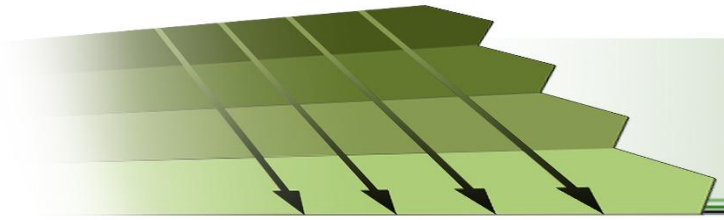


CORE
Public Health Functions for BC

Evidence Review:

Communicable Disease (Secondary Prevention)

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:
Malcolm H. Steinberg, BC Centre for Disease Control

Evidence Review accepted by:
Population and Public Health, Ministry of Healthy Living and Sport (July 2008)
Core Functions Steering Committee (January 2009)

TABLE OF CONTENTS

List of Tables

Appendices

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 communicable disease 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

This evidence paper focuses on secondary prevention and more specifically on screening, contact tracing, and post-exposure prophylaxis.

2.0 COMMUNICABLE DISEASES AND THE CORE FUNCTIONS FRAMEWORK

2.1 Core Programs

Communicable diseases are located in the disease, injury and disability prevention core programs, which are intended to prevent specific health problems that make, or might make, a significant contribution to the burden of disease. Priorities that are highlighted include vaccine-preventable diseases; prevention of sexually transmitted and blood-borne communicable diseases, including HIV/AIDS, chlamydia, gonorrhoea, syphilis, and viral hepatitis B and C; prevention and control of tuberculosis, especially the multiple resistant strains; prevention and control of travel-related, imported and exotic diseases, including rare but potentially serious conditions such as Lassa fever or Ebola virus; and new/emergent diseases.

Notwithstanding, the other three core program areas are also relevant for communicable disease prevention and control. In the health improvement core programs, examples of priority areas are reproductive health, which includes reducing sexually transmitted diseases and cervical cancer; and healthy development, which includes optimum immunization. In the environmental health core programs, continuing to assure and improve the safety and sustainability of our food, water, air and soil is of paramount importance for the prevention of a wide range of communicable diseases. The health emergency management core programs include responses to potential acts of bio-terrorism, which could involve highly infectious agents.

2.2 Public Health Strategies

The core functions framework assumes that public health core programs use four complementary strategies that are particularly identified with the public health approach. These four strategies of health promotion, health protection, preventive interventions, and health assessment and disease surveillance overlap with each other and rest on the capacity of the public health system. Each of these modalities is critical to the control and prevention of communicable diseases.

Health protection strategies important to communicable diseases include those relevant to safe food, drinking water and recreational water, and adequate community sanitation. Preventive intervention strategies, which impact on communicable diseases, include primary prevention initiatives such as immunization and vector control, and early secondary prevention strategies, which is the focus of this paper. Health assessment and disease surveillance strategies important for communicable disease prevention and control include detecting disease clusters and outbreaks through community-based, hospital-based, and clinical epidemiology, and laboratory surveillance networks. Finally, health promotion strategies important for communicable disease prevention and control include a set of strategies that enable people to increase control over and improve their health.

3.0 SECONDARY PREVENTION AND THE CORE FUNCTIONS FRAMEWORK

The continuum of prevention of communicable diseases includes measures to prevent their occurrence and those to arrest their progress and reduce their consequences once established. These measures range from primordial to quaternary prevention. However, as mentioned above, the focus of the ministry core functions framework for prevention is mainly concerned with primordial prevention and primary prevention, and to a much lesser extent, early secondary prevention. This latter prevention strategy is seen by the ministry to be the task of preventive primary care medicine, whereas the first two prevention strategies are understood to fall into the area of public health policy and health promotion (primordial prevention) and be the task of public health (primary prevention). While secondary prevention is critical for a comprehensive approach to communicable diseases it is especially important for those instances where vaccines, as a major method of primary prevention, are not available.

The ministry framework concurs that 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"[1] and views screening as the core detection strategy for achieving these goals. Reduction in the duration of infectivity, particularly among those most likely to transmit the infection to others, lowers the reproductive rate of infection ($R0$). It is worth noting that early detection and management of individuals with communicable diseases provide not only secondary prevention at the individual level, but also primary prevention at the population level by preventing further transmission. These set of secondary prevention measures include curative and preventive treatment as well as behavioural interventions for individuals, and provide insight for population health and health promotion strategies for the communities from which identified individuals originate.

While contact tracing or partner notification, and preventive treatment, including post-exposure prophylaxis as an aspect of this, are not specifically mentioned in the ministry reference document, these strategies are important secondary prevention measures. Active follow up of those exposed to communicable diseases is critical to prevent re-infection of the index case and reduce ongoing transmission from the index case (in the event of chronic disease or incomplete treatment) to the contact(s) and/or from the contact(s) to further susceptible individuals. Likewise, where preventive treatment is possible, prophylaxis of individuals identified through screening and/or partner notification is an important secondary prevention measure.

4.0 APPROACH TO GRADING THE EVIDENCE

Evidenced-based is usually taken to mean that the behavioural, social, and structural interventions that are relevant to the program goal(s) and objective(s), have been tested using a methodologically rigorous design, and have been shown to be effective in research settings. Common requirements include that they are evaluated using behavioural or health outcomes; compared to a control/comparison group(s) (or pre-post data without a comparison group (s) if a policy study); have no apparent bias when assigning persons to interventions or control groups or adjusting for any apparent assignment bias; and, produce significantly greater positive results when compared to control/comparison group(s), while not producing negative results.[2]

A number of approaches exist for grading the evidence for health related interventions and are far too numerous to review here. However it is worth highlighting a selection of those that have been widely used for assessing the evidence for secondary prevention initiatives.

- ***The Canadian Task Force on Preventive Health Care (CTFPHC)****:* The CTFPHC has updated their recommendations for clinical preventive actions to now include six letter grades or categories.[3] These changes reflect the ongoing evolution of methodology and reporting, both within the CTFPHC and in the larger context of evidence-based medicine, such as within the U.S. Preventive Services Task Force.[4] For example, the CTFPHC recommendations now include an "I" grade. This lets clinicians, the public and policy-makers know that the existing body of evidence is of insufficient quantity or quality (or both) to support a specific recommendation for that clinical preventive action. Thus, a decision to provide the clinical preventive action thus must be based on something other than evidence. Appendix 1 includes the recommended grades for specific clinical preventive actions, and the levels of evidence for research design and quality rating.
- ***The Canadian STD Guidelines rating system****:* This includes level of recommendation for treatment (following screening and/or partner notification activities) and quality of evidence indicators for the treatment recommendations. The indicators used reflect a combination of methodologies,[5] including those from the U.S. Preventive Services Task Force and the Canadian Task Force on Preventive Health Care (see Appendix 2).
- ***The American Family Physician Strength of Recommendation Taxonomy (SORT)****:* This approach was used in a recent Canadian review of third-trimester care and the prevention of infectious diseases.[6] SORT address the quality, quantity, and consistency of evidence and is designed for use by authors with varying degrees of expertise in evidence-based medicine and clinical epidemiology and interpreted by physicians with little or no formal training in these areas.[7] This approach is consistent with the information mastery framework[8] and is highlighted in Appendix 3.

Notwithstanding these and other approaches, the one that was selected for assessing the evidence for all the communicable disease papers is the one recently developed by the Health Development Agency in the United Kingdom.[9] This is briefly described.

4.1 The Health Development Agency Approach to Grading Evidence for Public Health Intervention

This approach suggests a pyramid of evidence building blocks upon which grades of recommendations may be based (see Appendix 4). Built up from a comprehensive review of the literature, complimented by consultations with individuals and organizations with expertise in public health and/or grading methodology, this approach presents a pragmatic framework that allows for the grade of recommendation to be promoted where the research design to demonstrate efficacy is weakened by design or methods, but where there is consistent evidence from corroborative studies to suggest that the intervention is relevant, feasible and could be implemented for the population in question. The Health Development Agency (HDA) approach also includes overall evidence for cost effectiveness.

4.1.1 Evidence of Efficacy

The HDA approach retains an evidence hierarchy to assess for the efficacy of an intervention in which high quality meta-analyses, and systematic reviews of randomized control trials or randomized control trials with a very low risk of bias are at one extreme of the spectrum. This leads into seven additional levels of evidence where expert opinion and formal consensus are at the other end of the spectrum. This is summarized in Appendix 5.

4.1.2 Evidence of Corroboration

A key distinction of the HDA approach is the recommendation that evidence for efficacy be combined with an overall assessment of the strength of evidence of corroboration for the intervention in question. This refers to evidence that confirms or strengthens conclusions and recommendations based on efficacy. As emphasized this is critical where the research design to demonstrate efficacy is weakened by design or methods.

Evidence for corroboration addresses the issues of direct applicability to a target population and extrapolated evidence and in so doing draws on sources of evidence above and beyond that found in studies of efficacy. While questions of efficacy ask if the intervention worked in the context of the study or research from which the evidence was drawn, evidence for corroboration pursues questions of effectiveness more deeply in that it asks if the intervention will work in practice in other settings and/or for other populations. In the HDA approach, evidence for corroboration is concerned with whether the intervention will work for this population and, even if it will work, whether it matters or if it will have relevant outcomes for this population. The former is referred to in the pyramid mentioned above as evidence to support implementation and the latter, evidence of salience. Questions of implementation consider issues of feasibility, plausibility, acceptability, transferability and sustainability.

In presenting the recommendation for the inclusion of evidence of corroboration, the authors of the HDA suggested that the evidence be graded in the following way:

- ***Strong****:* Consistent findings in two or more studies with very low risk of confounding, bias or chance carried out within the country of interest and applicable to the target population with evidence of salience and implementation

- ***Moderate**:* One study with the features listed above or two or more studies with very low risk of confounding, bias or chance not carried out in the country of interest but applicable to the target population, with evidence of salience and implementation
- ***Limited**:* Only one study of low, as opposed to very low, risk of confounding, bias or chance carried out within the country of interest, or two or more studies with inconsistent findings but on balance providing evidence of benefit, or studies of low risk not carried out in the country of interest but applicable to the target population
- ***No evidence**:* No study of acceptable quality or inconsistent studies with unclear benefit or no relevant research available

The HDA approach takes the evidence of efficacy and corroboration to arrive at a grading system for public health recommendations that includes five levels. The two extremes of this grading scheme are shown in Table 1 below. The full grading scheme is depicted in Appendix 6.

Table 1: Health Development Agency Grading System for Public Health Recommendations (selected categories)

Class	Basis for Decision
A (public health recommendation)	At least one 1++ study or consistent findings in a body of studies (3 or more or a systematic review) principally rated as 1+ for efficacy, with strong or moderate evidence of corroboration OR Consistent findings in a body of 2++ studies for efficacy, with strong evidence of corroboration
D (good practice point recommendation)*	A recommendation based on experience of best practice by health professionals and expert groups

* This is weaker than Class D (public health recommendation).

1++ refers to high quality meta-analyses, systematic reviews of randomized control trials (RCTs) (including cluster RCTs), or RCTs with a very low risk of bias.

1+ refers to well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.

2++ refers to high quality systematic reviews of, or individual high quality non- randomized intervention studies (controlled non randomized trial, controlled before-and-after, interrupted time series), comparative cohort and correlation studies with a very low risk of confounding, bias or chance.

5.0 SECONDARY PREVENTION: DEFINITIONS, SCOPE AND CHALLENGES

5.1 Screening

Screening is the presumptive identification of unrecognized disease by the application of tests which can be applied rapidly.[10] Screening is a strategy of case finding as is the identification, testing and treatment of contacts through partner notification initiatives.

Screening tests are usually not intended to be diagnostic and persons with positive findings are often referred for a diagnostic procedure or procedures such as a confirmatory test. However, many screening tests have very high sensitivity and specificity with the result that the positive predictive value of the test is often sufficient to act upon. This is moderated by the underlying prevalence of the disease in the target population.

The scope of a screening intervention can differ in the following ways:

- ***Mass screening or mandatory screening*** means the screening of the whole population as is the case in the Canadian Blood Services where testing is carried out on all donations to exclude hepatitis B (HBsAg, anti-HBc), hepatitis C (anti-HCV and HCV NAT), HIV (anti-HIV 1/2, and HIV NAT), HTLV-1/II (anti-HTLV-I/II), syphilis, and WNv (WNV NAT). Anti-CMV testing is also done on any collection from which platelets are manufactured. Plasma sent for fractionation also gets tested for B19 virus. Finally, bacterial testing (BacT Alert) is done on all plateletpheresis collections.[11] When the Buffy Coat platelet production process gets implemented in BC (within the next year), the blood transfusion services will be doing bacterial testing on all platelets products (Dr. M. Bigam, personal communication, March 29, 2006).

- ***Universal screening*** means to offer voluntary screening to as many people in the defined population as possible. An example here is the current recommended practice of screening for HIV in pregnant women in Canada where pregnant women are informed that an HIV test will be part of a standard group of prenatal tests and that unless they decline, they will receive the test. This "opt-out" strategy is distinguished from the "opt-in" approach where pregnant women are given pre-test counselling and must agree to the HIV test usually in writing. Monitoring of HIV screening uptake has demonstrated that the opt-out strategy results in higher uptake of testing.[12]

- ***Selective or targeted screening*** is applied to segments of the whole population considered to be at higher probability of having the disease based on risk factor assessment. The screening of women under 25 for chlamydia infection in family planning services is an example of selective screening where age is the risk factor that selects out these asymptomatic women from the population of all asymptomatic sexually active women.

Screening should be appropriately focused and should be based on surveillance data and knowledge of the populations and prevalence of disease. In general, as the prevalence of any communicable disease decreases in a population, there would be less emphasis on screening

programs, but increased emphasis on population-based interventions to reduce disease acquisition and transmission such as maintaining healthy sexual behaviours in the community for sexually transmitted infection (STI) prevention and control.

Generally accepted criteria for screening programs include that the screened condition be an important health condition; that the proposed screening test be acceptable to the population; and that an effective intervention be available.[13] These criteria impact on approaches to weigh the evidence for these interventions. Applying these criteria for hepatitis C screening in the antenatal period leaves little doubt about the conclusion.[14]

- ***The condition is an important public health problem***. Hepatitis C (HCV) infection can lead to serious sequelae such as liver cirrhosis and hepatocellular carcinoma. The natural history is well understood. HCV infected children are usually asymptomatic in the first five years of life. They may be at risk of serious hepatic disease in later life but the long-term natural history of vertically acquired HCV infection has not been adequately described

- ***A safe, valid and reliable screening test is available which is acceptable to those being tested***. Screening tests with satisfactory sensitivity and specificity are available but, due to the low prevalence of HCV infection in the general antenatal population their positive predictive value is low and a substantial number of uninfected women would test positive on the first sample.

- ***Treatment or an intervention of proven effectiveness is available***. There are currently no interventions of proven safety and efficacy for the prevention of mother-to-child transmission of HCV. There is no evidence that an elective caesarean section delivery reduces the risk of HCV vertical transmission or that type of infant feeding is associated with risk of transmission among women who are not co-infected with HIV. Antiviral treatment with ribavirin is contra-indicated in pregnancy. Treatment with interferon is not recommended for children under three years of age and the efficacy of treatment for vertically infected children has not been sufficiently evaluated.

- ***The risk of harm, both physical and psychological, is less than the chance of benefit***. Unnecessary anxiety is associated with re-testing of the not insignificant number of uninfected women who test positive on the first screening test. No intervention can be offered to infected women to reduce the risk of transmitting HCV to their child.

Thus, at the present time no case can be made for an HCV screening program that specifically targets the antenatal period.

The characteristics of a screening test include accuracy, estimates of yield, precision, reproducibility, sensitivity and specificity, and validity. This paper will not dwell on these aspects but instead focus on issues of application and coverage. The latter is a measure of the extent to which screening services for any particular communicable disease cover the potential need for these services in a community. Coverage is expressed as a proportion in which the numerator is the number of individuals actually screened from a target population and the denominator is the total number of individuals in the target population. For example, pregnant

women are a target population for a number of screening interventions but not all pregnant women necessarily receive this screening as a result of inadequate provider compliance in implementing screening guidelines and/or pregnant women themselves availing themselves of screening opportunities. The Ministry of Health in BC has recognized the need to increase uptake for HIV screening in this and other target populations and has set a goal of decreasing the proportion of those unaware of their HIV status by 50% over the period 2003–2007.[15] Thus the focus of this paper, with respect to screening, will be to examine evidence for where screening needs to be extended (or curtailed) and evidence, where it exists, for achieving optimal coverage through both provider and target population interventions.

5.2 Partner Notification

Partner notification, or contact tracing, is a well established public health practice. Appendix 7 summarizes the recommended approach to partner notification for sexually transmitted infections in Canada.[16] Guidelines for contact management for other communicable diseases are provided by the BC Centre for Disease Control (BCCDC).[17] These include guidelines for hepatitis A, hepatitis B, meningococcal disease, *B. Pertussis*, varicella zoster, *haemophilus influenzae* type b, and tuberculosis.

Partner notification, or contact tracing, in the fullest sense is a spectrum of activities in which cases exposed to known individuals with confirmed or suspected disease are identified and located (contacted and notified) and offered services that include assessment, counselling, screening and prevention, and support. Partner notification not only produces a public health benefit through contributing to disease surveillance and control, but dramatically reduces the risk of re-infection for the original patient. While partner notification is sometimes construed as an exercise in societal vs. individual rights, its aim is clearly to assist people in honouring the individual rights of their partners to know they have been put at risk and to make informed decisions regarding their health and in some instances their life.[18] One of the fundamental tenets of partner notification is that confidentiality of the source partner is maintained absolutely. In practice, however, if the contact has had only one partner then confidentiality is impossible to preserve.[19]

The difference between contact tracing and partner notification has both historical and philosophical interest. Many trace the use of contact tracing to Thomas Parran, the architect of US federal anti-venereal disease programming, who in 1936 emphasized that this was a key strategy to break "the chain of disease transmission".[20] By the 1940's "contact epidemiology" had become a central feature of syphilis control programs.[21] While the term partner notification has taken precedent since then there are those that challenge this on the basis that "partner notification is a unidimensional term for a multidimensional activity." This author feels that contact tracing is a more appropriate term and that it mirrors the three faces of the activity in a combined ethical, control and epidemiological tool. He adds that while contact tracing assists community efforts to reduce the disease burden and fulfill ethical obligations to warn the unsuspecting, its least appreciated and most powerful attribute is epidemiological where it can delineate risk networks hosting transmission and provide empiric estimates for mathematical model parameters. As he concludes, not only can contact tracing take epidemiologists to where the problem is but it can also tell them if they are in the wrong place. He ends off noting that

"partner notification is the shell of the activity whereas contact tracing is its soul."[22] While this author's comments are placed in the context of sexually transmitted diseases, they serve to unpack the meaning of this activity.

There are various approaches to partner notification that have been used.[23] These include:

- ***Provider referral****:* This uses third parties (usually health service personnel) to notify partners.
- ***Patient or self referral****:* This occurs when health service personnel encourage index patients to notify their partners.
- ***Contract referral****:* Also known as conditional referral, this refers to when health service personnel encourage index patients to notify their partners with the understanding that health service personnel will notify those partners who do not visit the health service by an agreed date.
- ***Outreach assistance****:* This follows on from a request of patients to notify partners by members of an outreach team indigenous to the community, who do not disclose the name of the patient to the partners.

Partner notification poses unique challenges to sex workers and their clients and injecting drug users. For example, in the former case, there is a strict code of ethics whereby sex workers do not disclose the identity of the clients that are known to them. For injection drug users (IDUs), the social consequence of drug use includes the possibility of legal prosecution. The outcome is often distrust, difficult access, fluctuating social networks. Informing about others is mostly unacceptable within this population and may result in retribution including violence.[24] Additional barriers to partner notification, especially in the context of sexually transmitted diseases,[25] include:

- Actual or feared physical or emotional abuse that may result from partner notification (e.g., conjugal violence). It is important to note that if there is a threat to patient safety, public health officials should be notified of this so that proper safety precautions are taken to protect the index case. Safety always trumps the notification process.
- Fear of losing a partner due to a STI diagnosis (blame/guilt).
- Feared legal procedures.
- Fear of re-victimization on the part of sex crime victims.
- Anonymous partnering.

One further challenge is posed by viral STDs, including HIV, is that asymptomatic contacts may perceive less to gain as a result of being notified. In addition, unless partner notification for these conditions results in behaviour change to reduce risk of transmission, this activity is not worthwhile from an epidemiological perspective. However, both of these issues can be debated. There are effective interventions for people with viral infections such as prophylactic therapy for

opportunistic infections and there is effective therapy to prevent vertical transmission of HIV. In addition, the contacts of viral STDs can be screened for coincident bacterial STDs for which they may also be at risk.[26] Finally, there are emerging strategies to exploit the impact of antiretroviral therapies based on reducing viral loads to levels below those required for transmission.[27] This is currently being studied in a two-arm, multi-site, randomized trial[28] to determine the effectiveness of this strategy in preventing the sexual transmission of HIV in HIV-serodiscordant couples.[i]

5.3 Post-exposure Prophylaxis

Post-exposure prophylaxis (PEP) is treatment provided after exposure to a communicable disease, in order to prevent the disease from occurring. This involves chemoprophylaxis, the provision of drug therapy, or immunoprophylaxis to produce active or passive immunity from immunization. PEP is a strategy that one can use after successful detection of exposed individuals to an index case through contact tracing, or in individuals that come forward after exposure to a source case known or suspected to be infected such as a health worker who has suffered a needle stick injury or a rape victim.

Guidelines for PEP are provided by the BCCDC.[29] These include guidelines for hepatitis A, hepatitis B, meningococcal disease, *B. Pertussis*, rabies, Simian B virus, varicella zoster, Botulism, *haemophilus influenzae* type b, measles, iGAS, influenza and tuberculosis. The protocols for PEP differ according to the disease under consideration and the nature of the treatments available.

