources. The survey showed that pediatric health care providers are missing opportunities to discuss the importance

of reading with young children during well-child visits. The reported amount of time spent watching television was not associated with diminished reading frequency.

Research is demonstrating the significant influence that daily reading to a young child has on speech and language development (Government of Canada, 2003; Sharif, Rieber & Ozuah, 2002; Canadian Paediatric Society, 2002) (Type 5). Some programs have focused on improving the language and literacy skills of children in socially and economically disadvantaged areas through parent-child interaction using shared book reading (Ezell, Justice & Parsons, 2000; High et al., 2000; Justice & Ezell, 2000) or specific shared home activities (Evans, Shaw & Bell, 2000). Programs that teach parents to share books with their children in a way that is child-centered and interactive have been the most effective and result in children being motivated to learn to read (Snow, Burns & Griffin, 1998, Type 5). Specifically, reading aloud to very young children has been shown to increase both expressive and receptive language skills in toddlers (DeBaryshe, 1993; Payne, Whitehurst & Angell, 1994) and verbal performance in elementary school (Scarborough, 1991; Scarborough & Dobrich, 1994).

Intervention programs that are based on activities and experiences that are rich in oral and written language should be targeted (Hodge & Downie, 2004). An evaluation of the program *Together We Are Heard* involved improving each child's oral language skills through group sessions at preschool. Sessions were facilitated by a speech pathologist on a daily basis (Hodge & Downie, 2004, Type 3). All children who participated in the language groups improved their language skills. Results cannot be generalized broadly due to the poor study design. Lundberg and Høien (1991, Type 3) followed 400 children who had received training in phonological awareness skills prior to Kindergarten entry and a control group that had no training. The experimental group consistently outperformed the control group on measures of rapid identification of single words, sentence reading and spelling through to Grade 4.

See Sections 4.0 (public health strategies, approaches and settings), 5.0 (parenting), and 18.0 and 19.0 (mental health) for more information.

20.2 Key Findings

Types 1 and 2

- Several aspects of speech screening have been inadequately studied to determine optimal methods, including which instrument to use, the age at which to screen and which interval is most useful. Use of risk factors (e.g., familial history), to guide selective screening is not supported by studies. Recent studies have shown the predictive nature of parental report for speech/language delays.

Types 3, 4 and 5

- Programs that support daily reading/storytelling to a young child have a positive effect on speech and language development.

Type 5

- Speech/language assessment tools and protocols designed for monolingual populations are generally not appropriate for multilingual populations.
- The “late talker” literature is inconclusive. There is insufficient evidence to predict which late talkers will catch up and which ones will continue to experience varying levels of difficulty. The impact of language intervention on linguistic outcomes of late talkers has not been addressed in longitudinal studies.

REFERENCES

Introduction/Methodology

- Ministry of Health. (2003). *Indicators of early childhood health and well-being in British Columbia*. Victoria, BC: Author.
- Ministry of Health. (2005). *A framework for core functions in public health*. Victoria, BC: Author.
- Ministry of Health, Population Health and Wellness. (2006). *Evidence review: Dental Public Health*. Victoria, BC: Author.
- Federal/Provincial/Territorial Advisory Committee on Population Health (1999). *Investing in early child development: The health sector contribution*. Ottawa, ON: Author.
- Government of Canada. (2003). *The well-being of Canada's young children: Government of Canada report*. Ottawa, ON: Human Resources Development Canada and Health Canada.
- Last, J. (2001). *A dictionary of epidemiology*. New York: Oxford University Press.
- McEwan, K., Hua, J., & Shepherd, C. (2002). *Child and youth mental health: Population health and clinical service considerations*. Vancouver, BC: University of British Columbia, Mental Health Evaluation & Community Consultation Unit.

Early Childhood Development: Core Concepts

- Grunewald, R. & Rolnick, A. (2005, March). *A proposal for achieving high returns on early childhood development*. Paper presented at the Washington Economic Policy Conference, Washington, DC. Retrieved July 15, 2009, from http://www.nabe.com/pc05/gruenwald_rolnick.pdf.
- Health Officers Council of BC. (2008). *Health inequities in British Columbia: Discussion paper*. Vancouver, BC: Public Health Association of British Columbia.
- Hertzman, C. (2000). The case for an early childhood development strategy. *ISUMA*, 1(2).
- Hertzman, C., McLean, S.A., Kohen, D., Dunn, J., Evans, T., & Smit-Alex, J. (2004). Early child development in Vancouver. *Horizons*, 6(4), 44–47. Retrieved June 23, 2009, from http://www.policyresearch.gc.ca/doclib/HOR_v6n4_200403_e.pdf.
- Human Resources Development Canada. (1997, August). *Synthesis of selected Canadian research on children and families*. Ottawa, ON: Author.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Hume, S., Hubberstey, C., & Rutman, D. (2005). *Parenting support and education: A literature review*. BC Parenting Vision Task Group.
- Mustard, F. & Pickerack, F. (2002). *Early childhood development in BC: Enabling communities*. Toronto: Founders' Network for the Canadian institute for Advanced Research.
- Russell, C. (2002). *The state of knowledge about prevention/early intervention*. Ottawa, ON: Invest in Kids.

Public Health Strategies, Approaches and Settings

- Alderton, T., & Campbell-Barr, V. (2005). Quality early education—quality food and nutrition practices? Some initial results from a pilot research project into food and nutrition practices in early years settings in Kent, UK. *International Journal of Early Years Education*, 13(3), 197–213.
- Alkon, A. & Boyce, J. (1999). Health assessment in child care centers: Parent and staff perceptions. *Pediatric Nursing*, 25(4), 439–442.
- American Dietetic Association. (2005). Position of the American Dietetic Association: Benchmarks for nutrition programs in child care settings. *Journal of the American Dietetic Association*, 105(6), 979–986.
- Anderson, L., Shinn, C., Fullilove, M., Scrimshaw, S., Fielding, J., Mormand, J., et al. (2003). The effectiveness of early childhood development programs: A systematic review. *American Journal of Preventive Medicine*, 24(3S), 32–46.
- Anderson, T.M., & Herz-Braun, R.D. (2001). Building a healthy me! Stacking up choices for good nutrition. *Journal of Nutrition Education*, 33(2), 116–117.
- Benjamin, S., Ammerman, A. S., Sommers, J., & Ward, D. (2005). *A nutrition and physical activity self-assessment instrument for child care settings: Development and rationale*. Paper presented at the meeting of the American Public Health Association, Philadelphia, PA
- Buadoo, F., & Seabrooks, M. (2005, December). *Day care providers nutrition program as a method of promoting women and child health*. Paper presented at the meeting of the American Public Health Association, Philadelphia, PA.
- Bull, J., McCormick, G., Swann, C. & Mulvihill, C. (2004). *Ante- and post-natal home-visiting programs: A review of reviews*. London: NHS Health Development Agency. Retrieved March 16, 2005, from www.hda.nhs.uk/evidence.
- Canadian Allergy, Asthma and Immunology Foundation. (1997). *Anaphylaxis in schools and other child care settings*. Ottawa, ON: Author. Retrieved April 13, 2006, from <http://www.allergyfoundation.ca/website/anaphschools.html>.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Cason, K.L. (2001). Evaluation of a preschool nutrition education program based on the theory of multiple intelligences. *Journal of Nutrition Education*, 33(3).
- Cava, M., Wade, K., Cho, S., Dwyer, J., Johnson, I., & Lee-Han, H. (1999). *The effectiveness of telephone intervention as a delivery strategy within the scope of public health nursing practice: A systematic overview*. Toronto: Public Health Research, Education and Development.
- Centers for Disease Control and Prevention Task Force on Community Prevention Services. (2003, October 3). First reports evaluating the effectiveness of strategies for preventing violence; early childhood home visitation. *MMWR Recommendations and Reports*, 52(RR 14), 1–9.
- Drummond, J., Weir, A., & Kysela, G. (2002). Home visitation programs for at-risk young families. *Canadian Journal of Public Health*, 93(2), 153–158.
- Dunn, C., Thomas, C., Ward, D., Pegram, L., Webber, K., & Cullitan, C. (2006). Design and implementation of a nutrition and physical activity curriculum for child care settings. *Prevention of Chronic Diseases*, 3(2), A58.
- Encyclopedia on Early Childhood Development. (2007, October 5). *Synthesis on home visiting programs (prenatal and postnatal)*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved August 2008, from <http://www.child-encyclopedia.com/>.
- Fletcher, J. & Branen, L. (1999). Feeding young children in group settings: Using scenarios for staff development. *Journal of Nutrition Education*, 31(6), 360B–361B.
- Fontaine, N. S., Torre, L. D., Grafwallner, R., & Underhill, B. (2006). Increasing quality in early care and learning environments. *Early Child Development & Care*, 176(2), 157–169.
- Gable, S., & Lutz, S. (2001). Nutrition socialization experiences of children in the head start program. *Journal of the American Dietetic Association*, 101(5), 572–577.
- Girolametto, L. & Weitzman, E. (2002). Responsiveness of child care providers in interactions with toddlers and preschoolers. *Language, Speech, and Hearing Services in Schools*, 33, 268–281.
- Girolametto, L., Weitzman, E., & Greenberg, J. (2003). Training day care staff to facilitate children's language. *American Journal of Speech-Language Pathology*, 12, 299–311.
- Gomby, D. (2005). *Home visitation in 2005: Outcomes for children and parents – Invest in Kids Working Paper No.7*. Ottawa, ON: Invest in Kids.
- Gray, R. & McCormick, M.C. (2005). Early childhood intervention programs in the US: Recent advances and future recommendations. *Journal of Primary Prevention*, 26(3), 259–275.
- Gupta, R., Shuman, S., Taveras, E., Kulldorff, M., & Finkelstein, J. (2005). Opportunities for health promotion education in child care. *Pediatrics*, 116(4), e499–505.

- Health Disparities Task Group, Federal/Provincial/Territorial Advisory Committee on Population Health and Health Security. (2004, December). *Reducing health disparities – Roles of the health sector: Recommended policy directions and activities*. Ottawa, ON: Author.
- Hinman, A.R., Saarlal, K.N., & Ross, D.A. (2004, November). A vision for child health information systems: Development child health information systems to meet medical care and public health needs. *Journal of Public Health Management and Practice*, (Suppl.), S91–98.
- Holden, T. (2007). *Home visiting research, training, and infrastructure: A literature review*. Vancouver, BC: BC Council for Families.
- Keating, D.P. & Hertzman, C. (Eds.). (1999). *Developmental health and the wealth of nations: social biological and educational dynamics*. New York: Guilford Press.
- Kitzman, H.J. (2004). Effective early childhood development programs for low-income families: Home visiting interventions during pregnancy and early childhood. *Encyclopedia on Early Childhood Development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved August 2008, from <http://www.child-encyclopedia.com/documents/KitzmanANGxp-Home.pdf>.
- Kruske, S., Schmied, V., Sutton, I., & O’Hare, J. (2004). Mothers’ experiences of facilitated peer support groups and individual child health nursing support: A comparative evaluation. *Journal of Perinatal Education*, 13(3), 31–38.
- Levy, P.M. & Cooper, J. (1999). Five a day, let’s eat and play: A nutrition education program for preschool children. *Journal of Nutrition Education*, 31(4), 235B–236B.
- Matheson, D., Spranger, K., & Saxe, A. (2002). Preschool children’s perceptions of food and their food experiences. *Journal of Nutrition Education*, 34(2), 85–92.
- Mann, V., Buffett, C., Campbell, M., Lee, K., & O’Donnell, R. (1999). *Effectiveness of day care centre infection control interventions*. Toronto: Ontario Ministry of Health, Public Health Branch.
- Mäntymaa, M., Puura, K., Luoma, I., Salmelin, R., Davis, H., Tsiantis, J., et al. (2003). Infant-mother interaction as a predictor of child’s chronic health problems. *Child Care, Health and Development*, 29(3), 181–191.
- Moore, H., Nelson, P., Marshall, J., Cooper, M., Zambas, H., & Brewster, K. et al. (2005). Laying foundations for health: Food provision for under 5s in day care. *Appetite*, 44(2), 207–213.
- Nahikian-Nelms, M. (1997). Influential factors of caregiver behavior at mealtime: A study of 24 child-care programs. *Journal of the American Dietetic Association*, 97(5), 505–509.
- Nelson, G., Westhues, A., & MacLeod, J. et al. (2003). A meta-analysis of longitudinal research on preschool prevention programs for children. *Prevention and Treatment*, 6 (December).

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Normand, C.L., Vitaro, F. & Charlebois, P. (2000). Involving parents in early prevention. *Isuma*, Autumn, 38–43.
- Norris, C., Brink, S., & Mosher, P. (1999, August). *Measuring non-parental care in the NLSCY: Content and process issues* [T-00-1E]. Ottawa: Applied Research Branch, Human Resources Development Canada. Retrieved March 14, 2005, from <http://www.hrsdc.gc.ca/eng/cs/sp/sdc/pkrf/publications/research/1999-001254/1999-001254.pdf>.
- O'Brien, R. (2005). Translating a research intervention into community practice: The Nurse Family Partnership. *Journal of Primary Prevention*, 26(3), 241–257.
- Ogilvy, C. (1992). How might psychological research findings be applied to increase the effectiveness of nurseries as learning contexts? *Early Child Development and Care*, 81, 65–75.
- Roberts, J., Bailey, D. & Bube Nychka, H. (1991). Teachers' use of strategies to facilitate the communication of preschool children with disabilities. *Journal of Early Intervention*, 15, 358–376.
- Roths, B., Fees, B. S., Bailey, G., & Fitzgerald, K. (2002). Let's move, learn, and have fun! *Journal of Nutrition Education Behaviour*, 34(6), 343–344.
- Russell, C. (2002). *The state of knowledge about prevention/early intervention*. Ottawa, ON: Invest in Kids.
- Russell, C. (2007). *Vital communities, vital support. How well do Canada's communities support parents of young children?* Ottawa, ON: Invest in Kids.
- Sharaga Swadener, S. (1994). *Nutrition education for preschool children: A review of the research*. Washington, DC: United States Department of Agriculture.
- Solnit, A.J. (1983). Foreword. In S. Provence & A. Naylor (Eds.), *Working with disadvantaged parents and their children: Scientific and practice issues* (pp. vii–ix). New Haven, CT: Yale University Press.
- Statistics Canada. (2006). *Child care: An 8 year profile*. Ottawa, ON: Author.
- Story, M., Kaphingst, K., & French, S. (2006). The role of child care settings in obesity prevention. *The Future of Children*, 16(1), 143–168.
- Tedstone, A., Aviles, M., Shetty, P., & Daniels, L. (Eds.) (2002). *Effectiveness of interventions to promote healthy eating in preschool children aged 1 to 5 years: A review*. London: Health Education Authority.
- Wade, K., Cava, M., Douglas, C., Feldman, L., Irving, H., O'Brien, M.A., et al. (1999). *A systematic review of the effectiveness of peer/paraprofessional 1:1 interventions targeted towards mothers (parents) of 0-6 year old children in promoting positive maternal (parental) and/or child health/development outcomes*. Toronto: Public Health Research, Education and Development.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Weitzman, E. (1994). The Hanen Program for Early Childhood Educators: Inservice training for child care providers on how to facilitate children's social, language and literacy development. *Infant Toddler Intervention: The Transdisciplinary Journal*, 4(3), 173–202.
- Williams, S. & Holinshead, W. (2004, November). Perspectives in integrated child health information systems: Parents, providers and public health. *Journal of Public Health Management Practice*, (Suppl), S57–S60.
- Williams, C.L., Strobino, B.A., Bollella, M., & Brotanek, J. (2004). Cardiovascular risk reduction in preschool children: The "healthy start" project. *Journal of the American College of Nutrition*, 23(2), 117–123.
- World Health Organization. (2003). *Diet, nutrition and the prevention of chronic diseases* [WHO Technical Report Series No. 916]. Geneva: World Health Organization. Retrieved April 27, 2006, from http://www.who.int/hpr/NPH/docs/who_fao_expert_report.pdf.
- Ziegler, P., Briefel, R., Clusen, N., & Devaney, B. (2006). Feeding infants and toddlers study (FITS): Development of the FITS survey in comparison to other dietary survey methods. *Journal of the American Dietetic Association*, 106(1S), 12–27.

Parenting

- Allen, S. & Daly, K. (2002). *The effects of father involvement: A summary of the research evidence*. Ontario: Father Involvement Initiative.
- Amato, P. & Rivera, F. (1999). Paternal involvement and children's behavior problems. *Journal of Marriage and the Family*, 61, 357–384.
- Ball, J. (2008, June). Aboriginal quality of life: Promoting equity and dignity for Aboriginal children in Canada. *IRPP Choices*, 14(7).
- Barlow, J., Coren, E. & Stewart-Brown, S. (2001). Parent-training programmes for improving maternal psychosocial health [CD002020]. *Cochrane Database of Systematic Reviews*, 4.
- Barlow, J., Johnston, I., Kendrick, D., Polnay, L., & Stewart-Brown, S. (2006). Individual and group-based parenting programmes for the treatment of physical child abuse and neglect. *Cochrane Database of Systematic Reviews*, 3.
- Barlow, J. & Parsons, J. (2003). Group-based parent-training programmes for improving emotional and behavioural adjustment in 0-3 year old children. *Cochrane Database of Systematic Reviews*, 2.
- Barlow, J., Parsons, J. & Stewart-Brown, S. (2005). Preventing emotional and behavioural problems: the effectiveness of parenting programmes with children less than 3 years of age. *Child: Care, Health & Development*, 31(1), 33–42.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Bent, K., Josephson, W. & Kelly, B. (2004). Effects of an Aboriginal cultural enrichment program on adolescent mothers' self perceptions. *First Peoples Child & Family Review*, 1(1), 83–100.
- Bernstein, V.J., Harris, E.J., Long, C.W., Iida, E. & Hans, S.L. (2005). Issues in the multi-cultural assessment of parent-child interaction: An exploratory study from the Starting Early Starting Smart Collaboration. *Journal of Applied Developmental Psychology*, 26(3), 241–275.
- Bunting, L. & McAuley, C. (2004). Research review: Teenage pregnancy and motherhood: The contribution of support. *Child and Family Social Work*, 9, 207–215.
- Callister, L. (2005). What as the literature taught us about culturally competent care of women and children? *Maternal Child Nursing*, 30(6), 380–388.
- Cambridge, M., Lexington, M., Hadley, M. & Bethesday, M. (2001, April). *National evaluation of family support programs. Volume A: The meta-analysis*. Massachusetts: ABT Associates Inc. Retrieved July 13, 2006, from <http://www.abtassociates.com/reports/NEFSP-VolA.pdf>.
- Canadian Paediatric Society. (2004). *Effective discipline for children* [Position Statement PP 2004-01]. Ottawa, ON: Author.
- Centre for Community Child Health, Royal Children's Hospital. (2004). *Literature review: Parenting information project*. Melbourne: Author.
- David, T., Gooch, K., Powell, S. & Abbott, L. (2003). *Birth to Three Matters: A review of the literature*. Manchester: Queen's Printer. Retrieved July 13, 2006, from <http://www.dfes.gov.uk/rsgateway/DB/RRP/u013918/index.shtml>.
- Dillon Goodson, B. (2005). Parent support programs and outcomes for children. *Encyclopedia on Early Childhood Development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved August 2008, from <http://www.child-encyclopedia.com/documents/GoodsonANGxp.pdf>.
- Dilworth, T. (2006). *Literature review: Poverty, homelessness and teenage pregnancy*. Saint John, NB: First Steps Housing Project Inc. Retrieved December 22, 2006, from http://tamarackcommunity.ca/downloads/vc/SJ_Literature_Review.pdf.
- Dion Stout, M. & Kipling, G.D. (1999, November 30). *Emerging priorities for the health of First Nations and Inuit children and youth*. Ottawa, ON: First Nations and Inuit Health.
- Eisenberg, N. (2005). Temperamental effortful control (self-regulation). *Encyclopedia on Early Childhood Development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, at <http://www.child-encyclopedia.com/documents/EisenbergANGxp.pdf>.
- Fagan, J. & Iglesias, A. (1999). Father involvement program effects on fathers, father figures and their Head Start children. *Early Childhood Research Quarterly*, 14(2), 243–269.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Fagerskiold, A. (2006). Support of fathers of infants by the child health nurse. *Scandinavian Journal of Caring Sciences*, 20(1), 79–85.
- Forer, B. & Holden, T. (2004). *Painting a portrait of support: Young parents & their children*. Vancouver, BC: The BC Alliance Concerned with Early Pregnancy and Parenthood, Partners Task Group.
- Foster, E.M., Prinz, R.J., Sanders, M.R., and Shapiro, C.J. 2008. The costs of a public health infrastructure for delivering parenting and family support, *Children and Youth Services Review*, 30, 493–450.
- Gavin, L., Black, M., Minor, S., Abel, Y., Papas, M. A. & Bentley, M. (2002). Young, disadvantaged fathers' involvement with their infants. *Journal of Adolescent Health*, 31, 266–276.
- Gepkens, A. & Gunning-Schepers, L. (1996). Interventions to reduced socioeconomic health differences: A review of the international literature. *European Journal of Public Health*, 6(3), 218–226.
- Harrison, M., Magill-Evans, J. & Sadoway, D. (2001). Scores on the Nursing Child Assessment Teaching Scale for father-toddler dyads. *Public Health Nursing*, 18, 94.
- Hume, S., Hubberstey, C. & Rutman, D. (2005). *Parenting support and education: A literature review*. Vancouver, BC: BC Parenting Vision Task Group.
- Joshi, A. (2006). *Evaluating the Parent-Child Mother Goose Program: A critical review*. Unpublished manuscript, University of British Columbia, Vancouver.
- Koniak-Griffin, D., Verzemnieks, L., Anderson, N., Brecht, M., Lesser, J., Kim, S. & Turner-Pluta, C. (2003). Nurse visitation for adolescent mothers: Two-year infant health and maternal outcomes. *Nursing Research*, 52(2), 127–136.
- Landy, S. & Tam, K.K. (1998). *Understanding the contribution of multiple risk factors on child development at various ages*. Ottawa, ON: Human Resources Development Canada.
- Lennon, M., Aber, J.L. & Blum, B. (1998, November). *Program, research and policy implications of evaluations of teenage parent programs*. New York: Research Forum on Children, Families, and the New Federalism. Retrieved December 13, 2006, from <http://www.researchforum.org/media/implications1.pdf>.
- Letourneau, N. (2001). Attrition among adolescents and infants involved in a parenting intervention. *Child: Care, Health and Development*, 27(2), 183–186.
- Letourneau, N., Hungler, K. & Fisher, K. (2005). Low-income Canadian Aboriginal and non-Aboriginal parent–child interactions. *Child: Care, Health & Development*, 31(5), 545–554.
- Lilley, S. & Price, P. (2005). *Healthy Beginnings Enhanced Home Visiting Initiative: Resource material that works for parents*. Nova Scotia: Nova Scotia Department of Health.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Magill-Evans, J., Harrison, M., Rempel, G. & Slater, L. (2006). Interventions with fathers of young children: A systematic literature review. *Journal of Advanced Nursing*, 55(2), 248–264.
- McBride, B (1991). Parent education and support programs for fathers: Outcome effects on paternal involvement. *Early Child Development and Care*, 67, 73–85.
- McCain, M. & Mustard, F. (1999). *Early years study: Reversing the real brain drain*. Ottawa, ON: Government of Ontario.
- Melendez, L. (2005). Parental beliefs and practices around early self-regulation: The impact of culture and immigration. *Infants and Young Children*, 18(2), 136–146.
- Moore, T. & Kotelchuck, M. (2004). Predictors of urban fathers' involvement in their child's health care. *Pediatrics* 113(3), 574–580.
- Moran, P., Ghate, D., & van der Merwe, A. (2004). *What works in parenting support? A review of the international evidence*. London: Department for Education and Skills.
- McEvoy, M., Lee, C., O'Neill, A., Groisman, A., Roberts-Butleman, K., Dinghra, K., et al. (2005). Are there universal parenting concepts among culturally diverse families in an inner-city pediatric clinic? *Journal of Pediatric Health Care*, 19(3), 142–150.
- Nystrom, K. & Ohrling, K. (2003). Parenthood experiences during the child's first year: Literature Review. *Journal of Advanced Nursing*, 46(3), 319–330.
- O'Brien Caughy, M., Huang, K., Miller, T. & Genevro, J. (2004). The effects of the Healthy Steps for Young Children Program: Results from observations of parenting and child development. *Early Childhood Research Quarterly*, 19, 611–630.
- Percy, M. & McIntyre, L. (2005). Using Touchpoints to promote parental self-competence in low-income, minority, pregnant and parenting teen mothers. *Journal of Pediatric Nursing*, 16(3), 180–186.
- Peterborough County-City Health Unit. (2005). *Nobody's Perfect Program – Peterborough 2003/2004 program outcome evaluation*. Peterborough, ON: Author.
- Philliber, S., Brooks, L., Phillips Lehrer, L., Oakley, M. & Waggoner, S. (2003). Outcomes of teen parenting programs in New Mexico. *Adolescence*, 38(151), 536–553.
- Raver, C. (2004). Placing emotional self-regulation in sociocultural and socioeconomic contexts. *Child Development*, 75(2), 346–353.
- Reebye, P., Ross, S., & Jamieson, K. (1999). *A literature review of child-parent/caregiver attachment theory and cross-cultural practices influencing attachment*. Toronto: St. Joseph's Women's Health Centre. Retrieved December 22, 2006, from <http://www.attachmentcrosscultures.org/research/index.html#1>.
- Russell, C. (2002). *The state of knowledge about prevention/early intervention*. Ottawa, ON: Invest in Kids.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Russell, C. (2003). *Parent education: What is required to build the skills parents need to raise healthy children?* Ottawa: Invest in Kids.
- Russell, C. (2007). *Vital communities, vital support. How well do Canada's communities support parents of young children?* Ottawa, ON: Invest in Kids.
- Saleh, M., Buzi, R., Weinman, M. & Smith, P. (2005). The nature of connections: Young fathers and their children. *Adolescence*, 40(159), 513–523.
- Sameroff, A.J. & Fiese, B.H. (2000). Transactional regulation: The developmental ecology of early intervention. In J.P. Shankoff & S.J. Miesels (Eds.), *Handbook of early childhood intervention* (2nd ed., pp. 135–159). New York: Cambridge University Press.
- Sanders, M. (2003). Triple P – Positive Parenting Program: A population approach to promoting competent parenting. *Australian e-Journal for the Advancement of Mental Health*, 2(3), 1–17.
- St. Joseph's Women's Health Centre & Parkdale Parents' Primary Prevention Program. (1999). *Attachment across cultures*. Toronto: Author. Retrieved December 22, 2006, from <http://www.attachmentcrosscultures.org/eindex.html>.
- Thomas, H., Camiletti, Y., Cava, M., Feldman, L., Underwood, J. & Wade, K. (1999). *Effectiveness of parenting groups with professional involvement in improving parent and child health developmental outcomes*. Ontario: Public Health Research, Education and Development Program.
- Yu, S., Huang, Z., Schwalberg, R. & Kogan, M. (2005). Parental awareness of health and community resources among immigrant families. *Maternal and Child Health Journal*, 9(1), 27–34.
- Waddell, C., Godderis, R., Wong, W. & Garland, O. (2004). *Implementing evidence-based practice in children's mental health*. Vancouver: University of British Columbia, Mental Health Evaluation & Community Consultation Unit.
- Williams, E. & Sadler, L. (2001). Effects of an urban high school-based child care center on self-selected adolescent parents and their children. *Journal of School Health*, 71(2), 47–52.