The provision of prophylactic regimens is often given before or without laboratory confirmation of infection in those exposed to the source case. These post-exposure prophylactic interventions are distinguished from chemoprophylaxis for the prevention of active disease given once an infection has been verified.

In certain instances, post-exposure treatment is not known to decrease the risk of transmission. This is the case of *haemophilus influenae* type b (Hib disease) and other evidence-based considerations would not be considered. However, this situation presents an opportunity for completion of Hib immunization of contacts and is therefore offered if there is a negative or incomplete history of immunization.

For the PEP of botulism, skin tests for sensitivity to serum or antitoxin are required prior to administration regardless if the patient has received serum or antitoxin previously and the decision to provide immunoprophylaxis for asymptomatic exposed people should be weighed carefully in view of the risk of adverse effects and sensitization to horse serum.

[i] The index case of the first group starts taking ART as soon as the couple is enrolled in the study, while the index case of the second group starts taking ART when his or her CD4+ cell count drops to 200 cells/mm^3 or when he or she develops an AIDS-defining illness. Both groups will receive HIV primary care and couples counselling sessions to teach them how to reduce their risk of transmission.

A number of challenges have been identified for the implementation of PEP guidelines. These were highlighted in an interview with four senior communicable disease nurses from Victoria, Kamloops, Prince George and Dawson Creek[ii] and include the following:

- ***Evidence of effectiveness of particular PEP regimens***. All cited the problematic examples of chemoprophylaxis for invasive Group A Streptococcal (iGAS), *B. Pertussis* (specifically TdaP vaccine for outbreaks of pertussis); and serogroup-specific meningococcal vaccine for contacts. Three of the nurses elaborated on the difficulty experienced with community physicians in supporting HA guidelines. For example, physicians stated public health was giving them conflicting messages (i.e., they were being asked to prescribe antibiotics for their patients where there was insufficient evidence, and then on the other hand with the "Do Bugs Need Drugs" program emphasized that antibiotics are being over-prescribed). These three nurses suggested there be subsections in the disease-specific chapter of the Communicable Disease Control Chapter from the BCCDC that summarize key effectiveness data, so that primary health care nurses would be more confident in their discussions with community physicians.

- ***Evidence regarding public health versus community physician involvement***: The nurses felt that the public is having a harder time accessing physicians. The suggestion was that public health can offer a "one-stop shop" if they have chemoprophylactic agents and dispense these. The nurses noted that there should be more consistent messaging to the public and that this should come from one source only. However they felt that there is a benefit of physician involvement if they know their patient's history.

- ***Evidence for communication and counselling approaches***: Evidence for the most effective means of communicating information (including benefit-risk communication) to cases and contacts of communicable diseases is needed to improve compliance with recommendations. This includes best practices in the initial interview of the case in order to obtain a comprehensive list of contacts. The nurses also requested evidence for effective approaches to counsel and educate contacts.

[ii] The question posed was: What evidence would be most useful to improve outcomes of HA recommendations for chemoprophylaxis and immunoprophylaxis?

6.0 SECONDARY PREVENTION: THE EVIDENCE

6.1 The Evidence for Screening

Numerous guidelines exist for the screening of communicable diseases but no documents were retrieved that bring these together in one source. In addition, guidelines for screening are usually contained within integrated documents for public and preventive health interventions for communicable diseases including their treatment. For example, STD guidelines are available from the Centers for Disease Control and Prevention (CDC) in Atlanta[30] and the updated Canadian guidelines are forthcoming from the Public Health Agency of Canada (PHAC). Early release of selected chapters has been made available and was consulted for this paper.[31] A key source for this section of the paper has been the *Canadian Guide to Clinical Preventive Health Care* (updated 2005/09).[32] This is a recent synthesis of the evidence-based recommendations on clinical preventive health care developed by the Canadian Task Force on Preventive Health Care (CTFPHC), [33] and includes screening.

The evidence for screening is presented for the antenatal population; neonates and infants; various high-risk and special populations; and the non-pregnant, non-high-risk asymptomatic population.

6.1.1 Antenatal Screening

HIV

Highest level of evidence: 2+	**Public health recommendation: C**

The CTFPHC recommends that voluntary screening for HIV in pregnant women should be considered in large cities, where the rate is highest, based on a concern about the low rate of HIV infection in Canada and the resulting poor positive predictive value of this screening intervention. This conclusion was arrived at after conflicting evidence from cohort studies.[34,35,36,37,38,39,40,41,42,43]

Notwithstanding, recent recommendations from the U.S. Preventive Services Task Force (USPSTF) recommend the screening of all pregnant women for HIV, basing this on good evidence where the benefits of screening substantially outweigh potential harms.[44]

A recent Canadian authored review has confirmed the recommendation for HIV testing for all pregnant women in the United States and Canada[45] with reference to various supporting guidelines.[46,47,48,49,50,51,52] The review emphasizes that women at increased risk for HIV infection should be re-tested in the third trimester of pregnancy and that testing should be voluntary and done with informed consent.[53,54] It is noted that areas in the United States and Canada that use "opt-out" voluntary testing strategies or mandatory testing of newborns have higher rates of screening than areas with an "opt-in" policy.[55,56] The review adds that targeted HIV testing in women thought to be at increased risk fails to identify a significant portion of infected women.[57]

Economic evaluations tend to support screening asymptomatic pregnant women for HIV. A cost benefit analysis conducted in 1992 concluded that the primary benefit of screening programs

targeted to women of childbearing age lies not in the prevention of HIV infection in their newborns but in the prevention of infection in their adult contacts. The authors recommended that screening medium and high-risk women is likely to be cost beneficial over a wide range of assumptions about program cost and behavioural change in response to screening.[58] A number of economic evaluations since this one, that have focused on infections averted and life expectancy costs, have concluded that universal, voluntary antenatal HIV screening is cost effective[59,60,61] with one study suggesting that this is achieved in populations where HIV prevalence exceeds 9 per 1,000.[62]

It is important to emphasize that no trials directly link HIV screening with clinical outcomes for the infected pregnant women. Good quality evidence has shown highly active antiretroviral regimens to be consistently effective in reducing clinical progression and mortality in persons with CD4 cell counts less that 200 cells/mm^3. [63,64] Theoretically, asymptomatic pregnant patients in an earlier stage of disease at the time of diagnosis may also benefit from these regimens. However, there are no completed trials showing clinical benefit from treatment versus no treatment in such patients.

Syphilis

Highest level of evidence: 2++	**Public health recommendation:** B

The USPSTF strongly recommends that clinicians screen all pregnant women for syphilis infection. The USPSTF found observational evidence that the universal screening of pregnant women decreases the proportion of infants with clinical manifestations of syphilis infection and those with positive serologies and concludes that the benefits of screening all pregnant women for syphilis infection substantially outweigh potential harms.[65]

Hepatitis B

Highest level of evidence: 2++	**Public health recommendation:** B

Prevention of perinatal infection through maternal HBsAg screening and post-exposure prophylaxis of at-risk infants, is one of four CDC's national immunization strategies to eliminate transmission of HBV infection. The other three includes universal infant immunization, universal immunization of previously unvaccinated adolescents aged 11–12 years,[66] and vaccination of adolescents and adults at increased risk for infection.[67] Screening for active hepatitis B infection is also recommended by other agencies.[68,69,70,71,72] All of these recommendations are based on good evidence that screening improves important health outcomes and concludes that benefits substantially outweigh harms. Women who were not screened during pregnancy and those at increased risk should be tested at admission for delivery.[73] The impact of this screening intervention has been examined in a Canadian setting and found to be cost effective.[74] It has also been found to be cost effective in a UK setting.[75]

Chlamydia and Gonorrhoea

Highest level of evidence: 2+	**Public health recommendation:** C

The CTFPHC concludes that there is fair evidence to support screening of pregnant women for chlamydia during their first prenatal visit and subsequent treatment based on cohort studies. The outcome for these studies was improved perinatal and postnatal outcomes for their infants from erythromycin treatment of women with an infection.[76,77,78,79]

Similarly, there is fair evidence to support annual screening of high-risk pregnant women (see high-risk and special populations below).

Although gonoccocal infection is relatively uncommon in many clinical practices, it is still suggested by various agencies that all pregnant women be screened in early pregnancy due to the adverse consequences of an untreated infection. Infection with *N gonorrhoeae* in pregnancy is associated with endometritis, pelvic sepsis, ophthalmia neonatorum and systemic neonatal infection. Some specialists also recommend rescreening for *C. trachomatis* and *N. gonorrhoeae* 4-6 weeks after therapy is completed in women with PID and documented infection with these pathogens although this is not based on evidence from high quality studies. Rescreening is distinct from early re-testing to detect therapeutic failure (test-of-cure). Except in pregnant women, test-of-cure is not recommended for persons treated with the recommended regimens, unless therapeutic compliance is in question.

Various sources contain recommendations for screening women for chlamydial infection and gonorrhea at increased risk for sexually transmitted diseases (STDs), including those younger than 25 years[80,81,82,83]; or universally.[84,85]

Bacteriuria

Highest level of evidence: 1+	**Public health recommendation:** A

Screening pregnant women for asymptomatic bacteriuria has been shown to be effective for pyelonephritis (RCT and controlled trial without randomization[86,87,88]); and intra-uterine growth retardation (RCT[89]). Mention has also been made in the CTFPHC guidelines of reduced premature labour, stillbirth, and pre-eclampsia but this is not referenced to any studies.

Rubella

Highest level of evidence: 2+	**Public health recommendation:** D

Various sources recommend that all pregnant women should be screened for rubella if testing was not performed before conception. Non-immune women should be counselled about the risks of rubella during pregnancy and offered vaccination in the immediate postpartum period.[90,91,92,93] Evidence to support these recommendations was only fair and did not include randomized trials or cohort studies.

Group B Streptococcus Disease

Highest level of evidence: 2+	**Public health recommendation:** D

The CTFPHC recommends universal screening for group B streptococcus (GBS) disease with selective treatment of colonized women who also have clinical risk factors.[94] This is based on fair evidence from cohort studies to support intrapartum chemoprophylaxis for all pregnant women followed by selective intrapartum chemoprophylaxis for all women with positive results of GBS colonization[95,96,97] and/or only those women with risk factors.[98,99] Risk factors include preterm labour (< 37 weeks gestation); prolonged rupture of membranes ≥ 18 hours; maternal fever ≥ 38.0°C; GBS bacteriuria during pregnancy; and previous delivery of a newborn with GBS disease regardless of current GBS colonization.

These CTFPHC recommendations have been confirmed in a Canadian review.[100] A number of agencies support the recommendation for universal screening but suggest that all colonized women be treated with intravenous antibiotics at the time of labour or rupture of membranes.[101,102,103] These recommendation are based on a nonrandomized, population-based study.[104] GBS bacteriuria indicates heavy maternal colonization. Thus the CDC in Atlanta has recommended that women with GBS bacteriuria or a previous infant with GBS infection should be offered intrapartum antibiotics routinely and therefore do not require vaginorectal culture.[105] The National Collaborating Centre for Women's and Children's Health, however, recommends against GBS screening, feeling that evidence of its clinical effectiveness and cost effectiveness remains uncertain.[106]

Bacterial Vaginosis

Highest level of evidence: 1++	**Public health recommendation not to screen:** A

The USPSTF,[107] a Cochrane review,[108] and a Canadian review[109] have concluded that routine screening is not recommended. The Cochrane review demonstrated that antibiotic therapy was effective at eradicating bacterial vaginosis during pregnancy but treatment was not significant in reducing the risk of preterm birth before 37 weeks, preterm birth before 32 weeks, or the risk of preterm prelabour rupture of membranes. For women with a previous preterm birth, treatment did not affect the risk of subsequent preterm birth. However, it may decrease the risk of preterm prelabour rupture of membranes. The authors concluded that for women with a previous preterm birth, there is some suggestion that treatment of bacterial vaginosis may reduce the risk of preterm prelabour rupture of membranes and low birth weight.

Herpes Simplex Virus (HSV)

Highest level of evidence: 2+	**Public health recommendation not to screen:** C

There is currently no evidence to investigate or treat pregnant women who have no history of genital herpes and whose partners also have no history. Screening trial and prospective cohort

study designs suggest fair evidence to exclude weekly screening from 32 weeks gestation in high-risk pregnancies (women with a history of recurrent herpes simplex or active disease during current pregnancy and those whose sexual partner has proven genital herpes simplex).[110,111,112] A cost effectiveness assessment of screening for maternal type-specific HSV antibodies demonstrated that $300,000 to $400,000 USD would be expended for each case of neonatal HSV infection averted and that under less favourable conditions expenditures would rise to almost $4 million USD per case of serious neonatal HSV infection prevented.

However, number of guidelines recommend that all pregnant women and their partners should be asked about a history of genital and orolabial HSV infection.[113,114,115,116,117]

Vaginal Trichomoniasis

This condition has been associated with adverse pregnancy outcomes, particularly premature rupture of the membranes, preterm delivery and low birth weight. However, data have not indicated that treating asymptomatic trichomoniasis during pregnancy lessens the risk of adverse pregnancy outcomes. In fact, treatment of asymptomatic trichomoniasis with metronidazole 2 g x 2 doses has been shown to increase preterm birth in a placebo-controlled trial.[118]

Varicella

Highest level of evidence: 4	**Public health recommendation: C**

Various studies have examined the cost effectiveness of antenatal varicella screening and concluded that a selective serotesting strategy, as part of a policy of screening and vaccination, could avert a significant number of cases and be cost-saving from a societal perspective.[119,120] This supports recommendations for selective prenatal serotesting with postpartum vaccination.[121]

Tuberculosis

Highest level of evidence: 4	**Public health recommendation: D**

Guidelines were located recommending purified protein derivatives (PPD) screening of all high-risk mothers at a preconception visit or the first antenatal care visit.[122] Important risk factors mentioned included poverty, drug use, HIV, new immigrants from tuberculosis endemic areas, and exposure to proven and suspected tuberculosis. These recommendations were motivated by significant risks of maternal tuberculosis including fetal infection, which can occur as haematogenous spread from the mother, by aspiration of amniotic fluid/endometrium, or airborne after delivery. In addition, congenital tuberculosis can result in mortality of 30 to 40%. However, these recommendations are based on expert consensus and not on evidence from quality studies.

Parasitic and Other Viral Infections

Highest level of evidence: 4	**Public health recommendation: C**

Routine screening for toxoplasmosis, cytomegalovirus, or parvovirus infection is not recommended[123] primarily because disease prevalence is low.[124] However, a review of two neonatal screening programs (New England Newborn Screening Program and the Danish National Neonatal Programme) for congenital infection with *Toxoplasmosis gondii* has concluded that this screening intervention is feasible in areas with a low risk of congenital infection and where prenatal screening will not be applicable. It is important to note that this paper, as with others recommending screening for toxoplasmosis, does not address primary means of prevention - avoidance of infection by cooking meats thoroughly to kill oocysts of toxoplasma, avoiding contact with cats (the definitive hosts) and their faeces, hand washing, and use of gloves when gardening.[125]

Immunization Status

Highest level of evidence: 2+	**Public health recommendation: D**

Screening pregnant women and women at risk for serologic or other proof of immunization status enjoys only fair evidence based on cohort studies[126,127] and expert opinion.[128]

Social Inequalities and Prenatal Screening

One review located has concluded that there are no significant social inequalities in either the offer or uptake of prenatal screening. [129] The review was prompted by some evidence that women from lower social classes and from some ethnic groups in the UK are less likely to receive screening for breast and cervical cancer.[130] A limitation of the review located is that it only focused on screening for HIV (in addition to a number of other non-communicable disease conditions). Three of the six HIV studies[131,132,133] reviewed studies identified ethnicity as a significant factor associated with screening but did not demonstrate consistent findings. The authors did report some evidence of ethnic inequalities with respect to South Asian women and screening for haemoglobin disorders and Down's syndrome when compared to White women but noted that further research is required to improve understanding of why testing may not be offered, the reasons for failure to take up testing when offered, and to identify whether there are other social inequalities in access to these screening interventions. Another study that looked at socioeconomic factors and their association with screening targeting women 20 years or older was conducted through a secondary analysis of data form Statistics Canada's National Population Health Survey and focused on Pap smears, mammography, bone densitometry and cholesterol screening. Findings showed having screening tests was associated with income, education, and place of residence and that patients who went to doctors for episodic care only were less likely to have preventive screening than patients who went for periodic health examinations.[134]

6.1.2 Neonates and Infants

The CTFHPC feels that there is fair evidence from cohort studies to include the screening of infants of HIV-positive women in the periodic health examination.[135,136,137]

Highest level of evidence: 2+	**Public health recommendation: C**

Routine screening of newborn sera or umbilical cord blood for syphilis is not recommended.

Highest level of evidence: 4	**Public health recommendation: D**

6.1.3 High-risk and Special Populations

HIV

Highest level of evidence: 1++	**Public health recommendation: A**

The CTFPHC concluded that there is good evidence from randomized controlled trials to include offering HIV screening in periodic health examinations of asymptomatic people at high risk. High-risk groups include homosexual and bisexual men, sex workers, injection drug users, people with sexually transmitted diseases, people receiving blood products between 1978 and 1985, sexual contacts of HIV-positive people, and people from countries with a high prevalence rate of HIV infection.

The USPSTF adds that both adolescents and adults at increased risk should be screened. The USPSTF definition of people at high risk includes men and women having unprotected sex with multiple sexual partners, the partners of sex workers, and men who have had sex with men after 1975. These recommendations support the Advancing HIV Prevention strategy from the CDC in Atlanta that aims to ensure that all health care providers include HIV testing, when indicated, as part of routine medical care on the same voluntary basis as other diagnostic and screening tests.[138] Previously, CDC has recommended that patients be offered HIV testing in high HIV-prevalence acute care hospitals and in clinical settings serving populations at increased risk (e.g., clinics that treat persons with STDs). This initiative adds to those recommendations to include offering HIV testing to all patients in all high HIV-prevalence clinical settings and to those with risks for HIV in low HIV-prevalence clinical settings.

As discussed above, it is important to emphasize that no trials directly link HIV screening with clinical outcomes. Data are insufficient to estimate the effects of screening and interventions on transmission rates or in patients with less immunologically advanced disease. This is different for persons with more advanced disease where appropriately timed interventions, including highly active antiretroviral therapy and the prevention of opportunistic infections lead to improved health outcomes including reduced risk for clinical progression and reduced mortality. Long-term data on adverse events associated with highly active antiretroviral therapy are not yet available. However, the conclusion still remains that benefits of HIV screening in high-risk populations outweigh harms.

Although the reporting of transmission from a Florida dentist to several of his patients resulted in an American public favouring mandatory testing of health care practitioners, HIV screening of surgeons and dentists has been found to rank among the more expensive medical lifesaving programs even using liberal assumptions about program effectiveness.[139] No challenges to these findings were located.

Syphilis

Highest level of evidence: 1++	**Public health recommendation:** A

The USPSTF strongly recommends screening persons at increased risk for syphilis infection. Although the USPSTF found no new direct evidence that screening for syphilis infection leads to improved health outcomes in persons at increased risk, there is adequate evidence that screening tests can accurately detect syphilis infection and that antibiotics can cure syphilis. Screening may result in potential harms (such as clinical evaluation of false-positive results, unnecessary anxiety to the patient, and harms of antibiotic use). The USPSTF concludes that the benefits of screening persons at increased risk for syphilis infection substantially outweigh the potential harms. Populations at increased risk for syphilis infection (as determined by incident rates) include men who have sex with men and engage in high-risk sexual behaviour, commercial sex workers, persons who exchange sex for drugs, and those in adult correctional facilities. There is no evidence to support an optimal screening frequency in these populations.

A comparison of the direct costs and effectiveness of syphilis detection by selective screening and partner notification demonstrated that on a cost per case basis, selective screening was more cost effective than partner notification in the detection of primary, secondary and maternal syphilis cases. However, when consideration was given to prophylactic treatment, partner notification was more cost effective in the detection of all early stage disease. The authors conclude that the relative benefits of partner notification over selective screening depends on prophylactic treatment and an increase in worker productivity.[140]

Persons diagnosed with other sexually transmitted diseases (STDs) (i.e., chlamydia, gonorrhoea, genital herpes simplex, human papilloma virus, and HIV) may be more likely than others to engage in high-risk behavior, placing them at increased risk for syphilis; however, there is no evidence that supports the routine screening of individuals diagnosed with other STDs for syphilis infection.[141]

Gonorrhoea and Chlamydia

Highest level of evidence: 1++	**Public health recommendation:** A

The CTFPHC feels that there is good evidence, based on randomized control trials, to screen those at high risk for gonorrhoea. These include individuals under age 30 years with at least two sexual partners in the previous year or age ≤ 16 years at first intercourse, sex workers, and sexual contacts of individuals known to have a sexually transmitted disease.[142,143,144]

There is fair evidence to support annual screening of high-risk women for chlamydia using direct fluorescent antibody testing,[145,146,147] enzyme-linked immunoassay,[148] and polymerase chain reaction.[149,150,151] These studies demonstrated that these tests were accurate and reliable. In addition, randomized control trials showed that treatment is effective in eliminating chlamydial infection.[152,153,154,155,156] One randomized control trial showed that screening lead to reduction of complications.[157] High risk is defined as sexually active women less than 25 years of age; women with new sexual partners, women or men with multiple sexual partners during the previous year, women who use non-barrier contraceptive methods; and women who have symptoms of chlamydial infection (cervical friability, mucopurulent cervical discharge or intermenstrual bleeding). This high-risk definition excludes sex workers.

Given the data showing that age-specific screening is cost effective, numerous initiatives are underway to extend screening to under 25-year-olds who would not normally request a chlamydia test. One of these is The Big Screen, a program in selected sites of the United Kingdom. This program will conduct screening in a variety of non-traditional, non-clinic based settings including youth centres, as well as in general practice sites, with a target to test 30,000 patients per year for two years. It is hoped that this pilot phase will lead to sustained funding.[158]

Hepatitis B

Highest level of evidence: 1+	**Public health recommendation:** B

Screening is recommended for HIV infected substance abusers in order to offer the hepatitis B vaccine to HIV infected substance users who have been identified by serology to be susceptible to hepatitis B.[159] This is based on clinical trials with laboratory results.

Hepatitis C

Highest level of evidence: 2+	**Public health recommendation for no screening:** B

A systematic review[160], commissioned by the U.S. Preventive Services Task Force (USPSTF) reviewed the evidence for testing for anti-HCV antibodies in adults at high-risk of infection.[iii] The review found insufficient evidence to recommend for or against routine screening for HCV infection in high-risk populations. The same review recommended against routine screening for HCV infection in asymptomatic adults who are not at increased risk (general population) for infection (see below). The USPSTF found no evidence that screening for HCV infection in adults at high risk leads to improved long-term health outcomes, although it conceded that the yield of screening would be substantially higher in a high-risk population than in an average-risk population and there is good evidence that anti-viral therapy improves intermediate outcomes, such as viremia. The review noted that there is, as yet, no evidence that newer treatment

[iii] The review considered established risk factors for HCV infection to include current or past intravenous drug use, transfusion before 1990, dialysis, and being a child of an HCV-infected mother. Surrogate markers, such as high-risk sexual behaviour (particularly sex with someone infected with HCV) and the use of illegal drugs, such as cocaine or marijuana, were also noted as having been associated with increased risk for HCV infection.

regimens for HCV infection, such as pegylated interferon plus ribavirin, improve long-term health outcomes.

The recommendations of this review panel have been challenged. [161] The authors emphasize that chronic hepatitis C would require many years of follow-up to determine the incidence of complication after treatment or of other interventions in asymptomatic persons. They contend that it seems inappropriate to wait several decades to measure the impact of early identification of this viral infection when current data support a positive therapeutic effect that points to long-term benefits. They conclude that medical and public health professionals should continue the practice of screening persons for risk factors; offering testing to those at increased risk for HCV infection; and providing infected persons with appropriate counselling, medical evaluation, and treatment.

A further systematic review has considered hepatitis C screening among injecting drug users and in genitourinary medicine (GUM) clinics.[162] This review compared screening to a no-screening scenario and estimated cost-utility (£/quality-adjusted life-year (QALY)). Six relevant studies of screening strategies (one cost-utility analysis, one cost–benefit analysis and four cost-effectiveness analyses) were located. Evidence in support of objectives other than the treatment of infected individuals was found to be limited. There was no compelling evidence to support the idea that behavioural changes would occur as a result of learning HCV status, either among those shown to be HCV-positive (who may be encouraged to reduce the risk of infecting others) or those shown to be HCV-negative (who might consider protecting themselves from infection). However, the authors did concede that the evidence base was insufficient to reject the possibility that such effects exist. Screening for HCV in IDUs in contact with services was found to be moderately cost-effective (about £30,000/QALY) and reasonably stable when explored in extensive one-way sensitivity analyses. Uncertainty around acceptability of screening and adherence to treatment and the simple nature of our model leads the investigators to recommend caution in accepting this estimate. Universal screening in GUM clinics was found to be less cost-effective and subject to greater uncertainty than screening IDUs in contact with services. It was emphasized that assessment of selective screening policies in the GUM clinic setting is restrained by scarcity of information on the epidemiology of HCV in groups other than IDUs. The authors concluded that while selective screening may be more cost-effective and affordable than universal screening, it remains open to question whether seeking people other than IDUs for screening represents a cost-effective use of resources.

Unprotected fisting (active and passive) during group-sex was found to be more common in HCV-infected than in uninfected men who have sex with men (MSM) in one case series report of mostly HIV-positive MSM with multiple partners throughout Europe.[163] None of the HCV-infected men used gloves. The authors note that one can imagine that fisting and the use of rectal enemas may cause mucosal damage, thereby increasing the risk of transmission. Their data show an ongoing spread of HCV among MSM within specific international sexual networks, in which LGV also emerged recently and possibly contributed to the transmission of HCV. The authors recommend active case finding, reporting and contact tracing to assess the spread of HCV among MSM. They also suggest that HCV testing of HIV-positive MSM at initial presentation and subsequently according to risk may reveal more cases. Finally, they suggest that screening MSM for HCV at STD clinics needs should be considered.

Tuberculosis

Highest level of evidence: 2+	**Public health recommendation:** B

The CTFPHC feels that there is good evidence to support screening individuals at high-risk for tuberculosis and good evidence not to screen individuals from the general population. This was demonstrated by cohort and case control studies.[164,165] High-risk includes immigrants from endemic areas (Africa, Asia, Central America and certain countries in South America and the Caribbean); Canadian-born aboriginals; close contacts of active cases; persons with abnormal chest radiographs consistent with healed tuberculosis; and persons with underlying medical conditions which increase their likelihood of reactivation of tuberculosis if infected (those with silicosis, jejunoilial by-pass, hemodialysis, gastrectomy, malnutrition, intravenous drug users, alcohol abusers and especially those with known or suspected infection with HIV).

Substance Abusers

Highest level of evidence: 2+	**Public health recommendation:** D

Integrating STI screening, counselling and treatment into substance treatment and outreach programs has been widely recommended. Entry into substance treatment has been linked to a reduction in risky sexual behaviour.[166]

Sex Workers

Highest level of evidence: 2+	**Public health recommendation:** C

One STI treatment strategy that has been shown to be effective for female sex workers and their clients is the provision of clinical services with regular screening.[167,168] Services provided include a strong peer education and empowerment component, emphasizing consistent condom use, providing effective treatment for both symptomatic and asymptomatic STIs, and attempting to address larger social, economic and human rights issues that increase vulnerability and risk. Outcomes reported have included increases in condom use and reductions in STI and HIV prevalence. The following are some examples:

- Regular screening and treatment services for sex workers in Senegal (where sex work is legal) have been credited with contributing to low and stable HIV seroprevalence.[169]
- A comprehensive approach to STI prevention and care was taken at Project SIDA in Kinshasa, Zaire, where condom use and voluntary clinic attendance were promoted within networks of sex workers.[170] Regular screening for curable STIs was conducted using sensitive laboratory tests. Over the life of the project, condom use increased and STI prevalence and HIV incidence decreased significantly.
- Similar strategies (clinical screening and peer education components), with comparable impact on condom use and STI rates, have been reported from La Paz,[171] Abidjan,[172] Cotonou,[173] and Nairobi.[174]

Travelers

Highest level of evidence: 4	**Public health recommendation: D**

It has been recommended that travelers who have had unprotected sex with new partners while travelling should be screened for chlamydia, gonorrhoea, syphilis, HIV, hepatitis B (if unvaccinated). Further, hepatitis C should be offered if the history reveals drug use, tattooing, body piercing, or other activities where sharing of contaminated equipment may have occurred.

High-risk Behaviour Screening

Highest level of evidence: 2+	**Public health recommendation: C**

There is evidence from cohort studies to include the obtaining of history of sexual practices and injection drug use in periodic health examinations of high-risk populations. While this intervention does not eliminate high-risk activities, inquiring about these practices and providing counselling to those with a positive history does reduce their incidence. [175,176, 177,178,179,180,181, 182,183,184,185,186]

Immigrants, Refugees

Highest level of evidence: 4	**Public health recommendation: D**

Evidence-based medicine on which to base screening protocols for immigrants, refugees, and international adoptees was found, in a review, to be lacking.[187] However the authors recommend the importance of reviewing health and vaccination records and inquiring about the symptoms of diseases prevalent in the country of origin or transit and screening for these as appropriate (e.g., malaria). Routine laboratory screening tests recommended for communicable diseases included stool for ova and parasites, serology for hepatitis B, and tests for HIV and syphilis. It was emphasized that a tuberculin skin test should be performed on all immigrants, and a chest radiograph should be obtained for any patient with symptoms or a positive PPD.

Individuals Who Have Suffered Sexual Abuse

Highest level of evidence: 4	**Public health recommendation: D**

Recommendations have been made in the Canadian STD Guidelines for:

- *Prepubertal Children*:
    - Males/Females: gonorrhoea, chlamydia, *N gonorrhoeae*, *Trichomonas vaginalis*, HIV, syphilis, hepatitis B (unless known to be immune), HSV.
    - Females: bacterial vaginosis, Candida.

- *Postpubertal Children/Adolescents/Adults*: HIV, gonorrhea, chlamydia, trichomonas, syphilis, hepatitis B (unless known to be immune), hepatitis C. Baseline HCV antibody is optional, since transmission of HCV is low via sexual contact. Testing for HCV may be considered if the (alleged) perpetrator(s) is/are at high risk for hepatitis C (e.g., known injection drug user[s]) and significant trauma has occurred with the assault.

6.1.4 Asymptomatic General Population

Influenza

Highest level of evidence: 2+	**Public health recommendation: D**

The CTFPHC concludes that there is insufficient evidence to include or exclude the screening of suspected cases for influenza. This is based on a trial without randomization performed in a laboratory setting.[188]

HIV

Highest level of evidence: 4	**Public health recommendation: D**

The CTFHPC concluded from expert opinion that there is poor evidence to include voluntary HIV screening of adults and adolescents who are not at increased risk for infection in the periodic health examination. These conclusions are in keeping with updated recommendations from the USPSTF.[189] The Task Force concluded that the benefit of screening adolescents and adults without risk factors for HIV is too small relative to potential harms to justify a general recommendation.

Gonorrhoea

Highest level of evidence: 2+	**Public health recommendation to screen females 15-29 years of age: D**

The CTFPHC feels that there is fair evidence not to screen the general population for *N. gonorrheae* based on cohort studies.[190,191,192] A cost effective assessment of screening for gonorrhoea in urban emergency departments reached a different conclusion for women between 15 and 29 years of age.[193] The authors modeled net lifetime health consequences, costs, and cost effectiveness to compare routine emergency department care with gonorrhoea screening using five different detection methods. Their results showed that screening women in this age group using urine-based nucleic acid amplification testing would prevent substantial reproductive morbidity and that this rapid, point-of-care test is cost effective when compared with other well accepted preventive interventions. The authors did acknowledge that this recommendation would generally apply to situations where chlamydia screening is already offered because chlamydia prevalence is higher than gonorrhoea in nearly all settings.

Chlamydia

The CTFPHC concludes that there is fair evidence to exclude routine screening of the general female population for asymptomatic chlamydial infections based on modeling studies. While it has been shown that available screening tests are accurate and reliable, these studies demonstrate that these tests have poor positive predictive value and cost-effectiveness when prevalence is low. Most studies assessed in one review suggested that universal screening for chlamydia is more cost effective than selective screening only when the prevalence of infection exceeds 3% to 6%.[194] The CTFPHC also noted that no study showed that screening and early detection lead to reduction of complications.[195,196,197,198]

Despite this, a review of published studies on the cost effectiveness of screening for chlamydia concluded that all studies suggest screening is cost effective at the prevalence of infection expected in the various target populations. However the authors caution that the assumptions in the models were difficult to confirm and there is a need for more data, particularly on the risk complications in women with asymptomatic lower tract infection.[199] This conclusion is strengthened by a review of rates of complications from chlamydial infection, which form important assumptions for cost effective determinations.[200] The authors based probabilities of complications on available registration data from Amsterdam and compared these to complication assumptions used for cost effective studies identified in the literature. Rates of complications identified in the literature for pelvic inflammatory disease and for complications after PID, such as ectopic pregnancy, tubal factor infertility, and chronic pelvic pain, varied from 15% to 80%, 5% to 25%, 10% to 20%, and 18% to 30% respectively. Using the data from local Amsterdam registrations, they estimated probabilities for PID, ectopic pregnancy, and tubal factor infertility for women with a current chlamydial infection to be 0.43%, 0.07% and 0.02% respectively. They conclude that an overestimation of the current complication rates is likely and that this effect is potentially the greatest in populations with a low prevalence of chlamydia with the result that the currently assumed cost savings associated with screening may disappear when using more realistic estimates for complications.

Highest level of evidence: 2+	**Public health recommendation: C**

The literature rarely discusses screening men for chlamydial infection. One review noted that no studies were found to determine whether screening asymptomatic men would reduce transmission or prevent acute infections or complications but emphasized that age is the strongest risk factor for both men and women.[201] This is reemphasized for women in a cross sectional and cost effectiveness study of family planning and sexually transmitted diseases female clients from various sites in the USA. The authors note that age and behavioural history are as sensitive in predicting chlamydial infection as criteria that include cervicitis. They conclude that at prevalence rates in the populations studied, it would be cost saving to screen universally in family planning clinics and selectively in STD clinics. The caution regarding complication assumptions cited above, however, applies to this study.[202]

Highest level of evidence: 2+	**Public health recommendation: C**

Extending screening to non-traditional settings is attracting growing interest. A recent review of these initiatives for sexually transmitted disease screening identified 17 studies in jails, eight in emergency rooms, five in schools and 15 in other community settings. It found that jail and emergency room-based screening had the highest yields and the largest numbers screened.[203] These initiatives face challenges of defining and reaching target populations, overcoming logistic issues, developing communication and counselling strategies, and determining whether these alternative testing strategies are effectively reducing infection rates.[204]

Highest level of evidence: 2+	**Public health recommendation:** C

Syphilis

Highest level of evidence: see high-risk and special populations above

The USPSTF recommends against routine screening of asymptomatic persons who are not at increased risk for syphilis infection. Given the low incidence of syphilis infection in the general population and the consequent low yield of such screening, the USPSTF concludes that potential harms of screening (i.e., opportunity cost, false-positive tests, and labelling) in a low-incident population outweigh the benefits.[205]

Human Papilloma Virus

Highest level of evidence: 2+	**Public health recommendation:** D

The CTFHPC has concluded that there is fair evidence to exclude HPV screening (beyond Papanicolaou testing for cervical cancer) from the periodic health examination for asymptomatic women. This was based on evidence from cohort[206,207,208,209] and case-control[210,211] studies where HPV infection was associated with risk and grade of cervical cancer. This includes using any of the following diagnostic tests: visual inspection, papanicolaou testing, colposcopy or cervicography, group-specific antigen, in-situ DNA hybridization, dot blot technique, and the southern blot technique. In addition to evidence from these studies, acetic acid application is not a specific test for HPV infection, and the specificity and sensitivity of this procedure for screening have not been defined. Based on this alone, the routine use of this procedure for screening to detect subclinical infection is not recommended[iv]. It is important to emphasize that the Pap test is not a screening test for STDs. Notwithstanding this recommendation from the CTFHPC, the Public Health Agency of Canada has noted that although asymptomatic screening for HSV and HPV is not currently recommended studies are ongoing assessing whether screening in certain situations is cost-beneficial and that new information may alter these recommendations.[212]

[iv] However, some experienced clinicians find this test useful for identification of flat genital warts.

Hepatitis B

Highest level of evidence: 2+	**Public health recommendation:** D

The USPSTF recommends against routinely screening the general asymptomatic population for chronic hepatitis B virus infection[213] as no evidence was located that this improves long-term health outcomes such as cirrhosis, hepatocellular carcinoma, or mortality.[214] The USPSTF notes that the prevalence of HBV infection is low and the majority of infected individuals do not develop chronic infection, cirrhosis, or HBV-related liver disease. Potential harms of screening include labeling, although there is limited evidence to determine the magnitude of this harm. As a result, the USPSTF concluded that the potential harms of screening for HBV infection in the general population are likely to exceed any potential benefits.

Hepatitis A

Highest level of evidence: 4	**Public health recommendation:** D

It has been recommended to consider screening for populations with the potential for higher levels of pre-existing immunity. The potential cost-savings of testing should be weighed against the likelihood that testing would interfere with initiating vaccination.

High-risk Behaviour

Highest level of evidence: 4	**Public health recommendation:** D

There is poor evidence to include in or exclude from periodic health examinations of asymptomatic people in the general population the obtaining of history of sexual practices and injection drug use. Consensus that the evidence was conflicting comes from expert opinion.[215],[216],[217]

Hepatitis C

Highest level of evidence: 2++	**Public health recommendation:** B

The systematic review referred to above, commissioned by the USPSTF, focused on whether it was useful to test for anti-HCV antibodies in asymptomatic adults who have no history of liver disease.[218] The review concluded that there is no evidence that screening for HCV infection leads to improved long-term health outcomes, such as decreased cirrhosis, hepatocellular cancer, or mortality. Although the review found that there is good evidence that anti-viral therapy improves intermediate outcomes, such as viremia, it decided that there is limited evidence that such treatment improves long-term health outcomes. The review noted that current treatment regimen is long and costly and is associated with a high patient dropout rate due to adverse effects. It added that potential harms of screening include unnecessary biopsies and labelling, although it conceded that there is limited evidence to determine the magnitude of these harms. Thus the

USPSTF concluded that the potential harms of screening for HCV infection in adults who are not at increased risk for HCV infection were likely to exceed potential benefits.

6.1.5 Interventions to Increase Screening Coverage

Screening for communicable diseases requires both "push" and "pull" strategies. Health care services need to be more accessible to the target populations and there is a need to ensure optimum awareness and knowledge among practitioners about screening guidelines. In addition, health communication initiatives are needed to raise awareness and motivation for screening within the target populations. It is important to note that, while public health recommendations promoting screening in asymptomatic persons are directed to both health care providers and clients, actual strategies to promote screening efforts have been primarily directed toward health care providers. One review of gonorrhoea and chlamydia screening found no published studies on client-initiated screening strategies.[219]

Some examples of these push and pull strategies are briefly mentioned.

- A randomized control trial, in a US setting, tested a multi-component Internet continuing medical education (CME) intervention for increasing chlamydia screening of at-risk women aged 16-26 years. The intervention was successful in blunting a decline in chlamydia screening and is fairly impressive given the limited intervention intensity. Each physician completed an average of 2.4 CME modules, released sequentially every three months, and each module required an average of 12 minutes to complete.

- The College of Family Physicians of Canada has attempted to increase screening practices of their members and the wider physician fraternity by incorporating the CTFHPC guidelines into Evidence-Based Preventive Care Checklist Forms© for family physicians during complete health assessments.[220] These forms include selected communicable disease screening activities. The forms have non-evidence-based components that are a part of routine practice. The forms have been validated as part of the PERFORM (Preventive Health, Evidence-based, Recommendation Form) in a trial conducted at the family medicine clinics of St. Michael's Hospital, Toronto, Ontario (publication pending). Apparently, the results showed a dramatic increase in preventive health care. As well, 77% of physicians surveyed at the end of the trial said they would continue to use the forms in their routine care and 85% said it improved their documentation of preventive health care by at least 50%.

- Mass media campaigns have been used to encourage HIV testing. A Cochrane review assessed the effect of mass media interventions and the most effective form of mass media intervention at a general population level or in specific target populations, in relation to changes in HIV testing, compared with a control group or with pre-intervention levels. Of the 35 references that were identified, two randomized controlled trials, three non-randomized controlled studies, and nine interrupted time series were included in the final analysis. All individual studies concluded that mass media were effective, and this was confirmed by reanalysis of the interrupted time series studies which all had initial impact. However, no long-term effects were seen on mass media interventions for promotion of HIV testing. A further limitation of mass screening not commented on by this review is its selective impact. For example, national and local

campaigns were used to motivate uptake of HIV testing in Scottish genitourinary medicine clinics. Significant increases in the number of those testing were noted.[221] Television based media campaigns produced the greatest increase in testing rates (average 46% increase over 2 months) compared with newspapers and poster campaigns (average 6% increase over 2 months). However these changes appeared to be largely confined to those at low risk of infection. Disproportionately attracting those at lower risk will reduce the cost effectiveness of screening interventions.

- A multimedia HIV testing campaign aimed at gay and bisexual men in London, UK, particularly targeting those of Black and South European origin and those under 25 years of age used peer images with detailed information about how to access testing at a specific testing center. The campaign resulted in a 4.5-fold rise in MSM testing at the campaign clinic with no significant changes in comparison clinics. Further, increases were proportionately greater in the sub-populations targeted with peer images. The authors conclude that including detailed information about accessing testing services may be a vital ingredient in the success of media campaigns focusing on HIV testing.[222]

6.2 The Evidence for Partner Notification

As mentioned, there are clear Canadian recommendations for partner notification, or contact tracing, to be found in the STD Guidelines as well as those from the BCCDC. The latter include guidelines for hepatitis A, hepatitis B, meningococcal disease, *B. Pertussis*, varicella zoster, *haemophilus influenzae* type b (Hib), and tuberculosis. In the main, these two sets of guidelines are not referenced to supportive evidence but are nevertheless referred to here.

6.2.1 Botulism

As would be expected, it is important to determine the health status of other household members and other individuals who may have shared the same sources of food suspected to be contaminated with toxins produced by *Clostridium botulinum.* There is no need to notify contacts beyond those that shared the same food source. Despite excretion of *C. botulinum* toxin and organisms at high levels in the feces of intestinal botulism patients for weeks to months after onset of illness, no instance of secondary person to person transmission has been documented.

6.2.2 *Haemophilus Influenzae* Type B

Contacts are any persons residing with the case of invasive Hib disease or a person who has spent four or more hours per day with the case for at least five of the seven days preceding the day of hospital admission of the case. It is assumed that when children have spent four or more hours together per day, they are likely to have napped and/or eaten together, which increases transmission risk.

6.2.3 Hepatitis A

Priority contacts that should be identified include household, close non-household, sexual, drug-sharing, food handler, daycare, and institutional contacts. If symptoms are suggestive of hepatitis A virus infection in any contacts it is recommended that further contact tracing is undertaken.

6.2.4 Hepatitis B

Contact tracing is essential to identify those at risk of acquiring hepatitis B, both to clarify their immune status and to provide vaccine protection to the non-immune. Contacts include sexual and percutaneous exposures during the period of infectivity; children of hepatitis B-infected mothers who did not receive HBIg and vaccine at birth; and those living in the household of the index case. For substance abusers, contact tracing can be improved through repeat prompting and reading back the list of recalled sexual and injection partners to elicit reports of additional sexual and injection partners.[223]

6.2.5 Meningococcal Disease

Close contacts include the following:

- Household contacts of the case.
- Contacts who share sleeping arrangements with the case.
- Children and staff in child care and preschool facilities.
- persons who have had direct contamination of their nose or mouth with oral/nasal secretions of a case (i.e., kissing on the mouth; sharing toothbrushes, eating utensils, cigarettes, mouth-guards, water bottles or musical instrument mouthpieces).
- Health care workers who have had intensive unprotected contact (without wearing a mask) with infected patients (e.g., intubation, resuscitation or closely examining the oropharynx of patients).
- Airline passengers sitting immediately on either side of the case (but not across the aisle) when the total time spent aboard the aircraft was at least 8 hours.
- Those who have had direct exposure to eye secretions of cases of primary meningococcal conjunctivitis.