General Development

- American Academy of Pediatrics, Committee on Children with Disabilities. (2001). Developmental surveillance and screening of infants and young children. *Pediatrics*, 108(1), 192–196.
- Blackwell, J. (2001). Clinical practice guideline: Screening and diagnosing autism. *Journal of the American Academy of Nurse Practitioners*, 13(12), 534–536.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Butler, M. & Geber, J. (1998). *Review of developmental screening tools used in public health nursing practice*. Victoria, BC: Ministry for Children and Families.
- Cadman, D., Chambers, L., Walter, S., Ferguson, R., Johnston, N. & McNamee, J. (1987). Evaluation of public health preschool child developmental screening; The process and outcomes of a community program. *American Journal of Public Health*, 77(1), 45–51.
- Cadman, D., Walter, S., Chambers, L., Ferguson, R., Szatmari, N., Johnston, N. et al. (1988). Predicting problems in school performance from preschool health, developmental and behavioural assessments. *Canadian Medical Association Journal*, 139(1), 31–36.
- Canadian Task Force on Preventive Health Care. (1993). *Preschool screening for developmental problems*. Ottawa, ON: Author.
- Canadian Task Force on Preventive Health Care. (2001). Preventive health care, 2001 update: Screening and management of developmental dysplasia of the hip in newborns. *Canadian Medical Association Journal*, 164(12), 1669–1677.
- Glascoe, F. (1997). Parents' concerns about children's development: Prescreening technique or screening test? *Pediatrics*, 99(4), 522–528.
- Glascoe, F. (2000a). Detecting and addressing developmental and behavioral problems in primary care. *Pediatric Nursing*, 26(3), 251–259.
- Glascoe, F. (2000b). Evidence-based approach to developmental and behavioural surveillance using parents' concerns. *Child: Care, Health and Development*, 26(2), 137–149.
- Glascoe, F. (2001). Are overreferrals on developmental screening tests really a problem? *Archives of Pediatrics & Adolescent Medicine*, 155, 54–59.
- Glascoe, F. & Dworkin, P. (1995). The role of parents in the detection of developmental and behavioral problems. *Pediatrics*, 95(6), 829–836.
- Henderson, L. & Meisels, S. (1994). Parental involvement in the developmental screening of their young children: A multiple-source perspective. *Journal of Early Intervention*, 18(2), 141–154.
- Janson, H. & Squires, J. (2004). Parent-completed developmental screening in a Norwegian population sample: A comparison with US normative data. *Acta Paediatrica*, 93, 1525–1529.
- King, T. & Glascoe, F. (2003). Developmental surveillance of infants and young children in pediatric primary care. *Current Opinion in Pediatrics*, 15, 624–629.
- McKay, K., Shannon, A., Vater, S., & Dworkin, P. (2006). ChildServ: Lessons learned from the design and implementation of a community-based developmental surveillance program. *Infants & Young Children*, 19(4), 371–377.

- Romanczyk, R., Gillis, M., Noyes-Grosser, D., Holland, J., Holland, C. & Lyons, D. (2005). Clinical clues, developmental milestones and early identification/assessment of children with disabilities. *Infants & Young Children, 18*(3), 212–221.
- Squires, J., Nickel, R., & Eisert, D. (1996). Early detection of developmental problems: Strategies for monitoring young children in the practice setting. *Journal of Developmental and Behavioral Pediatrics, 17*, 420–427.
- To, R., Guttman, A., Dick, P., Rosenfield, J., Parkin, P., Cao, H., et al. (2004). What factors are associated with poor developmental attainment in young Canadian children? *Canadian Journal of Public Health, 95*(4), 258–263.
- US Preventive Services Task Force. (2006). Screening for developmental dysplasia of the hip: Recommendation Statement. *Pediatrics, 117*, 898–902.

Physical Health and Development: Prenatal Influences

- American Academy of Pediatrics. (2000). Fetal alcohol and alcohol-related neurodevelopmental disorders. *Pediatrics, 106*(2), 358–361.
- Bhutta, A.T., Cleves, M.A., Casey, P.H., Cradock, M.M., & Anand, K.J. (2002). Cognitive and behavioral outcomes of school-aged children who were born preterm: A meta-analysis. *JAMA: The Journal of the American Medical Association, 288*(6), 728–737.
- British Columbia Reproductive Care Program. (1999). *Discharge planning guide for substance using women and their newborns*. Vancouver, BC: Author.
- British Columbia Reproductive Care Program. (2005). *Alcohol use in the perinatal period and fetal alcohol spectrum disorder*. Vancouver, BC: Author.
- Burd, L. & Juelson, T. (2003). Community-based screening for fetal alcohol syndrome. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from <http://www.excellenceearlychildhood.ca/documents/Burd-JuelsonANGxp.pdf>.
- Caley, L., Kramer, C., & Robinson, L. (2005). Fetal alcohol spectrum disorder. *The Journal of School Nursing, 21*(3), 139–146.
- Caley, L., Shipkey, N., Winkelman, T., Dunlap, C., & Rivera, S. (2006). Evidence-based review of nursing interventions to prevent secondary disabilities in fetal alcohol spectrum disorder. *Pediatric Nursing, 32*(2), 155–162.
- Chudley, A., Conry, J., Cook, J., Looock, C., Rosales, T., & LeBlanc, N. (2005). Fetal alcohol spectrum disorder: Canadian guidelines for diagnosis. *Canadian Medical Association Journal, 172*(Suppl. 5), S1–S21.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Coles, C.D. (2003). Individuals affected by fetal alcohol spectrum disorder (FASD) and their families. Prevention, intervention and support. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from <http://www.child-encyclopedia.com/documents/ColesANGxp.pdf>.
- Cone-Wesson, B. (2005). Prenatal alcohol and cocaine exposure: Influences on cognition, speech, language and hearing. *Journal of Communication Disorders*, 38, 279–302.
- Government of Canada. (2003). *The well-being of Canada's young children: Government of Canada report*. Ottawa, ON: Human Resources Development Canada and Health Canada.
- Jacobson, J. & Jacobson, S. (2002). Effects of prenatal alcohol exposure on child development. *Alcohol Research & Health*, 26(4), 282–286.
- Jacobson, S. & Jacobson, J. (2003). FAS/FAE and its impact on psychosocial child development. (2003). *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from <http://www.child-encyclopedia.com/documents/JacobsonANGxp.pdf>.
- Jansen, R., Fitzgerald, H., Ham, H., & Zucker, R. (1995). Pathways into risk: Temperament and behavior problems in three- to five-year-old sons of alcoholics. *Alcoholism: Clinical and Experimental Research*, 19(4), 501–509.
- Leslie, M. & Roberts, G. (2001). *Enhancing fetal alcohol syndrome (FAS)-related interventions at the prenatal and early childhood stages in Canada*. Ottawa, ON: Public Health Agency of Canada. Accessed on July 13, 2005 from http://www.phac-aspc.gc.ca/dca-dea/publications/pdf/enhancing_fas_e.pdf.
- Liaw, F., Meisels, S., & Brooks-Gunn, J. (1995). The effects of experience of early intervention on low birth weight, premature children: The Infant Health and Development Program. *Early Childhood Research Quarterly*, 10, 405–431.
- O’Conner, M., Kogan, N., & Findlay, R. (2002). Prenatal alcohol exposure and attachment behavior in children. *Alcoholism: Clinical and Experimental Research*, 26(10), 1592–1602.
- Pridham, K., Krolikowski, M., Limbo, R., Paradowski, J., Rudd, N., Meurer, J., et al. (2006). Guiding mothers’ management of health problems of very low birth-weight infants. *Public Health Nursing*, 23(3), 205–215.
- Russell, C. (2002). *The state of knowledge about prevention/early intervention*. Ottawa, ON: Invest in Kids.
- Schandler, S., Thomas, S., & Cohen, M. (1995). Spatial learning deficits in preschool children of alcoholics. *Alcoholism: Clinical and Experimental Research*, 19(4), 1067–1072.

Willford, J., Leech, S., & Day, N. (2006). Moderate prenatal alcohol exposure and cognitive status of children at age 10. *Alcoholism: Clinical and Experimental Research*, 30(6), 1–9.

Zucker, R., Kincaid, S., Fitzgerald, H., & Bingham, R. (1995). Alcohol schema acquisition in preschoolers: Differences between children of alcoholics and children of non-alcoholics. *Alcoholism: Clinical and Experimental Research*, 19(4), 1111–1117.

Physical Health and Development: Physical Activity and Motor Development

American College of Sports Medicine. (2000). *ACSM's guidelines for exercise testing and prescription* (6th ed.). Philadelphia: Williams & Wilkins, Lippincott.

Baranowski, T., Thompson, W., DuRant, R., Baranowski, J., & Puhl, J. (1993). Observations on physical activity in physical locations: Age, gender, ethnicity and month effects. *Research Quarterly in Exercise and Sport*, 64, 1–7.

Brown, B., Weitzman, M., Bzostek, s., Kavanaugh, M., Aufseeser, D., Bagley, S., et al. (2004). *Early child development in social context: A chartbook*. New York: Child Trends & Center for Child Health Research.

Canadian Paediatric Society. (2002). Healthy active living for children and youth. *Journal of Paediatric Child Health*, 7, 339–345.

Ekeland, E., Heian, F., Hagen, K., Abbott, J., & Nordheim, L. (2004). Exercise to improve self-esteem in children and young people [CD003683]. *Cochrane Database of Systematic Reviews*, 1.

Gallahue, D. (1982). *Understanding motor development in children*. New York: Wiley.

Fowler, E.G., Kolobe, T.H., Damiano, D.L., Thorpe, D.E., Morgan, D.W., Brunstrom, J.E., et al. (2007). Promotion of physical fitness and prevention of secondary conditions for children with cerebral palsy: Section on Pediatrics Research Summit proceedings. *Physical Therapy*, 87(11), 1495–1510.

Irwin, J., He, M., Sangster Bouch, M., Tucker, P. & Pollett, G. (2005). Preschoolers' physical activity behaviours: Parents perspectives. *Canadian Journal of Public Health*, 96(4), 299–303.

Kahn, E., Ramsey, L., Brownson, R., Heath, G., Howze, E., Powel, K., et al. (2002). The effectiveness of interventions to increase physical activity: A systematic review. *American Journal of Preventive Medicine*, 22, 73–107.

Kohl, H. & Hobbs, K. (1998). Development of physical activity behaviors among children and adolescents. *Pediatrics*, (Suppl.), 549–553.

Malina, R. (1994). Physical activity: Relationship to growth, maturation and physical fitness. In C. Bouchard, R. Shephard, & T., Stephens (eds.), *Physical activity, fitness and health*:

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

International proceeding and consensus statement (pp. 918–930). Champaign, IL: Human Kinetics

- Moore, L., Lombardi, D., White, M., Campbell, J., Oliveria, S. & Ellison, R. (1991). Influence of parents' physical activity levels on activity levels of young children. *Journal of Pediatrics*, 188, 215–219.
- Ritchie, L., Ivey, S., Masch, M., Woodward, G., Ikeda, J., & Crawford, P. (2001). *Pediatric overweight: A review of the literature*. Berkley, CA: The Centre for Weight and Health, University of California.
- Rice, M. & Howell, C. (2000). Measurement of physical activity, exercise and physical fitness in children: Issues and concerns. *Journal of Pediatric Nursing*, 15(3), 148–156.
- Spittle, A., Orton, J., & Boyd, R. (2005). Early developmental intervention programs post hospital discharge to prevent motor and cognitive impairments in preterm infants [CD005495]. *Cochrane Database of Systematic Reviews*, 4.
- To, R., Guttmann, A., Dick, P., Rosenfield, J., Parkin, P., Cao, H., et al. (2004). What factors are associated with poor developmental attainment in young Canadian children? *Canadian Journal of Public Health*, 95(4), 258–263.
- Task Force on Community Preventive Services. (2001, October). Increasing physical activity: A report on recommendations of the Task Force on Community Preventive Services. *Morbidity and Mortality Weekly Report*, 50(RR-18), 1–16. Retrieved May 30, 2006, from <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5018a1.htm>.

Physical Health and Development: Physical Growth and General Health

- Agras, W.S., & Mascola, A.J. (2005). Risk factors for childhood overweight. *Current Opinion in Pediatrics*, 17(5), 648–652.
- Arenz, S., Ruckerl, R., Koletzko, B., & von Kries, R. (2004). Breast-feeding and childhood obesity - a systematic review. *International Journal of Obesity and Related Metabolic Disorders: Journal of the International Association for the Study of Obesity*, 28(10), 1247–1256.
- Baird, J., Fisher, D., Lucas, P., Kleijnen, J., Roberts, H., & Law, C. (2005). Being big or growing fast: Systematic review of size and growth in infancy and later obesity. *BMJ (Clinical Research Ed.)*, 331(7522), 929.
- Baranowski, T., Cullen, K. W., Nicklas, T., Thompson, D., & Baranowski, J. (2002). School-based obesity prevention: A blueprint for taming the epidemic. *American Journal of Health Behavior*, 26(6), 486–493.
- Barlow, S.E., & Dietz, W.H. (2002). Management of child and adolescent obesity: Summary and recommendations based on reports from pediatricians, pediatric nurse practitioners, and registered dietitians. *Pediatrics*, 110(1 Pt 2), 236–238.