6.2.6 Bordatella Pertussis

High-risk contacts are infants < 1 year of age (regardless of immunization status) and pregnant women in the 3rd trimester. Other contacts for whom chemoprophylaxis is recommended are all household contacts and all those in a family or group day care if there is an infant < 1 year of age or a pregnant woman in the 3rd trimester in the household.

6.2.7 Varicella

An individual is considered a contact if they have had one or more of the following types of contact with someone known to have varicella during the period of communicability, with someone having disseminated zoster, or with an immunocompromised host with zoster:

- Continuous household contact (living in the same dwelling).
- Sharing the same hospital room.

- Face-to-face contact for five or more minutes.
- Direct contact with zoster or varicella vesicular fluid.

Contact with non-disseminated zoster lesions in an immunocompetent person that are well covered by clothing or dressings does not constitute an exposure.

Individuals at high risk for complications of varicella disease that should receive priority contact tracing efforts include:

- Those who are immunocompromised due to disease or therapy.
- Premature infants (<37 weeks gestation) exposed during their first weeks of life.
- Newborns whose mothers develop varicella disease 5 days before or 48 hours after delivery.
- Pregnant women.
- Those with cystic fibrosis.
- Those awaiting solid organ transplant or haematopoietic stem cell transplant.
- Recipients of a solid organ transplant or HSCT.
- Those undergoing hemo- or peritoneal dialysis.
- Those with nephrotic syndrome.
- Those on chronic salicylate therapy.

6.2.8 Herpes Simplex Virus

Partner notification is not required as a public health measure, in part because of the following:

- Most disease presents as recurrences.
- It is difficult to assess whether a contact has ever had a primary genital infection.
- Patients with genital herpes should be encouraged to inform their sexual partner(s) of the past 60 days prior to symptom onset or date of diagnosis where asymptomatic to make them aware of the risk of infection, if uninfected, and to aid diagnosis in a partner if the disease does arise.

6.2.9 Human Papilloma Virus

Human papilloma virus (HPV) infection is not a reportable disease in Canada and standard partner notification recommendations that apply for other STIs are not useful in reducing transmission of HPV. However, patients should be encouraged to inform their sex partner(s) that

they have or have had genital warts or an abnormal Pap smear, but there is no proof that this will lower the risk to the partner.

6.2.10 Tuberculosis

The demonstration, in 1962, that isoniazid (INH) was effective in preventing tuberculosis (TB) among household contacts of persons with TB disease[224] has led to the inclusion of the investigation of contacts and treatment of contacts with latent TB infection in TB control strategies. On average, 10 contacts are listed for each person with a case of infectious TB in the United States. Approximately 20–30% of all contacts have LTBI, and 1% have TB disease. Of those contacts that ultimately will have TB disease, approximately half acquire disease in the first year after exposure. For this reason, contact investigations constitute a crucial prevention strategy.

The evidence for the investigation of TB contacts, including partner notification initiatives, has recently been reviewed by the National Tuberculosis Controllers Association and the CDC.[225] Key issues from this review are summarized below.

Decisions to initiate a contact investigation

- Index patients with positive acidfast bacillus (AFB) sputum-smear results or pulmonary cavities have the highest priority for investigation.
- Patients who have lung cavities observed on a chest radiograph typically are more infectious than patients with non-cavitary pulmonary disease. This is an independent predictor after bacteriologic findings are taken into account.
- Cough frequency and severity are not predictive of contagiousness. However, singing is associated with TB transmission.
- Transmission from children aged <10 years is unusual.
- A contact investigation should be considered if the index patient has confirmed or suspected pulmonary, laryngeal, or pleural TB. An investigation is recommended if the sputum smear has AFB on microscopy, unless the result from an approved NAA test. If AFB are not detected by microscopy of three sputum smears, an investigation still is recommended if the chest radiograph (i.e., the plain view or a simple tomograph) indicates the presence of cavities in the lung.

Investigating the index patient and sites of transmission

- Comprehensive information regarding an index patient is the foundation of a contact investigation. The majority of TB patients are likely to be born in other countries, and their fluency in English often is insufficient for productive interviews to be conducted in English. Patients should be interviewed by persons who are fluent in their primary language. If this is not possible, health departments should provide interpretation services.

- Determining the infectious period focuses the investigation on those contacts most likely to be at risk for infection and sets the timeframe for testing contacts. Because the start of the infectious period cannot be determined with precision by available methods, a practical estimation is necessary. On the basis of expert opinion, an assigned start that is 3 months before a TB diagnosis is recommended.

- The infectious period is closed when the following criteria are satisfied: 1) effective treatment (as demonstrated by *M. tuberculosis* susceptibility results) for >2 weeks; 2) diminished symptoms; and 3) mycobacteriologic response (e.g., decrease in grade of sputum smear positivity detected on sputum-smear microscopy).

- A minimum of two interviews is recommended. At the first interview, the index patient is unlikely to be oriented to the contact investigation because of social stresses related to the illness (e.g., fear of disability, death, or rejection by friends and family). The second interview is conducted 1–2 weeks later, when the patient has had time to adjust to the disruptions caused by the illness and has become accustomed to the interviewer, which facilitates a two-way exchange.

- All possible sites of transmission should be listed, regardless of how long the patient spent at the sites.

- Site visits are complementary to interviewing. They add contacts to the list and are the most reliable source of information regarding transmission settings. Failure to visit all potential sites of transmission has contributed to TB outbreaks. Visiting the index patient's residence is especially helpful for finding children who are contacts.

<u>Assigning priorities to contacts</u>

- Given that a contact is theoretically anyone who has been exposed to *M. tuberculosis* infection by sharing air space with a person with infectious TB, there is a need to assign priorities to contacts.

- Priority ranking is determined by the characteristics of individual contacts and the features of the exposure. When exposure is related to households, congregate living settings, or cough-inducing medical procedures, contacts are designated as high priority.

- Priorities are based on the likelihood of infection and the potential hazards to the individual contact if infected. The most important factors are age <5 years and immune status. HIV infection results in the progression of *M. tuberculosis* infection to TB disease more frequently and more rapidly than any other known factor, with disease rates estimated at 35–162 per 1,000 person-years of observation and a greater likelihood of disseminated and extrapulmonary disease. HIV-infected contacts are assigned high priority, and, starting at the time of the initial encounter, extra vigilance for TB disease is recommended.

- High priority contacts are household contacts, those < 5 years, contact with a medical risk factor (HIV or other factor that results in compromised immunity), contact with exposure during medical procedure (bronchoscopy, sputum induction, or autopsy), contact with

exposure in congregate settings (correctional facilities, workplaces, hospitals and other health care settings, schools, shelters and other settings providing services for homeless persons, transportation modes such as military vessels at sea, commercial aircraft, passenger trains, and school buses, and drug or alcohol usage sites), exceeds duration environment limits.

- Contacts exposed to medium priority contacts include those exposed to either (a) persons with suspected tuberculosis with abnormal chest radiographs not consistent with TB disease; or (b) persons diagnosed as acid-fast bacilli sputum smear-negative TB cases based on abnormal chest radiographs that are consistent with TB disease AND who are household contacts and/or less than 5 years and/or who have had contact with a medical risk factor and/or who have had contact with exposure during medical procedure.

Diagnostic and public health evaluation of contacts

- This should include a chest radiograph. The recommended period between most recent exposure and final tuberculin skin testing has been revised; it is 8–10 weeks, not 10–15 weeks as recommended previously.

When to expand a contact investigation

- When contacts initially classified as being a lower priority are reclassified as having a higher priority, a contact investigation should then be expanded. Data regarding high- and medium-priority contacts inform this decision.

- A graduated approach is used for contact investigations (i.e., a concentric circles model). With this model, if data indicate that contacts with the greatest exposure have an infection rate greater than would be expected in their community, contacts with progressively less exposure are sought. The contact investigation would expand until the rate of positive skin test results for the contacts was indistinguishable from the prevalence of positive results in the community.

Communicating through the media

- Media coverage of contact investigations affords an opportunity to increase public knowledge of TB control and the role of the health department.

Contact investigations in special circumstances

- Conducting contact investigations in special settings and circumstances include schools, hospitals, worksites, and congregate living quarters. This often involves making a distinction between a contact investigation and an outbreak investigation. A working definition of "outbreak" is consistent with either of two sets of criteria:

    - During (and because of) a contact investigation, two or more contacts are identified as having active TB, regardless of their assigned priority; or

  - Any two or more cases occurring <1 year of each other are discovered to be linked, and the linkage is established outside of a contact investigation (e.g., two patients who received a diagnosis of TB outside of a contact investigation are found to work in the same office, and only one or neither of the persons was listed as a contact to the other).

- Social network analysis might offer an effective way to list TB contacts and assign priorities to them. Social network analyses have been tested retrospectively on TB outbreak investigations and contact investigations. However, the use of social network analysis to improve contact investigations has not been tested prospectively, the methods might require additional labour, and further operational research is needed.

- Certain settings require intensified onsite approaches for ensuring that contacts are completely evaluated and for meeting objectives for treating LTBI. These include correctional facilities, workplaces, hospitals and other health care settings, schools, shelters and other settings providing services for homeless persons, transportation modes (military vessels at sea, commercial aircraft, passenger trains, and school buses), and drug or alcohol usage sites.

6.2.11 Sexually Transmitted Infections: The Evidence

Various reviews to locate evidence for partner notification have been undertaken.[226,227] This paper draws on the most recent of these. [228] This extensive Cochrane review included 11 randomized control trials (RCTs) and came to the following conclusions:

- ***Strategies in people with HIV infection***: One systematic review of one RCT found that, in people with HIV infection, offering index patients a choice between provider referral (where the identity of the index patient is not revealed to the partner) and patient referral resulted in more partners being notified than offering patient referral alone.[229]

- ***Strategies in people with gonorrhoea or chlamydia***: One systematic review of two RCTs found that, in people with gonorrhoea, contract referral increased the rate of partners presenting for treatment compared with patient referral. [230,231] No RCTs assessing provider referral in people with gonorrhoea were located in this review. One RCT in people with non-gonococcal urethritis (mainly chlamydia) identified by this review found that provider referral increased the proportion of partners notified and of positive partners detected per patient compared with patient referral.[232] The review found no RCTs assessing contract referral in people with chlamydia or outreach assistance in people with gonorrhoea or chlamydia.

- ***Strategies in people with syphilis***: One large RCT comparing different partner notification strategies in people with syphilis found no significant difference in the proportion of partners notified between provider referral and contract referral, when people receiving the contract referral option were given 2 days to notify their partners. No RCTs assessing patient referral or outreach assistance were located by the review.[233]

- ***Strategies to improve the effectiveness of patient referral****:* This Cochrane review comments on a number of strategies to achieve this outcome. These are briefly summarized before returning to examine discussions in the literature for approaches to enhance this and other partner notification strategies.

    - Verbal, nurse-given health education together with patient-centred counselling by lay workers, when compared with standard care among patients with any STD, results in small increases in the rate of partners treated.[234]

    - Counselling plus contact referral cards and telephone follow up compared with counselling alone: One RCT identified by a systematic review provided insufficient evidence about the effects of adding telephone reminders and contact cards to patient referral in improving partner notification.[235]

    - Different health professionals: One RCT identified by a systematic review provided insufficient evidence about the effects of patient referral by different types of health care professionals in improving partner notification.[236]

    - Information pamphlets: One RCT identified by a systematic review provided insufficient evidence about the effects of information pamphlets in improving partner notification.[237]

    - Educational videos: The review found insufficient evidence from an RCT to support educational videos in improving partner notification.[238]

This Cochrane review found no studies showing that partner notification results in a health benefit, either to the partner or to future partners of infected people. The authors point out that obtaining such evidence would be technically and ethically difficult. However they refer to one RCT in asymptomatic women compared identifying, testing, and treating women at increased risk for cervical chlamydial infection versus usual care. It found this reduced incidence of pelvic inflammatory disease (RR 0.44, 95% CI 0.20 to 0.90).[239] This evidence suggests that partner notification, which also aims to identify and treat people who are largely unaware of infection, would provide a direct health benefit to partners who are infected.

The authors noted that partner notification affects either of two outcomes, i.e., prevention of morbidity in those notified, or prevention of transmission to others. While both were acknowledged as benefits, the authors argue that it would seem more likely that infected partners are more valuable to identify, since these individuals have either acquired infection from the index case (and are at high risk of further morbidity or transmitting infection to others), or infected the index case (proving that they are high-risk sex partners, responsible for transmission). The authors emphasize that few of the studies assessed the proportion of partners who were infected. Instead, most studies relied on surrogate outcomes such as partners presenting for medical evaluation, or reports by index patients of partners presenting. As a result, one cannot know more fully the benefits of partner notification.

In summarizing the shortcomings of these studies, the authors recommended the following:

- There is a need for evaluations of interventions combining provider training and patient education.
- There is also a need for trials in the future to assess whether the partner notification strategies they evaluate have an impact on index patient re-infection rates, changes in the behaviour of index patients or partners, particularly for HIV patients, and incidence of STDs.
- Future trials also need to consider measuring to what extent strategies are successful at reaching partners who are "high transmitters" as opposed to monogamous partners.
- The acceptability of various partner notification strategies to index patients and partners needs to be assessed.
- The costs of partner notification need to be measured and compared.
- The potential harms of partner notification needs to be assessed. These include effects of partner notification on relationships between patients and partners and, in particular, on the rate of violence, abuse, and abandonment of patient or partner.

6.2.12 Sexually Transmitted Infections: Towards Enhanced Approaches

A recent review[240] of innovative approaches to STI control, including partner notification provides a number of useful considerations:

- ***Cluster tracing and peer referral****:* Partner notification programs for syphilis have long included efforts to test cases' nonsexual contacts (i.e., "suspects") and the social and sexual contacts named by uninfected persons initially identified through partner notification activities (i.e., "associates"), a process called *cluster tracing or cluster case finding*.[241] More recently, increasing research on sexual networks has prompted renewed interest in focusing on social networks as a means to identify persons who have undiagnosed syphilis or HIV.[242] Such efforts have met with mixed success. Studies conducted in the 1990s reported interviewing between 9.1 and 500 syphilis cases to identify one new case of syphilis among suspects or associates. A variant on traditional cluster tracing is *peer referral*. Peer referral involves recruiting persons from an at-risk social network to refer other members of the network for HIV or STI testing. Peer recruiters are typically given some incentive for referring others. A small study of HIV positive patients treated in an inner-city Los Angeles HIV clinic suggests that this approach may be effective. In that study, 31 HIV-positive patients referred 79 peers for testing and counselling, of whom 37 (47%) tested HIV positive.[243] This success does not appear to have been replicated, and further research on this intervention is merited.
- ***Expedited partner therapy (EPT)****:* This is a promising alternative to partner notification. EPT is a global term for approaches to treating the sex partners of persons who have STI that bypass the traditional requirement that all partners receive a complete medical evaluation before therapy. Such approaches include having public health personnel deliver medications to sex partners, contracts with pharmacies to provide medication to

sex partners without the partners' prior examination, or having patients deliver prescriptions to their partners. In most instances EPT has involved *patient-delivered partner therapy* (PDPT), the practice of dispensing medications to patients for them to give to their sex partners. Observational studies conducted in the 1980s and early 1990s found that women provided with PDPT experienced lower rates of recurrent chlamydial infection.[244,245] Three randomized controlled trials subsequently tested the hypothesis that EPT, usually PDPT, could decrease the prevalence of infection in index patients (those originally diagnosed with the STI) at follow-up testing. Two of these trials showed a statistically significant decrease in infection at follow-up in persons given EPT compared with controls[246,247] whereas the third reported a non-significant trend toward lower rates of chlamydial infection in women receiving PDPT.[248] Recipients of EPT were also significantly more likely to report that their partners were treated. These trials demonstrate that PDPT decreases the occurrence of persistent or recurrent gonorrhea or chlamydial infection in men and women but that the benefit is greater for gonorrhea, likely reflecting lower cure rates for chlamydial infection than for gonorrhea among women receiving conventional therapies. State health departments in California and Washington State have already issued PDPT guidelines and the CDC in Atlanta has issued guidelines for EPT. [249]

- ***New communication technology****:* It has been suggested that new technology for communication, such as the Internet and mobile telephones may provide additional tools for partner notification.[250] The authors emphasize that this has not been well studied. One study described looked at the use of the internet reported on a case controlled study carried out during an outbreak of syphilis in gay men in San Francisco. Participants of an Internet chat room were sent emails by the Internet service provider, informed of a syphilis cluster and encouraged to seek medical evaluation. A substantially higher number of Internet traced partners per index underwent medical evaluation than previous studies among similar populations.[251] While the ease, convenience, anonymity and immediacy of these novel methods have the potential to improve the efficiency and cost effectiveness of partner notification, there are numerous ethical issues to consider if these technologies are to be adopted. They need to be trialed thoroughly and their benefits weighed against any adverse effects.

- ***New testing methodologies****:* The development of nucleic acid amplification tests (NAATs), with the associated ability to test urine and self-obtained vaginal swab or flush specimens, and the advent of safe, single-dose oral therapies for gonorrhoea and chlamydial infections have led to several innovations in screening and partner treatment. One randomized study assessed home sampling versus conventional contact tracing for detecting chlamydia infection in male partners of infected women.[252] Women in the intervention group were asked to supply their partners with an envelope containing a 10 ml sterile container, information on collecting the first urine sample of the morning, and a prepaid envelope for returning the sample to the laboratory. Envelopes supplied by the control group contained a request for the partner to visit his doctor as well as a contact slip and a prepaid envelope to be given to the doctor for returning a urethral swab sample. Significantly more partners were examined in the intervention group compared with the control group. Although not significant, there were more new cases of *C. trachomatis* per index case in the intervention group (0.27) than in the control group (0.14). The

difference between the two groups was 0.13 (-0.03 to 0.29). Furthermore, there was a trend for partners of women in the intervention group to be tested earlier than those of women in the control group.

6.3 The Evidence for Post-exposure Prophylaxis

As mentioned above, guidelines for PEP are provided by the BCCDC for hepatitis A, hepatitis B, meningococcal disease, *B. Pertussis*, rabies, Simian B virus, varicella zoster, botulism, *haemophilus influenzae* type b, measles, iGAS, influenza and tuberculosis. However, the Communicable Disease Control manual that contains these guidelines does not reference these guidelines to supporting evidence. Likewise, guidelines for PEP of sexually transmitted diseases are contained in the Canadian STD guidelines and these are rarely supported with evidence references. However, these guidelines provide a basis for examining the evidence for PEP interventions.

6.3.1 HIV

Highest level of evidence: 4	**Public health recommendation: D**

A cost effectiveness modeling study of PEP following sexual exposure to HIV concluded that purely from an economic standpoint, PEP should be restricted to partners of infected persons; for example, serodiscordant couples, to patients reporting unprotected receptive (not insertive) anal intercourse (including condom breakage), and possibly to cases where there is a substantial likelihood that the partner is infected.[253] This study used standard techniques of cost utility analysis and defined the main outcome variable to be the cost per quality adjusted life year saved by the program.

6.3.2 Hepatitis B

Highest level of evidence: 2+	**Public health recommendation: C**

The effectiveness of hepatitis B immune globulin (HBIG) and/or hepatitis B vaccine in various post-exposure settings has been reviewed. [254] Findings are based on evaluation by prospective studies. Administration of hepatitis B immune globulin (HBIG) promptly after exposure and 1 month later was found to have a combined efficacy of about 75% in protecting susceptible persons with perinatal, percutaneous, sexual, or mucosal exposure to HBV.[255,256,257,258]

Hepatitis B vaccine is highly immunogenic and efficacious and can be used to provide both pre-exposure and post-exposure protection. Combined active passive immunization has the advantage of providing both immediate and long-term protection.

- For infants born to mothers who are infected with HBV, the combination of HBIG given at birth and hepatitis B vaccine given at birth and ages 1 and 6 months is 85–90% effective in preventing perinatal HBV transmission.[259,260] Regimens involving a vaccine series alone have shown 70–85% efficacy in preventing perinatal transmission.

- In the occupational setting, multiple doses of HBIG initiated within 1 week following percutaneous exposure to HBsAg-positive blood provides an estimated 75% protection from HBV infection.[261,262,263] Although the post-exposure efficacy of the combination of HBIG and the hepatitis B vaccine series has not been evaluated in the occupational setting, the increased efficacy of this regimen observed in the perinatal setting, compared with HBIG alone, is presumed to apply to the occupational setting as well. In addition, because persons requiring PEP in the occupational setting are generally at continued risk for HBV exposure, they should receive the hepatitis B vaccine series.

BCCDC recommends the following indications for HBIG and hepatitis B vaccine:

- Infant born to known HBsAg positive woman.
- Infant born to woman at high risk for hepatitis B infection (i.e., intravenous drug use, sex trade work) whose infectious status is unknown or negative (possible window period).
- Infant < 12 months of age has a household contact or primary care giver with acute hepatitis B infection.
- Percutaneous or mucosal exposure to HBsAg positive source. For substance users, Hep B should be provided to all needle-sharing partners. As mentioned, contact tracing can be improved through repeat prompting and reading back the list of recalled sexual and injection partners to elicit reports of additional sexual and injection partners.[264]
- Sexual partner(s) of person with known acute or chronic hepatitis B infection. For steady, long-term sexual partners of chronic hepatitis B carriers, test for HBsAg, anti-HBc and anti-HBs to determine if client is susceptible and requires HBIG, or has been infected previously.

6.3.3 Hepatitis A

Highest level of evidence: 2+	**Public health recommendation: C**

Since the 1940s, passive immunization with immune globulin (IG), administered within 2 weeks of exposure, has been shown to be an effective means of preventing or markedly attenuating clinical hepatitis A in persons exposed to HAV.[265] Studies in household contacts have shown that IG can reduce the incidence of clinical hepatitis A by 80–90%.[266] The earlier that IG is given after exposure the more likely it is that protection will result.[267] One would even provide prophylaxis without confirmation of the index case if he/she is not in a high-risk group for hepatitis B or C and if prophylaxis must be undertaken immediately because of time constraints.

PEP is recommended by the BCCDC for the following contacts:

- Household.
- Close non-household, day care.
- Drug-sharing.

- Sexual contacts.
- If the case is a food handler, other food handlers at the same establishment at risk of hepatitis A (as assessed by public health staff).
- Patrons of eating establishments who ate food handled by an infected food handler as specified.

Food handlers, day care workers, and health care providers are seen to be priority groupings.

More extensive PEP (Hepatitis A vaccine or I6) is recommended in the following instances:

- Daycare centres that accept diapered children:
    - All child attendees and staff when one case occurs in an attendee or staff member, or when cases are identified in at least two of the households of the child attendees.
    - Household contacts of diapered daycare centre attendees when cases have occurred in three or more households of child attendees or when the outbreak is recognized more than 3 weeks after the onset of the index case.
    - Newly hired staff, or to children newly admitted to the centre during the six week time period following identification of that last case.
- Daycare centres not caring for diapered children:
    - If a case occurs in a staff member or child attendee, provide hepatitis A vaccine or IG for previously unimmunized staff members in contact with the index case and for unimmunized children in the same room as the index case.
    - All residents and staff of institutions for the developmentally challenged when an outbreak occurs.
    - All inmates and staff of correctional facilities when an outbreak occurs.

6.3.4 *Haemophilus Influenzae* Type B

Highest level of evidence: 1+	**Public health recommendation: B**

A randomized controlled clinical trial and an uncontrolled trial have shown that a 4-day antibiotic regimen can reduce both the rate of asymptomatic carriage of Hib and the incidence of secondary infection in household and day care contacts of infected persons.[268,269]

Post-exposure Hib immunization is not known to decrease the risk of transmission. Rather, the situation presents an opportunity for completion of Hib immunization of contacts. To effectively prevent secondary spread, rifampin should be given concurrently to all contacts (at the same time or within 3 days) to prevent re-infection within the contact group.

Chemoprophylaxis is recommended for:

- All household contacts, regardless of age, in the following circumstances:
    - Household with at least 1 contact younger than 4 years of age who is unimmunized or incompletely immunized for age.
    - Household with a child younger than 12 months of age if the child has not received the primary series of three doses.
    - Household with an immunocompromised child regardless of that child's Hib immunization status (i.e., even if fully immunized).
- Preschool/day care contacts (including staff), regardless of age, when 2 or more cases of invasive Hib disease have occurred within 60 days among attendees and unimmunized or incompletely immunized children are attending.
- The case, if younger than 2 years of age or is a member of a household with a susceptible contact, and who had been treated with a regimen other than cefotaxime sodium or ceftriaxone sodium. Chemoprophylaxis usually is provided just before discharge from hospital

Chemoprophylaxis may be considered in the following situations at the discretion of the Medical Health Officer for:

- All household contacts of the case when at least one contact is a child of any age with immunodeficiency, sickle cell disease, asplenia, or leukemia.
- Health care workers who have administered mouth-to-mouth resuscitation to the case.

6.3.5 Group B Streptococcus (GBS) Disease

Highest level of evidence: 2+	**Public health recommendation: D**

As mentioned above, the CTFPHC (and a recent Canadian review) feels that there is fair evidence from cohort studies to support intrapartum chemoprophylaxis for all pregnant women followed by selective intrapartum chemoprophylaxis for all women with positive results of GBS colonization and/or only those women with risk factors. See prenatal screening above. Risk factors include preterm labour (< 37 weeks gestation); prolonged rupture of membranes $\geq$ 18 hours; maternal fever $\geq$ 38.0^{o}C; group B streptococcus bacteriuria during pregnancy; and previous delivery of a newborn with group B streptococcus disease regardless of current group B streptococcus colonization.

6.3.6 Group A Streptococcal (GAS) Disease

Highest level of evidence: 4	**Public health recommendation: D**

A working group, hosted by the CDC in Atlanta in 1995 summarized the data regarding the risk of GAS disease among household contacts of an index patient and the potential efficacy of chemoprophylaxis.[270] Data on the transmission of GAS and risk factors for severe infection were considered. Population-based surveillance data were used to estimate the risk of invasive GAS disease among household contacts of a case patient. The potential efficacy of chemoprophylaxis was considered using estimates of the efficacy of various regimens in eradicating pharyngeal carriage. The group concluded that no definite recommendations could be made at that time regarding chemoprophylaxis for household contacts of persons with invasive GAS infection. The group felt that more data were needed to assess the risk of subsequent cases and to determine an optimal regimen for chemoprophylaxis. The group recommended that until such data are available, physicians and health departments should base decisions regarding chemoprophylaxis on their assessment of the risk associated with each individual case.

6.3.7 Gonococcal Opthalmia Neonatorum

Highest level of evidence: 2+	**Public health recommendation: C**

The CTFPHC has noted that evidence for the universal prophylaxis of this condition has been forthcoming from controlled trials without randomization[271,272] and studies of comparison of times and places with or without the intervention.[273,274] With respect to chlamydial infection prophylacitc agents have comparable efficacy, but evidence for efficacy of any agent is inconclusive from randomized control trials.[275] It is worth mentioning that an RCT demonstrated that immediate as opposed to delayed silver nitrate prophylaxis does not significantly affect parent-infant bonding.[276]

6.3.8 Tuberculosis

Highest level of evidence: 1+	**Public health recommendation: B**

The CTFPHC feels that there is good evidence to recommend INH prophylaxis to household contacts and skin test converters and persons with underlying medical conditions like HIV that increase the risk of reactivation of infection. There is fair evidence to recommend INH prophylaxis for those aged <35 years or individuals with fibrotic scars on chest x-ray and poor evidence to recommend for or against prophylaxis for those aged over 35 years. This is based on INH preventing active cases of tuberculosis for patients with positive skin test. Evidence to support these recommendations comes from randomized control trials of household contacts[277,278]; skin test converters[279,280]; those with fibrotic scars on chest radiographs, with co-infection with HIV, less than 35 years of age[281] and those greater than 35 years of age[282,283]. Evidence for prophylaxis of persons with underlying medical conditions that increase the risk of reactivation of infection came from expert opinion.[284]

Chemoprophylaxis is only given to tuberculin positive close contacts with two exceptions. The first is of a skin test negative child who is a household contact of an infectious case. In this instance one refers to primary chemoprophylaxis. The second is treatment provided during the window period for susceptible and vulnerable contacts to prevent rapidly emerging TB disease. While the evidence for this practice of so called window-period prophylaxis is inferential, all models and theories support it and it is widely recommended.[285,286,287,288,289]

It is worth noting that the risk of dying from an overdose of isoniazid has been shown to approach the 10.2% risk of dying from traumatic suicide in Arizona aboriginal people in whom the rate of suicide was found to exceed the rate of TB. This led the authors to suggest that in aboriginal people targeted for preventive treatment there is careful selection; the dispensing of small amounts of therapy at short intervals and the close monitoring of compliance; and the dispensing of individually wrapped tablets to mitigate against overdosing.[290]

6.3.9 Influenza

Highest level of evidence: 1+	**Public health recommendation: B**

The CTFPHC concludes that there is good evidence to support amantadine chemoprophylaxis for influenza of high-risk or unvaccinated individuals around the index case. This is based on a randomized control trial that demonstrated a reduced incidence of symptomatic infection from influenza A virus.[291] A randomized, double-blind, placebo-controlled study showed that post-exposure with oseltamivir protected close contacts of influenza-infected persons against influenza illness, prevented outbreaks within households and was well tolerated.[292] A prospective randomized comparison of oseltamivir treatment with or without post-exposure prophylaxis demonstrated that oseltamivir is an effective option for preventing the transmission of influenza within households.[293] A double-blind, randomized study of inhaled zanamivir for the prevention of influenza in families showed that it was well tolerated and was effective in preventing influenza types A and B within households where the index patient was not treated.[294]

6.3.10 Botulism

Highest level of evidence: 4	**Public health recommendation: D**

As mentioned above, the decision to provide immunoprophylaxis for asymptomatic exposed people should be weighed carefully in view of the risk of adverse effects and sensitization to horse serum. If a decision is made to provide botulism antitoxin, this should not be delayed awaiting laboratory confirmation but started as early as possible.

6.3.11 Meningococcal Disease

Highest level of evidence: 2++	**Public health recommendation:** B

The cornerstone of prevention of secondary cases of invasive meningococcal disease is aggressive contact tracing to identify people at increased risk of disease (i.e., close contacts). The management of close contacts of cases with conjunctivitis or pneumonia is the same as for close contacts of invasive disease. Internationally, however, there are no uniform recommendations regarding chemoprophylaxis. Most jurisdictions recommend chemoprophylaxis for household contacts, but jurisdictions vary with respect to their recommendations for other types of close contacts and for the index case.

A recent systematic review of evidence for control policies for invasive meningococcal disease determined that the evidence supports the use of chemoprophylaxis for household contacts and for index cases. However, there were insufficient studies to examine evidence for chemoprophylaxis in child care settings.[295] Chemoprophylaxis is also indicated for *close contacts* when there is strong clinical suspicion of invasive meningococcal disease in the index case, and lab confirmation is not possible within 24 hours. The Public Health Agency of Canada (PHAC) reached a similar conclusion based on available evidence and expert opinion[296] and considers close contacts to be the following:

- Household contacts of a case.
- Persons who share sleeping arrangements with the case.
- Persons who have direct contamination of their nose or mouth with the oral/nasal secretions of a case (e.g., kissing on the mouth, shared cigarettes, shared drinking bottles).
- Health care workers (HCWs) who have had intensive unprotected contact (without wearing a mask) with infected patients (e.g., intubating, resuscitating or closely examining the oropharynx).
- Children and staff in child care and nursery school facilities.
- Airline passengers sitting immediately on either side of the case (but not across the aisle) when the total time spent aboard the aircraft was at least 8 hours.

The PHAC also agrees that chemoprophylaxis is not recommended for casual contacts (i.e., school or classroom contacts, transportation and workplace contacts, or social contacts who are not close contacts**.**) Nor is it recommended for emergency workers or health care contacts of cases, except where the health care worker's nose or mouth has been directly contaminated with oral or nasal secretions from a case of invasive meningococcal disease or purulent discharge from the eye of a case of primary meningococcal conjunctivitis.

The PHAC has accepted the National Advisory Committee on Immunization (NACI) recommendation that vaccination of unimmunized household and intimate social contacts may further reduce the risk of secondary cases beyond the benefit of chemoprophylaxis.[297]

6.3.12 Bordatella Pertussis

Highest level of evidence: 4	**Public health recommendation: D**

BCCDC recommends PEP for high-risk contacts including:

- Infants < 1 year of age (regardless of immunization status).
- Pregnant women in the 3rd trimester).
- All household contacts if there is an infant < 1 year of age or a pregnant woman in the 3rd trimester in the household.
- All those in a family or group daycare if there is an infant < 1 year of age or a pregnant woman in the 3rd trimester in the daycare.

Chemoprophylactic treatment of all high-risk contacts is recommended because immunization provides only partial protection and immunized people can still harbour and transmit *B. Pertussis*.

Non-high-risk contacts should receive PEP at the discretion of the Medical Health Officer. These include staff working with neonates, unimmunized contacts and pregnant women at all stages of pregnancy.

The CDC in Atlanta presents similar guidelines and references these to various studies which show that administration of post-exposure prophylaxis to asymptomatic household contacts within 21 days of onset of cough in the index patient can prevent symptomatic infection.[298] It is emphasized that coughing (symptomatic) household members of a pertussis patient should be treated as if they have pertussis.

Because severe and sometimes fatal pertussis-related complications occur in infants aged <12 months, especially among infants aged <4 months, post-exposure prophylaxis should be administered in exposure settings that include infants aged <12 months or women in the third trimester of pregnancy.

Abstracts and published case series describing use of azithromycin among infants aged <1 month report fewer adverse events compared with erythromycin.[299] To date, use of azithromycin in infants aged <1 month has not been associated with infantile hypertrophic pyloric stenosis (IHPS). Therefore, for pertussis, azithromycin is the preferred macrolide for post-exposure prophylaxis and treatment of infants aged <1 month. In this age group, the risk for acquiring severe pertussis and its life-threatening complications outweigh the potential risk for IHPS that has been associated with erythromycin.[300] Infants aged <1 month who receive a macrolide should be monitored for IHPS and other serious adverse events.

6.3.13 Rabies

Highest level of evidence: 4	**Public health recommendation: D**

PEP for rabies is based on an extensive algorithm that places bites from a bat in BC and those from various other animals that have exhibited signs of rabies at the time of exposure at high risk requiring intervention.

6.3.14 Simian B Virus

Highest level of evidence: 4	**Public health recommendation: D**

PEP for simian virus is provided to persons exposed but not documented to be infected. There have been no noted cases in which humans who received post-exposure prophylaxis within 72 hours of exposure developed disease. PEP is strongly recommended for cases with skin exposure that could not be adequately cleaned or mucosal exposure to a high-risk source (macaque monkey) particularly if there was a deep puncture bite or laceration of the head, neck or torso. PEP is not recommended for skin exposure in which the skin remains intact, or for exposure associated with non-macaque species of nonhuman primates.

6.3.15 Varicella

Highest level of evidence: 4	**Public health recommendation: D**

PEP should be provided to susceptible contacts at high risk for complications of varicella disease. An individual is considered a contact if they have had one or more of the following types of contact with someone known to have varicella during the period of communicability, with someone having disseminated zoster, or with an immunocompromised host with zoster:

- Continuous household contact (living in the same dwelling).
- Sharing the same hospital room.
- Face-to-face contact for five or more minutes.
- Direct contact with zoster or varicella vesicular fluid.

Contact with non-disseminated zoster lesions in an immunocompetent person that are well covered by clothing or dressings is not considered an exposure.

Varicella vaccination has been shown to be effective in preventing or reducing the severity of varicella if given to a susceptible individual within 3 to 5 days after exposure to wild-type varicella.

Varicella zoster immune globulin given within 96 hours of exposure may prevent or modify disease in susceptible close contacts of cases and should be given to:

- Exposed susceptible pregnant women.
- Immunocompromised clients (congenital or acquired) due to treatment or disease including some clients receiving high doses of corticosteroids.
- Newborn infants whose mothers develop varicella disease 5 days before or 48 hours after delivery.
- Hospitalized premature infants exposed during their first weeks of life.
- Exposed infants of < 28 weeks' gestational age regardless of maternal immune status.
- Exposed infants of 29 to 37 weeks' gestational age if the mother was not immune.

6.3.16 Victims of Sexual Abuse

Highest level of evidence: 4	**Public health recommendation: D**

The CTFPHC recommends that PEP for victims of sexual abuse should be provided for gonorrhea, chlamydia, trichomonas, syphilis, and hepatitis B (unless known to be immune). HIV PEP following sexual abuse is recommended when the assailant is known to be HIV-infected and significant exposure has occurred (e.g., oral, anal, and/or vaginal penetration without a condom or condom status unknown/broken). PEP may also be available on a case-by-case basis for other high-risk exposures (e.g., source a known injection drug user, multiple assailants and/or significant injury) and vaginal, anal or oral penetration has occurred. Currently, recommendations vary by province, and the decision to offer PEP should be made in conjunction with an HIV specialist and/or provincial/territorial/regional protocols.

6.3.17 PEP Following a Bioterrorist Communicable Disease Outbreak

A number of studies have assessed the experiences of the CDC post-exposure prophylaxis program following the anthrax attacks of 2001.[301,302,303] These studies were prompted by the relatively poor response to the PEP program. The attacks precipitated decisions to offer PEP to an estimated 10,000 individuals potentially exposed. Overall, approximately 5,420 individuals received education about the extended program. Of these 1,727 agreed to take antibiotics for the full 100 days but only 199 also chose to be vaccinated. Reasons for this poor response that have been advanced include fear of side effects, confusion about the efficacy of antibiotics, fear of antibiotic resistance, a belief of insignificant exposure, lack of perception of personal susceptibility, and observations that others who were not taking PEP had not become ill. These studies have promoted the recommendation that culturally appropriate and timely health education messages and methods promoting adherence, delivered by trusted individuals will be needed to ensure adequate compliance in programs of this nature in the future. [304]

6.3.18 PEP and Communication

The recommendations presented above from the assessment of the PEP program for anthrax focus attention on risk communication. This is a science based approach for communicating effectively in high concern situations and offers some insights for more effective PEP compliance outcomes. Covello has applied risk communication theoretical perspectives and models to various health events including the West Nile Virus epidemic in New York City in 1999 and 2000 and to a possible bioterrorist event.[305] While most instances requiring PEP do not take on the proportions of these events they do present similar communication challenges to health care practitioners to effect optimal compliance with PEP protocols.

Using Covello's approach risk communication, applied to circumstances requiring PEP, would assume that individuals who are requested to accept PEP regimens would find themselves in a high-concern situation and that this would create substantial barriers to effective communication and evoke strong emotions, such as fear, anxiety, distrust, anger, outrage, helplessness, and frustration. This challenges most approaches to communication of risk that assumes that the target audience comprises individuals who rationally review evidence to identify and choose the course of action that will maximize benefit to health. Covello argues that high-risk situations can result in an emotionally charged communication environment and that familiar and traditional approach to communication often fall short or can make the situation worse. He points out that evaluation studies indicate that personnel from many agencies and organizations involved in risk controversies lack the knowledge, sensitivity, and skills needed for effective risk communication.

A number of authors have offered suggestions for communicating with parents who are uncertain about immunizing their children.[306,307,308] For example, Bellaby offers the following conclusions to inform attempts to improve risk communication from an assessment of the understanding of UK parents' attitudes to combined MMR vaccination[309]:

- The challenge to authority, including the authority of science, should be expected in a healthy democracy.
- The establishment should disseminate evidence to the public in a transparent way that is sensitive to the ways of understanding of diverse groups.
- Communicating risk effectively to the so called masses, and so priming people to act appropriately, is about much more than providing even the best of information: it is a matter of two way communication and obtaining agreement. Concordance has to be the aim if compliance is to fall into place.

Additional recommendations include approaching "vaccine hesitancy" with a "selective vaccination" approach. This refers to starting with vaccines that are acceptable to the family, discussing ones that are a concern and working towards additional vaccines with a sensitive communication plan.[310] One study emphasized that providers need to be up to speed about reports in the media concerning apparent adverse reactions to immunizations and to counteract this with objective information.[311]

Alaszewski and Horlick-Jones add to the insights concerning risk communication by emphasizing that the social context influences the ways that individuals respond to information on risk.[312] Individuals evaluate the trustworthiness of sources and the relevance of information for their everyday lives. They add that individual and group responses to information on health risk are influenced by a range of social factors including:

- The extent to which the source of the information is trusted.
- The relevance of the information for everyday life and decision making.
- The relation to other perceived risks.
- The fit with previous knowledge and experience.
- The difficulty and importance of the choices and decisions.

Paling notes that the most powerful precursor for effective risk communication is for the doctor to strive to display both competence and a caring approach.[313] He feels that it is prudent to remind patients that virtually all treatments are inevitably associated with some risk of possible harm. This not only reflects the truth but also helps to counteract the tendency of some patients to expect totally risk-free medicine. He stresses the need to supplement verbal explanations with numerical data; to use absolute numbers as opposed to relative risks or percentage improvements when explaining risks; to state the odds from a positive and negative perspective and to use a consistent denominator; and to use visual aids wherever possible, to maximise understanding. He concludes that the goal is to make sure the patient's informed consent is based on information—not just data.