- Bell, M. (2004). Failure to thrive. *Update*, 68(11), 571–578.
- Benoit, D. (2004). Services and programs proven to be effective in managing young children's (birth to age five) eating behaviours and impact on their social and emotional development: Comments on piazza and Carroll-Hernandez, Ramsay and Black. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved April 30, 2006, from <http://www.child-encyclopedia.com/documents/BenoitANGxp-Eating.pdf>.
- Berg, F., Buechner, J., Parham, E. & Weight Realities Division of the Society for Nutrition Education. (2003). Guidelines for childhood obesity prevention programs: Promoting healthy weight in children. *Journal of Nutrition Education Behavior*, 35(1), 1–4.
- Birch, L. & Deysher, M. (1986). Caloric compensation and sensory specific satiety: Evidence for self regulation of food intake by young children. *Appetite*, 7(4), 323–331.
- Birch, L. & Fisher, J. (1998). Development of eating behaviors among children and adolescents. *Pediatrics*, 101(3 Pt 2), 539–549.
- Birch, L. & Fisher, J. (2000). Mothers' child-feeding practices influence daughters' eating and weight. *The American Journal of Clinical Nutrition*, 71(5), 1054–1061.
- Birch, L., Birch, D., Marlin, D. & Kramer, L. (1982). Effects of instrumental consumption on children's food preference. *Appetite*, 3(2), 125–134.
- Bitler, M. & Currie, J. (2005). Does WIC work? the effects of WIC on pregnancy and birth outcomes. *Journal of Policy Analysis and Management*, 24(1), 73–91.
- Black, M., Dubowitz, H., Hutcheson, J., Berenson-Howard, J., & Starr, R. (1995). A randomized clinical trial of home intervention for children with failure to thrive. *Pediatrics*, 95(6), 807–814.
- Block, R. & Krebs, N. (2005). Failure to thrive as a manifestation of child neglect. *Pediatrics*, 116(5), 1234–1237.
- Brown, R., & Ogden, J. (2004). Children's eating attitudes and behaviour: A study of the modelling and control theories of parental influence. *Health Education Research*, 19(3), 261–271.
- Burke, V., Beilin, L., Simmer, K., Oddy, W., Blake, K. & Doherty, D., et al. (2005). Predictors of body mass index and associations with cardiovascular risk factors in Australian children: A prospective cohort study. *International Journal of Obesity (Lond)*, 29(1), 15–23.
- Butte, N.F. (2001). The role of breastfeeding in obesity. *Pediatric Clinics of North America*, 48(1), 189–198.
- Canadian Paediatric Society. (2002). *Healthy active living for children and youth. position statement* [HAL 2002-01]. Ottawa, ON: Author. Retrieved April 28, 2006, from <http://www.cps.ca/english/statements/HAL/HAL02-01.htm>.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Canadian Task Force on Preventive Health Care. (1994). *Well-baby care in the first 2 years of life*. Ottawa, ON: Author.
- Canadian Task Force on Preventive Health Care. (1994). *Disadvantaged children*. Ottawa, ON: Author.
- Center for Child Health Research. (2004). *Early child development in social context: A chartbook*. New York: Author.
- Chaput, J.P., & Tremblay, A. (2006). Obesity at an early age and its impact on child development. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved April 27, 2006, from <http://www.child-encyclopedia.com/documents/chaput-tremblayANGxp.pdf>.
- Chatoor, I., Surles, J., Ganiban, J., Beker, L., Paez, L.M., & Kerzner, B. (2004). Failure to thrive and cognitive development in toddlers with infantile anorexia. *Pediatrics*, *113*(5), e440–e447.
- Chatterji, P. & Brooks-Gunn, J. (2004). WIC participation, breastfeeding practices, and well-child care among unmarried, low-income mothers. *American Journal of Public Health*, *94*(8), 1324–1327
- Corbett, S.S. & Drewett, R.F. (2004). To what extent is failure to thrive in infancy associated with poorer cognitive development? A review and meta-analysis. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *45*(3), 641–654.
- Daniels, S.R., Arnett, D.K., Eckel, R.H., Gidding, S.S., Hayman, L.L., Kumanyika, S., et al. (2005). Overweight in children and adolescents: Pathophysiology, consequences, prevention, and treatment. *Circulation*, *111*(15), 1999–2012.
- de Onis, M., Blossner, M., Borghi, E., Frongillo, E.A., & Morris, R. (2004). Estimates of global prevalence of childhood underweight in 1990 and 2015. *Journal of the American Medical Association*, *291*(21), 2600–2606.
- Dennison, B.A., Erb, T.A., & Jenkins, P.L. (2002). Television viewing and television in bedroom associated with overweight risk among low-income preschool children. *Pediatrics*, *109*(6), 1028–1035.
- Dewey, K.G. (2003). Is breastfeeding protective against child obesity? *Journal of Human Lactation: Official Journal of International Lactation Consultant Association*, *19*(1), 9–18.
- Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada & Community Health Nurses Association of Canada. (2004). *The use of growth charts for assessing and monitoring growth in Canadian infants and children*. Ottawa, ON: Author.
- Dietz, W.H. (2001). Breastfeeding may help prevent childhood overweight. *Journal of the American Medical Association*, *285*(19), 2506–2507.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Ebbeling, C.B., Pawlak, D.B., & Ludwig, D.S. (2002). Childhood obesity: Public-health crisis, common sense cure. *Lancet*, *360*(9331), 473–482.
- Ells, L. J., Campbell, K., Lidstone, J., Kelly, S., Lang, R., & Summerbell, C. (2005). Prevention of childhood obesity. *Best Practice & Research. Clinical Endocrinology & Metabolism*, *19*(3), 441–454.
- Faith, M.S., Berkowitz, R.I., Stallings, V.A., Kerns, J., Storey, M., & Stunkard, A.J. (2004). Parental feeding attitudes and styles and child body mass index: Prospective analysis of a gene-environment interaction. *Pediatrics*, *114*(4), e429–436.
- Fisher, J.O., & Birch, L.L. (1999). Restricting access to palatable foods affects children's behavioral response, food selection, and intake. *The American Journal of Clinical Nutrition*, *69*(6), 1264–1272.
- Fisher, J.O., Birch, L.L., Smiciklas-Wright, H., & Picciano, M.F. (2000). Breast-feeding through the first year predicts maternal control in feeding and subsequent toddler energy intakes. *Journal of the American Dietetic Association*, *100*(6), 641–646.
- Fitzgibbon, M.L., Stolley, M.R., Schiffer, L., Van Horn, L., KauferChristoffel, K., & Dyer, A. (2005). Two-year follow-up results for Hip-Hop To Health Jr.: A randomized controlled trial for overweight prevention in preschool minority children. *The Journal of Pediatrics*, *146*(5), 618–625.
- Fox, M.K., Devaney, B., Reidy, K., Razafindrakoto, C., & Ziegler, P. (2006). Relationship between portion size and energy intake among infants and toddlers: Evidence of self-regulation. *Journal of the American Dietetic Association*, *106*(1 Suppl 1), S77–83.
- Francis, L.A., Hofer, S.M., & Birch, L.L. (2001). Predictors of maternal child-feeding style: Maternal and child characteristics. *Appetite*, *37*(3), 231–243.
- Fuller, C., Keller, L., Olson, J., & Plymale, A. (2005). Helping preschoolers become healthy eaters. *Journal of Pediatric Health Care*, *19*(3), 178–182.
- Gillman, M.W., Rifas-Shiman, S.L., Camargo, C.A., Jr, Berkey, C.S., Frazier, A.L., Rockett, H.R., et al. (2001). Risk of overweight among adolescents who were breastfed as infants. *Journal of the American Medical Association*, *285*(19), 2461–2467.
- Grummer-Strawn, L.M., Mei, Z., & Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System. (2004). Does breastfeeding protect against pediatric overweight? Analysis of longitudinal data from the centers for disease control and prevention pediatric nutrition surveillance system. *Pediatrics*, *113*(2), e81–86.
- Hanley, A.J., Harris, S.B., Gittelsohn, J., Wolever, T.M., Saksvig, B., & Zinman, B. (2000). Overweight among children and adolescents in a native canadian community: Prevalence and associated factors. *The American Journal of Clinical Nutrition*, *71*(3), 693–700.
- Harvey-Berino, J. & Rourke, J. (2003). Obesity prevention in preschool Native-American children: A pilot study using home visiting. *Obesity Research*, *11*(5), 606–611.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Health Canada. (2004). *Health Canada evaluation of the Canada Prenatal Nutrition Program*. Ottawa, ON: Author.
- Hedley, A., Ogden, C., Johnson, C., Carroll, M., Curtin, L. & Flegal, K.M. (2004). Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. *Journal of the American Medical Association*, 291(23), 2847–2850.
- Hediger, M.L., Overpeck, M.D., Ruan, W.J., & Troendle, J.F. (2002). Birthweight and gestational age effects on motor and social development. *Paediatric & Perinatal Epidemiology*, 16(1), 33–46.
- Horodyski, M.A., & Stommel, M. (2005). Nutrition education aimed at toddlers: An intervention study. *Pediatric Nursing*, 31(5), 364, 367–372.
- Jain, A. (2004). *What works for obesity?* London: BMJ Publishing Group. Retrieved April 29, 2006, from <http://www.unitedhealthfoundation.org/obesity.pdf>.
- Jain, A., Sherman, S.N., Chamberlin, L.A., Carter, Y., Powers, S.W., & Whitaker, R.C. (2001). Why don't low-income mothers worry about their preschoolers being overweight? *Pediatrics*, 107(5), 1138–1146.
- Jansson, A., Isacson, A., Kornfält, R. & Lindholm, L. (1998). Quality in child healthcare: The views of mothers and public health nurses. *Scandinavian Journal of Caring Sciences*, 12, 195–204.
- Klesges, R.C., Coates, T.J., Brown, G., Sturgeon-Tillisch, J., Moldenhauer-Klesges, L.M., Holzer, B., et al. (1983). Parental influences on children's eating behavior and relative weight. *Journal of Applied Behavior Analysis*, 16(4), 371–378.
- Klesges, R.C., Stein, R.J., Eck, L.H., Isbell, T.R., & Klesges, L.M. (1991). Parental influence on food selection in young children and its relationships to childhood obesity. *The American Journal of Clinical Nutrition*, 53(4), 859–864.
- Kuepper-Nybelen, J., Lamerz, A., Bruning, N., Hebebrand, J., Herpertz-Dahlmann, B., & Brenner, H. (2005). Major differences in prevalence of overweight according to nationality in preschool children living in Germany: Determinants and public health implications. *Archives of Disease in Childhood*, 90(4), 359–363.
- Lederman, S.A., Akabas, S.R., Moore, B.J., Bentley, M.E., Devaney, B., Gillman, M.W., et al. (2004). Summary of the presentations at the Conference on Preventing Childhood Obesity, December 8, 2003. *Pediatrics*, 114, 1146–1173.
- Lee, Y., Mitchell, D.C., Smiciklas-Wright, H., & Birch, L.L. (2001). Diet quality, nutrient intake, weight status, and feeding environments of girls meeting or exceeding recommendations for total dietary fat of the American Academy of Pediatrics. *Pediatrics*, 107(6), E95.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Li, R., Hsia, J., Fridinger, F., Hussain, A., Benton-Davis, S., & Grummer-Strawn, L. (2004). Public beliefs about breastfeeding policies in various settings. *Journal of the American Dietetic Association, 104*(7), 1162–1168.
- Lobstein, T., Baur, L., Uauy, R., & IASO International Obesity TaskForce. (2004). Obesity in children and young people: A crisis in public health. *Obesity Reviews, 5*(Suppl. 1), 4–104.
- Locklin, M. (2005). The redefinition of failure to thrive from a case study perspective. *Pediatric Nursing, 31*(6), 474–479, 495.
- McKenzie, T.L., Sallis, J.F., Nader, P.R., Patterson, T.L., Elder, J.P., Berry, C.C., et al. (1991). BEACHES: An observational system for assessing children's eating and physical activity behaviors and associated events. *Journal of Applied Behavior Analysis, 24*(1), 141–151.
- Mennella, J.A., Jagnow, C.P., & Beauchamp, G.K. (2001). Prenatal and postnatal flavor learning by human infants. *Pediatrics, 107*(6), E88.
- Moyer, V. & Butler, M. (2004). Gaps in the evidence for well-child care: A challenge to our profession. *Pediatrics, 114*(6), 1511–1521.
- Nestle, M., & Jacobson, M. F. (2000). Halting the obesity epidemic: A public health policy approach. *Public Health Reports, 115*(1), 12–24.
- Nichols, M.R., & Livingston, D. (2002). Preventing pediatric obesity: Assessment and management in the primary care setting. *Journal of the American Academy of Nurse Practitioners, 14*(2), 55–62; quiz 63–65.
- O'Brien, S.H., Holubkov, R., & Reis, E. C. (2004). Identification, evaluation, and management of obesity in an academic primary care center. *Pediatrics, 114*(2), e154–159.
- O'Dea, J.A. (2005). Prevention of child obesity: 'first, do no harm'. *Health Education Research, 20*(2), 259–265.
- Olshansky, S.J., Passaro, D.J., Hershow, R.C., Layden, J., Carnes, B.A., Brody, J., et al. (2005). A potential decline in life expectancy in the United States in the 21st century. *New England Journal of Medicine, 352*(11), 1138–1145.
- Ontario College of Family Physicians. (2004). *Improving the odds: Healthy child development* (2nd ed.). Toronto: Author. Retrieved March 7, 2006, from http://www.beststart.org/resources/hlthy_chld_dev/pdf/HCD_complete.pdf.
- Orlet Fisher, J., Rolls, B.J., & Birch, L.L. (2003). Children's bite size and intake of an entree are greater with large portions than with age-appropriate or self-selected portions. *The American Journal of Clinical Nutrition, 77*(5), 1164–1170.
- Owen, C.G., Martin, R.M., Whincup, P.H., Davey-Smith, G., Gillman, M.W., & Cook, D.G. (2005). The effect of breastfeeding on mean body mass index throughout life: A quantitative review of published and unpublished observational evidence. *The American Journal of Clinical Nutrition, 82*(6), 1298–1307.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Panpanich, R. & Garner, P. (1999). Growth monitoring in children [CD001443]. *Cochrane Database of Systematic Reviews*, 4.
- Pérez-Escamilla, R. (2005). Influence of breastfeeding on psychosocial development. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved May 1, 2006, from <http://www.child-encyclopedia.com/documents/Perez-EscamillaANGxp.pdf>.
- Plourde, G. (2006). Preventing and managing pediatric obesity. recommendations for family physicians. *Canadian Family Physician*, 52, 322–328.
- Proctor, M.H., Moore, L.L., Gao, D., Cupples, L.A., Bradlee, M.L., Hood, M.Y., et al. (2003). Television viewing and change in body fat from preschool to early adolescence: The Framingham children's study. *International Journal of Obesity and Related Metabolic Disorders: Journal of the International Association for the Study of Obesity*, 27(7), 827–833.
- Rapp, K., Schick, K.H., Bode, H., & Weiland, S.K. (2005). Type of kindergarten and other potential determinants of overweight in pre-school children. *Public Health Nutrition*, 8(6), 642–649.
- Registered Nurses' Association of Ontario. (2005). *Nursing best practice guideline: Primary prevention of childhood obesity*. Toronto: Author. Retrieved March 1, 2006, from http://www.rnao.org/Storage/12/620_BPG_childhood_obesity.pdf.
- Reilly, J. (2006). Early prevention of obesity. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development.
- Reilly, J.J., Methven, E., McDowell, Z.C., Hacking, B., Alexander, D., Stewart, L., et al. (2003). Health consequences of obesity. *Archives of Disease in Childhood*, 88(9), 748–752.
- Riley, M.R., Bass, N.M., Rosenthal, P., & Merriman, R.B. (2005). Underdiagnosis of pediatric obesity and underscreening for fatty liver disease and metabolic syndrome by pediatricians and pediatric subspecialists. *Journal of Pediatrics*, 147(6), 839–842.
- Ritchie, L.D., Welk, G., Styne, D., Gerstein, D.E., & Crawford, P.B. (2005). Family environment and pediatric overweight: What is a parent to do? *Journal of the American Dietetic Association*, 105(5 Suppl 1), S70–79.
- Robinson, T.N. (2001). Television viewing and childhood obesity. *Pediatric Clinics of North America*, 48(4), 1017–1025.
- Rourke, L., Leduc, D. & Rourke, J. (2006). *Rourke Baby Record: Evidence-based infant/child health maintenance guideline*. Ottawa, ON: Canadian Paediatric Society & the College of Family Physicians of Canada. Retrieved July 13, 2006, from www.cfpc.ca/local/files/Communications/Health%20Policy/rbr2006%20final%20PDF%20060604.pdf.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Rudolf, M.C. & Logan, S. (2005). What is the long term outcome for children who fail to thrive? A systematic review. *Archives of Disease in Childhood*, 90(9), 925–931.
- Schlenker, J. & Ward, R. (1999). Development and application of a pediatric anthropometric evaluation system. *Canadian Journal of Dietetic Practice and Research*, 60(1), 20–26.
- Sherry, B. (2005). Food behaviors and other strategies to prevent and treat pediatric overweight. *International Journal of Obesity (London)*, 29(Suppl. 2), S116–126.
- Sherry, B., Mei, Z., Scanlon, K.S., Mokdad, A.H., & Grummer-Strawn, L.M. (2004). Trends in state-specific prevalence of overweight and underweight in 2- through 4-year-old children from low-income families from 1989 through 2000. *Archives of Pediatrics & Adolescent Medicine*, 158(12), 1116–1124.
- Shields, M. (2005). *Nutrition: Findings from the Canadian Community Health Survey. Issue no.1. Measured obesity: Overweight Canadian children and adolescents*. Ottawa, ON: Statistics Canada. Retrieved March 15, 2006, from www.statcan.ca/english/research/82-620-MIE/2005001/articles/child/cobesity.htm.
- Shunk, J.A. & Birch, L.L. (2004). Girls at risk for overweight at age 5 are at risk for dietary restraint, disinhibited overeating, weight concerns, and greater weight gain from 5 to 9 years. *Journal of the American Dietetic Association*, 104(7), 1120–1126.
- Siega-Riz, A.M., Kranz, S., Blanchette, D., Haines, P.S., Guilkey, D.K., & Popkin, B.M. (2004). The effect of participation in the WIC program on preschoolers' diets. *Journal of Pediatrics*, 144(2), 229–234.
- Spruijt-Metz, D., Lindquist, C.H., Birch, L.L., Fisher, J.O., & Goran, M.I. (2002). Relation between mothers' child-feeding practices and children's adiposity. *The American Journal of Clinical Nutrition*, 75(3), 581–586.
- Stamatakis, E., Primatesta, P., Chinn, S., Rona, R., & Falaschetti, E. (2005). Overweight and obesity trends from 1974 to 2003 in English children: What is the role of socioeconomic factors? *Archives of Disease in Childhood*, 90(10), 999–1004.
- Summerbell, C.D., Waters, E., Edmunds, L.D., Kelly, S., Brown, T., & Campbell, K.J. (2005). Interventions for preventing obesity in children [CD001871]. *Cochrane Database of Systematic Reviews*, 3.
- Swinburn, B.A., Caterson, I., Seidell, J.C., & James, W.P. (2004). Diet, nutrition and the prevention of excess weight gain and obesity. *Public Health Nutrition*, 7(1A), 123–146.
- Tanner, E.M. & Finn-Stevenson, M. (2002). Nutrition and brain development: Social policy implications. *American Journal of Orthopsychiatry*, 72(2), 182–193.
- Taveras, E.M., Scanlon, K.S., Birch, L.L., Rifas-Shiman, S.L., Rich-Edwards, J.W., & Gillman, M.W. (2004). Association of breastfeeding with maternal control of infant feeding at age 1 year. *Pediatrics*, 114(5), e577–583.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Tremblay, M.S. & Willms, J.D. (2000). Secular trends in the body mass index of Canadian children. *Canadian Medical Association Journal*, 163(11), 1429–1433.
- US Department of Health and Human Services. (2001). *The Surgeon General's call to action to prevent and decrease overweight and obesity 2001*. Rockland, MD: Author. Retrieved May 7, 2006, from <http://www.surgeongeneral.gov/topics/obesity/calltoaction/CalltoAction.pdf>.
- VanVrancken-Tompkins, C.L. & Sothorn, M.S. (2006). Preventing obesity in children from birth to 5 years. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved April 26, 2006, from <http://www.enfant-encyclopedie.com/pages/PDF/VanVrancken-Tompkins-SothornANGxp.pdf>.
- Ward, M.J., Kessler, D.B., & Altman, S.C. (1993). Infant--mother attachment in children with failure to thrive. *Infant Mental Health Journal*, 14(3), 208–220.
- Wells, J.C. & Ritz, P. (2001). Physical activity at 9-12 months and fatness at 2 years of age. *American Journal of Human Biology*, 13(3), 384–389.
- Whitaker, R.C., Wright, J.A., Pepe, M.S., Seidel, K.D., & Dietz, W.H. (1997). Predicting obesity in young adulthood from childhood and parental obesity. *New England Journal of Medicine*, 337(13), 869–873.
- World Health Organization. (2003). *Diet, nutrition and the prevention of chronic diseases* [WHO Technical Report Series No. 916]. Geneva: Author. Retrieved April 27, 2006, from http://www.who.int/hpr/NPH/docs/who_fao_expert_report.pdf.
- World Health Organization. (2006). *World Health Organization child growth standards – Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age – Methods and development*. Geneva: Author.
- Worobey, J., Pisuk, J., & Decker, K. (2004). Diet and behavior in at-risk children: Evaluation of an early intervention program. *Public Health Nursing*, 21(2), 122–127.

Physical Health and Development: Nutrition and Breastfeeding

- Agrasada, G.V., Gustafsson, J., Kylberg, E., & Ewald, U. (2005). Postnatal peer counselling on exclusive breastfeeding of low-birthweight infants: A randomized, controlled trial. *Acta Paediatrica*, 94(8), 1109–1115.
- Agriculture and Agri-Food Canada. (1998). *Canada's action plan for food security: A response to the World Food Summit*. Ottawa, ON.
- Alaimo, K., Olson, C., & Frongillo, E. (2001). Food insufficiency and American school-aged children's cognitive, academic and psychosocial development. *Pediatrics*, 108(3), 824b.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Alaimo, K., Olson, C., & Frongillo, E. (2002). Food insufficiency, family income and health in US pre-school and school-aged children. *American Journal of Public Health, 91*, 781–786.
- Albon, D.J. (2005). Approaches to the study of children, food and sweet eating: A review of the literature. *Early Child Development & Care, 175*(5), 407–417.
- Altucher, K., Rasmussen, K.M., Barden, E.M., & Habicht, J.P. (2005). Predictors of improvement in hemoglobin concentration among toddlers enrolled in the Massachusetts WIC program. *Journal of the American Dietetic Association, 105*(5), 709–715.
- American Academy of Pediatrics. Committee on Public Education. (2001). American academy of pediatrics: Children, adolescents, and television. *Pediatrics, 107*(2), 423–426.
- Anderson, J.W., Johnstone, B.M., & Remley, D.T. (1999). Breast-feeding and cognitive development: A meta-analysis. *American Journal of Clinical Nutrition, 70*(4), 525–535.
- Arblaster, L., Lambert, M., Entwistle, V., Forster, M., Fullerton, D., Sheldon, T., et al. (1996). A systematic review of the effectiveness of health service interventions aimed at reducing inequalities in health. *Journal of Health Services Research & Policy, 1*(2), 93–103.
- Atkinson, S.A. (2003). Nutrition and its impact on psychosocial child development: Perspective on preterm infants. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development.
- Auestad, N., Scott, D.T., Janowsky, J.S., Jacobsen, C., Carroll, R.E., Montalto, M.B., et al. (2003). Visual, cognitive, and language assessments at 39 months: A follow-up study of children fed formulas containing long-chain polyunsaturated fatty acids to 1 year of age. *Pediatrics, 112*(3 Pt 1), e177–183.
- Bachrach, V.R., Schwarz, E., & Bachrach, L.R. (2003). Breastfeeding and the risk of hospitalization for respiratory disease in infancy: A meta-analysis. *Archives of Pediatrics & Adolescent Medicine, 157*(3), 237–243.
- Ball, T.M., & Wright, A. (1999). Health care costs of formula. *Pediatrics, 103*(4), 870–876.
- Beard, J.L., Hendricks, M.K., Perez, E.M., Murray-Kolb, L.E., Berg, A., Vernon-Feagans, L., et al. (2005). Maternal iron deficiency anemia affects postpartum emotions and cognition. *Journal of Nutrition, 135*(2), 267–272.
- Beinner, M.A., Lamounier, J.A., & Tomaz, C. (2005). Effect of iron-fortified drinking water of daycare facilities on the hemoglobin status of young children. *Journal of the American College of Nutrition, 24*(2), 107–114.

- Benoit, D. (2004). Services and programs proven to be effective in managing young children's (birth to age five) eating behaviours and impact on their social and emotional development: Comments on piazza and Carroll-Hernandez, Ramsay and Black. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved April 30, 2006, from <http://www.excellence-earlychildhood.ca/documents/BenoitANGxp.pdf>.
- Benton, D. (2001). Micro-nutrient supplementation and the intelligence of children. *Neuroscience and Biobehavioral Reviews*, 25(4), 297–309.
- Berg, A.O. (2004). Behavioral interventions to promote breastfeeding: Recommendations and rationale: United States Preventive Services Task Force. *Internet Journal of Gynecology & Obstetrics*, 3(1), 5–15.
- Birch, L. & Deysher, M. (1986). Caloric compensation and sensory specific satiety: Evidence for self regulation of food intake by young children. *Appetite*, 7(4), 323–331.
- Birch, L. & Fisher, J. (1998). Development of eating behaviors among children and adolescents. *Pediatrics*, 101(3 Pt 2), 539–549.
- Birch, L.L., McPhee, L., Shoba, B.C., & Steinberg, L. (1987). What kind of exposure reduces children's food neophobia? Looking vs. tasting. *Appetite*, 9(3), 171–178.
- Black, M.M. (2003). Helping children develop healthy eating habits. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved April 30, 2006, from <http://www.child-encyclopedia.com/documents/BlackANGxp-Eating.pdf>.
- Bonuck, K.A., Trombly, M., Freeman, K., & McKee, D. (2005). Randomized, controlled trial of a prenatal and postnatal lactation consultant intervention on duration and intensity of breastfeeding up to 12 months. *Pediatrics*, 116(6), 1413–1426.
- Borzekowski, D.L. & Robinson, T.N. (2001). The 30-second effect: An experiment revealing the impact of television commercials on food preferences of preschoolers. *Journal of the American Dietetic Association*, 101(1), 42–46.
- Bowman, S.A., Gortmaker, S.L., Ebbeling, C.B., Pereira, M.A., & Ludwig, D.S. (2004). Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. *Pediatrics*, 113(1 Pt 1), 112–118.
- Branca, F. & Ferrari, M. (2002). Impact of micronutrient deficiencies on growth: The stunting syndrome. *Annals of Nutrition & Metabolism*, 46, 8–17.
- Breastfeeding Committee for Canada. (2002). *The Baby-Friendly™ Initiative in community health services: A Canadian implementation guide*. Toronto: Author.

- Briefel, R., Hanson, C., Fox, M.K., Novak, T., & Ziegler, P. (2006). Feeding infants and toddlers study: Do vitamin and mineral supplements contribute to nutrient adequacy or excess among US infants and toddlers? *Journal of the American Dietetic Association*, 106(Suppl. 1), S52–65.
- Briefel, R.R., Reidy, K., Karwe, V., & Devaney, B. (2004). Feeding infants and toddlers study: Improvements needed in meeting infant feeding recommendations. *Journal of the American Dietetic Association*, 104(Suppl. 1), s31–37.
- British Columbia Baby-Friendly Network. (2005). *Making BC baby-friendly: Report of the British Columbia Baby-Friendly Network survey of hospitals & community health agencies*. Vancouver, BC: Author.
- Broughton, M., Janssen, P.S., Hertzman, C., Innis, S.M., & Frankish, C.J. (2006). *Predictors and outcomes of household food insecurity among inner city families with preschool children in Vancouver*. Unpublished manuscript.
- Burdette, H.L., Whitaker, R.C., Kahn, R.S., & Harvey-Berino, J. (2003). Association of maternal obesity and depressive symptoms with television-viewing time in low-income preschool children. *Archives of Pediatrics & Adolescent Medicine*, 157(9), 894–899.
- Burklow, K.A., McGrath, A.M., Valerius, K.S., & Rudolph, C. (2002). Relationship between feeding difficulties, medical complexity, and gestational age. *Nutrition in Clinical Practice*, 17(6), 373–378.
- Byrne, E. & Nitzke, S. (2002). Preschool children's acceptance of a novel vegetable following exposure to messages in a storybook. *Journal of Nutrition Education and Behavior*, 34(4), 211–213.
- Callen, J., & Pinelli, J. (2004). Incidence and duration of breastfeeding for term infants in Canada, United States, Europe, and Australia: A literature review. *Birth*, 31(4), 285–292.
- Campbell, K. J., Crawford, D. A., & Ball, K. (2006). Family food environment and dietary behaviors likely to promote fatness in 5-6 year-old children. *Int.J.Obes.(Lond)*,
- Canadian Paediatric Society. (2004a). *Canadian paediatric surveillance report 2004 results*. Ottawa, ON: Canadian Paediatric Society and Health Canada.
- Canadian Paediatric Society. (2004b). *Weaning from the breast: Position statement [CP 2004-01]*. Ottawa, ON: Author.
- Canadian Paediatric Society, Dietitians of Canada, & Health Canada. (2005). *Nutrition for healthy term infants*. Ottawa, ON: Minister of Public Works and Government Services. Retrieved March 14, 2006, from http://www.hc-sc.gc.ca/fn-an/pubs/infant-nourrisson/nut_infant_nourrisson_term_1_e.html#summary.
- Canadian Paediatric Society, Nutrition Committee. (1995). Nutrient needs and feeding of premature infants. *Canadian Medical Association Journal*, 152(11), 1765–1785.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Canadian Paediatric Society. (1999). *Promoting good television habits*. Paediatrics & Child Health, July/August.
- Caraher, M. & Coveney, J. (2004). Public health nutrition and food policy. *Public Health Nutrition*, 7(5), 591–598.
- Caraher, M. & Cowburn, G. (2005). Taxing food: Implications for public health nutrition. *Public Health Nutrition*, 8(8), 1242–1249.
- Caroli, M., Argentieri, L., Cardone, M., & Masi, A. (2004). Role of television in childhood obesity prevention. *International Journal of Obesity and Related Metabolic Disorders*, 28(Suppl. 3), S104–108.
- Carruth, B.R. & Skinner, J.D. (2001). Mothers' sources of information about feeding their children ages 2 months to 54 months. *Journal of Nutrition Education*, 33(3), 143–147.
- Carruth, B.R., Ziegler, P.J., Gordon, A., & Hendricks, K. (2004). Developmental milestones and self-feeding behaviors in infants and toddlers. *Journal of the American Dietetic Association*, 104(Suppl. 1), s51–56.
- Carver, J.D. (2005). Nutrition for preterm infants after hospital discharge. *Advances in Pediatrics*, 52, 23–47.
- Casey, P.H., Szeto, K.L., Robbins, J.M., Stuff, J.E., Connell, C., Gosset, J.M., & Simpsom, P.M. (2005). Child health-related quality of life and household food security. *Archives of Pediatric and Adolescent Medicine*, 159, 51–56.
- Center on Hunger, Poverty and Nutrition Policy. (1995). *Statement on the link between nutrition and cognitive development in children* (2nd ed.). Medford, MA: Tufts University of Nutrition.
- Centers for Disease Control and Prevention. (2002, October 11). Iron deficiency--United States, 1999-2000. *Morbidity and Mortality Weekly Report*, 51(40), 897–899. Retrieved March 3, 2006, from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5140a1.htm>.
- Chaudhuri, A. (2005). Why we should offer routine vitamin D supplementation in pregnancy and childhood to prevent multiple sclerosis. *Medical Hypotheses*, 64(3), 608–618.
- Che, J. & Chen, J. (2001, May). Food insecurity in Canadian households. *Health Reports*, 12(4). Ottawa, ON: Statistics Canada.
- Cockroft, J.E., Durkin, M., Masding, C., & Cade, J.E. (2005). Fruit and vegetable intakes in a sample of pre-school children participating in the 'five for all' project in Bradford. *Public Health Nutrition*, 8(7), 861–869.
- Committee on Nutrition, American Academy of Pediatrics. (2001). The use and misuse of fruit juice in pediatrics. *Pediatrics*, 107(5), 1210–1213.
- Community Nutritionists Council of BC. (2004). *Making the connection – Food security and public health*. British Columbia: Author.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Cook, J.T., Frank, D.A., Berkowitz, C., Black, M.M., Casey, P.H., Cutts, D.B., et al. (2004). Food insecurity is associated with adverse health outcomes among human infants and toddlers. *Journal of Nutrition*, 134(6), 1432–1438.
- Cooke, L.J., Wardle, J., Gibson, E.L., Sapochnik, M., Sheiham, A., & Lawson, M. (2004). Demographic, familial and trait predictors of fruit and vegetable consumption by pre-school children. *Public Health Nutrition*, 7(2), 295–302.
- Coulthard, H., Blissett, J., & Harris, G. (2004). The relationship between parental eating problems and children's feeding behavior: A selective review of the literature. *Eating Behaviors*, 5(2), 103–115.
- Coveney, J. (2005). A qualitative study exploring socio-economic differences in parental lay knowledge of food and health: Implications for public health nutrition. *Public Health Nutrition*, 8(3), 290–297.
- Cravioto, J. & Delicardie, E.R. (1976). Malnutrition in early childhood and some of its later effects at individual and community levels. *Food and Nutrition*, 2(4), 2–11, 32.
- Dani, J., Burrill, C., & Demmig-Adams, B. (2005). The remarkable role of nutrition in learning and behaviour. *Nutrition and Food Science*, 35(4), 258--263.
- Daniels, S.R., Arnett, D.K., Eckel, R.H., Gidding, S.S., Hayman, L.L., Kumanyika, S., et al. (2005). Overweight in children and adolescents: Pathophysiology, consequences, prevention, and treatment. *Circulation*, 111(15), 1999–2012.
- Davis, M.K. (2001). Breastfeeding and chronic disease in childhood and adolescence. *Pediatric Clinics of North America*, 48(1), 125–141, ix.
- de Oliveira, M.I., Camacho, L.A., & Tedstone, A.E. (2001). Extending breastfeeding duration through primary care: A systematic review of prenatal and postnatal interventions. *Journal of Human Lactation*, 17(4), 326–343.
- Deinard, A.S., List, A., Lindgren, B., Hunt, J.V., & Chang, P.N. (1986). Cognitive deficits in iron-deficient and iron-deficient anemic children. *Journal of Pediatrics*, 108(5 Pt 1), 681–689.
- Dennis, C. (2002). Breastfeeding peer support: Maternal and volunteer perceptions from a randomized controlled trial. *Birth*, 29(3), 169–176.
- Dennison, B.A., Rockwell, H.L., & Baker, S.L. (1997). Excess fruit juice consumption by preschool-aged children is associated with short stature and obesity. *Pediatrics*, 99(1), 15–22.
- Dennison, B.A., Russo, T.J., Burdick, P.A., & Jenkins, P.L. (2004). An intervention to reduce television viewing by preschool children. *Archives of Pediatrics & Adolescent Medicine*, 158(2), 170–176.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Desjardins, E., Roberts, W., McGibon, D., Field, D., Garrison, L., Davids, R., et al. (2002). *A systematic approach to community food security: A role for public health*. Toronto: Ontario Public Health Association. Retrieved March 12, 2006, from http://www.opha.on.ca/ppres/2002-01_pp.pdf.
- Dietitians of Canada. (2005). *Individual and household food insecurity in Canada: Position of dietitians of Canada*. Toronto: Author. Retrieved March 7, 2006, from http://www.dietitians.ca/news/downloads/Food_Insecurity_position.pdf.
- Dietitians of Canada. (2006a). Is there a benefit to feeding formula supplemented with long chain polyunsaturated fatty acids (LCPUFA) to healthy term infants? *PEN: Practice-Based Evidence in Nutrition*. Retrieved May 2, 2006, from <http://www.dieteticsatwork.com/pen/KnowledgePathway.asp?kpid=1874&pqcatid=144&pqid=1768>.
- Dietitians of Canada. (2006b). Vitamin/Mineral supplementation evidence summary. *PEN: Practice-Based Evidence in Nutrition*. Retrieved May 2, 2006, from <http://www.dieteticsatwork.com/pen/KnowledgePathway.asp?kpid=2025&trcatid=42&trid=768>.
- Donnelly, A., Snowden, H.M., Renfrew, M.J., & Woolridge, M.W. (2000). Commercial hospital discharge packs for breastfeeding women [CD002075]. *Cochrane Database of Systematic Reviews*, 2.
- Drewnowski, A. (2000). Nutrition transition and global dietary trends. *Nutrition*, 16(7-8), 486–487.
- Dubois, L. & Girard, M. (2005). Breast-feeding, day-care attendance and the frequency of antibiotic treatments from 1.5 to 5 years: A population-based longitudinal study in Canada. *Social Science & Medicine*, 60(9), 2035–2044.
- Ebo, D.G. & Stevens, W.J. (2001). IgE-mediated food allergy--extensive review of the literature. *Acta Clinica Belgica*, 56(4), 234–247.
- Eichenberger Gilmore, J.M., Hong, L., Broffitt, B., & Levy, S.M. (2005). Longitudinal patterns of vitamin and mineral supplement use in young white children. *Journal of the American Dietetic Association*, 105(5), 763–774.
- Eertmans, A., Baeyens, F., & Van den Bergh, O. (2001). Food likes and their relative importance in human eating behavior: Review and preliminary suggestions for health promotion. *Health Education Research*, 16(4), 443–456.
- Evans, W.D., Finkelstein, E.A., Kamerow, D.B., & Renaud, J.M. (2005). Public perceptions of childhood obesity. *American Journal of Preventive Medicine*, 28(1), 26–32.
- Fairbank, L., O'Meara, S., Renfrew, M.J., Woolridge, M., Sowden, A.J., & Lister-Sharp, D. (2000). A systematic review to evaluate the effectiveness of interventions to promote the initiation of breastfeeding [Abstract]. *Health Technology Assessment*, 4(25), 1–183.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Federal/Provincial/Territorial Advisory Committee on Population Health (1999). *Investing in early child development: The health sector contribution*. Ottawa, ON: Author.
- Fewtrell, M.S. (2004). The long-term benefits of having been breast-fed. *Current Pediatrics*, 14(2), 97–103.
- Fewtrell, M.S., Morley, R., Abbott, R.A., Singhal, A., Isaacs, E.B., Stephenson, T., et al. (2002). Double-blind, randomized trial of long-chain polyunsaturated fatty acid supplementation in formula fed to preterm infants. *Pediatrics*, 110(1 Pt 1), 73–82.
- Finkelstein, E., French, S., Variyam, J.N., & Haines, P.S. (2004). Pros and cons of proposed interventions to promote healthy eating. *American Journal of Preventive Medicine*, 27(Suppl. 3), 163–171.
- Fiocchi, A., Martelli, A., De Chiara, A., Moro, G., Warm, A., & Terracciano, L. (2003). Primary dietary prevention of food allergy. *Annals of Allergy, Asthma & Immunology*, 91(1), 3–12; quiz 12–15, 91.
- Fisher, J.O. & Birch, L.L. (1995). Fat preferences and fat consumption of 3- to 5-year-old children are related to parental adiposity. *Journal of the American Dietetic Association*, 95(7), 759–764.
- Fisher, J.O., Mitchell, D.C., Smiciklas-Wright, H., & Birch, L.L. (2002). Parental influences on young girls' fruit and vegetable, micronutrient, and fat intakes. *Journal of the American Dietetic Association*, 102(1), 58–64.
- Flournoy, R. & Treuhaft, S. (2005). *Healthy food, healthy communities: Improving access and opportunities through food retailing*. California: PolicyLink. Retrieved March 12, 2006, from <http://www.policylink.org/pdfs/HealthyFoodHealthyCommunities.pdf>.
- Flynn, M.A.T. (2003). *Community prevention of obesity in Canada: The technical document*. Calgary, AB: Alberta Health Services. Retrieved February 28, 2006, from http://www.calgaryhealthregion.ca/programs/childobesity/pdf/the_tech_doc.pdf.
- Fox, M.K., Devaney, B., Reidy, K., Razafindrakoto, C., & Ziegler, P. (2006). Relationship between portion size and energy intake among infants and toddlers: Evidence of self-regulation. *Journal of the American Dietetic Association*, 106(Suppl. 1), S77–83.
- Fox, M.K., Pac, S., Devaney, B., & Jankowski, L. (2004). Feeding infants and toddlers study: What foods are infants and toddlers eating? *Journal of the American Dietetic Association*, 104(Suppl. 1), s22–30.
- Fox, M.K., Reidy, K., Novak, T., & Ziegler, P. (2006b). Sources of energy and nutrients in the diets of infants and toddlers. *Journal of the American Dietetic Association*, 106(1S), 28–42.
- Gartner, L.M., Morton, J., Lawrence, R.A., Naylor, A.J., O'Hare, D., Schanler, R.J., et al. (2005). Breastfeeding and the use of human milk. *Pediatrics*, 115(2), 496–506.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Gdalevich, M., Mimouni, D., & Mimouni, M. (2001a). Breast-feeding and the onset of atopic dermatitis in childhood: A systematic review and meta-analysis of prospective studies. *Journal of the American Academy of Dermatology*, 45(4), 520–527.
- Gdalevich, M., Mimouni, D., & Mimouni, M. (2001b). Breast-feeding and the risk of bronchial asthma in childhood: A systematic review with meta-analysis of prospective studies. *Journal of Pediatrics*, 139(2), 261–266.
- Geltman, P.L., Meyers, A.F., Mehta, S.D., Brugnara, C., Villon, I., Wu, Y.A., et al. (2004). Daily multivitamins with iron to prevent anemia in high-risk infants: A randomized clinical trial. *Pediatrics*, 114(1), 86–93.
- Gera, T. & Sachdev, H.P.S. (2002). Effect of iron supplementation on incidence of infectious illness in children: Systematic review. *British Medical Journal (Clinical Research Ed.)*, 325(7373), 1142.
- Gerrish, C.J. & Mennella, J.A. (2001). Flavor variety enhances food acceptance in formula-fed infants. *American Journal of Clinical Nutrition*, 73(6), 1080–1085.
- Gidding, S.S., Dennison, B.A., Birch, L.L., Daniels, S.R., Gilman, M.W., Lichtenstein, A.H., et al. (2005). Dietary recommendations for children and adolescents: A guide for practitioners. Consensus statement from the American Heart Association. *Circulation*, 112(13), 2061–2075.
- Gidding, S.S., Dennison, B.A., Birch, L.L., Daniels, S.R., Gilman, M.W., Lichtenstein, A.H., et al. (2006). Dietary recommendations for children and adolescents: A guide for practitioners. *Pediatrics*, 117(2), 544–559.
- Government of Canada, (2008), *Bisphenol A, fact sheet*. Retrieved October 30, 2008, from http://www.chemicalsubstanceschimiques.gc.ca/challenge-defi/bisphenol-a_fs-fr_e.html.
- Grantham-McGregor, S. & Ani, C. (2001). A review of studies on the effect of iron deficiency on cognitive development in children. *Journal of Nutrition*, 131(2), 649S.
- Greer, F.R. (2004). Issues in establishing vitamin D recommendations for infants and children. *American Journal of Clinical Nutrition*, 80(Suppl. 6), 1759S–1762S.
- Gregory, K. (2005). Update on nutrition for preterm and full-term infants. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 34(1), 98–108.
- Grenier, T. (2004). Programs to protect, support and promote breastfeeding. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved May 1, 2006, from <http://www.child-encyclopedia.com/documents/GreinerANGxp.pdf>.
- Guise, J.M., Austin, D., & Morris, C.D. (2005). Review of case-control studies related to breastfeeding and reduced risk of childhood leukemia. *Pediatrics*, 116(5), e724–731.

- Guise, J.M., Palda, V., Westhoff, C., Chan, B.K., Helfand, M., Lieu, T.A., et al. (2003). The effectiveness of primary care-based interventions to promote breastfeeding: Systematic evidence review and meta-analysis for the US Preventive Services Task Force. *Annals of Family Medicine*, 1(2), 70–78.
- Gunnarsson, B.S., Thorsdottir, I., & Palsson, G. (2005). Iron status in 6-y-old children: Associations with growth and earlier iron status. *European Journal of Clinical Nutrition*, 59(6), 761–767.
- Habicht, J.P., & WHO Expert Consultation. (2004). Expert consultation on the optimal duration of exclusive breastfeeding: The process, recommendations, and challenges for the future. *Advances in Experimental Medicine and Biology*, 554, 79–87.
- Hadders-Algra, M. (2005). The role of long-chain polyunsaturated fatty acids (LCPUFA) in growth and development. *Advances in Experimental Medicine and Biology*, 569, 80–94.
- Hamm, M.W. & Bellows, A.C. (2003). Community food security: Background and future directions. *Journal of Nutrition and Education Behaviour*, 35(1), 37–43.
- Harris, S.S. (2005). Vitamin D in type 1 diabetes prevention. *Journal of Nutrition*, 135(2), 323–325.
- Harrison, K. & Marske, A.L. (2005). Nutritional content of foods advertised during the television programs children watch most. *American Journal of Public Health*, 95(9), 1568–1574.
- Hays, T. & Wood, R.A. (2005). A systematic review of the role of hydrolyzed infant formulas in allergy prevention. *Archives of Pediatrics & Adolescent Medicine*, 159(9), 810–816.
- He, M., Irwin, J.D., Sangster Bouck, L.M., Tucker, P., & Pollett, G.L. (2005). Screen-viewing behaviors among preschoolers: Parents' perceptions. *American Journal of Preventive Medicine*, 29(2), 120–125.
- Health Canada. (1989). *Promoting nutritional health during the preschool years*. Ottawa, ON: Author.
- Health Canada. (2002). *Canada's food guide to healthy eating: Focus on preschoolers*. Ottawa, ON: Author. Retrieved March 15, 2006, from www.hc-sc.gc.ca/fn-an/food-guide-aliment/res/fg_preschoolers-prescolaire_ga_e.html.
- Health Canada, (2004a). *Exclusive breastfeeding duration*. Ottawa, ON: Author. Retrieved October 14, 2008, from http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/nutrition/excl_bf_dur-dur_am_excl-eng.pdf.
- Health Canada. (2004b). *Health Canada evaluation of the Canada Prenatal Nutrition Program*. Ottawa, ON: Author.
- Health Canada. (2004c). *Vitamin D supplementation for breastfed infants*. Ottawa, ON: Author. Retrieved March 24, 2006, from www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/nutrition/vita_d_supp_e.pdf.

- Health Canada. (2006). Benzene in soft drinks. Ottawa, ON: Author. Retrieved May 24, 2006, from http://www.hc-sc.gc.ca/fn-an/securit/chem-chim/benzene/index_e.html.
- Hector, D. & King, L. (2005). Interventions to encourage and support breastfeeding. *New South Wales Public Health Bulletin*, 16(3-4), 56–61.
- Hediger, M.L., Overpeck, M.D., Ruan, W.J., & Troendle, J.F. (2002). Birthweight and gestational age effects on motor and social development. *Paediatric & Perinatal Epidemiology*, 16(1), 33–46.
- Heinig, M.J. (2001). Host defense benefits of breastfeeding for the infant. Effect of breastfeeding duration and exclusivity. *Pediatric Clinics of North America*, 48(1), 105–123, ix.
- Helland, I.B., Smith, L., Saarem, K., Saugstad, O.D., & Drevon, C.A. (2003). Maternal supplementation with very-long-chain n-3 fatty acids during pregnancy and lactation augments children's IQ at 4 years of age. *Pediatrics*, 111(1), e39–44.
- Henderson, A. (2005). Vitamin D and the breastfed infant. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 34(3), 367–372.
- Hendricks, K., Briefel, R., Novak, T., & Ziegler, P. (2006). Maternal and child characteristics associated with infant and toddler feeding practices. *Journal of the American Dietetic Association*, 106(Suppl. 1), S135–148.
- Hindin, T.J., Contento, I.R., & Gussow, J.D. (2004). A media literacy nutrition education curriculum for head start parents about the effects of television advertising on their children's food requests. *Journal of the American Dietetic Association*, 104(2), 192–198.
- Hoerr, S., Utech, A.E., & Ruth, E. (2005). Child control of food choices in head start families. *Journal of Nutrition Education and Behavior*, 37(4), 185–190.
- Hoffman, D.R., Theuer, R.C., Castaneda, Y.S., Wheaton, D.H., Bosworth, R.G., O'Connor, A.R., et al. (2004). Maturation of visual acuity is accelerated in breast-fed term infants fed baby food containing DHA-enriched egg yolk. *Journal of Nutrition*, 134(9), 2307–2313.
- Hoorweg J. & Stanfield, J.P. (1976). The effects of protein energy malnutrition in early childhood on intellectual and motor abilities in later childhood and adolescence. *Developmental Medicine and Child Neurology*, 18(3), 330–350.
- Horodyski, M.A., Hoerr, S., & Coleman, G. (2004). Nutrition education aimed at toddlers: A pilot program for rural, low-income families. *Family & Community Health*, 27(2), 103–113.
- Innis, S., Derkson, G. & Harrison, R. (2006). *Comorbidity of iron deficiency, dental caries and risk of cognitive delays and poor health in preschool children*. Vancouver, BC: Human Early Learning Partnership. Retrieved February 13, 2006, from www.earlylearning.ubc.ca.