REFERENCES

[1] Last J. *A dictionary of epidemiology*. New York: Oxford University Press; 2001.
[2] Centers for Disease Control and Prevention. *Glossary of HIV prevention terms. Appendix to HIV community planning guide*; 2003 July. Available from: http://www.cdc.gov/hiv/pubs/hiv-cp/appendixD.htm.
[3] Canadian Task Force on Preventive Health Care. New grades for recommendations from the Canadian Task Force on Preventive Health Care. *Can Med Assoc J*. 2003;169(3):207-208.
[4] Harris RP, Helfand M, Woolf SH, Lohr KN, Mulrow CD, Teutsch SM, et al. Current methods of the US Preventive Services Task Force: a review of the process. *Am J Prev Med* 2001;20(3 Suppl):21-35.
[5] Gross PA, Barrett TL, Dellinger EP, et al. Purpose of quality standards for infectious diseases. *Clin Infect Dis.* 1994;18:421.
[6] Kirkham C, Harris S, Grzybowski S. Evidence-based prenatal care: part II. Third-trimester care and prevention of infectious diseases. *Am Fam Physician*. 2005;71:1555-60,1561-2.
[7] Ebell MH, Siwek J, Weiss BD, Woolf SH, Susman J, Ewigman B, et al. Strength of Recommendation Taxonomy (SORT): A patient-centered approach to grading evidence in the medical literature. *Am Fam Physician*. 2004;69:549-57.
[8] Slawson DC, Shaughnessy AF, Bennett JH. Becoming a medical information master: feeling good about not knowing everything. *J Fam Pract*. 1994;38:505-13.
[9] Weightman A, Ellis S, Cullum A, Sander L, Turley R. *Grading Evidence and Recommendations for Public Health Interventions: Developing and Piloting a Framework. Health Development Agency*. London: NHS; 2005. Available from: http://www.publichealth.nice.org.uk/page.aspx?o=503421.
[10] Last J. *A dictionary of epidemiology*. New York: Oxford University Press; 2001.
[11] Canadian Blood Services. *Detailed tests for transmissible diseases*. Available from: http://209.217.107.132/web/TMWS.nsf/EnglishHome?OpenFrameSet&Frame=Main&src=http://209.217.107.132/web/TMWS.nsf/page/E_Resources?OpenDocument.
[12] Walmsley S. Opt in or opt out: What is optimal for prenatal screening for HIV infection? *Can Med Assoc J*. 2003;18:168-708.
[13] Peters TJ, Wildschut HI, Weiner CP. Epidemiologic considerations in screening. In Wildschut HI, Weiner CP, Peters TJ, editors. When to screen in obstetrics and gynecology. Philadelphia: WB Saunders; 1996. p.1-12.
[14] Lucy Pembrey L, Newell ML, Peckham C. Is there a case for hepatitis C infection screening in the antenatal period? (Review) *J Med Screen*. Winter 2003;10(4):161-168.
[15] Ministry of Health Planning, Ministry of Health Services**.** Priorities for action in managing the epidemics HIV/AIDS in BC: 2003-2007. Victoria, BC: Ministry of Health Planning; 2003 September. Available from: http://www.healthservices.gov.bc.ca/hiv/priorities.html.
[16] Public Health Agency of Canada. *Canadian guidelines on sexually transmitted infections* (STI) 2006 Edition (Early release of selected chapters). Available from: http://www.phac-aspc.gc.ca/std-mts/sti_2006/sti_intro2006_e.html.
[17] BC Centre for Disease Control. *Communicable disease control chapter*. Last modified 18 October 2005. Available from: http://www.bccdc.org/content.php?item=192&PHPSESSID=4462e85fd66a183929c88a426641a405.
[18] Public Health Agency of Canada. *Canadian guidelines on sexually transmitted infections* (STI) 2006 Edition (Early release of selected chapters). Available from: http://www.phac-aspc.gc.ca/std-mts/sti_2006/sti_intro2006_e.html.
[19] Bayer R, Tooney KE. HIV prevention and the two. faces of partner notification. *Am J Public Health*. 1992;82:1158-1164.
[20] Parran T. The next great plague to go. *Survey Graphic*. 1936;25:405-411.
[21] Cowan FM, French R, Johnson AM. The role and effectiveness of partner notification in STD control: a review. *Genitourin Med*. 1996;72:247-252.
[22] Potterat JJ. Contact tracing's price is not its value [editorial]. *Sex Transm Dis.* 1997;24:519-21.
[23] Mathews C, Coetzee N. Partner notification. *Clin Evid*. 2004 Jun;(11):2113-20.
[24] Sydney Sexual Health Centre. *A practical handbook for health care providers managing people with HIV, viral hepatitis, and other STIs and HIV-related tuberculosis*. Edition 2; 2002. Available from: http://www.ashm.org.au/uploadFile/ctm2rev_cover_corporate.pdf.

[25] Public Health Agency of Canada. *Canadian guidelines on sexually transmitted infections* (STI) 2006 Edition (Early release of selected chapters). Available from: http://www.phac-aspc.gc.ca/std-mts/sti_2006/sti_intro2006_e.html.
[26] Cowan FM, French R, Johnson AM. The role and effectiveness of partner notification in STD control: a review. *Genitourin Med*. 1996;72:247-252.
[27] Quinn T, Wawer MJ,Sewankambo N, et al. Viral load and heterosexual transmission of human immunodeficiency virus type 1. *N Engl J Med*. 2000;342:921-929.
[28] HIV Prevention Trials Network. *A randomized trial to evaluate the effectiveness of antiretroviral therapy plus HIV primary care versus HIV primary care alone to prevent the sexual transmission of HIV-1 in serodiscordant couples* [website]. Available from: http://www.hptn.org/research_studies/hptn052.asp. [Accessed 2006 Mar 25].
[29] BC Centre for Disease Control. *Communicable disease control chapter*. Last modified 18 October 2005. Available from: http://www.bccdc.org/content.php?item=192&PHPSESSID=4462e85fd66a183929c88a426641a405.
[30] Workowski KA, Levine WC. Sexually transmitted diseases treatment guidelines—2002. *MMWR*. 2002, May 10;51(RR06):1-80.
[31] Public Health Agency of Canada. *Canadian guidelines on sexually transmitted infections* (STI) 2006 Edition (Early release of selected chapters). Available from: http://www.phac-aspc.gc.ca/std-mts/sti_2006/sti_intro2006_e.html.
[32] Canadian Task Force on Preventive Health Care. *Canadian guide to clinical preventive health care*. Ottawa, ON: Minister of Supply and Services Canada; 1994. Available from: http://www.phac-aspc.gc.ca/publicat/clinic-clinique/index.html.
[33] Canadian Task Force on Preventive Health Care [website]. Available from: http://www.ctfphc.org/map/map.htm.
[34] Hoff R, Berardi VP, Weiblen BJ, et al. Seroprevalence of human immunodeficiency virus among childbearing women. *N Engl J Med.* 1988;318:525-530.
[35] Schechter MT, Ballem PJ, Buskard NA, et al. An anonymous seroprevalence survey of HIV infection among pregnant women in British Columbia and the Yukon Territory. *Can Med Assoc J.* 1990;143:1187-1192.
[36] Hankins CA, Laberge C, Lapointe N, et al. HIV infection among Quebec women giving birth to live infants. *Can Med Assoc J.* 1990;143:885-893.
[37] Coates RA, Frank JW, Arshinoff R, et al. The Ontario HIV seroprevalence study of childbearing women: results from the first year of testing. *Clin Invest Med.* 1992;15:1-7.
[38] Peckham CS, Tedder RS, Briggs M, et al. Prevalence of maternal HIV infection based on unlinked anonymous testing of newborn babies. *Lancet.* 1990;335:516-519.
[39] Landesman S, Minkoff H, Holman S, et al. Serosurvey of human immunodeficiency virus infection in parturients. Implications for human immunodeficiency virus testing programs of pregnant women. *JAMA.* 1987;258:2701-2703.
[40] Barbacci MB, Dalabetta GA, Repke JT, et al. Human immunodeficiency virus infection in women attending an inner-city prenatal clinic: ineffectiveness of targeted screening. *Sex Transm Dis.* 1990;17:122-126.
[41] Fehrs LJ, Hill D, Kerndt PR, et al. Targeted HIV screening at a Los Angeles prenatal/family planning health center. *Am J Public Health.* 1991;81:619-622.
[42] Lindsay MK, Feng TI, Peterson HB, et al. Routine human immunodeficiency virus infection screening in unregistered and registered inner-city parturients. *Obstet Gynecol.* 1991;77:599-603.
[43] Wenstrom KD, Zuidema LJ: Determination of the seroprevalence of human immunodeficiency virus infection in gravidas by non-anonymous versus anonymous testing. *Obstet Gynecol.* 1989;74:558-561.
[44] U.S. Preventive Services Task Force. Screening for HIV: recommendation statement. *Ann Intern Med*. 2005;143:32-37.
[45] Kirkham C, Harris S, Grzybowski S. Evidence-based prenatal care: part II. Third-trimester care and prevention of infectious diseases. *Am Fam Physician.* 2005;71:1555-60,1561-2.
[46] American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for perinatal care*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; Washington, DC: American College of Obstetricians and Gynecologists; 2002.
[47] National Collaborating Centre for Women's and Children's Health. *Antenatal care: routine care for the healthy pregnant woman*. London: RCOG Press. Available from: http://www.rcog.org.uk/resources/Public/Antenatal_Care.pdf .
[48] Institute for Clinical Systems Improvement. Knowledge resources. Routine prenatal care. Bloomington, MN: Institute for Clinical Systems Improvement. Available from: http://www.icsi.org/knowledge/detail.asp?catID=29&itemID=191.

[49] Workowski KA, Levine WC. Sexually transmitted diseases treatment guidelines—2002. *MMWR*. 2002, May 10;51(RR06):1-80.
[50] Centers for Disease Control and Prevention. Revised recommendations for HIV screening of pregnant women. *MMWR*. 2001;50(RR-19):63-85.
[51] Samson L, King S. Evidence-based guidelines for universal counselling and offering of HIV testing in pregnancy in Canada [published correction appears in *Can Med Assoc J* 1998;159:22]. *Can Med Assoc J*. 1998;158:1449-57.
[52] Stoto MA, Almario DA, McCormick MC. *Reducing the odds: preventing perinatal transmission of HIV in the United States*. Washington, DC: National Academy Press; 1999.
[53] Centers for Disease Control and Prevention. Revised recommendations for HIV screening of pregnant women. *MMWR*. 2001;50(RR-19):63-85.
[54] Territorial Advisory Committee on AIDS. Guiding principles for human immunodeficiency virus (HIV) testing of women during pregnancy—2002. *Can Commun Dis Rep*. 2002;28:105-8.
[55] Centers for Disease Control and Prevention. HIV testing among pregnant women--United States and Canada, 1998-2001. *MMWR*. 2002;51:1013-6.
[56] Jayaraman GC, Preiksaitis JK, Larke B. Mandatory reporting of HIV infection and opt-out prenatal screening for HIV infection: effect on testing rates. *Can Med Assoc J*. 2003;168:679-82.
[57] Samson L, King S. Evidence-based guidelines for universal counselling and offering of HIV testing in pregnancy in Canada [published correction appears in *Can Med Assoc J* 1998;159:22]. *Can Med Assoc J*. 1998;158:1449-57.
[58] Brandeau ML, Owens DK, Sox CH, Wachter RM. Screening women of childbearing age for human immunodeficiency virus. a cost benefit analysis. *Arch Intern Med*. 1992;152(11):2229-37.
[59] Zaric GS, Bayoumi AM, Brandeau ML, Owens DK. The cost effectiveness of voluntary prenatal and routine newborn HIV screening in the United States. *J Acquir Immune Defic Syndr*. 2000:25(5):403-416.
[60] Postma MJ, Beck EJ, Mandalia S, Sherr L, Walters MDS, Houweling H, et al. Universal HIV screening of pregnant women in England: cost effectiveness analysis. *BMJ*. 1999;318:1656-60.
[61] Ades AE, Sculpher MJ, Gibb DM, Gupta R, Ratcliffe J. A cost-effectiveness analysis of antenatal HIV testing in the UK. *BMJ*. 1999;319:1230-34.
[62] Ecker JL. The cost effectiveness of human immunodeficiency virus screening in pregnancy. *Am J Obstet Gynecol*. 1996;174(2):716-721.
[63] McNaghten AD, Hanson DL, Jones JL, Dworkin MS, Ward JW. Effects of antiretroviral therapy and opportunistic illness. *AIDS*. 1999 Sep 10;13(13):1687-95.
[64] Palella FJ Jr, Delaney KM, Moorman AC, et al. Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. *N Engl J Med*. 1998 Mar 26;338(13):853-60.
[65] U.S. Preventive Services Task Force. *Screening for syphilis infection: recommendation statement*. Rockville (MD): Agency for Healthcare Research and Quality; 2004. Available from: http://www.guideline.gov/summary/summary.aspx?ss=15&doc_id=5265&nbr=3592.
[66] Centers for Disease Control and Prevention. Immunization of adolescents: recommendations of the Advisory Committee on Immunization Practices, the American Academy of Pediatrics, the American Academy of Family Physicians, and the American Medical Association. *Morbidity and Mortality Weekly Report.*1996 Nov 22;45(RR-13):1-16.
[67] Mast EE, Williams IT, Alter MJ, Margolis HS. Hepatitis B vaccination of adolescent and adult high-risk groups in the United States. *Vaccine*. 1998;16(Suppl):S27-29.
[68] American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for perinatal care*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; Washington, DC: American College of Obstetricians and Gynecologists; 2002.
[69] National Collaborating Centre for Women's and Children's Health. *Antenatal care: routine care for the healthy pregnant woman*. London: RCOG Press. Available from: http://www.rcog.org.uk/resources/Public/Antenatal_Care.pdf .
[70] Institute for Clinical Systems Improvement. Knowledge resources. Routine prenatal care. Bloomington, MN: Institute for Clinical Systems Improvement. Available from: http://www.icsi.org/knowledge/detail.asp?catID=29&itemID=191.
[71] U.S. Preventive Services Task Force. *Guide to clinical preventive services*. 2nd ed. Washington, DC: U.S. Department of Health and Human Services, Office of Public Health and Science, Office of Disease Prevention and Health Promotion; 1996.
[72] Centers for Disease Control and Prevention. Maternal hepatitis B screening practices—California, Connecticut, Kansas, and United States, 1992-1993. *Morbidity and Mortality Weekly Report.* 1994;43:311, 317-20.

[73] American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for perinatal care*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; Washington, DC: American College of Obstetricians and Gynecologists; 2002.
[74] Okun NB, Larke RP, Waters JR, Joffres MR. Success of a program of routine prenatal screening for hepatitis B surface antigen: the first 2 years. *Can Med Assoc J*. 1990;143(12):1317-21.
[75] Jordan R, Law M. An appraisal of the efficacy and cost-effectiveness of antenatal screening for hepatitis B. *J Med Screen*. 1997;3:117-27.
[76] Alger L, Lovchik J. Comparative efficacy of clindamycin versus erythromycin in eradication of antenatal Chlamydia trachomatis. *Am J Obstet Gynecol*. 1991;165:375-81.
[77] Cohen L, Veille J-C, Calkins B. Improved pregnancy outcome following successful treatment of chlamydial infection. *JAMA*. 1990;263:3160-3.
[78] Black-Payne C, Ahrabi M, Bocchini J, et al. Treatment of Chlamydia trachomatis identified with Chlamydiazyme during pregnancy. Impact on perinatal complications and infants. *J Reprod Med*. 1990;35:362-7.
[79] McMillan J, Weiner L, Lamberson H, et al. Efficacy of maternal screening and therapy in the prevention of chlamydia infection of the newborn. *Infection*. 1985;13:263-6.
[80] American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for perinatal care*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; Washington, DC: American College of Obstetricians and Gynecologists; 2002.
[81] Institute for Clinical Systems Improvement. Knowledge resources. Routine prenatal care. Bloomington, MN: Institute for Clinical Systems Improvement. Available from: http://www.icsi.org/knowledge/detail.asp?catID=29&itemID=191.
[82] U.S. Preventive Services Task Force. *Guide to clinical preventive services*. 2nd ed. Washington, DC: U.S. Department of Health and Human Services, Office of Public Health and Science, Office of Disease Prevention and Health Promotion; 1996.
[83] Nelson HD, Helfand M. Screening for chlamydial infection. *Am J Prev Med*. 2001;20(Suppl. 3):95-107.
[84] Workowski KA, Levine WC. Sexually transmitted diseases treatment guidelines—2002. *MMWR*. 2002, May 10;51(RR06):1-80.
[85] Davies HD, Wang EE. Periodic health examination, 1996 update: 2. Screening for chlamydial infections. Canadian Task Force on the Periodic Health Examination. Can Med Assoc J 1996;154:1631-44.
[86] Patterson TF, Andriole VT: Bacteriuria in pregnancy. *Infect Dis Clin North Am* 1987; 1: 807-822
[87] Little PJ: The incidence of urinary infection in 5,000 pregnant women. *Lancet* 1966; 2(470): 925-928
[88] Campbell-Brown M, McFadyen IR, Seal DV, et al. Is screening for bacteriuria in pregnancy worth while? *Br Med J Clin Res Ed.* 1987;294:1579-82.
[89] Romero R, Oyarzun E, Mazor M, et al. Meta-analysis of the relationship between asymptomatic bacteriuria and preterm delivery/low birth weight. *Obstet Gynecol.* 1989;73:576-82.
[90] American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for perinatal care*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; Washington, DC: American College of Obstetricians and Gynecologists; 2002.
[91] National Collaborating Centre for Women's and Children's Health. *Antenatal care: routine care for the healthy pregnant woman*. London: RCOG Press. Available from: http://www.rcog.org.uk/resources/Public/Antenatal_Care.pdf .
[92] Institute for Clinical Systems Improvement. Knowledge resources. Routine prenatal care. Bloomington, MN: Institute for Clinical Systems Improvement. Available from: http://www.icsi.org/knowledge/detail.asp?catID=29&itemID=191.
[93] U.S. Preventive Services Task Force. *Guide to clinical preventive services*. 2nd ed. Washington, DC: U.S. Department of Health and Human Services, Office of Public Health and Science, Office of Disease Prevention and Health Promotion; 1996.
[94] Canadian Task Force on Preventive Health Care. Prevention of group B streptococcal infection in newborns: recommendation statement from the Canadian Task Force on Preventive Health Care. *Can Med Assoc J*. 2002;166:928-30.
[95] Morales WJ, Lim D. Reduction of group B streptococcal maternal and neonatal infections in preterm pregnancies with premature rupture of membranes through a rapid identification test. *Am J Obstet Gynecol*. 1987;157:13-6.
[96] Pylipow M, Gaddis M, Kinney JS. Selective intrapartum prophylaxis for group B streptococcus colonization: management and outcomes of newborns. *Pediatrics*. 1994;93:631-5.

[97] Gibbs RS, McDuffie RS Jr, McNabb F, Fryer GE, Miyoshi T, Merenstein G. Neonatal group B streptococcal sepsis during 2 years of a universal screening program. *Obstet Gynecol*. 1994;84:496-500.
[98] Allardice JG, Baskett TF, Seshia MM, Bowman N, Malazdrewicz R. Perinatal group B streptococcal colonization and infection. *Am J Obstet Gynecol*. 1982;142:617-20.
[99] Garland SM, Fliegner JR. Group B streptococcus (GBS) and neonatal infections: the case for intrapartum chemoprophylaxis. *Aust NZ J Obstet Gynecol*. 1991;31:119-22.
[100] Money DM, Dobson S. The prevention of early-onset neonatal group B streptococcal disease. *J Obstet Gynaecol Can*. 2004;26:826-40, 50.
[101] Schrag S, Gorwitz R, Fultz-Butts K, Schuchat A. Prevention of perinatal group B streptococcal disease. Revised guidelines from CDC. *Morbidity & Mortality Weekly Report.* 2002;51(RR-11):1-22.
[102] American College of Obstetricians and Gynecologists. ACOG committee opinion: number 279, December 2002. Prevention of early-onset group B streptococcal disease in newborns. *Obstet Gynecol*. 2002;100:1405-12.
[103] Money DM, Dobson S. The prevention of early-onset neonatal group B streptococcal disease. *J Obstet Gynaecol Can*. 2004;26:826-40, 50.
[104] Schrag SJ, Zell ER, Lynfield R, Roome A, Arnold KE, Craig AS, et al. A population-based comparison of strategies to prevent early-onset group B streptococcal disease in neonates. *N Engl J Med*. 2002;347:233-9.
[105] Schrag S, Gorwitz R, Fultz-Butts K, Schuchat A. Prevention of perinatal group B streptococcal disease. Revised guidelines from CDC. *Morbidity & Mortality Weekly Report.* 2002;51(RR-11):1-22.
[106] National Collaborating Centre for Women's and Children's Health. *Antenatal care: routine care for the healthy pregnant woman*. London: RCOG Press. Available from: http://www.rcog.org.uk/resources/Public/Antenatal_Care.pdf .
[107] U.S. Preventive Services Task Force. Screening for bacterial vaginosis in pregnancy: recommendations and rationale. *Am J Prev Med*. 2001;20(Suppl. 3):59-61.
[108] McDonald H, Brocklehurst P, Parsons J, Vigneswaran R. Antibiotics for treating bacterial vaginosis in pregnancy. *Cochrane Database of Systematic Reviews*. 2005Jan 25;1:CD000262.
[109] Kirkham C, Harris S, Grzybowski S. Evidence-based prenatal care: part II. Third-trimester care and prevention of infectious diseases. *Am Fam Physician*. 2005;71:1555-60,1561-2.
[110] Arvin AM, Hensleigh PA, Prober CG, et al. Failure of antepartum maternal cultures to predict the infant's risk of exposure to herpes simplex virus at delivery. *N Engl J Med.* 1986;315:796-800.
[111] Corey L, Spear PG. Infections with herpes simplex virus. *N Engl J Med.* 1986;314:686-91.
[112] Prober CG, Hensleigh PA, Boucher FD, et al. Use of routine viral cultures at delivery to identify neonates exposed to herpes simplex virus. *N Engl J Med.* 1988;318:887-91.
[113] American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for perinatal care*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; Washington, DC: American College of Obstetricians and Gynecologists; 2002.
[114] Workowski KA, Levine WC. Sexually transmitted diseases treatment guidelines—2002. *MMWR*. 2002, May 10;51(RR06):1-80.
[115] U.S. Preventive Services Task Force. *Guide to clinical preventive services*. 2nd ed. Washington, DC: U.S. Department of Health and Human Services, Office of Public Health and Science, Office of Disease Prevention and Health Promotion; 1996.
[116] Smith JR, Cowan FM, Munday P. The management of herpes simplex virus infection in pregnancy. *Br J Obstet Gynaecol*. 1998;105:255-60.
[117] Royal College of Obstetricians and Gynaecologists. Clinical green top guidelines: management of genital herpes in pregnancy. London: Royal College of Obstetricians and Gynaecologists. Available from: http://www.rcog.org.uk/guidelines.asp?PageID=106&GuidelineID=39.
[118] Klebanoff MA, Carey JC, Hauth JC, et al. National Institute of Child Health and Human Development Network of Maternal-Fetal Medicine Units. Failure of metronidazole to prevent preterm delivery among pregnant women with asymptomatic Trichomonas vaginalis infection. *N Engl J Med.* 2001;345:487-93.
[119] Smith WJ, Jackson LA, Watts DH, Koepsell TD. Prevention of chickenpox in reproductive age women: cost effectiveness of routine prenatal screening with postpartum vaccination of susceptibles. *Obstet Gynecol*. 1998:92:535-45.
[120] Glantz JC, Mushlin AI. Cost effectiveness of routine antenatal varicella screening. *Obstet Gynecol*. 1998:91(4):519-28.
[121] Kirkham C, Harris S, Grzybowski S. Evidence-based prenatal care: part II. Third-trimester care and prevention of infectious diseases. *Am Fam Physician*. 2005;71:1555-60,1561-2.

[122] Institute for Clinical Systems Improvement. Knowledge resources. Routine prenatal care. Bloomington, MN: Institute for Clinical Systems Improvement. Available from: http://www.icsi.org/knowledge/detail.asp?catID=29&itemID=191.
[123] ACOG Practice Bulletin. Perinatal viral and parasitic infections. Number 20, September 2000. American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet*. 2002;76:95-107.
[124] Pinard JA, et al. Maternal serologic screening for toxoplasmosis. *J Midwifery Womens Health*. 2003;48:308-16.
[125] Benenson AS, editor. *Control of communicable disease manual*. 16th ed. Washington DC: American Public Health Association; 1995.
[126] Lee SH, Ewert DP, Frederick PD, et al. Resurgence of congenital rubella syndrome in the 1990s. Report on missed opportunities and failed prevention policies among women of childbearing age. *JAMA.* 1992;267:2616-20.
[127] Zealley H, Edmond E. Rubella screening and immunization of schoolgirls: results six to seven years after vaccination. *Br Med J.* 1982;284:382-4.
[128] Cradock-Watson JE. Laboratory diagnosis of rubella: past, present and future. *Epidemiol Infect.* 1991;107:1-15.
[129] Rowe RE, Garcia J, Davidson LL. Social and ethnic inequalities in the offer and uptake of prenatal screening and diagnosis in the UK: a systematic review. *Public Health*. 2004;118(3):177-89.
[130] Gordon D, Shaw M, Dorling D, Davey Smith G, editors. *Inequalities in health. The evidence presented to the independent inquiry into inequalities in health, chaired by Sir Donald Acheson*. Bristol, UK: The Policy Press; 1999.
[131] Meadows J, Jenkinson S, Catalan J. Who chooses to have the HIV antibody test in the antenatal clinic?. *Midwifery.* 1994;10:44-8.
[132] Mercey D, Helps BA, Copas A, Petruckevitch A, Johnson AM, Spencer J. Voluntary universal antenatal HIV testing [see comments]. *Br J Obstet Gynaecol.* 1996;103:1129-33. Comment in: *Br J Obstet Gynaecol*. 1996;103:viii.
[133] Duffy TA, Wolfe CD, Varden C, Kennedy J, Chrystie IL. Women's knowledge and attitudes, and the acceptability of voluntary antenatal HIV testing. *Br J Obstet Gynaecol.* 1998;105:849-54.
[134] Finkelstein MM. Preventive screening: what factors influence testing? *Can Fam Physician*. 2002;48:1494-1501.
[135] Pizzo PA. Pediatric AIDS: problems within problems. *J Infect Dis.* 1990;161:316-25.
[136] Husson RN, Comeau AM, Hoff R. Diagnosis of human immunodeficiency virus infection in infants and children. *Pediatrics.* 1990;86:1-10.
[137] Walter EB, McKinney RE, Lane BA, et al. Interpretation of western blots of specimens from children infected with human immunodeficiency virus type 1: implications for prognosis and diagnosis. *J Pediatr.* 1990;117(2 Pt 1):255-8.
[138] Centers for Disease Control and Prevention. Advancing HIV prevention: new strategies for a changing epidemic—United States, 2003. *Morbidity and Mortality Weekly Report.* 2003 Apr 18;52(15):329-32.
[139] Sell RL, Jovell AJ, Siegel JE. HIV screening of surgeons and dentists: a cost effectiveness analysis. *Infect Control Hosp Epidemiol*. 1994;15:635-45.
[140] Reynolds SL, Kapadia AS, Leonard L, Ross MW. Examining the direct costs and effectiveness of syphilis detection by selective screening and partner notification. J Public Health Med. 2001;23(4):339-45.
[141] U.S. Preventive Services Task Force. *Screening for syphilis infection: recommendation statement*. Rockville (MD): Agency for Healthcare Research and Quality; 2004. Available from: http://www.guideline.gov/summary/summary.aspx?ss=15&doc_id=5265&nbr=3592.
[142] Handsfield HH, McCormack WM, Hook EW, et al. A comparison of single-dose cefixime with ceftriaxone as treatment for uncomplicated gonorrhea. The gonorrhea treatment study group. *N Engl J Med.* 1991;325:1337-41.
[143] Smith BL, Mogabgab WJ, Dalu ZA, et al. Multicenter trial of fleroxacin versus ceftriaxone in the treatment of uncomplicated gonorrhea. *Am J Med.* 1993;94(3A):81S-84S.
[144] Handsfield HH, McCuchan JA, Corey L, et al. Evaluation of new anti-infective drugs for the treatment of uncomplicated gonorrhea in adults and adolescents. Infectious Diseases Society of America and the Food and Drug Administration. *Clin Infect Dis.* 1992;15(Suppl): S123-S130.
[145] Shafer M-A, Vaughan E, Lipkin E, et al. Evaluation of fluorescein-conjugated monoclonal antibody test to detect Chlamydia trachomatis endocervical infections in adolescent girls. *Pediatrics.* 1986;108:779-83.
[146] Stamm W, Harrison H, Alexander E, et al. Diagnosis of Chlamydia trachomatis infections by direct immunofluorescence staining of genital secretions. *Ann Intern Med*. 1984;101:638-41.
[147] Forbes B, Bartholoma N, McMillan J, et al. Evaluation of a monoclonal antibody test to detect chlamydia in cervical and urethral specimens. *J Clin Microbiol.* 1986;23:1136-7.
[148] Moncada J, Schachter J, Bolan G, et al. Confirmatory assay increases specificity of the chlamydiazyme test for Chlamydia trachomatis infection of the cervix. *J Clin Microbiol.* 1990;28:1770-73.

[149] Jaschek G, Gaydos CA, Welsh LE, et al. Direct detection of Chlamydia trachomatis in urine specimens from symptomatic and asymptomatic men by using a rapid polymerase chain reaction assay. *J Clin Microbiol.* 1993;31:1209-12.
[150] Mahony JB, Luinstra KE, Sellors JW, et al. Role of confirmatory PCRs in determining performance of Chlamydia Amplicor PCR with endocervical specimens from women with a low prevalence of infection. *J Clin Microbiol.* 1994;32:2490-3.
[151] Mahony J, Luinstra K, Sellors J, et al. Confirmatory polymerase chain reaction testing for Chlamydia trachomatis in first-void urine from asymptomatic and symptomatic men. *J Clin Microbiol.* 1992;30:2241-5.
[152] Linnemann C, Heaton C, Ritchey M. Treatment of Chlamydia trachomatis infections: comparison of 1- and 2-g doses of erythromycin daily for seven days. *Sex Transm Dis.* 1987;14:102-6.
[153] Alary M, Joly JR, Moutquin JM, et al. Randomised comparison of amoxycillin and erythromycin in treatment of genital chlamydial infection in pregnancy. *Lancet.* 1994;344:1461-5.
[154] Martin D, Mroczowski T, Dalu Z, et al. A controlled trial of a single dose of azithromycin for the treatment of chlamydial urethritis and cervicitis. *N Engl J Med,* 1992;327:921-5.
[155] Hammerschlag MR, Golden NH, Oh MK, et al. Single dose of azithromycin for the treatment of genital chlamydial infections in adolescents. *J Pediatr.* 1993;122:961-5.
[156] Hooton TM, Batteiger BE, Judson FN, et al. Ofloxacin versus doxycycline for treatment of cervical infection with Chlamydia trachomatis. *Antimicrob Agents Chemother.* 1992;36:1144-6.
[157] Cohen L, Veille J-C, Calkins B. Improved pregnancy outcome following successful treatment of chlamydial infection. *JAMA.* 1990;263:3160-3.
[158] *The Big Screen*. Available from: http://www.thebigscreen-sussex.co.uk/healthcareprofessional/index.html. [Accessed 2006 Feb 25].
[159] New York State Department of Health. *Aspects of primary care for the HIV-infected substance user*. New York: New York State Department of Health; 2004. Available from: http://www.guidelines.gov/summary/summary.aspx?view_id=1&doc_id=5980.
[160] Chou R, Clark EC, Helfand M. Screening for hepatitis c: a review of the evidence for the US Preventive Services Taskforce. *Ann Intern Med.* 2004;140:465-79.
[161] Alter MJ, Seeff LB, Bacon BR, Thomas DL, Rigsby MO, Di Bisceglie AM. Testing for hepatitis C virus infection should be routine for persons at increased risk for infection. *Ann Intern Med*. 2004;141(9):715-7.
[162] Stein K, Dalziel K, Walker A, et al. Screening for hepatitis C among injecting drug users and in genitourinary medicine clinics: systematic reviews of effectiveness, modelling study and national survey of current practice. *Health Technol Assess*. 2002;6(31). Available from: http://www.hta.ac.uk/fullmono/mon631.pdf.
[163] Gotz HM, van Doornum G, Niesters HG, den Hollander JG, Thio HB, de Zwart O. A cluster of acute hepatitis C virus infection among men who have sex with men—results from contact tracing and public health implications. *AIDS.* 2005;19:969-74.
[164] Centers for Disease Control and Prevention. Screening for tuberculosis and tuberculous infection in high-risk populations. The use of preventative therapy for tuberculous infection in the United States. Recommendations of the Advisory Committee for Elimination of Tuberculosis. *Morbidity and Mortality Weekly Report.* 1990;39(RR-8):1-12.
[165] Longfield JN, Margileth AM, Golden SM, et al. Interobserver and method variability in tuberculin skin testing. *Pediatr Infect Dis.* 1984;3(4):323-6.
[166] Hoffman JA, Klein H, Clark DC, Boyd FT. The effect of entering drug treatment on involvement in HIV-related risk behaviors. *Am J Drug Alcohol Abuse.* 1998;24:259-84.
[167] Steen R, Dallabetta G. Sexually transmitted infection control with sex workers: regular screening and presumptive treatment augment efforts to reduce risk and vulnerability. *Reprod Health Matters*. 2003:11(22):74-90.
[168] Steen R, Dallabetta G. Sexually transmitted infection control with sex workers: regular screening and presumptive treatment augment efforts to reduce risk and vulnerability. *Reprod Health Matters*. 2003:11(22):74-90.
[169] Meda N, Ndoye I, M'Boup S, et al. Low and stable HIV infection rates in Senegal: natural course of the epidemic or evidence for success of prevention? *AIDS*. 1999;13(11):1397-405.
[170] Laga M, Alary M, Nzila N, et al. Condom promotion, sexually transmitted diseases treatment, and declining incidence of HIV-1 infection in female Zairian sex workers. *Lancet.* 1994;344:246-48.
[171] Ghys PD, Diallo MO, Ettiegne-Traore V, et al. Increase in condom use and decline in HIV and sexually transmitted diseases among female sex workers in Abidjan, Cote d'Ivoire, 1991 1998. *AIDS.* 2002;16(2):251-8.
[172] Levine WC, Revollo R, Kaune V, et al. Decline in sexually transmitted disease prevalence in female Bolivian sex workers: impact of an HIV prevention project. *AIDS.* 1998;12(14):1899-906.

[173] Alary M, Mukenge-Tshibaka L, Bernier F, et al. Decline in the prevalence of HIV and sexually transmitted diseases among female sex workers in Cotonou, Benin, 1993-1999. *AIDS*. 2002;16(3):463-70.
[174] Moses S, Ngugi EN, Costigan A, Kariuki C, Maclean I, Brunham RC, et al. Response of a sexually transmitted infection epidemic to a treatment and prevention programme in Nairobi, Kenya. *Sex Transm Infect*. 2002;78(Suppl 1):114-20.
[175] McCusker J, Stoddard AM, Mayer KH, et al. Effects of HIV antibody test knowledge on subsequent sexual behaviors in a cohort of homosexually active men. *Am J Public Health.* 1988;78:462-7.
[176] Van Griensven GJP, de Vroome EMM, Tielman RAP, et al. Effect of human immunodeficiency virus (HIV) antibody knowledge on high-risk sexual behavior with steady and nonsteady sexual partners among homosexual men. *Am J Epidemiol.* 1989;129:596-603.
[177] Schechter MT, Craib KJP, Willoughby B, et al. Patterns of sexual behavior and condom use in a cohort of homosexual men. *Am J Public Health.* 1988;78:1535-8.
[178] Van Griensven GJP, de Vroome EMM, Tielman RAP, et al. Effect of human immunodeficiency virus (HIV) antibody knowledge on high-risk sexual behavior with steady and nonsteady sexual partners among homosexual men. *Am J Epidemiol.* 1989;129:596-603.
[179] Robertson JR, Skidmore CA, Roberts JJK. HIV infection in intravenous drug users: a follow-up study indicating changes in risk-taking behaviour. *Br J Addict.* 1988;83:387-91.
[180] Fox R, Odaka NJ, Brookmeyer R, et al. Effect of HIV antibody disclosure on subsequent sexual activity in homosexual men. *AIDS.* 1987;1:241-6.
[181] van Griensven GJP, de Vroome EMM, Goudsmit JAAP, et al. Changes in sexual behaviour and the fall in incidence of HIV infection among homosexual men. *BMJ.* 1989;298:218-21.
[182] Kim HC, Raska K, Clemow L. Human immunodeficiency virus infection in sexually active wives of infected hemophilic men. *Am J Med.* 1988;85:472-6.
[183] Laurian Y, Peynet J, Verroust F. HIV infection in sexual partners of HIV-seropositive patients with hemophilia. *N Engl J Med.* 1989;320:183.
[184] Casadonte PP, Des Jarlais DC, Friedman SR, et al. Psychological and behavioral impact among intravenous drug users of learning HIV test results. *Int J Addict.* 1990;25(4):409-26.
[185] Martin GS, Serpelloni G, Galvan U, et al. Behavioural change in injecting drug users: evaluation of an HIV/AIDS education programme. *AIDS Care.* 1990;2:275-9.
[186] McKeganey N. Being positive: drug injectors' experiences of HIV injection. *Br J Addict.* 1990;85:1113-24.
[187] Stauffer WM, Kamat D, Walker PF. Screening of international immigrants, refugees, and adoptees. *Prim Care*. 2002;29(4):879-905.
[188] Waner JL, Todd S, Shalaby H, et al. Comparison of Directigen Flu-A with viral isolation and direct immunofluorescence for the rapid detection and identification of influenza A virus. *J Clin Microbiol.* 1991;29(3):479-82.
[189] U.S. Preventive Services Task Force. Screening for HIV: recommendation statement. *Ann Intern Med*. 2005;143:32-37.
[190] Allard R, Robert J, Turgeon P, et al. Predictors of asymptomatic gonorrhea among patients seen by private practitioners. *Can Med Assoc J.* 1985;133:1135-9, 1146.
[191] Phillips RS, Hanff PA, Wertheimer A, et al. Gonorrhea in women seen for routine gynecologic care: Criteria for testing. *Am J Med.* 1988;85:177-82.
[192] Rosenthal GE, Mettler G, Pare S, et al. A new diagnostic index for predicting cervical infection with either *Chlamydia trachomatis* or *Neisseria gonorrhoeae*. *J Gen Intern Med.* 1990;5:319-26.
[193] Aledort JE, Hook EW III, Weinstein MC, Goldie SJ. The cost-effectiveness of gonorrhea screening in urban emergency departments. *Sex Transm Dis*. 2005;32:425-36.
[194] Handsfield HH. STD risk assessment and chlamydia screening: what's missing? *Am J Prev Med*. 2000;18:183-5.
[195] Sellors JW, Pickard L, Gafni A, et al. Effectiveness and efficiency of selective vs universal screening for chlamydial infection in sexually active young women. *Arch Intern Med.* 1992;152:1837-44.
[196] Washington A, Arno P, Brooks M. The economic cost of pelvic inflammatory disease. *JAMA.* 1986;255:1735-8.
[197] Estany A, Todd M, Vasques M, et al. Early detection of genital chlamydial infection in women: an economic evaluation. *Sex Transm Dis.* 1989;16:21-7.
[198] Phillips R, Aronson M, Taylor W, et al. Should tests for Chlamydia trachomatis cervical infection be done during routine gynecologic visits? An analysis of the costs of alternative strategies. *Ann Intern Med.* 1987;107:188-94.
[199] Honey E, Augood C, Templeton A, Russell I, Paavonen J, Mardh PA, et al. Cost effectiveness of screening for *Chlamydia trachomatis*: a review of published studies. *Sex Transm Infect.* 2002;78:406-12.

[200] van Valkengoed IG, Morre SA, van den Brule AJ, Meijer CJ, Bouter LM, Boeke AJ. Overestimation of complication rates in evaluations of Chlamydia trachomatis screening programmes--implications for cost-effectiveness analyses. *Int J Epidemiol*. 2004 Apr;33(2):416-25.
[201] Nelson HD, Helfand M. Screening for chlamydial infection. *Am J Prev Med*. 2001;20(Suppl 3):95-107.
[202] Marrazzo JM, Celum CL, Hillis SD, Fine D, DeLisle S, Handsfield HH. Performance and cost-effectiveness of selective screening criteria for Chlamydia trachomatis infection in women. Implications for a national Chlamydia control strategy. *Sex Transm Dis.* 1997:24:131-41.
[203] Cohen DA, Kanouse DE; Iguchi MY, Bluthenthal RN, Galvan FH, Bing EG. Screening for sexually transmitted diseases in non-traditional settings: a personal view. *Int J STD AIDS.* 2005;16(8):521-7.
[204] Ford CA, Viadro CI, Miller WC. Testing for chlamydial and gonorrheal infections outside of clinic settings: a summary of the literature. *Sex Transm Dis.* 2004;31(1):38-51.
[205] U.S. Preventive Services Task Force. *Screening for syphilis infection: recommendation statement*. Rockville (MD): Agency for Healthcare Research and Quality; 2004. Available from: http://www.guideline.gov/summary/summary.aspx?ss=15&doc_id=5265&nbr=3592.
[206] Koutsky LA, Holmes KK, Critchlow MS, et al. A cohort study of the risk of cervical intraepithelial neoplasia grade 2 or 3 in relation to papillomavirus infection. *N Engl J Med.* 1992;327:1272-8.
[207] Mitchell H, Drake M, Medley G. Prospective evaluation of risk of cervical cancer after cytological evidence of human papillomavirus infection. *Lancet.* 1986;1:573-5.
[208] Campion MJ, McCance DJ, Cuzick J, et al. Progressive potential of mild cervical atypia: prospective cytological, colposcopic, and virological study. *Lancet.* 1986;2:237-40.
[209] Pagano R, Chanen W, Rome RM et al. The significance of human papilloma virus atypia ("wart virus infection") found alone on cervical cytology screening. *Aust N Z J Obstet Gynaecol.* 1987;27:136-9.
[210] Reeves WC, Brinton LA, Garcia M, et al. Human papillomavirus infection and cervical cancer in Latin America. *N Engl J Med.* 1989;320:1437-41.
[211] Schiffman MH, Bauer HM, Hoover RN, et al. Epidemiologic evidence showing that human papillomavirus infection causes most cervical intraepithelial neoplasia. *J Natl Cancer Inst.* 1993;85:958-64.
[212] Public Health Agency of Canada. *Canadian guidelines on sexually transmitted infections* (STI) 2006 Edition (Early release of selected chapters). Available from: http://www.phac-aspc.gc.ca/std-mts/sti_2006/sti_intro2006_e.html.
[213] U.S. Preventive Services Task Force. *Screening for hepatitis B virus infection: recommendation statement*. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2004. Available from: http://www.guidelines.gov/summary/summary.aspx?doc_id=4774&nbr=003453&string=Hepatitis#s24.
[214] Agency for Healthcare Research and Quality. *Screening for hepatitis B virus infection: a brief evidence update for the U.S. Preventive Services Task Force*. Rockville (MD): Agency for Healthcare Research and Quality; 2004. Available from: http://www.ahrq.gov/clinic/3rduspstf/hepbscr/hepbup.htm.
[215] Lifson AR, Chiasson MA, Stoneburner RL. Screening for HIV infection in sexually transmitted disease clinics. *N Engl J Med.* 1988;319:242-3.
[216] Wenstrom KD, Zuidema LJ. Determination of the seroprevalence of human immunodeficiency virus infection in gravidas by non-anonymous versus anonymous testing. *Obstet Gynecol.* 1989;74:558-61.
[217] Centers for Disease Control. Human immunodeficiency virus infection in the United States: a review of current knowledge. *Morbidity and Mortality Weekly Report.* 1987 Dec 18;36(Suppl 6):1-48.
[218] Chou R, Clark EC, Helfand M. Screening for hepatitis c: a review of the evidence for the US Preventive Services Taskforce. *Ann Intern Med.* 2004;140:465-79.
[219] Chacko MR, Wiemann CM, Smith PB. Chlamydia and gonorrhea screening in asymptomatic young women. *J Pediatr Adolesc Gynecol.* 2004;17(3):169-78.
[220] Dubey V, Mathew R, Katyal S, Iglar K. *Evidence-based preventive care checklist form*. Mississauga, ON: College of Family Physicians of Canada. Available from: http://www.cfpc.ca/English/cfpc/communications/health%20policy/Preventive%20Care%20Checklist%20Forms/Intro/default.asp?s=1.
[221] Ross JD, Scott GR. The association between HIV media campaigns and number of patients coming forward for HIV antibody testing. *Genitorurin Med.* 1993;69(3):193-5.
[222] McOwan A, Gilleece Y, Chrislett L, Mandalia S. Can targeted HIV testing campaigns alter health seeking behaviour? *AIDS Care*. 2002:14(3):385-90.
[223] Brewer DD, Garrett S, Kulasingam S. Forgetting as a cause of incomplete reporting of sexual and drug injection partners. *Sex Transm Dis.* 1999;26:166-76.