- Innis, S.M. (2003). Nutrition and its impact on psychosocial child development: Preterm infants (2004th ed.). *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved May 1, 2006, from <http://www.child-encyclopedia.com/documents/InnisANGxp.pdf>.
- Innis, S.M., Nelson, C.M., Wadsworth, L.D., MacLaren, I.A., & Lwanga, D. (1997). Incidence of iron-deficiency anaemia and depleted iron stores among nine-month-old infants in Vancouver, Canada. *Canadian Journal of Public Health*, 88(2), 80–84.
- Jacobi, C., Agras, W.S., Bryson, S., & Hammer, L.D. (2003). Behavioral validation, precursors, and concomitants of picky eating in childhood. *Journal of the American Academy of Child & Adolescent Psychiatry*, 42(1), 76.
- Jain, A., Concato, J., & Leventhal, J.M. (2002). How good is the evidence linking breastfeeding and intelligence? *Pediatrics*, 109(6), 1044–1053.
- James, D.C., Dobson, B., & American Dietetic Association. (2005). Position of the American Dietetic Association: Promoting and supporting breastfeeding. *Journal of the American Dietetic Association*, 105(5), 810–818.
- James, J., Thomas, P., Cavan, D., & Kerr, D. (2004). Preventing childhood obesity by reducing consumption of carbonated drinks: Cluster randomised controlled trial. *British Medical Journal*, 328(7450), 1237–1239.
- Johnson, D.B., Birkett, D., Evens, C., & Pickering, S. (2005). Statewide intervention to reduce television viewing in WIC clients and staff. *American Journal of Health Promotion*, 19(6), 418–421.
- Kirkpatrick, S. & Tarasuk, V. (2003). The relationship between low income and household food expenditure patterns in Canada. *Public Health Nutrition*, 6(6), 589–597.
- Klement, E., Cohen, R.V., Boxman, J., Joseph, A., & Reif, S. (2004). Breastfeeding and risk of inflammatory bowel disease: A systematic review with meta-analysis. *American Journal of Clinical Nutrition*, 80(5), 1342–1352.
- Knol, L.L., Haughton, B., & Fitzhugh, E.C. (2005). Dietary patterns of young, low-income US children. *Journal of the American Dietetic Association*, 105(11), 1765–1773.
- Kramer, M.S., Chalmers, B., Hodnett, E.D., Sevkovskaya, Z., Dzikovich, I., Shapiro, S., et al. (2001). Promotion of breastfeeding intervention trial (PROBIT): A randomized trial in the republic of Belarus. *Journal of the American Medical Association*, 285(4), 413–420.
- Kramer, M.S. & Kakuma, R. (2004). The optimal duration of exclusive breastfeeding: A systematic review. *Advances in Experimental Medicine and Biology*, 554, 63–77.
- Kranz, S., Siega-Riz, A.M., & Herring, A.H. (2004). Changes in diet quality of American preschoolers between 1977 and 1998. *American Journal of Public Health*, 94(9), 1525–1530.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Krebs, N.F., Westcott, J.E., Butler, N., Robinson, C., Bell, M., & Hambidge, K.M. (2006). Meat as a first complementary food for breastfed infants: Feasibility and impact on zinc intake and status. *Journal of Pediatric Gastroenterology and Nutrition*, 42(2), 207–214.
- Kumanyika, S. & Grier, S. (2006). Targeting interventions for ethnic minority and low-income populations. *The Future of Children*, 16(1), 187–207.
- Kwan, M.L., Buffler, P.A., Abrams, B., & Kiley, V.A. (2004). Breastfeeding and the risk of childhood leukemia: A meta-analysis. *Public Health Reports*, 119(6), 521–535.
- Labarere, J., Glebert-BAudino, N., Ayrat, A., Duc, C., Berchotteau, M., Bouchon, N., et al. (2005). Efficacy of breastfeeding support provided by trained clinicians during an early, routine, preventive visit: A prospective, randomized, open trial of 226 mother-infant pairs. *Pediatrics*, 115(2), e139–e146.
- Law, Malcolm. (2000). Dietary fat and adult diseases and the implications for childhood nutrition: An epidemiologic approach. *American Journal of Clinical Nutrition*, 72.
- Lederman, S.A., Akabas, S.R., Moore, B.J., Bentley, M.E., Devaney, B., Gillman, M.W., et al. (2004). Summary of the presentations at the conference on preventing childhood obesity, December 8, 2003. *Pediatrics*, 114, 1146–1173.
- Ledrou, I. & Gervais, J. (2005). Food insecurity. *Health Reports*, 16(3), 47–51. Retrieved June 26, 2009, from <http://www.statcan.gc.ca/studies-etudes/82-003/archive/2005/7841-eng.pdf>.
- Liu, Y.H., & Stein, M.T. (2005). Feeding behaviour of infants and young children and its impact on child psychosocial and emotional development. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved April 26, 2006, from <http://www.child-encyclopedia.com/documents/Liu-SteinANGxp.pdf>.
- Lozoff, B. (1989). Nutrition and behavior. *American Psychologist*, 44(2), 231–236.
- Lozoff, B., Jimenez, M.D., Hagen, J., Mollen, E., & Wolf, A.W. (2000). Poorer behavioral and developmental outcome more than 10 years after treatment for iron deficiency in infancy. *Pediatrics*, 105, E51.
- Lucas, A., Bishop, N.J., King, F.J., & Cole, T.J. (1992). Randomised trial of nutrition for preterm infants after discharge. *Archives of Disease in Childhood*, 67(3), 324–327.
- Lucas, A., Morley, R., & Cole, T.J. (1998). Randomised trial of early diet in preterm babies and later intelligence quotient. *British Medical Journal (Clinical Research Ed.)*, 317(7171), 1481–1487.
- Lucas, A., Stafford, M., Morley, R., Abbott, R., Stephenson, T., MacFadyen, U., et al. (1999). Efficacy and safety of long-chain polyunsaturated fatty acid supplementation of infant-formula milk: A randomised trial. *Lancet*, 354(9194), 1948–1954.

- Ludwig, D.S., Peterson, K.E., & Gortmaker, S.L. (2001). Relation between consumption of sugar-sweetened drinks and childhood obesity: A prospective, observational analysis. *Lancet*, 357(9255), 505–508.
- Lumeng, J.C., Rahnema, S., Appugliese, D., Kaciroti, N., & Bradley, R.H. (2006). Television exposure and overweight risk in preschoolers. *Archives of Pediatrics & Adolescent Medicine*, 160(4), 417–422.
- Marquis, M., Filion, Y.P., & Dagenais, F. (2005). Does eating while watching television influence children's food-related behaviours? *Canadian Journal of Dietetic Practice and Research*, 66(1), 12–18.
- Marriott, L.D., Foote, K.D., Bishop, J.A., Kimber, A.C., & Morgan, J.B. (2003). Weaning preterm infants: A randomised controlled trial. *Archives of Disease in Childhood. Fetal and Neonatal Edition*, 88(4), F302–307.
- Martin, R.M., Ben-Shlomo, Y., Gunnell, D., Elwood, P., Yarnell, J.W., & Davey-Smith, G. (2005). Breast feeding and cardiovascular disease risk factors, incidence, and mortality: The Caerphilly study. *Journal of Epidemiology and Community Health*, 59(2), 121–129.
- Martin, R.M., Davey Smith, G., Mangtani, P., Tilling, K., Frankel, S., & Gunnell, D. (2004). Breastfeeding and cardiovascular mortality: The Boyd Orr cohort and a systematic review with meta-analysis. *European Heart Journal*, 25(9), 778–786.
- Martin, R.M., Gunnell, D., Owen, C.G., & Smith, G.D. (2005). Breast-feeding and childhood cancer: A systematic review with metaanalysis. *International Journal of Cancer*, 117(6), 1020–1031.
- Martin, R.M., Gunnell, D., & Smith, G.D. (2005). Breastfeeding in infancy and blood pressure in later life: Systematic review and meta-analysis. *American Journal of Epidemiology*, 161(1), 15–26.
- Matheson, D., Spranger, K., & Saxe, A. (2002). Preschool children's perceptions of food and their food experiences. *Journal of Nutrition Education and Behavior*, 34(2), 85.
- McCann, J.C. & Ames, B.N. (2005). Is docosahexaenoic acid, an n-3 long-chain polyunsaturated fatty acid, required for development of normal brain function? An overview of evidence from cognitive and behavioral tests in humans and animals. *American Journal of Clinical Nutrition*, 82(2), 281–295.
- McKeown, D. (2006). *Food security: Implications for the early years – Background paper*. Toronto: Toronto Public Health
- Mennella, J.A., Jagnow, C.P., & Beauchamp, G.K. (2001). Prenatal and postnatal flavor learning by human infants. *Pediatrics*, 107(6), E88.
- Mikkila, V., Rasanen, L., Raitakari, O.T., Pietinen, P., & Viikari, J. (2005). Consistent dietary patterns identified from childhood to adulthood: The cardiovascular risk in Young Finns study. *British Journal of Nutrition*, 93(6), 923–931.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Milner, J.D., Stein, D.M., McCarter, R., & Moon, R.Y. (2004). Early infant multivitamin supplementation is associated with increased risk for food allergy and asthma. *Pediatrics*, *114*(1), 27–32.
- Minchin, M. (2000). Artificial feeding and risk. *The Practising Midwife*, *3*(3), 18–20.
- Ministry of Health. (2005). Pregnancy outreach program provincial annual report 2004/05. Retrieved May 29, 2007, from <http://www.bcapop.ca>.
- Ministry of Health, Population Health and Wellness. (2006a). *Evidence review: Food security*. Victoria, BC: Author.
- Ministry of Health, Population Health and Wellness. (2006b). *Model core program paper: Food security*. Victoria, BC: Author.
- Moore, E.S. (2006). It's child's play: Advergaming and the online marketing of food to children. Henry J. Kaiser Family Foundation.
- Morgan, J.B., Lucas, A., & Fewtrell, M.S. (2004). Does weaning influence growth and health up to 18 months? *Archives of Disease in Childhood*, *89*(8), 728–733.
- Nagpal, J., Sachdev, H.P.S., Singh, T., & Mallika, V. (2004). A randomized placebo-controlled trial of iron supplementation in breastfed young infants initiated on complementary feeding: Effect on haematological status. *Journal of Health, Population, and Nutrition*, *22*(2), 203–211.
- National Advertising Review Council. (2004). *White paper: Guidance for food advertising self-regulation*. New York: Author.
- Ness, A.R., Maynard, M., Frankel, S., Smith, G.D., Frobisher, C., Leary, S.D., et al. (2005). Diet in childhood and adult cardiovascular and all cause mortality: the Boyd Orr cohort. *Heart*, *91*, 894–898.
- Nicklas, T., Johnson, R., & American Dietetic Association. (2004). Position of the American Dietetic Association: Dietary guidance for healthy children ages 2 to 11 years. *Journal of the American Dietetic Association*, *104*(4), 660–677.
- Nja, F., Nystad, W., Lodrup Carlsen, K.C., Hetlevik, O., & Carlsen, K.H. (2005). Effects of early intake of fruit or vegetables in relation to later asthma and allergic sensitization in school-age children. *Acta Paediatrica*, *94*(2), 147–154.
- Nolan, K., Schell, L.M., Stark, A.D., & Gomez, M.I. (2002). Longitudinal study of energy and nutrient intakes for infants from low-income, urban families. *Public Health Nutrition*, *5*(3), 405–412.
- Norris, F.J., Larkin, M.S., Williams, C.M., Hampton, S.M., & Morgan, J.B. (2002). Factors affecting the introduction of complementary foods in the preterm infant. *European Journal of Clinical Nutrition*, *56*(5), 448–454.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Olson, C.M. & Holben, D.H. (2002). Position of the American Dietetic Association: Domestic food and nutrition security. *Journal of the American Dietetic Association*, 102(12), 1840–1847.
- Omar, M.A., Coleman, G., & Hoerr, S. (2001). Healthy eating for rural low-income toddlers: Caregivers' perceptions. *Journal of Community Health Nursing*, 18(2), 93–106.
- Ontario College of Family Physicians. (2004). *Improving the odds: Healthy child development* (2nd ed.). Toronto: Author. Retrieved March 7, 2006, from http://www.beststart.org/resources/hlthy_chld_dev/pdf/HCD_complete.pdf.
- Ostry, A. & Rideout, K. (2004). *Food security indicators for bc regional health authorities*. Final Report to the BC Community Nutritionists Council. Vancouver, BC: University of British Columbia.
- Osuntokun, B.O. (1973). Protein-calorie malnutrition and intellect in childhood: A review. *African Journal of Medical Sciences*, 4(2), 327–342.
- Osuntokun, B.O. (1972). The effects of malnutrition on the development of cognitive functions of the nervous system in childhood. *Tropical and Geographical Medicine*, 24(4), 311–326.
- Owen, C.G., Whincup, P.H., Odoki, K., Gilg, J.A., & Cook, D.G. (2002). Infant feeding and blood cholesterol: A study in adolescents and a systematic review. *Pediatrics*, 110(3), 597–608.
- Park, R., Senior, R. & Stein, A. (2003). The offspring of mothers with eating disorders. *European Child & Adolescent Psychiatry*, 12(Suppl. 1), 110–119.
- Patrick, H. & Nicklas, T.A. (2005). A review of family and social determinants of children's eating patterns and diet quality. *Journal of the American College of Nutrition*, 24(2), 83–92.
- Perez, E.M., Hendricks, M.K., Beard, J.L., Murray-Kolb, L.E., Berg, A., Tomlinson, M., et al. (2005). Mother-infant interactions and infant development are altered by maternal iron deficiency anemia. *Journal of Nutrition*, 135(4), 850–855.
- Pratt, B.M. & Woolfenden, S.R. (2002). Interventions for preventing eating disorders in children and adolescents [CD002891]. *Cochrane Database of Systematic Reviews*, 2.
- Pridham, K., Brown, R., Clark, R., Limbo, R.K., Schroeder, M., Henriques, J., et al. (2005). Effect of guided participation on feeding competencies of mothers and their premature infants. *Research in Nursing & Health*, 28(3), 252–267.
- Protheroe, L., Dyson, L., Renfrew, M.J., Bull, J., & Mulvihill, C. (2003). *The effectiveness of public health interventions to promote the initiation of breastfeeding: Evidence briefing*. London, England: NHS Health Development Agency.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Public Health Agency of Canada. (2001). The CAPC/CPNP think tank: Factors that contribute to increased breastfeeding in the CAPC/CPNP population. Ottawa, ON: Author. Retrieved July 31, 2009, from http://www.phac-aspc.gc.ca/dca-dea/publications/breast_e.html.
- Public Health Research, Evaluation and Development Program. (1999). Enhancing fruit and vegetable consumption in people four years of age and older. Toronto: Author. Retrieved March 7, 2006, from <http://old.hamilton.ca/phcs/ephpp/Research/Summary/1999/FruitVegetableConsume.pdf>.
- Ram, F.S., Ducharme, F.M., & Scarlett, J. (2002). Cow's milk protein avoidance and development of childhood wheeze in children with a family history of atopy [CD003795]. *Cochrane Database of Systematic Reviews*, 3.
- Ramsay, M. (2004). Feeding skill, appetite and feeding behaviours of infants and behaviours of infants and young children and their impact on growth and psychosocial development. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved April 30, 2006, from <http://www.child-encyclopedia.com/documents/RamsayANGxp.pdf>.
- Reed, D.B. (1996). Focus groups identify desirable features of nutrition programs for low-income mothers of preschool children. *Journal of the American Dietetic Association*, 96(5), 501–503.
- Registered Nurses' Association of Ontario. (2005). *Nursing best practice guideline: Primary prevention of childhood obesity*. Toronto: Author. Retrieved March 1, 2006, from http://www.rnao.org/Storage/12/620_BPG_childhood_obesity.pdf.
- Renfrew, M.J., Ansell, P., & Macleod, K.L. (2003). Formula feed preparation: Helping reduce the risks; a systematic review. *Archives of Disease in Childhood*, 88(10), 855–858.
- Riches, G. (2004). *Right to food case study: Canada*. Rome: Food and Agricultural Organization of the United Nations.
- Roberfroid, D., Kolsteren, P., Hoeree, T., & Maire, B. (2005). Do growth monitoring and promotion programs answer the performance criteria of a screening program? A critical analysis based on a systematic review. *Tropical Medicine & International Health*, 10(11), 1121–1133.
- Roberts, S.B. & Heyman, M.B. (2000). Micronutrient shortfalls in young children's diets: Common, and owing to inadequate intakes both at home and at child care centers. *Nutrition Reviews*, 58(1), 27–29.
- Rose, D. & Bodor, J.N. (2006). Household food insecurity and overweight status in young school children: Results from the early childhood longitudinal study. *Pediatrics*, 117(2), 464–473.
- Rydell, A.M. & Dahl, M. (2005). Children with early refusal to eat: Follow-up in adolescence. *Acta Paediatrica*, 94(9), 1186–1191.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Rysdale, L. (2004a). *Implementing the NutriSTEP program: Nutrition screening tool for every pre-schooler*. Sudbury, ON: Sudbury & District Health Unit.
- Rysdale, L. (2004b). Voices from the field—Improving the nutritional health and well-being of women and young children. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved March 7, 2006, from <http://www.enfant-encyclopedie.com/pages/PDF/RysdaleANGps.pdf>.
- Sachdev, H.P.S., Tarun, G., & Nestel, P. (2005). Effect of iron supplementation on mental and motor development in children: Systematic review of randomised controlled trials. *Public Health Nutrition*, 8(2), 117–132.
- SanGiovanni, J.P., Parra-Cabrera, S., Colditz, G.A., Berkey, C.S., & Dwyer, J.T. (2000). Meta-analysis of dietary essential fatty acids and long-chain polyunsaturated fatty acids as they relate to visual resolution acuity in healthy preterm infants. *Pediatrics*, 105(6), 1292–1298.
- Satter, E.M. (1986a). Childhood eating disorders. *Journal of the American Dietetic Association*, 86(3), 357–361.
- Satter, E.M. (1986b). The feeding relationship. *Journal of the American Dietetic Association*, 86(3), 352–356.
- Satter, E.M. (1995). Feeding dynamics: Helping children to eat well. *Journal of Pediatric Health Care*, 9(4), 178–184.
- Savoie, N. & Rioux, F.M. (2002). Impact of maternal anemia on the infant's iron status at 9 months of age. *Canadian Journal of Public Health*, 93(3), 203–207.
- Scott, J.A. (2005). What works in breastfeeding promotion? *Journal of the Royal Society of Health*, 125(5), 203–204.
- Sikorski, J., Renfrew, M.J., Pindoria, S., & Wade, A. (2002). Support for breastfeeding mothers. *Cochrane Database of Systematic Reviews*, 1.
- Singhal, A., Cole, T.J., & Lucas, A. (2001). Early nutrition in preterm infants and later blood pressure: Two cohorts after randomised trials. *Lancet*, 357(9254), 413–419.
- Skalicky, A., Meyers, A.F., Adams, W.G., Yang, Z., Cook, J.T., & Frank, D.A. (2005). Child food insecurity and iron deficiency anemia in low-income infants and toddlers in the United States. *Maternal and Child Health Journal*, 1–9.
- Skinner, J.D., & Carruth, B.R. (2001). A longitudinal study of children's juice intake and growth: The juice controversy revisited. *Journal of the American Dietetic Association*, 101(4), 432–437.
- Skinner, J.D., Carruth, B.R., Bounds, W., Ziegler, P., & Reidy, K. (2002). Do food-related experiences in the first 2 years of life predict dietary variety in school-aged children? *Journal of Nutrition Education and Behavior*, 34(6), 310–315.

- Skinner, J.D., Ziegler, P., & Ponza, M. (2004). Transitions in infants' and toddlers' beverage patterns. *Journal of the American Dietetic Association*, 104(Suppl. 1), s45–50.
- Snow, C.E. & Beals, D.E. (2006). Mealtime talk that supports literacy development. *New Directions for Child and Adolescent Development*, (111), 51–66.
- Spruijt-Metz, D., Lindquist, C.H., Birch, L.L., Fisher, J.O., & Goran, M.I. (2002). Relation between mothers' child-feeding practices and children's adiposity. *American Journal of Clinical Nutrition*, 75(3), 581–586.
- Stang, J. (2006). Improving the eating patterns of infants and toddlers. *Journal of the American Dietetic Association*, 106(Suppl. 1), S7–9.
- Stang, J., Taft Bayerl, C, & Flatt M.M. (2003). Position of the American Dietetic Association: Child and adolescent food and nutrition programs. *Journal of the American Dietetic Association*, 103(7), 887–893.
- Stang, J., Taft Bayerl, C, & Flatt M.M. (2006). Position of the American Dietetic Association: Child and adolescent food and nutrition programs. *Journal of the American Dietetic Association*, 106(9), 1467–1475.
- Statistics Canada. (2005). Breastfeeding practices, females aged 15 to 55 who had a baby in the previous five years, Canada, provinces, territories and peer groups, 2003 (Canadian Community Health Survey, Cycle 2.1) [Catalogue No. 82-221]. *Health Indicators*, 2005(1), Ottawa, ON: Author. Retrieved March 15, 2006, from www.statcan.ca/english/freepub/82-221-XIE/2005001/tables/pdf/2178_03.pdf.
- Statistics Canada. (2006). Television viewing, by age and sex, by province. *Summary Tables*. Last updated December 22, 2006. Retrieved May 30, 2007. <http://www40.statcan.ca/101/cst01/arts23.htm>.
- Story, M. (2005). A perspective on family meals: Do they matter? *Nutrition Today*, 40(6), 261–266.
- Story, M., & French, S. (2004). Food advertising and marketing directed at children and adolescents in the US. *International Journal of Behavioral Nutrition and Physical Activity*, 1(1), 3.
- Talwar, P.P. (1975). Developing indices of nutritional level from anthropometric measurements on women and young children. *American Journal of Public Health*, 65(11), 1170–1174.
- Tanner, E.M. & Finn-Stevenson, M. (2002). Nutrition and brain development: Social policy implications. *American Journal of Orthopsychiatry*, 72(2), 182–193.
- Taylor, J.P., Evers, S., & McKenna, M. (2005). Determinants of healthy eating in children and youth. *Canadian Journal of Public Health*, 96(Suppl. 3), S20–6, S22–9.
- Taylor, J.S., Kacmar, J.E., Nothnagle, M., & Lawrence, R.A. (2005). A systematic review of the literature associating breastfeeding with type 2 diabetes and gestational diabetes. *Journal of the American College of Nutrition*, 24(5), 320–326.

- Tedstone, A., Aviles, M., Shetty, P., & Daniels, L. (Eds.) (2002). *Effectiveness of interventions to promote healthy eating in preschool children aged 1 to 5 years: A review*. London: Health Education Authority.
- Tedstone, A., Dunce, N., Aviles, M., Shetty, P., & Daniels, L. (Eds.). (2002). *Effectiveness of interventions to promote healthy feeding in infants under one year of age*. London: Health Education Authority.
- Tomkins, A. (2001). Vitamin and mineral nutrition for the health and development of the children of Europe. *Public Health Nutrition*, 4(1A), 91–99.
- Uauy, R. & Castillo-Duran, C. (2005). *Nutrition in early life: Present gaps in knowledge in designing optimal diets for the first two years of life*. South Africa: Nestle Nutrition Institute Africa. Retrieved April 30, 2006, from <http://www.nnia.co.za/CPD/articles/nutritioninearlylife.pdf>.
- Valle, N. J., Santos, I. S., & Gigante, D. P. (2004). Nutritional interventions and child growth among under-two-year-olds: A systematic review. *Cadernos De Saude Publica / Ministerio Da Saude, Fundacao Oswaldo Cruz, Escola Nacional De Saude Publica*, 20(6), 1458–1467.
- Verrall, T. & Gray-Donald, K. (2005). Impact of a food-based approach to improve iron nutrition of at-risk infants in northern Canada. *Preventive Medicine*, 40(6), 896–903.
- von Berg, A., Koletzko, S., Grubl, A., Filipiak-Pittroff, B., Wichmann, H.E., Bauer, C.P., et al. (2003). The effect of hydrolyzed cow's milk formula for allergy prevention in the first year of life: The German infant nutritional intervention study, a randomized double-blind trial. *Journal of Allergy and Clinical Immunology*, 111(3), 533–540.
- Wadsworth, L.A. & Thompson, A.M. (2005). Media literacy: A critical role for dietetic practice. *Canadian Journal of Dietetic Practice and Research*, 66(1), 30–36.
- Wardle, J., Carnell, S., & Cooke, L. (2005). Parental control over feeding and children's fruit and vegetable intake: How are they related? *Journal of the American Dietetic Association*, 105(2), 227–232.
- Weimer, J. (2001). The economic benefits of breastfeeding: A review and analysis. *Food Assistance and Nutrition Research Report* [No. FANRR13]. Washington, DC: Food and Rural Economics Division, Economic Research Service, US Department of Agriculture.
- Westenhofer, J. (2001). Establishing good dietary habits - capturing the minds of children. *Public Health Nutrition*, 4(1A), 125–129.
- Whitlock, E.P., Williams, S.B., Gold, R., Smith, P.R., & Shipman, S.A. (2005). Screening and interventions for childhood overweight: A summary of evidence for the US Preventive Services Task Force. *Pediatrics*, 116(1), e125–144.

- Williams, C.L., Hayman, L.L., Daniels, S.R., Robinson, T.N., Steinberger, J., Paridon, S., et al. (2002). Cardiovascular health in childhood: A statement for health professionals from the committee on atherosclerosis, hypertension, and obesity in the young (AHOY) of the council on cardiovascular disease in the young, American Heart Association. *Circulation*, *106*(1), 143–160.
- Willows, N., Dewailly, E., & Gray-Donald, K. (2000). Anemia and iron status in Inuit infants from Northern Quebec. *Canadian Journal of Public Health*, *91*, 407–410.
- Willows, N., Morel, J., & Gray-Donald, K. (2000). Prevalence of anemia among James Bay Cree infants of Northern Quebec. *Canadian Medical Association Journal*, *162*(3), 323–326.
- Willows, N.D., Iserhoff, R., Napash, L., Leclerc, L., & Verrall, T. (2005). Anxiety about food supply in Cree women with infants in Quebec. *International Journal of Circumpolar Health*, *64*(1), 55–64.
- Wolin, S.J. & Bennett, L.A. (1984). Family rituals. *Family Process*, *23*(3), 401–420.
- Woodward, L.J. & Liberty, K.A. (2005). Breastfeeding and child psychosocial development. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved May 1, 2006, from <http://www.child-encyclopedia.com/documents/Woodward-LibertyANGxp.pdf>.
- World Alliance for Breastfeeding Action. (n.d.). WABA activity sheet 10: Breastfeeding and food security. Malaysia: Author.
- World Health Organization/UNICEF. (1990). *Innocenti declaration on the protection, promotion and support of breastfeeding*. Florence, Italy: Authors.
- World Health Organization, Division of Child Health and Development. (1998). *Evidence for the ten steps to successful breastfeeding*. Geneva, Switzerland: Author.
- World Health Organization. (2001). *Global strategy for infant and young child feeding: Optimal duration of exclusive breastfeeding*. Geneva: Author. Retrieved March 2, 2006, from <http://www.enonline.net/pool/files/ife/wha-res-54-on-6-month-exc-breastfeeding.pdf>.
- Wosje, K.S., Specker, B.L., & Giddens, J. (2001). No differences in growth or body composition from age 12 to 24 months between toddlers consuming 2% milk and toddlers consuming whole milk. *Journal of the American Dietetic Association*, *101*(1), 53–56.
- Young, L., Anderson, J., Beckstrom, L., Bellows, L., & Johnson, S.L. (2004). Using social marketing principles to guide the development of a nutrition education initiative for preschool-aged children. *Journal of Nutrition Education and Behavior*, *36*(5), 250–257.
- Zeiger, R.S. (2003). Food allergen avoidance in the prevention of food allergy in infants and children. *Pediatrics*, *111*(6 Pt 3), 1662–1671.

Zemel, B.S., Riley, E.M., & Stallings, V.A. (1997). Evaluation of methodology for nutritional assessment in children: Anthropometry, body composition, and energy expenditure. *Annual Review of Nutrition*, 17, 211–235.

Zlotkin, S. (2003). Clinical nutrition: 8. The role of nutrition in the prevention of iron deficiency anemia in infants, children and adolescents. *Canadian Medical Association Journal*, 168(1), 59.

Zlotkin, S.H., Ste-Marie, M., Kopelman, H., Jones, A., & Adam, J. (1996). The prevalence of iron depletion and iron deficiency anaemia in a randomly selected group of infants from four Canadian cities. *Nutrition Research*, 16(5), 729–733.

Physical Health and Development: Hearing Screening

American Speech-Language Hearing Association. (2005). Early Hearing Detection and Intervention Action Center. Retrieved December 31, 2005, from <http://www.nsslha.org/about/legislation-advocacy/federal/ehdi/default.htm>.

Bamford, J., Fortnum, H., Bristow, K., Smith, J., Vamvakas, G., Davies, L., et al. (2007). Current practice, accuracy, effectiveness and cost-effectiveness of the school entry hearing screen. *Health Technology Assessment*, 11(32), 1–168, iii–iv.

Canadian Working Group on Childhood Hearing. (2005). Early hearing and communication development: Canadian Working Group on Childhood Hearing (CWGCH) resource document. Ottawa, ON: Minister of Public Works and Government Services Canada.

Clark S. (2005, February). Progress report and rollout update. *Newborn Hearing Screening Programme Newsletter*, 5, 5.

Early Hearing Detection and Intervention, BC Steering Committee. (2005, July). Hearing screening for every baby – A sound start: A British Columbia Initiative for Early Hearing Detection and Intervention. Vancouver: Author.

Gallaudet Research Institute. (2005). Annual survey of deaf and hard of hearing children and youth: 2003-2004 regional and national summary. Washington, DC: Author.

Helfand, M., Thompson, D., Davis, R., McPhillips, H., Lieu, T.L., & Homer, C.J. (2001, October). Newborn hearing screening: A summary of the evidence for the U.S. Preventive Services Task Force. Rockville, MD: Agency for Healthcare Research and Quality. Retrieved August 10, 2009, from <http://www.ahrq.gov/clinic/3rduspstf/newbornscreen/newbornsum1.htm>.

Joint Committee on Infant Hearing. (2000). Year 2000 position statement: Principles and guidelines for early hearing detection intervention programs. *American Journal of Audiology*, 9, 9–29.

- Kennedy, C.R., McCann, D.C., Campbell, M.J., Law, C.M., Mullee, M., Petrou, S., et al. (2006). Language ability after early detection of permanent childhood hearing impairment. *New England Journal of Medicine*, 354, 2131–2141.
- Markides A. (1986). Age at fitting of hearing aids and speech intelligibility. *British Journal of Audiology*, 20, 165–167.
- Norton, S.J., Gorga, M.P., Widen, J.E., Folsom, R.C., Sininger, Y., Cone-Wesson, B., et al. (2000). Identification of neonatal hearing impairment: Evaluation of transient evoked otoacoustic emission, distortion product otoacoustic emission, and auditory brain stem response test performance. *Ear and Hearing*, 21, 508–528.
- Ramkalawan, T.W. & Davis, A.C. (1992). The effects of hearing loss and age of intervention on some language metrics in young hearing-impaired children. *British Journal of Audiology*, 26, 97–107.
- Thompson, D.C., McPhillips, H., Davis, R.L., Lieu, T.A., Homer, C.J., & Helfand, M. (2001). Universal newborn hearing screening: Summary of evidence. *Journal of the American Medical Association*, 286(16), 2000–2010.
- UK National Screening Committee. (n.d.). What is screening? Retrieved September 17, 2008, from <http://www.screening.nhs.uk/screening>.
- Uus, K. & Bamford, J. (2006). Effectiveness of population-based newborn hearing screening in England: Ages of interventions and profile of cases. *Pediatrics*, 117(5), 887–893.
- Wessex Universal Neonatal Hearing Screening Trial Group. (1998). Controlled trial of universal neonatal screening for early identification of permanent childhood hearing impairment. *Lancet*, 352, 1957–1964.
- Yoshinaga-Itano, C., Sedey, A.L., Coulter, D.K., & Mehl, A.L. (1998). Language of early- and later-identified children with hearing loss. *Pediatrics*, 102, 1161–1171.

Physical Health and Development: Vision Screening

- C Green Health Info. (2005, November). Preschool vision screening - A review of the science underlying preschool vision screening with implications for BC. Victoria, BC: Ministry of Health Services.
- Dunfield, L., Keating, T. (2007). Preschool vision screening [Technology Report number 73]. Ottawa, ON: Canadian Agency for Drugs and Technologies in Health.
- Feightner, J.W. (1994). Routine preschool screening for visual and hearing problems. In Canadian Task for on the Periodic Health Examination (ed.), *Canadian guide to clinical preventive health care* (pp. 298–304). Ottawa: Health Canada. Retrieved July 11, 2008, from http://www.ctfphc.org/Full_Text/Ch27full.htm.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

Joish, V.N., Malone, D.C., & Miller, J.M. (2003). A cost-benefit analysis of vision screening methods for preschoolers and school-age children. *Journal of AAPOS*, 7(4), 283–290.

Calonge, N. (2004). Screening for visual impairment in children younger than age 5 years: Recommendation statement. *Annals of Family Medicine*, 2(3), 263–266.

Physical Health and Development: Environmental Health

American Academy of Pediatrics, Committee on Environmental Health. (2004). Ambient air pollution: Health hazards to children (Policy Statement). *Pediatrics*, 114(6), 1699–1707.

Becker, A., Lemiere, C., Berube, D., Boulet, L., Ducharme, F., FitzGerald, M., et al. (2004). *Summary of recommendations from the Canadian Asthma Consensus Guidelines*. Ottawa, ON: Canadian Medical Association.

Best Start: Ontario's Maternal, Newborn and Early Child Development Resource Centre & the Canadian Partnership for Children's Health and Environment. (2006). *Playing it safe: Service provider strategies to reduce environmental risks to preconception, prenatal and child health*. Toronto: Authors. Retrieved June 13, 2006, from www.beststart.org/resources/env_action/pdf/envirostrategies.pdf.

Brown, B., Weitzman, M., Bzostek, S., Kavanaugh, M., Aufseeser, D., Bagley, S., et al. (2004). *Early child development in social context: A chartbook*. New York: Child Trends & Center for Child Health Research.

Campbell, M., Buckeridge, D., Dwyer, J., Fong, S., Mann, V., Sanchez-Sweatman, O., et al. (1999). *Effectiveness of environmental awareness interventions*. Ottawa, ON: Public Health Research, Education and Development Program.

Canadian Partnership for Children's Health and Environment. (2005). *Child health and the environment – A primer*. Ottawa, ON: Author.

Canadian Task Force on Preventive Health Care. (1994). *Screening children for lead exposure in Canada*. Ottawa, ON: Author.

Centre for Reviews and Dissemination, National Library for Health. (2005). *Database of abstracts of reviews of effects. Protecting children from environmental tobacco smoke (ETS) exposure: A critical review*. United Kingdom: University of York. Retrieved June 1, 2006, from <http://nhscrd.york.ac.uk/online/dare/20031926.htm>.

Centers for Disease Control and Prevention. (2006). *Facts on...Lead*. Washington, DC: Author. Retrieved July 13, 2006, from <http://www.cdc.gov/NCEH/lead/guide/1997/docs/factlead.htm>.

Commission for Environmental Cooperation. (2006). *Children's health and the environment in North America*. Montreal, PQ: Author.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Community Paediatrics Committee, Canadian Paediatric Society. (2004). Recommendations for safe sleeping environments for infants and children. *Paediatrics & Child Health*, 9(9), 659–663.
- Edwards, N., Aubin, P. & Morrison, M. (2000). *The effectiveness of postpartum smoking relapse prevention strategies: A systematic review of the evidence 1992-1999*. Ottawa, ON: Public Health Research, Education and Development.
- Emmons, K., Wong, M., Hammond, K., Velicer, W., Fava, J., Monroe, A. et al. (2001). Intervention and policy issues related to children’s exposure to environmental tobacco smoke. *Preventive Medicine*, 32, 321–331.
- Feldman, W. & Randel, P. (1994). Screening children for lead exposure in Canada. In Canadian Task Force on the Periodic Health Examination (ed.), *The Canadian guide to clinical preventive health care* (pp. 268–288). Ottawa, ON: Minister of Supply and Services Canada. Retrieved July 13, 2006, from <http://www.phac-aspc.gc.ca/publicat/clinic-clinique/pdf/s2c25e.pdf>.
- Gehrman, C. & Hovell, M. (2003). Protecting children from environmental tobacco smoke. *Nicotine & Tobacco Research*, 4(3), 289–301.
- Glinianaia, S., Rankin, J., Bell, R., Piess-Mullooli, T., & Howel, D. (2004). Does particulate air pollution contribute to infant death? A systematic review. *Environmental Health Perspectives*, 112(14), 1365–1370.
- Global Initiative for Asthma. (2004). *Global strategy for asthma management and prevention*. Maryland: National Institute for Health. Retrieved January 1, 2007, from www.ginasthma.com/download.asp?intId=13.
- Goldman, L. (2005). Child health and the environment: A review of the evidence. *Zero to Three*, 26(2), 11–19.
- Government of Canada. (2003). *The well-being of Canada’s young children: Government of Canada report*. Ottawa, ON: Human Resources Development Canada and Health Canada.
- Landrigan, P., Kimmel, C., Correa, A. & Eskenazi, B. (2004). Children’s health and the environment: Public health issues and challenges for risk assessment. *Environmental Health Perspectives*, 112(2), 257–265.
- Peat, J., Keena, V., Harakeh, Z., & Marks, G. (2001). Parental smoking and respiratory tract infections in children. *Paediatric Respiratory Reviews*, 2, 207–213.
- Registered Nurses Association of Canada. (2004). *Promoting asthma control in children*. Toronto: Author. Retrieved January 1, 2007, from <http://www.rnao.org/Page.asp?PageID=924&ContentID=812>.
- Toronto Public Health. (2005). *Environmental threats to children: Understanding the risks, enabling prevention*. Toronto: Author.

- US Preventive Services Task Force. (2003). *Counseling to prevent tobacco use and tobacco-caused disease*. Rockville, MD: Agency for Healthcare Research and Quality. Retrieved July 3, 2006, from www.ahrq.gov/clinic/uspstf/uspstbac.htm.
- Waters, R., Polnay, E., Campbell, R., Webster, P., Spencer, N., et al. (2005). Family and carer smoking control programmes for reducing children's exposure to environmental tobacco smoke. *Cochrane Database of Systematic Reviews*.

Physical Health and Development: Sexual Health and Development

- Brown, J. & Witherspoon, E. (2002). The mass media and American adolescents' health. *Journal of Adolescent Health, 31*(6 Suppl. 1), 153–170.
- Cohn, D.S. (1991). Anatomic doll play of preschoolers referred for sexual abuse and those not referred. *Child Abuse & Neglect 15*, 455–466.
- Cosentino, C, Meyer-Mahlenburg, H., Alpert, J., Weinberg, S. & Gaines, R. (1995). Sexual behavior problems and psychopathology symptoms in sexually abused girls. *Journal of American Academy Child and Adolescent Psychiatry, 34*(8), 1033–1042.
- Early Childhood Sexuality Education Task Force. (1995). *Right from the start: Guidelines for sexuality issues birth to 5 years*. New York: Sexuality Information and Education Council of the United States.
- Everson, M.D. & Boat, B.W. (1990). Sexualized doll play among young children: Implications for the use of anatomical dolls in sexual abuse evaluations. *Journal of American Academy of Child and Adolescent Psychiatry, 29*, 736–742.
- Fitzpatrick, P., Deechan, A., & Jennings, S. (1995). Children's sexual behaviour and knowledge: A community study. *Irish Journal of Psychological Medicine, 12*(3), 87–91.
- Friedrich, W.N., Grambsch, P., Damon, L., Hewitt, S., Koverola, C., Lang, R., et al. (1992). Child sexual behavior inventory: Normative and clinical comparisons. *Psychological Assessment, 4*(3), 303–311.
- Friedrich, W., Grambsch, P., Broughton, D., Kuiper, J. & Beilke, R. (1991). Normative sexual behavior in children. *Pediatrics, 88*, 456–464.
- Gil, E. & Cavanagh Johnson, T. (1993). *Sexualized children – Assessment and treatment of sexualized children and children who molest*. Rockville, MD: Launch Press.
- Haugaard, J. & Tilly, C. (1988). Characteristics predicting children's responses to sexual encounters with other children. *Child Abuse & Neglect, 12*, 209–218.
- Haugaard, J. (1996). Sexual behaviors between children: Professionals' opinions and undergraduates' recollections. *Families in Society: The Journal of Contemporary Human Services, 2*, 81–89.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Health Canada. (2003). *Canadian guidelines for sexual health education*. Ottawa, ON: Author.
- Heiman, M., Leiblum, S., Cohen, S. & Pallitto, L. (1998). A comparative survey of beliefs about “normal” childhood sexual behaviors. *Child Abuse & Neglect*, 22(4), 289–304.
- Hornor, G. (2004). Sexual behavior in children: Normal or not? *Journal of Pediatric Health Care*, 18(2), 57–64.
- Jampole, L. & Weber, M.K. (1987). An assessment of the behavior of sexually abused and nonabused children with anatomically correct dolls. *Child Abuse & Neglect*, 11, 187–192.
- Kendall-Tackett, K.E., Williams, L. & Finkelhor, D. (1993). The impact of sexual abuse on children: A review and synthesis of recent empirical studies. *Psychological Bulletin*, 113, 164–180.
- Lamb, S. & Coakley, M. (1993). “Normal” childhood sexual play and games: Differentiating play from abuse. *Child Abuse & Neglect*, 17, 515–526.
- Larsson, I. (2001). *Child sexuality and sexual behaviour*. Stockholm: Swedish National Board of Health and Welfare.
- Lindblad, F., Gustafsson, P., Larsson, I. & Lundin, B. (1995). Preschooler’s sexual behaviour at daycare centers: an epidemiological study. *Child Abuse & Neglect*, 19(5), 569–577.
- Phipps-Yonas, S., Yonas, A., Turner, M. & Kauper, M. (1993). Sexuality in early childhood. *University of Minnesota Center for Urban and Regional Affairs Reports*, 23, 1–5.
- Sandfort, T. & Rademakers, J. (2000). *Childhood sexuality: Normal sexual behavior and development*. New York: The Haworth Press.
- Sandfort, T. & Cohen-Kettens, P. (2000). Sexual behavior in Dutch and Belgian children as observed by their mothers. *Journal of Psychology & Human Sexuality*, 12, 105–116.
- Sandnabba, K., Santtila, P., Wannas, M. & Krook, K. (2003). Age and gender specific sexual behaviors in children. *Child Abuse & Neglect*, 27, 579–604.
- Sivan, A., Schor, D., Koepl, G. & Noble, L. (1988). Interaction of normal children with anatomic dolls. *Child Abuse & Neglect*, 12, 295–304.
- Smith, M. & Grocke, M. (1995). *Normal family sexuality and sexual knowledge in children*. London: Royal College of Psychiatrists/Gaskell Press.

Physical Health and Development: Child Abuse and Neglect

- Harris, W.W., Lieberman, A.F. & Marans, S. (2007). In the best interests of society. *Journal of Child Psychology and Psychiatry*, 48(3), 392–411.

Emotional/Mental Health and Development: Prenatal/Parental Influences

- Brugha, T., Wheatly, S., Taub, N., Culverwell, A., Friedman, T., Kirwan, P., et al. (2000). Pragmatic randomized trial of antenatal intervention to prevent postnatal depression by reducing psychosocial risk factors. *Psychological Medicine*, 30(6), 1273–1281.
- Canadian Paediatric Society. (2004). Maternal depression and child development (Position Statement). *Paediatrics & Child Health*, 9(8), 575–583. Retrieved July 13, 2008, from <http://www.cps.ca/English/statements/PP/pp04-03.htm#Conclusions>.
- Chung, E., McCollum, K., Irma, E., Helen, L., & Culhane, J. (2004). Maternal depressive symptoms and infant health practices among low-income women. *Pediatrics*, 113(6), e523–e529.
- Craig, E. (2004). Parenting programs for women with mental illness who have young children: A review. *Australian and New Zealand Journal of Psychiatry*, 38, 923–928.
- Cuijpers, P., Van Straten, A. & Smit, F. (2005). Preventing the incidence of new cases of mental disorders: A meta-analytic review. *Journal of Nervous and Mental Disease*, 193(2), 119–125.
- Davey, S., Dziurawiec, S. & O'Brien-Malone, A. (2006). Mens' voices: Postnatal depression from the perspective of male partners. *Qualitative Health Research*, 16(2), 206–220.
- Dennis, C. (2003). The effect of peer support on postpartum depression: A pilot randomized controlled trial. *Canadian Journal of Psychiatry*, 48(2), 115–124.
- Devlin, J. & O'Brien, L. (1999). Children of parents with mental illness. *Australian and New Zealand Journal of Mental Health Nursing*, 8, 19–29.
- Evans, J., Heron, J., Francomb, H., Oke, S., & Golding, J. (2001). Cohort study of depressed mood during pregnancy and after childbirth. *British Medical Journal*, 323(7307), 257–260.
- Government of Canada. (2003). *The well-being of Canada's young children: Government of Canada report*. Ottawa, ON: Human Resources Development Canada and Health Canada.
- Hipwell, A., Murray, L., Ducournau, P. & Stein, A. (2005). The effects of maternal depression and parental conflict on children's peer play. *Child Care Health and Development*, 31(1), 11–23.
- Hossain, A., Field, T., Gonzalez, J., Malphurs, J. & DelValle, C. (1994). Infants of "depressed" mothers interact better with their nondepressed fathers. *Infant Mental Health Journal*, 15, 348–357.
- Jones, N., McFall, B. & Diego, M. (2004) Patterns of brain electrical activity in infants of depressed mothers who breastfeed and bottle feed. *Biological Psychology*, 67(1), 103–124.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Mezulis, A., Shibley Hyde, J. & Clark, R. (2004). Father involvement moderates the effect of maternal depression during a child's infancy on child behavior problems in kindergarten. *Journal of Family Psychology, 18*(4), 575–588.
- Moran, P., Ghate, D. & van der Merwe, A. (2004). *What works in parenting support? A review of the international evidence*. London: Department for Education and Skills.
- Oberlander, T.F., Warburton, W., Misri, S., Aghajanian, J., & Hertzman C. (2006). Neonatal outcomes after prenatal exposure to selective serotonin reuptake inhibitor antidepressants and maternal depression using population-based linked health data. *Archives of General Psychiatry, 63*(8), 898–906.
- Roy, C., Zoccolillo, M., Gruber, R., Boivin, M., Perusse, D. & Tremblay, R. (2005). Construct validity of an instrument to assess major depression parents in epidemiologic studies. *Canadian Journal of Psychiatry, 50*(12), 784–791.
- Russell, C. (2002). *A national survey of parents of young children*. Ottawa, ON: Invest in Kids.
- Sanford, M., Byrne, C., Williams, S., Atley, S., Ridley, T., Miller, J., et al. (2003). A pilot study of a parent-education group for families affected by depression. *Canadian Journal of Psychiatry, 48*, 78–86.
- Silver, E., Heneghan, A., Bauman, L. & Stein, R. (2006). The relationship of depressive symptoms to parenting competence and social support in inner-city mothers of young children. *Maternal and Child Health Journal, 10*(1), 105–112.
- Tammentie, T., Tarkka, M., Astedt-Kurki, P., Paavilainen, E. & Laippala, P. (2004). Family dynamics and postnatal depression. *Journal of Psychiatric and Mental Health Nursing, 11*, 141–149.
- Waddell, C., McEwan, K., Peters, R., Hua, J. & Garland, O. (2007). Preventing mental health disorders in children, a public health priority. *Canadian Journal of Public Health, 98*(3), 174–178.
- Weissman, M.M., Pilowsky, D.J., Wickramaratne, P.J., Talati, A., Wisniewski, S.R., Fava, M., et al. (2006). Remissions in maternal depression and child psychopathology. *Journal of the American Medical Association, 295*(12), 1389–1398.
- Zlotnick, C., Johnson, S., Miller, I., Pearlstein, T. & Howard, M. (2001). Postpartum depression in women receiving social assistance: Pilot study of an interpersonal-therapy-oriented group intervention. *American Journal of Psychiatry, 158*, 638–640.

Emotional/Mental Health and Development: Child Mental Health and Attachment

- Bakermans-Kranenburg, M., van Ijzendoorn, M. & Juffer, F. (2003). Less is more: Meta-analyses of sensitivity and attachment interventions in early childhood. *Psychological Bulletin, 129*(2), 195–215.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Bakermans-Kranenburg, M., van Ijzendoorn, M. & Juffer, F. (2005). Disorganized infant attachment and preventive interventions: A review and meta-analysis. *Infant Mental Health Journal*, 26(3), 191–216.
- BC Reproductive Mental Health Program, BC Women's Hospital & Health Centre. (2006). *Addressing perinatal depression: A framework for BC's health authorities*. Vancouver, BC: Author.
- Children's Mental Health and Policy Research Program, University of British Columbia. (2004a). *Preventing and treating anxiety disorders in children and youth*. Vancouver, BC: Author:
- Children's Mental Health and Policy Research Program, University of British Columbia. (2004b). *Preventing and treating conduct disorders in children and youth*. Vancouver, BC: Author:
- Children's Mental Health and Policy Research Program, University of British Columbia. (2004c). *Preventing and treating depression in children and youth*. Vancouver, BC: Author:
- Durlak, J. & Wells, A. (1997). Primary prevention mental health programs for children and adolescents: A meta-analytic review. *American Journal of Community Psychology*, 25(2), 115–152.
- Evans, J., Heron, J., Francomb, H., Oke, S. & Golding, J. (2001). Cohort study of depressed mood during pregnancy and after childbirth. *British Medical Journal*, 323(7307), 257–260.
- Federal/Provincial/Territorial Advisory Committee on Population Health (1999). *Investing in early child development: The health sector contribution*. Ottawa, ON: Author.
- Grossmann, K. & Grossmann, K.E. (2005). The impact of attachment to mother and father at an early age on children's psychosocial development through young adulthood. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from http://www.enfant-encyclopedie.com/pages/PDF/GrossmannANGxp_rev.pdf.
- Harland, P., Reijneveld, S., Harland, P., Brugman, S., Verloove-VAnhorick, S. & Verhulst, F. (2002). Family factors and life events as risk factors for behavioural and emotional problems in children. *European Child & Adolescent Psychiatry*, 11, 176–184.
- Hennighausen, K. & Lyons-Ruth, K. (2005). Disorganization of attachment strategies in infancy and childhood. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from http://www.enfant-encyclopedie.com/pages/PDF/Hennighausen-LyonsRuthANGxp_rev.pdf.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- Irwin, L., Siddiqi, A. & Hertzman, C. (2007). *Early child development: A powerful equalizer. Final report: For WHO Commission on Social Determinants of Health*. Vancouver, BC: Human Early Learning Partnership & Global Knowledge for Early Child Development.
- Jones, N., McFall, B. & Diego, M. (2004) Patterns of brain electrical activity in infants of depressed mothers who breastfeed and bottle feed. *Biological Psychology*, 67(1), 103–124.
- Larun, L., Nordheim, L., Ekeland, E., Hagen, K. & Heian, F. (2003). Exercise in prevention and treatment of anxiety and depression among children and young people (Protocol [CD004691]. *Cochrane Database of Systematic Reviews*, 4.
- Luthar, S. (2005). Resilience at an early age and its impact on child psychosocial development. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from <http://www.enfant-encyclopedie.com/Pages/PDF/LutharANGxp.pdf>.
- Masten, A. & Gewirtz, A. (2006). Resilience in development: The importance of early childhood. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from <http://www.enfant-encyclopedie.com/Pages/PDF/Masten-GewirtzANGxp.pdf>.
- Mäntymaa, M., Puura, K., Luoma, I., Salmelin, R., Davis, H., Tsiantis, J., et al. (2003). Infant-mother interaction as a predictor of child's chronic health problems. *Child: Care, health and development*, 29(3), 181–191.
- Merry, S., McDowell, H., Hetrick, S., Bir, J. & Muller, N. (2004). Psychological and/or educational interventions for the prevention of depression in children and adolescents [CD003380]. *Cochrane Database of Systematic Reviews*, 2.
- Mussell, B., Cardiff, K. White, J. (2004). *The mental health and well-being of aboriginal children and youth: Guidance for new approaches and services*. Victoria, BC: Ministry of Children and Family Development.
- Oberlander, T.F., Warburton, W., Misri, S., Aghajanian, J., & Hertzman C. (2006). Neonatal outcomes after prenatal exposure to selective serotonin reuptake inhibitor antidepressants and maternal depression using population-based linked health data. *Archives of General Psychiatry*, 63(8), 898–906.
- Russell, C. (2003). *Parent education: What is required to build the skills parents need to raise healthy children?* Ottawa, ON: Invest in Kids.
- Thomas, H., Boyle, M., Micucci, S. & Cocking, L. (2002). *Community-based interventions to improve child mental health: Review of reviews*. Ottawa, ON: Public Health Research, Education and Development Program.
- Van Ijzendoorn, M., Schuengel, C. & Bakermans-Kranenburg, M. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology*, 11, 225–249.

Waddell, C. (2002). *Prevalence of mental disorders in children and youth*. Vancouver, BC: Mental Health Evaluation & Community Consultation Unit, University of British Columbia.

Waddell, C., McEwan, K., Hua, J. & Shepherd, C. (2002). *Child and youth mental health: Population health and clinical service considerations*. Vancouver, BC: Mental Health Evaluation & Community Consultation Unit, University of British Columbia.

Waddell, C., McEwan, K., Shepherd, C.A., Offord, D.R. & Hua, J.M. (2005). A public health strategy to improve the mental health of Canadian children. *Canadian Journal of Psychiatry*, 50(4), 226–233.

Speech, Language and Communication Development

Beitchman, J.H., Wilson, B., Johnson, C.J., Atkinson, L., Young, A., Adlaf, E., et al. (2001). Fourteen-year follow-up of speech/language impaired and control children: Psychiatric outcome. *Journal of American Academy of Child and Adolescent Psychiatry*, 40(1), 75–82.

Canadian Association of Speech-Language Pathologists and Audiologists. (2005). *Speech, language and hearing fact sheet*. Ottawa, ON: Author.

Canadian Paediatric Society. (2002). Promoting literacy in the physician's office. Position statement. *Paediatric Child Health*, 7(6), 398–403.

Cantwell, D.P. & Baker, L. (1991) Association between attention deficit hyperactivity disorder and learning disorder. *Journal of Learning Disabilities*, 24, 88–95.

Catts, H., Fey, M. & Tomblin, J. (2002). A longitudinal investigation of reading outcomes in children with language impairments. *Journal of Speech, Language and Hearing Research*, 45, 1142–1157.

Catts, H., Fey, M., Zhang, X. & Tomblin, B. (1999). Language basis of reading and reading disabilities: evidence from a longitudinal investigation. *Scientific Studies of Reading*, 3, 331–361.

Crago, M. & Westernoff, F. (1997). *Position paper on speech-language pathology and audiology in the multicultural, multilingual context*. Ottawa, ON: Canadian Association of Speech-Language Pathologists and Audiologists.

de Jong, P. & Leseman, P. (2001). Lasting effects of home literacy on reading achievement in school. *Journal of School Psychology*, 39(5), 389–414.

Debaryshe, B. (1993). Joint picture-book reading correlates of early oral language skill. *Journal of Child Language*, 20(2), 455–461.

- Downey, D., Mraz, R., Knott, J., Knulson, C., Holte, L. & Dyke, D. (2002). Diagnosis and evaluation of children who are not talking. *Infants and Young Children, 15*(2), 38–48.
- Evans, M.A., Shaw, D. & Bell, M. (2000). Home literacy activities and their influence on early literacy skills. *Canadian Journal of Experimental Psychology, 54*(2), 65–75.
- Ezell, H., Justice, L. & Parsons, D. (2000). Enhancing the emergent literacy skills of pre-schoolers with communication disorders: a pilot investigation. *Child Language, Teaching and Therapy, 16*, Part 2, 121–140.
- Fox, A., Dodd, B. & Howard, D. (2002). Risk factors for speech disorders in children. *International Journal of Language and Communication Disorders, 37*(2), 117–131.
- Geva, E. (2006). Learning to read in a second language: Research, implications, and recommendations for services. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from <http://www.enfant-encyclopedie.com/Pages/PDF/GevaANGxp.pdf>.
- Gierut, J. (n.d.). Phonological disorders in children. *Treatment Efficacy Summary*. Rockville, MD: American Speech-Language Hearing Association. Retrieved August 24, 2009, from <http://www.asha.org/NR/rdonlyres/4BAF3969-9ADC-4C01-B5ED-1334CC20DD3D/0/5076CognitiveFactSheets.pdf>
- Girolametto, L. & Weitzman, E. (2002). Responsiveness of child care providers in interactions with toddlers and preschoolers. *Language, Speech, and Hearing Services in Schools, 33*, 268–281.
- Girolametto, L., Weitzman, E., Wiigs, M. & Steig Pearce, P. (1999). The relationship between maternal language measures and language development in toddlers with expressive vocabulary delays. *American Journal of Speech-Language Pathology, 8*, 364–374.
- Haden, C.A., Reese, E. & Fivush, R. (1996). Mothers' extratextual comments during storybook reading: Stylistic differences over time and across texts. *Discourse Processes, 21*, 135–169.
- Hart, B. & Risley, T. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore, MD: Paul H. Brooks.
- Government of Canada. (2003). *The well-being of Canada's young children: Government of Canada report*. Ottawa, ON: Human Resources Development Canada and Health Canada.
- Herrero, M. & Hechtman, L. (1994). Antisocial disorders in hyperactive subjects from childhood to adulthood: predictive factors and characterization of subgroups. *American Journal of Orthopsychiatry, 65*(4), 510.
- High, P., LaGasse, L., Becker, S., Ahlgre, I. & Gardner, A. (2000). Literacy promotion in primary care pediatrics: Can we make a difference. *Pediatrics, 105*(4 Pt 2), 927–934.

- Hodge, T. & Downie, J. (2004). Together we are heard: Effectiveness of daily ‘language’ groups in a community preschool. *Nursing and Health Sciences*, 6, 101–107.
- Huaqing Qi, C. & Kaiser, A. (2004). Problem behaviors of low-income children with language delays: *An observation study*. *Journal of Speech, Language and Hearing Research*, 47, 595–609.
- Johnson, C.J. (2007). Prevalence of speech and language disorders in children. *Encyclopedia of Language and Literacy Development*. London, ON: Canadian Language and Literacy Research Network. Retrieved September 2008 from <http://www.literacyencyclopedia.ca/pdfs/topic.php?topId=24>.
- Johnston, J. (2005). Factors that influence language development. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from <http://www.enfant-encyclopedie.com/Pages/PDF/JohnstonANGxp.pdf>.
- Justice, L.M. & Ezell, H.K. (2000). Enhancing children’s print and word awareness through home-based parent intervention. *American Journal of Speech-Language Pathology*, 9, 257–269.
- Kelly, D. (1998). A clinical synthesis of the “late talker” literature: Implications for service delivery. *Language, Speech and Hearing Services in Schools*, 29, 76–84.
- Kuo, A., Franke, T., Regalado, M. & Halfon, N. (2004). Parent report of reading to young children. *Pediatrics*, 113(6), 1944–1953.
- La Paro, K., Justice, L., Skibbe, L. & Pianta, R. (2004). Relations among maternal, child and demographic factors and the persistence of preschool language impairment. *American Journal of Speech-Language Pathology*, 13, 291–303.
- Law, J., Boyle, J., Harris, F., Harkness, A. & Nye, C. (2000). Screening for primary speech and language delay: A systematic review of the literature. *International Journal of Language & Communication Disorders*, 33, 21–23.
- Law, J. & Durkin, C. (2000) Language and literacy: a time for “joined up” thinking. *Educational Psychology in Practice* 16, 1 75–87.
- Law, J., Garrett, Z. & Nye, C. (2005). The efficacy of treatment for children with developmental speech and language delay/disorder: A meta-analysis. *Journal of Speech, Language and Hearing Research*, 47, 924–943.
- Lewis, B.A. & Freebairn, L. (1992). Residual effects of preschool phonology disorders in grade school, adolescence, and adulthood. *Journal of Speech and Hearing Research*, 35, 819–831.

- Lundberg, I. & Høien, T. (1991). Initial enabling knowledge and skills in reading acquisition: Print awareness and phonological segmentation. In D.E. Sawyer & B. Fox (Eds.), *Phonological awareness: The evolution of a concept* (pp. 73–95). New York: Springer-Verlag.
- Menyuk, P., Chesnick, M., Weis Liebergoot, J., Korngold, B. & D’Agostino, R. (1991). Predicting reading problems in at-risk children. *Journal of Speech and Hearing Research*, 34, 893–903.
- Nancollis, A., Lawrie, B. & Dodd, B. (2005). Phonological awareness intervention and the acquisition of literacy skills in children from deprived social backgrounds. *Language, Speech and Hearing Services in Schools*, 36, 325–335.
- National Health Service Centre for Reviews and Dissemination. (1998). Pre-school hearing, speech, language and vision screening. *Effective Health Care*, 4(2). York: Author. Accessed on January 2, 2007 from <http://www.york.ac.uk/inst/crd/EHC/ehc42.pdf>.
- Nelson, H., Nygren, P., Walker, M. & Panoscha, R. (2006). Screening for speech and language delay in preschool children: Systematic evidence review for the US Preventive Services Task Force. *Pediatrics*, 117, e298–e319.
- Nicoladis, E., Charbonnier, M., & Popescu, A. (2006). Second language/bilingualism at an early age with emphasis on its impact on early socio-cognitive and socio-emotional development. *Encyclopedia on early childhood development*. Montreal, PQ: Centre of Excellence for Early Childhood Development. Retrieved July 13, 2006, from <http://www.enfant-encyclopedie.com/pages/PDF/Nicoladis-Charbonnier-PopescuANGxp.pdf>.
- Oller, D., Eilers, R., Neal, A. & Schwartz, H. (1999). Precursors to speech in infancy: The prediction of speech and language disorders. *Journal of Communication Disorders*, 32(4), 223–245.
- Paradis, J. (2005). Grammatical morphology in children learning English as a second language: Implications of similarities with specific language impairment. *Language, Speech and Hearing Services in Schools*, 36, 172–187.
- Paul, R., Hernandez, R., Taylor, L. & Johnson, K. (1996). Narrative development in late talkers: Early school age. *Journal of Speech and Hearing Research*, 39(6), 1295–1303.
- Paul, R., Murray, C., Clancy, K & Andrews, D. (1997). Reading and metaphonological outcomes in late talkers. *Journal of Speech, Language and Hearing Research*, 40(5), 1037–1047.
- Payne, A., Whitehurst, G. & Angell, A. (1994). The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Childhood Research Quarterly*, 9, 427–440.
- Pickstone, C., Hannon, P. & Fox, L. (2002). Surveying and screening preschool language development in community-focused intervention programs: A review of instruments. *Child: Care, Health & Development*, 28(3), 251–264.

- Qi, C. & Kaiser, A. (2004). Problem behaviors of low-income children with language delays: An observation study. *Journal of Speech, Language and Hearing Research, 47*, 595–609.
- Raban, B. & Nolan, A. (2005). Reading practices experienced by preschool children in areas of disadvantage. *Journal of Early Childhood Research, 3*(3), 289–298.
- Rannard, L., Lyons, C. & Glenn, S. (2005). Parent concerns and professional responses: The case of specific language impairment. *British Journal of General Practitioners, 55*(518), 710–714.
- Rescorla, L. (2005). Age 13 language and reading outcomes in late-talking toddlers. *Journal of Speech, Language and Hearing Research, 48*, 459–472.
- Rescorla, L., Roberts, J. & Dahlsgaard, K. (1997). Late talkers at 2: Outcome at age 3. *Journal of Speech, Language and Hearing Research, 40*(3), 556–566.
- Roberts, J., Jurgens, J. & Burchinal, M. (2005). The role of home literacy practices in preschool children’s language and emergent literacy skills. *Journal of Speech, Language and Hearing Research, 48*, 345–359.
- Royal College of Speech and Language Therapists. (2005). *Royal College of Speech and Language Therapists Clinical Guidelines*. Oxon, UK: Speechmark Publishing.
- Scarborough, H. & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review, 14*, 245–302.
- Scarborough, H.S. (1991). Antecedents to reading disability: Preschool language development and literacy experiences of children from dyslexic families. *Reading and Writing, 3*, 219–233.
- Senechal, M. & LeFevre, J. (2002). Parental involvement in the development of children’s reading skill: A five year longitudinal study. *Child Development, 73*(2), 445–460.
- Sharif, I., Rieber, S. & Ozuah, P. (2002). Exposure to Reach Out and Read and vocabulary outcomes in inner city preschoolers. *Journal of the National Medical Association, 94*(3), 171–177.
- Snow, C.E., Burns, S. & Griffin, P. (Eds.). (1998). *Preventing reading difficulties before kindergarten*. Washington, DC: National Academy Press.
- Snowling, M.J., Adams, J.W., Bishop, D.V.M. & Stothard, S.E. (2001). Educational attainments of school leavers with a preschool history of speech-language impairments. *International Journal of Language and Communication Disorders, 36*(2), 173–183.
- Toppelberg, C. & Shapiro, T. (2000). Language Disorders: A 10 year research update review. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*(2), 143–152.
- van Kleeck, A., Gillam, R. & Hamilton, L. (1997). The relationship between middle-class parents’ book-sharing discussion and their preschoolers’ abstract language development. *Journal of Speech, Language and Hearing Research, 40*, 1261–1271.

- Walker, D., Greenwood, C., Hart, B. & Carta, J. (1994). Prediction of school outcomes based on early language production and socioeconomic factors. *Child Development, 65*(2), 606–612.
- Waller, M., Sollod, R. & Sander, E. (1983). Psychological assessment of speech and language disordered children. *Language, Speech and Hearing Services in Schools, 14*, 92–98.
- Warr-Leeper, G. (2001) An overview of programs and effectiveness research in early intervention for environmentally disadvantaged children. *Journal of Speech-Language Pathology and Audiology, 24*(2), 90–103.
- Warr-Leeper, G., Wright, N.A. & Mack, A. (1994). Language disabilities of antisocial boys in residential treatment. *Behavior Disorders, 19*, 159–169.
- Weitzman, C., Roy, L., Walls, T. & Tomlin, R. (2004). More evidence for Reach Out and Read: A home-based study. *Pediatrics, 113*(5), 1248–1253.

GLOSSARY

Adiposity Rebound – a point at which body fatness normally declines to a minimum (around 5-6 years of age) before increasing again into adulthood.

Allergen – A substance that is foreign to the body and can cause an allergic reaction in certain people. For example, pollen, dander, mould.

Allergic Rhinitis – term for hay fever, a condition due to allergy that mimics a chronic cold.

Allergy – inappropriate or exaggerated reaction of the immune system to substances that cause no symptoms in the majority of people. Symptoms may be caused by exposure of the skin to a chemical, of the respiratory system to particles of dust or pollen or of the stomach and intestines to a particular food. The term applies to all immunologically mediated reactions, not just IgE hypersensitivity.

Asthma – a chronic inflammation of the bronchial tubes (airways) that causes swelling and narrowing (constriction) of the airways. The result is difficulty breathing.

Atopic Dermatitis – a chronic (long-lasting) disease that affects the skin.

Atopy – genetic tendency to develop the classic allergic diseases: atopic dermatitis, allergic rhinitis and asthma. Atopy involves the capacity to produce Immunoglobulin E (IgE) in response to common environmental proteins such as house dust mite, grass pollen, and food allergens.

Baby Friendly Hospital Initiative (BFHI) – launched in 1991, is an effort by UNICEF and the World Health Organization to ensure that all maternity facilities become centres of breastfeeding support. The “Baby-Friendly” designation can be given if a facility does not accept free or low-cost breast milk substitutes, feeding bottles or teats and has implemented 10 specific steps to support successful breastfeeding.

Canonical Babbling – stage four of the development of language which begins around six months of age.

Corrected Age – 40 weeks minus the number of weeks premature.

Division of Responsibility in Feeding – practice developed by Ellyn Satter that promotes parents deciding what, when and where to feed children (beyond breastfeeding); and children deciding whether or not to eat and how much.

Exclusive Breastfeeding – the practice of feeding only breast milk (including expressed breast milk) and allows the baby to receive vitamins, minerals or medicine. Water, breast milk substitutes, other liquids and solid foods are excluded. (World Health Organization).

Food Allergy – an adverse immunologic response to food protein.

Expressive Language – putting words together to form thoughts or express one’s self.

Guided Participation – a process through which an experienced person helps another person who has less experience to become competent in practices that are personally and socially meaningful practices of everyday life.

High Birth Weight – infant born weighing more than 4,000 g at birth.

Lactational Amenorrhea – skipping menstrual periods during breastfeeding.

Late Talkers – children under 24 months who indicate delayed acquisition of language milestones.

Learned Safety – experiences with novel tastes that are not followed by negative gastrointestinal consequences.

Low Birth Weight – infants weighing less than 2,500 g at birth.

Media Literacy – the ability to read analyze, evaluate and produce communication in a variety of media forms, including television.

Morphemes – smallest meaningful unit in the grammar of a language.

Multiple Intelligences – theory developed in 1983 by Dr. Howard Gardner at Harvard University. It proposes eight different intelligences to account for a broader range of human potential in children and adults than does IQ. The components are: linguistic, logical-mathematical, spatial (picture smart), bodily-kinesthetic, musical, interpersonal, intrapersonal and naturalistic (www.thomasarmstrong.com/multiple_intelligences.htm).

Neophobia – Fear of anything new, of innovation, an irrational fear of new situations, places, or things. In animal behaviour, neophobia refers to the tendency of an animal to avoid or retreat from an unfamiliar object or situation.

Non-Word Repetition – repetitions of non-words (e.g., reiterant speech).

Obesity – body mass index over the 95th percentile for age and sex. (Note: the Centers for Disease Control and Prevention categorize this as overweight).

Obesogenic – related to causing (or tending to cause) obesity.

Overweight – body mass index over the 85th percentile for age and sex.

Phonological – producing sounds.

Preterm – infants born before 37 completed weeks of gestation.

Receptive Language – ability to process, comprehend or integrate spoken language.

Toxicodynamic – alterations in a biological system resulting from exposure to chemicals.

Toxicokinetic – the passage through the body system of a toxic agent or its metabolites.

Very Low Birth Weight – infants weighing 1,500 g or less at birth.

APPENDIX 1: CORE PROGRAMS EVIDENCE PAPERS

A number of other public health evidence papers are being developed which have relevance to early childhood health and development. Examples of these papers include:

- Dental/Oral Health
 - Prevention of dental disease.
 - Best practices.
- Unintentional Injury
 - Shaken baby syndrome
 - Infant safe sleeping
 - Sudden infant death syndrome – reducing the risk (smoke-free environment; infant safe sleeping practices)
 - Water safety/drowning
 - Infant and child automobile restraints
- Communicable Disease Prevention and Control
 - Early childhood immunizations
- Reproductive Health and Prevention of Disabilities
 - Health promotion; breastfeeding
 - Delivery of prevention programs
 - Aboriginal program delivery
 - Prenatal influences on healthy infant and child development
 - Perinatal tobacco use and environmental tobacco smoke exposure
- Food Security
 - Best practices
 - Other indicators
 - Low-income
 - Health and food choices

- Healthy Living: Physical Activity and Healthy Eating
 - Breastfeeding
 - Eating patterns among Aboriginal peoples
 - Food insecurity and vulnerability
 - Impact of family and home environment
- Mental Health Promotion and Mental Disorders Prevention
 - Mental health promotion
 - Prenatal and post-natal home visiting
 - Early childhood mental health – parenting programs
 - Adolescent mental health
- Prevention of Violence, Abuse and Neglect
 - Shaken baby syndrome
 - Infant mental health/attachment
 - Unintentional injury
 - Home visitation
- Community Environmental Health
 - Sun safety
- Chronic Disease Prevention
 - Asthma
- Prevention of Disabilities (Congenital and Genetic)
 - Preterm/low birth weight infants.
- Prevention of Harms Associated with Substances
 - Developmental pathways
 - Second-hand smoke exposure.
 - Effective parenting, nurturing and social/cognitive stimulation

APPENDIX 2: KEY WORDS SEARCHED

Single words or words in combination were used in the search.

Public Health Strategies, Approaches and Settings

- home visiting, child, infant, peer support, public health, services, child care, group settings, group work, public health nurse, telephone interventions, internet, surveillance, community partnerships, community programs, outcomes, health education, prevention, outcomes

Parenting

- parenting, parenting styles, parent attitudes, parent behaviours, ethnicity, culture, parent education, parent support, peer support, fathers, teen pregnancy, teen parenting, young families, television, social marketing, health education, outcomes, prevention, public health, parenting skills, multicultural, aboriginal, indigenous, ethnic

General Development

- developmental screening, targeted, universal, public health, services, child outcomes, prevention, outcomes

Physical Health and Development: Prenatal Influences

- Fetal alcohol spectrum disorder, preterm, low birth weight, parent, alcohol, prenatal influences, child, child/infant development, child/infant health, child/infant outcomes, prevention

Physical Health and Development: Physical Activity and Motor Development

- child, physical activity, motor development, public health, services, child outcomes, prevention, outcomes

Physical Health and Development: Physical Growth and General Health

- physical growth, well-child care, growth monitoring, growth charts, public health, service, child outcomes, child health, child development, prevention, outcomes

Physical Health and Development: Nutrition and Breastfeeding

- early childhood/toddler/child/preschool, nutrition, feeding, eating, breastfeeding, food safety, nutrient deficiency, food security/hunger, failure-to-thrive, marketing/television, obesity, overweight, allergy, child care, television/advertising

Physical Health and Development: Environment

- environmental health, child, health effects, prevention, public health, service, asthma, second hand smoke

Physical Health and Development: Sexual Health and Development

- child, sexual health, sexual development, public health, prevention, services, outcomes

Emotional/Mental Health and Development: Prenatal/Parental Influences

- mental illness, postpartum depression, maternal depression, parental depression, child outcomes, child, prevention, services

Emotional/Mental Health and Development: Child Mental Health and Attachment

- child, mental health, attachment, resilience, protective factors, public health, service, prevention, outcomes, parenting skills

Speech, Language and Communication Development

- child speech, child language, child communication, child literacy, late talkers, prevention, public health, child outcomes, screening, universal, targeted

APPENDIX 3: PRACTITIONER ROLE IN SUPPORTING CHILD HEALTH AND DEVELOPMENT

Taken from: *Birth to Three Matters: A Review of the Literature* (2003), by T. David, K. Gouch, S. Powell & L. Abbott.

Practitioners need to be able to:

- Provide opportunities to explore and play in a safe and secure environment - children's mobility and movement are important for their development.
- Know about brain development and the importance of 'nourishment' (a good diet - in both the form of food and of physical and psychological stimulation).
- Help parents see that intimate behaviours such as bugging and nudging, pet names and idiosyncratic behaviour are important and that children's development sometimes seems difficult because they are trying to become independent people with a sense of self.
- Have reasonable rules which fit with children's rhythms and give a pattern to life.
- Know that parents, as well as children, need support.
- Know about child abuse and neglect and have other colleagues to consult.
- Recognize the additional requirements of babies and young children with special needs, and plan how to ensure these children have access, in a philosophical, as well as practical sense, to similar experiences and opportunities to their peers.
- Help communities and the public understand the importance of positive interactions and experiences in the first three years for all areas of development, including brain development, and for enjoyment in the here and now.
- Access the education and training necessary in order to fulfill their important role.

APPENDIX 4: CANADIAN GROWTH MONITORING RECOMMENDATIONS

Taken from: *The Use of Growth Charts for Assessing and Monitoring Growth in Canadian Infants and Children* (2004), by the Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada & Community Health Nurses Association of Canada.

- Serial measurements of recumbent length (birth to ages two or three) or height (\geq age 2), weight and head circumference (birth to age two) should be part of the scheduled well-baby and well-child health visits. Health maintenance visits should be organized according to immunization schedule with additional visits within the first month and also at 9 months of age (Type 5 evidence).
- Weights and measures should be obtained using calibrated, well-maintained quality equipment and standardized measurement techniques. An individual child's measurements should be recorded in the data table of a consistent growth chart appropriate for age and gender and then plotted to identify any disturbances in height or weight gain. Corrected age should be used at least until 24 to 36 months of age for premature infants (Graded by the writers as "Fair Evidence" – no criteria given).
- The growth of breastfed infants can be evaluated on the CDC growth charts, but breastfed infants grow differently from artificially fed infants during the first year of life. Breastfed infants tend to become leaner after 304 months of life.
- Until internationally diverse growth charts are available and have been reviewed for use in Canada, the growth charts of the American Centers for Disease Control and Prevention (CDC) are recommended. (Type 5 evidence). The clinical set of charts, including the 3rd and 97 percentiles are favoured. Health care providers should be aware that breastfed infants grow differently from formula-fed infants in the first year of life – they tend to become leaner after 3-4 months of life. These differences should be anticipated with assessing growth of exclusively breastfed infants (Graded by the writers as "Fair Evidence" – no criteria given).
- Health care providers are encouraged to take the time to teach children and their caregivers how to interpret the growth chart and what the target growth pattern should be (Type 5 evidence).
- BMI-for-age is recommended to screen children from age two onwards to identify those who may be at risk for conditions and illnesses related to excess body fat (Graded by the writers as "Fair Evidence" – no criteria given).
- For Canadian children, the CDC BMI-for-age charts are recommended (Type 5 evidence).
- Traditional measures of underweight, such as percent ideal body weight or weight-for-length/stature percentile (available for use up to approximately age five) continue to be recommended until the validity of using BMI to assess underweight is established.

Alternatively, BMI-for-age may be used to screen for underweight (age 2 onwards) with an awareness of the existing limited experience of its role in underweight (Type 5 evidence).

- The following cut-offs are recommended as guidance for further assessment, referral or treatment, but not as diagnostic criteria for labelling children:
 - Shortness or stunting: length-for-age or height-for-age below 3rd percentile (Type 5 evidence).
 - Underweight or wasting: BMI-for-age below 5th percentile or body weight at or below 89 per cent of ideal ($\leq 89\%$ IBW) or weight-for-length/-stature < 3 rd percentile (Type 5 evidence).
 - Overweight: 85th percentile $<$ BMI-for-age below 95th percentile (Type 5 evidence).
 - Obesity: BMI-for-age at or above 95th percentile (Graded by the writers as “Fair Evidence” – no criteria given).
- Given the rising prevalence and associated short-and long-term health risks of pediatric obesity, routine screening for obesity as part of the pediatric health maintenance visit is recommended (Type 5 evidence).
- Children with suspected overweight via the BMI, should undergo evaluation and possible treatment (Type 5 evidence).

APPENDIX 5: NUTRITION IN HEALTHY TERM INFANTS

Taken from: *Nutrition for Healthy Term Infants* (2005), by the Canadian Paediatric Society, Dietitians of Canada, & Health Canada.

Summary of Principles and Recommendations

Breastfeeding

Breastfeeding is the optimal method of feeding infants.

Recommendation:

1. Encourage exclusive breastfeeding for the first 6 months of life, as breast milk is the best food for optimal growth. Breastfeeding may continue for up to 2 years and beyond.

Active public health, hospital, community and workplace support of breastfeeding will increase initiation rates and duration of breastfeeding.

Recommendations:

2. Provide antenatal and postnatal counselling about the principles and practice of breastfeeding.
3. Encourage frequent feeds during the early postnatal period.
4. Provide more community-based programs supporting breastfeeding families as the length of hospital stays decreases.
5. Encourage support in the community and workplace for flexible work schedules, part-time nursing and the use of expressed breast milk.

Breastfeeding is rarely contraindicated. Neither smoking nor environmental contaminants are necessarily contraindications to breastfeeding. Moderate, infrequent alcohol ingestion, the use of most prescription and over-the-counter drugs and many maternal infections do not preclude breastfeeding.

Recommendations:

6. Encourage women who smoke to stop or reduce smoking; however, even if smoking is continued, breastfeeding is still the best choice.
7. Limit intake of alcohol.
8. Whenever drugs are prescribed or infection detected, assess each case on an individual basis.
9. When the mother is known to be HIV antibody positive, alternatives to breastfeeding are indicated.

Vitamin D deficiency is a health concern in Canada. Infant formulas and milks are fortified with vitamin D. Breastfed infants should also receive extra vitamin D in the form of a supplement.

Recommendation:

10. Provide a daily 10 µg (400 IU) vitamin D supplement to all breastfed infants starting at birth and until the diet includes at least 10µg (400 IU) per day of vitamin D from other dietary sources, or until the breastfed infant reaches 1 year of age. After 1 year, all children should have a daily intake of 5 µg (200 IU) of vitamin D.

Alternate Milks

If an infant is not breastfed, or is partially breastfed, commercial formulas are the most acceptable alternative to breast milk until 9 to 12 months of age.

Recommendations:

11. Use cow's milk-based, iron-fortified formulas until 9 to 12 months of age.
12. Iron-fortified follow-up formulas are a preferred alternative to cow's milk from 6 months until 9 to 12 months of age.
13. Use soy-based formulas only for those infants who cannot take dairy-based products for health, cultural or religious reasons, such as a vegan lifestyle, or galactosemia.
14. Specialty formulas are indicated only for infants with detected or suspected pathology.

The use of nutritionally incomplete alternate milks as the sole source of nutrition for infants is inappropriate. Pasteurized whole cow's milk, however, is an important component of a mixed infant diet after 9 months of age. For infants unable to take cow's milk products, continue commercial soy formula until 2 years of age.

Recommendations:

15. Pasteurized whole cow's milk may be introduced at 9 to 12 months of age and continued throughout the second year of life.
16. Partly skimmed milk (1% and 2%) is not routinely recommended in the first 2 years.
17. Skim milk is inappropriate in the first 2 years.
18. Soy (except soy formula), rice or other vegetarian beverages, whether or not they are fortified, are inappropriate alternatives to breast milk, formula or pasteurized whole cow's milk in the first 2 years.

Other Fluids in Infant Feeding

Tap water, well water meeting established standards of safety and commercially bottled water, except mineral or carbonated water, are generally suitable for infants. Limit the use of "fruit juice" to avoid interfering with the intake of nutrient-containing foods and fluids. Herbal teas and other beverages are of no known benefit to an infant and may be harmful.

Recommendations:

19. Bring all water for feeding infants less than 4 months of age to a rolling boil for at least 2 minutes to ensure that it is pathogen free.
20. Limit fruit juice to avoid interfering with the intake of breast milk or infant formula.
21. Do not use herbal teas or other beverages.

Transition to Solid Foods

Six-month-old infants are physiologically and developmentally ready for new foods, textures and modes of feeding. By 1 year of age, the ingestion of a variety of foods from the different food groups of Canada's Food Guide to Healthy Eating is desirable.

Recommendations:

22. Introduce nutrient-rich complementary foods at 6 months to meet the infant's increasing nutritional requirements and developmental needs.
23. To prevent iron deficiency, iron-containing foods are recommended as the first foods.

Safety Issues Around Feeding

Foods provided to infants must be free of patho-gens, appropriate in size and texture, nutritionally sound and fed safely.

Recommendations:

24. To prevent infant botulism, do not use honey in the feeding of infants under 1 year of age.
25. To prevent salmonella poisoning, cook all eggs well and do not use products containing raw eggs.
26. Hard, small and round, smooth and sticky solid foods are not recommended because they may cause choking and aspiration.
27. Ensure that infants and toddlers are always supervised during feeding.
28. Avoid feeding an infant using a "propped" bottle.

Nutrition in the Second Year

Healthy eating is important in the second year to: (a) provide the energy and nutrients needed to grow and develop; (b) develop a sense of taste and an acceptance and enjoyment of different foods; and (c) instill attitudes and practices which may form the basis for lifelong health-promoting eating patterns.

Recommendation:

29. Small, frequent, nutritious and energy-dense feedings of a variety of foods from the different food groups are important to meet the nutrient and energy needs during the second year.

Other Issues in Infant Nutrition

(i) Food allergies

Whenever possible, allergies to food should be prevented. Evidence shows that exclusive breastfeeding for at least 4 months decreases the risk of allergies in infants with a positive family history.

Recommendation:

30. Encourage exclusive breastfeeding for the first 6 months to decrease the risk of allergy.

Treatment of proven food allergies involves avoidance of foods known to cause symptoms.

Recommendation:

31. When food choices are restricted, ensure that dietary intake continues to meet nutrient and energy needs.

(ii) Colic

Dietary manipulations have had limited success in the treatment of colic.

Recommendation:

32. Ensure that any dietary modification or pharmacological interventions are safe.

(iii) Constipation

In infancy, true constipation is infrequent.

Recommendation:

33. Parents need to be educated about the wide variation in normal bowel function in infants and toddlers to avoid over treatment of normal variants.

(iv) Dietary fat

Dietary fat is an important source of energy and the only source of essential fatty acids.

Recommendation:

34. Dietary fat restriction during the first 2 years is not recommended because it may compromise the intake of energy and essential fatty acids and adversely affect growth and development.

(v) Dental caries

Prevalence of dental caries is lower where infants and children have access to fluoridated water and where long-term exposure of teeth to nutrient-containing liquids is avoided. Excessive fluoride intake can cause dental fluorosis.

Recommendations:

35. Fluoride supplementation is not recommended for infants less than 6 months of age.
36. For infants between the ages of 6 months to 2 years who are living in areas where the household water supply contains less than 0.3 ppm ($\mu\text{g/L}$) fluoride, daily supplementation with 0.25 mg fluoride is recommended. Where the principal drinking water source contains ≥ 0.3 ppm ($\mu\text{g/L}$) fluoride, supplementation is not recommended.
37. Avoid excessive intake of fluoride.
38. Avoid the use of a bottle during sleep time or as a pacifier. Avoid nocturnal and long-term use of baby bottles containing liquids other than water.
39. Do not dip pacifiers or nipples in sugar or honey.

(vi) Gastroenteritis

Manage mild to moderate dehydration associated with gastroenteritis with oral rehydration therapy (ORT). Prevent malnutrition.

Recommendations:

40. Manage mild to moderate dehydration with an oral electrolyte solution and early refeeding.
41. For infants who are breastfed, continue breastfeeding while supplementing fluid intake with an oral electrolyte solution.

(vii) Diabetes

The exact role of early infant nutrition as a possible etiologic factor for infants genetically at risk for diabetes has not been proven.

Recommendation:

42. There is no justification at this time to recommend changes to infant feeding practices for the purpose of preventing diabetes.

(viii) Iron-deficiency anemia

Iron deficiency is preventable through appropriate feeding choices.

Recommendations:

43. Continue exclusive breastfeeding for the first 6 months.
44. Introduce nutrient-rich complementary foods with particular attention to iron at 6 months of age.
45. Choose iron-containing formulas for infants who are not breastfed or for infants receiving formula as well as breast milk.
46. Delay the introduction of whole cow's milk until 9 to 12 months of age.
47. Continue to offer iron-fortified foods beyond 1 year of age to provide sufficient iron.
48. Where informed parents choose not to adhere to these recommendations, screen for anemia at 6 to 8 months of age and provide medicinal iron drops if necessary.

(ix) Vegetarian diets

Nutritional needs can be met by most well-planned vegetarian diets. For vegetarian diets that are limited in variety and nutritional quality, professional advice regarding supplements is appropriate.

Recommendations:

49. For vegan infants who are not breastfed, promote commercial soy-based infant formula during the first 2 years of life.
50. After dietary assessment, recommend nutrient supplements for vegan diets which are found to be nutritionally incomplete.

APPENDIX 6: INVEST IN KIDS PARENTING SKILLS

Results of the Invest in Kids literature review regarding the skills parents require to promote: infant/child emotional and social development, secure attachment and to promote compliance and internalization and to build the strengths of their child's temperament.

Skills to promote infant/child emotional and social development:

- To accurately assess the momentary state of alertness or mood of the infant.
- To provide prompt, sensitive and effective responses to the distress of young infants.
- To realize that their own emotions are monitored very closely by infants.
- To avoid becoming angry with young children and to protect them from others' anger.
- If either parent is anxious, depressed or in other negative states, to provide some periods of relief from this atmosphere for infants and children.
- To understand that they communicate their own emotions, especially the intensity of emotions through their voice, their facial and body expressions and their touch.
- To talk about their own and their children's emotions from a very early age.
- When other people are around, to help even very young children to understand the emotions that the others are experiencing.

Skills to promote secure attachment:

- Accurately assess infant cues and signals to they can respond.
- To respond promptly and sensitively when their infants are in distress.
- To know what infants/children are capable of and know what can be done to assist them.
- To feel and communicate warm feelings with their infants and young children.

Skills to promote compliance & internalization and to build the strengths of their child's temperament:

- To develop a warm relationship with the child.
- To be patient.
- To know that even very young children will accommodate and negotiate when they are reluctant to follow parent directions.
- To use parental authority, but in moderation and always in the context of a loving relationship.

Core Public Health Functions for BC: Evidence Review
Healthy Infant and Child Development

- To know about the different kinds of temperament and to respect the temperament individuality.
- To know the cues and signals their child sends them.
- To know that parents have a temperament too.
- To know that it is unrealistic to try to treat each of their children “exactly the same”.
- To know that some temperament characteristics are more challenging than others.
- To know how typical children grow and develop to know how to work with a specific child’s temperament.
- To know that even young children “select” people and environments to suit their temperament.
- To know parenting programs can be helpful.