[224] Ferebee SH, Mount FW. Tuberculosis morbidity in a controlled trial of the prophylactic use of isoniazid among household contacts. *Am Rev Respir Dis.* 1962;85:490-510.
[225] Centers for Disease Control and Prevention. Guidelines for the investigation of contacts of persons with infectious tuberculosis; recommendations from the National Tuberculosis Controllers Association and CDC, and Guidelines for using the QuantiFERON®-TB Gold test for detecting *Mycobacterium tuberculosis* infection, United States. *MMWR.* 2005;54(RR-15).
[226] Macke BA, Maher JE. Partner notification in the United States: an evidence-based review. *Am J Prev Med.* 1999;17(3):230-42.
[227] Oxman AD, Scott EA, Sellors JW, et al. Partner notification for sexually transmitted disease: an overview of the evidence. *Can J Public Health.* 1994;85(Suppl):41-7.
[228] Mathews C, Coetzee N, Zwarenstein M, et al. Strategies for partner notification for sexually transmitted diseases. *Cochrane Database of Systematic Reviews.* 2001;4:CD002843.
[229] Landis SE, Schoenbach VJ, et al. Results of a randomized trial of partner notification in cases of HIV infection in North Carolina. *N Engl J Med.* 1992;326(2):101-6.
[230] Cleveland JQ. A cost-effective study of alternate methods for Gonorrhea contact referral and rescreening. Unpublished manuscript reviewed in: Oxman AD, Scott EAF, Sellors JW, et al. Partner notification for sexually transmitted diseases: an overview of the evidence. *Can J Public Health.* 1994;85:127-132.
[231] Potterat JJ, Rothenberg RR. The case-finding effectiveness of a self-referral system for gonorrhea: a preliminary report. *Am J Public Health.* 1977;67(2):174-6.
[232] Katz BP, Danos CS, et al. Efficiency and cost-effectiveness of field follow-up for patients with *Chlamydia trachomatis* infection in a sexually transmitted disease clinic. *Sex Transm Dis.* 1988;15(1):11-16.
[233] Peterman TA, Toomey KE, Dicker LW, Zaidi AA, Wroten JE, Carolina J. Partner notification for syphilis: a randomized controlled trial of three approaches. *Sex Transm Dis.* 1997;24(9):511-18.
[234] Ellison G, Moniez V, Stein J. A randomized controlled trial of a standardised health message vs patient-centred counseling to improve STD partner notification. *Ann Hum Biol.* 2001;30(in press).
[235] Montesinos L, Frisch LE, Greene BF, Hamilton M. An analysis of and intervention in the sexual transmission of disease. *J Appl Behav Anal.* 1990;23(3):275-84.
[236] Katz BP, Danos CS, et al. Efficiency and cost-effectiveness of field follow-up for patients with c*hlamydia trachomatis* infection in a sexually transmitted disease clinic. *Sex Transm Dis.* 1988;15(1):11-16.
[237] Cleveland JQ. A cost-effective study of alternate methods for Gonorrhea contact referral and rescreening. Unpublished manuscript reviewed in: Oxman AD, Scott EAF, Sellors JW, et al. Partner notification for sexually transmitted diseases: an overview of the evidence. *Can J Public Health.* 1994;85:127-132.
[238] Solomon MZ, DeJong W. The impact of a clinic-based educational videotape on knowledge and treatment behavior of men with gonorrhea. *Sex Transm Dis.* 1988;15:127-32.
[239] Scholes D, Stergachis A, Heidrich FE, et al. Prevention of pelvic inflammatory disease by screening for cervical chlamydial infection. *N Engl J Med.* 1996;21:1399-1401.
[240] Golden MR. Innovative approaches to the prevention and control of bacterial sexually transmitted infections. *Infect Dis Clin North Am.* 2005;19(2):513-40.
[241] Spencer JN. A critical piece by whatever name. *Sex Transm Dis.* 2000;27:19-20.
[242] Rothenberg R.The transformation of partner notification. *Clin Infect Dis.* 2002;35:S138-S145.
[243] Jordon W, Tolbert L, Smith R. Partner notification and focused intervention as a means of identifying HIV-positive patients. *J Natl Med Assoc.* 1998;90:542-6.
[244] Ramstedt K, Forssman L, Johannisson G. Contact tracing in the control of genital Chlamydia trachomatis infection. *Int J STD AIDS.* 1991;2:116-18.
[245] Kissinger P, Brown R, Reed K. Effectiveness of patient delivered partner medication for preventing recurrent Chlamydia trachomatis. *Sex Transm Infect.* 1998;74:331-3.
[246] Golden MR, Whittington WL, Handsfield HH. Impact of expedited sex partner treatment on recurrent or persistent gonorrhea or chlamydial infection: a randomized controlled trial. *N Engl J Med.* 2005;352:676-85.
[247] Kissinger P, Farley TA, Richardson-Alston G, et al. A comparison of three different strategies to treat partners of men with urethritis. Presented at the 15th International Society for Sexually Transmitted Disease Research Congress. Ottawa, Canada, July 27-30, 2003.
[248] Kissinger P, Brown R, Reed K. Effectiveness of patient delivered partner medication for preventing recurrent Chlamydia trachomatis. *Sex Transm Infect.* 1998;74:331-3.

[249] Centers for Disease Control and Prevention. Program operations guidelines for STD prevention. Atlanta, GA: Centers for Disease Control and Prevention; 2005. Available from: www.cdc.gov/std/program/partner/TOC-PGpartner.htm. [Accessed: 2005 Dec 19].
[250] Tomnay JE, Pitts MK, Fairley CK. New technology and partner notification: Why aren't we using them? *Int J STD AIDS.* 2005;16:19-22.
[251] Klausner JD, Wolf W, Fischer-Ponce L, Zolt I, Katz MH. Tracing a syphilis outbreak through cyberspace. *JAMA.* 2000;284:447-9.
[252] Andersen B, Østergaard L, Møller JK, Olesen F. Home sampling versus conventional contact tracing for detecting *Chlamydia trachomatis* infection in male partners of infected women: randomised study. *BMJ.* 1998;316:350-1.
[253] Pinkerton SD, Holtgrave DR, Bloom FR. Cost effectiveness of post exposure prophylaxis following sexual exposure to HIV. *AIDS.* 1998;12(9):1067-78.
[254] Centers for Disease Control and Prevention. Updated U.S. Public Health service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. *MMWR.* 2001 Jun 29;50(RR-11). Available from: http://www.cdc.gov/mmwr/PDF/rr/rr5011.pdf.
[255] Maynard JE. Passive immunization against hepatitis B: a review of recent studies and comment on current aspects of control. *Am J Epidemiol.* 1978;107:77-86.
[256] Hoofnagle JH, Seeff LB, Bales ZB, et al. Passive-active immunity from hepatitis B immune globulin: reanalysis of a Veterans Administrative cooperative study of needle stick hepatitis, the Veterans Administration Cooperative Study Group. *Ann Intern Med.* 1979;91:813-18.
[257] Perrillo RP, Campbell CR, Strang S, et al. Immune globulin and hepatitis B immune globulin: prophylactic measures for intimate contacts exposed to acute type B hepatitis. *Arch Intern Med.* 1984;144:81-5.
[258] Beasley RP, Hwang LY, Stevens CE, et al. Efficacy of hepatitis B immune globulin for prevention of perinatal transmission of the hepatitis B carrier state: final report of a randomized double-blind, placebocontrolled trial. *Hepatology.* 1983;3:135-41.
[259] Wong VC, Ip HM, Reesink HW, et al. Prevention of HBsAg carrier state in newborn infants of mothers who are chronic carriers of HBsAg and HBeAg by administration of hepatitis-B vaccine and hepatitis-B immunoglobulin: double-blind randomised, placebo-controlled study. *Lancet.* 1984;1:921-6.
[260] Stevens CE, Toy PT, Tong MJ, et al. Perinatal hepatitis B virus transmission in the United States: prevention by passive-active immunization. *JAMA.* 1985;253:1740-5.
[261] Grady GF, Lee VA, Prince AM, et al. Hepatitis B immune globulin for accidental exposures among medical personnel: final report of a multicenter controlled trial. *J Infect Dis.* 1978;138:625-38.
[262] Seeff LB, Zimmerman HJ, Wright EC, et al. A randomized, double blind controlled trial of the efficacy of immune serum globulin for the prevention of post-transfusion hepatitis: a Veterans Administration cooperative study. *Gastroenterology.* 1977;72:111-21.
[263] Prince AM, Szmuness W, Mann MK, et al. Hepatitis B "immune" globulin: effectiveness in prevention of dialysis-associated hepatitis. *N Engl J Med.* 1975;293:1063-7.
[264] Brewer DD, Garrett S, Kulasingam S. Forgetting as a cause of incomplete reporting of sexual and drug injection partners. *Sex Transm Dis.* 1999;26:166-176.
[265] Hollinger FB, Glombicki AP. Hepatitis A virus. In: Mandell GL, Douglas RG, Bennett JE, editors. *Principles and practice of infectious diseases*. 3rd ed. New York: Churchill Livingstone; 1990. p. 1383-99.
[266] Mosley JW, Reisler DM, Brachott D, et al. Comparison of two lots of immune serum globulin for prophylaxis of infectious hepatitis. *Am J Epidemiol.* 1968;87:539-50.
[267] Mosley JW, Reisler DM, Brachott D, et al. Comparison of two lots of immune serum globulin for prophylaxis of infectious hepatitis. *Am J Epidemiol.* 1968;87:539-50.
[268] Band JD, Fraser DW, Ajello G. Prevention of Haemophilus influenzae type b disease. *JAMA.* 1984;251: 2381-86.
[269] Granoff DM, Gilsdorf J, Gessert C, et al. Haemophilus influenzae type B disease in a day care center: eradication of carrier state by rifampin. *Pediatrics.* 1979;63:397-401.
[270] Working Group on Prevention of Invasive Group A Streptococcal Infections. Prevention of invasive group a streptococcal disease among household contacts of case-patients: is prophylaxis warranted? *JAMA.* 1998;279:1206-10.
[271] Laga M, Plummer FA, Piot P, et al. Prophylaxis of gonococcal and chlamydial ophthalmia neonatorum. A comparison of silver nitrate and tetracycline. *N Engl J Med.* 1988;318:653-7.
[272] Hammerschlag MR, Cummings C, Roblin PM, et al. Efficacy of neonatal ocular prophylaxis for the prevention of chlamydial and gonococcal conjunctivitis. *N Engl J Med.* 1989;320:769-72.

[273] Laga M, Meheus A, Piot P. Epidemiology and control of gonococcal ophthalmia neonatorum. *Bull World Health Organ.* 1989;67:471-7.
[274] Lund RJ, Kibel MA, Knight GJ, et al. Prophylaxis against gonococcal ophthalmia neonatorum. A prospective study. *S Afr Med J.* 1987;72:620-2.
[275] Bell TA, Sandstrom KI, Gravett MG, et al. Comparison of ophthalmic silver nitrate solution and erythromycin ointment for prevention of natally acquired *Chlamydia trachomatis*. *Sex Transm Dis.* 1987;14:195-200.
[276] Butterfield PM, Emde RN, Svejda MJ. Does the early application of silver nitrate impair maternal attachment? *Pediatrics.* 1981;67:737-8.
[277] Pape JW, Jean SS, Ho JL. Effect of isoniazid prophylaxis on the incidence of active tuberculosis and progression of HIV infection. *Lancet.* 1993;342:268-72.
[278] Mount FW, Ferebee SH. The effect of isoniazid prophylaxis on tuberculosis morbidity among household contacts of previously known cases of tuberculosis. *Am Rev Respir Dis.* 1962;85:821-7.
[279] Bush O, Sigimoto M, Fujii Y, et al. Isoniazid prophylaxis in contacts of persons with known tuberculosis. Second Report. *Am Rev Respir Dis.* 1965;92:732-40.
[280] Veening GJ. Long term isoniazid prophylaxis: Controlled trial on INH prophylaxis after recent tuberculin conversion in young adults. *Bull Un Int Tuberc.* 1968;41:169-71.
[281] Curry FJ. Prophylactic effect of isoniazid in young tuberculin reactors. *New Engl J Med.* 1967;277(11):562-7.
[282] Ferebee SH, Mount FW, Murray FJ, et al. A controlled trial of isoniazid prophylaxis in mental institutions. *Am Rev Respir Dis.* 1963;88(2):161-75.
[283] Pape JW, Jean SS, Ho JL. Effect of isoniazid prophylaxis on the incidence of active tuberculosis and progression of HIV infection. *Lancet.* 1993;342:268-72.
[284] American Thoracic Society: Control of tuberculosis in the United States. *Am Rev Respir Dis.* 1992;146:1623-33.
[285] American Thoracic Society. Guidelines for the investigation and management of tuberculosis contacts. *Am Rev Resp Dis*. 1976;114:1-5.
[286] Centers for Disease Control. Targeted tuberculin testing and treatment of latent tuberculosis infection. *MMWR.* 2000;49(RR-6):1-51.
[287] Lincoln EM, Sewell EM. *Tuberculosis in children*. New York: McGraw-Hill Book Company; 1963.
[288] Comstock GW, Cauthen GM. Epidemiology of tuberculosis. In: Reichman LB, Hershfield ES, editors. *Tuberculosis: a comprehensive international approach*. New York: Marcel Dekker; 1993.
[289] Markowitz N, Hansen NI, Hopewell PC, et al. Incidence of tuberculosis in the United States among HIV-infected persons. *Ann Intern Med*. 1997;126:123-32.
[290] Hoeppner VH, Marciniuk DD. Tuberculosis in aboriginal Canadians. *Can Respir J*. 2000 Mar-Apr;7(2):141-6.
[291] Sears SD, Clements ML. Protective efficacy of low dose amantadine in adults challenged with wild-type influenza A virus. *Antimicrob Agents Chemother*. 1987;31(10):1470-3.
[292] Welliver R, Monto AS, Carewicz O, et al. Effectiveness of Oseltamivir in preventing influenza in household contacts. *JAMA*. 2001;285:748-54.
[293] Hayden FG, Belshe R, Villanueva C, et al. Management of influenza in households: A prospective, randomized comparison of Oseltamivir treatment with or without postexposure prophylaxis. *J Infect Dis*. 2004;189:440-449.
[294] Monto AS, Pichichero ME, Blankenberg SJ, et al. Zanamvir prophylaxis: An effective strategy for the prevention of influenza types A and B within households. *J Infect Dis*. 2002;186:1582-8.
[295] Purcell B, Samuelsson S, Hahne SJM, et al. Effectiveness of antibiotics in preventing meningococcal disease after a case: systematic review. *Br Med J.* 2004;328:1339-42.
[296] Public Health Agency of Canada. Guidelines for the prevention and control of meningococcal disease. *Canada Communicable Disease Report.* 2005 May;31S1.
[297] National Advisory Committee on Immunization. Statement on recommended use of meningococcal vaccines. *Canada Communicable Disease Report.* 2001;27(ACS-6):2-36.
[298] Centers for Disease Control and Prevention. Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis. *MMWR*. 2005 Dec 9;54(RR14):1-16.
[299] Friedman DS, Curtis RC, Schauer SL, et al. Surveillance for transmission and antibiotic adverse events among neonates and adults exposed to a healthcare worker with pertussis. *Infect Control Hosp Epidemiol*. 2004;25:967-73.
[300] Honein MA, Paulozzi LJ, Himelright IM, et al. Infantile hypertrophic pyloric stenosis after pertussis prophylaxis with erythromycin: a case review and cohort study. *Lancet.* 1999;354:2101-5.
[301] Miro S, Kaufman S. Anthrax in New Jersey: a health education experience in bioterrorism response and preparedness. *Health Promot Pract*. 2005;6(4):430-6.

[302] Williams JL, Noviello SS, Griffith KS, et al. Anthrax post exposure prophylaxis in postal workers, Connecticut, 2001. *Emerg Infect Dis.* 2002;8:1133–7.
[303] Jefferds MD, Roy S, Hayslett J, et al. Promoting postal workers' adherence to antibiotic prophylaxis to prevent inhalational anthrax—Washington, DC. In Centers for Disease Control and Prevention. *51st Annual Epidemic Intelligence Service Conference Program and Abstracts Book*. Atlanta, GA: Centers for Disease Control and Prevention; 2002.
[304] Bresnitz EA. Lessons learned from the CDC's post exposure prophylaxis program following the anthrax attacks of 2001. *Pharmacoepidemiol Drug Saf*. 2005;14:389-91.
[305] Covello V, Peters RG, Wojtecki JG, Hyde RC. Risk communication, the west nile virus epidemic, and bioterrorism: responding to the communication challenges posed by the intentional or unintentional release of a pathogen in an urban setting. *J Urban Health*. 2001;78(2):382-91.
[306] Halperin, S. How to advise parents unsure about immunization. *Canadian Journal of CME*. 2000 Jan:62- 75.
[307] Pennie RA. *Advice for health providers: counselling parents who are uncertain about immunizing their children*. Hamilton, ON: McMaster University; 2000.
[308] National Advisory Committee on Immunization. (2002). Talking with patients about immunization. *Canadian Immunization Guide*. 6th ed., pp.42-54). Ottawa, ON: Canadian Medical Association; 2002. p. 42-54.
[309] Bellaby P. Communication and miscommunication of risk: understanding UK parents' attitudes to combined MMR vaccination. *BMJ*. 2003;327:725-8.
[310] Bibus R, Rietberg K, Greenfield L, Nugent-Carney J, Hubbard B, Duchin J. Experts forum on vaccine hesitancy. Presented at the US National Immunization Conference, March 2006. Available from: http://cdc.confex.com/cdc/viewHandout.cgi?uploadid=883.
[311] Nowak G. What happens communication wise when a child is immunized? Insights from a three-year study. CDC. Presented at the US National Immunization Conference, March 2006. Available from: http://cdc.confex.com/cdc/viewHandout.cgi?uploadid=951.
[312] Alaszewski A, Horlick-Jones T. How can doctors communicate information about risk more effectively? *BMJ*. 2003;327:728-31.
[313] Paling J. Strategies to help patients understand risks. *BMJ*. 2003;327:745-8.

APPENDIX 1: CANADIAN TASK FORCE ON PREVENTIVE HEALTH GRADING SYSTEM

Recommended Grades for Specific Clinical Preventive Actions

A	The CTF concludes that there is **good** evidence to recommend the clinical preventive action.
B	The CTF concludes that there is **fair** evidence to recommend the clinical preventive action.
C	The CTF concludes that the existing evidence is **conflicting** and does not allow making a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making.
D	The CTF concludes that there is **fair** evidence to recommend against the clinical preventive action.
E	The CTF concludes that there is **good** evidence to recommend against the clinical preventive action.
I	The CTF concludes that there is **insufficient** evidence (in quantity and/or quality) to make a recommendation, however other factors may influence decision-making.
The CTF recognizes that in many cases patient specific factors need to be considered and discussed, such as the value the patient places on the clinical preventive action; its possible positive and negative outcomes; and the context and /or personal circumstances of the patient (medical and other). In certain circumstances where the evidence is complex, conflicting or insufficient, a more detailed discussion may be required.	

Levels of Evidence - Research Design Rating

I	Evidence from randomized controlled trial(s)
II-1	Evidence from controlled trial(s) without randomization
II-2	Evidence from cohort or case-control analytic studies, preferably from more than one centre or research group
II-3	Evidence from comparisons between times or places with or without the intervention; dramatic results in uncontrolled experiments could be included here
III	Opinions of respected authorities, based on clinical experience; descriptive studies or reports of expert committees

Levels of Evidence - Quality (Internal Validity) Rating

Good	A study (including meta-analyses or systematic reviews) that meets all design-specific criteria well.
Fair	A study (including meta-analyses or systematic reviews) that does not meet (or it is not clear that it meets) at least one design-specific criterion but has no known "fatal flaw".
Poor	A study (including meta-analyses or systematic reviews) that has at least one design-specific "fatal flaw", or an accumulation of lesser flaws to the extent that the results of the study are not deemed able to inform recommendations.

APPENDIX 2: CANADIAN STD GUIDELINES GRADING SYSTEM

Levels of Recommendation

Recommendation: **A**	Strongly recommends that clinicians routinely provide the treatment to eligible patients. **Good evidence** that the treatment improves important health outcomes and concludes that benefits substantially outweigh harms
Recommendation: **B**	Recommends that clinicians routinely provide the treatment to eligible patients. At least **fair evidence** that the treatment improves important health outcomes and concludes that benefits outweigh harms
Recommendation: **C**	No recommendation for or against routine provision of the treatment. At least **fair evidence** that the treatment can improve health outcomes but concludes that the balance of the benefits and harms is **too close to justify a general recommendation**
Recommendation: **D**	Recommends against routinely providing the treatment to asymptomatic patients. At least **fair evidence** that the treatment is **ineffective** or that harms outweigh benefits
Recommendation: **I**	**Evidence is insufficient** to recommend for or against routinely providing the treatment. Evidence that the treatment is effective is **lacking, of poor quality or conflicting,** and the balance of benefits and harms cannot be determined

Quality of Evidence

I	Evidence from at least one properly randomized, controlled trial
II	Evidence from at least one well-designed clinical trial without randomization, from cohort or case-control analytic studies (preferably from more than one centre), from multiple time-series studies or from dramatic results in uncontrolled experiments
III	Evidence from opinions of respected authorities based on clinical experience, descriptive studies or reports of expert committees

APPENDIX 3: AMERICAN FAMILY PHYSICIAN STRENGTH OF RECOMMENDATION TAXONOMY (SORT)

Taken from: Kirkham C, Harris S, Grzybowski S. Evidence-based prenatal care: part II. Third-trimester care and prevention of infectious diseases. American Family Physician, April 15, 2005 http://www.findarticles.com/p/articles/mi_m3225/is_8_71/ai_n13793207.
Ebell MH, Siwek J, Weiss BD, Woolf SH, Susman J, Ewigman B, Bowman M. Strength of Recommendation Taxonomy (SORT): A patient-centered approach to grading evidence in the medical literature. Am Fam Physician 2004;69:549-57.-

Table 1: Strength-of-Recommendation Grades

Strength of Recommendation	Basis for Recommendation
A	Consistent, good-quality patient-oriented evidence*
B	Inconsistent or limited-quality patient-oriented evidence*
C	Consensus, usual practice, opinion, disease-oriented evidence,* or case series for studies of diagnosis, treatment, prevention, or screening

* Patient-oriented evidence measures outcomes that matter to patients: morbidity, mortality, symptom improvement, cost reduction, and quality of life. Disease-oriented evidence measures intermediate, physiologic, or surrogate end points that may or may not reflect improvements in patient outcomes (e.g., blood pressure, blood chemistry, physiologic function, pathologic findings).

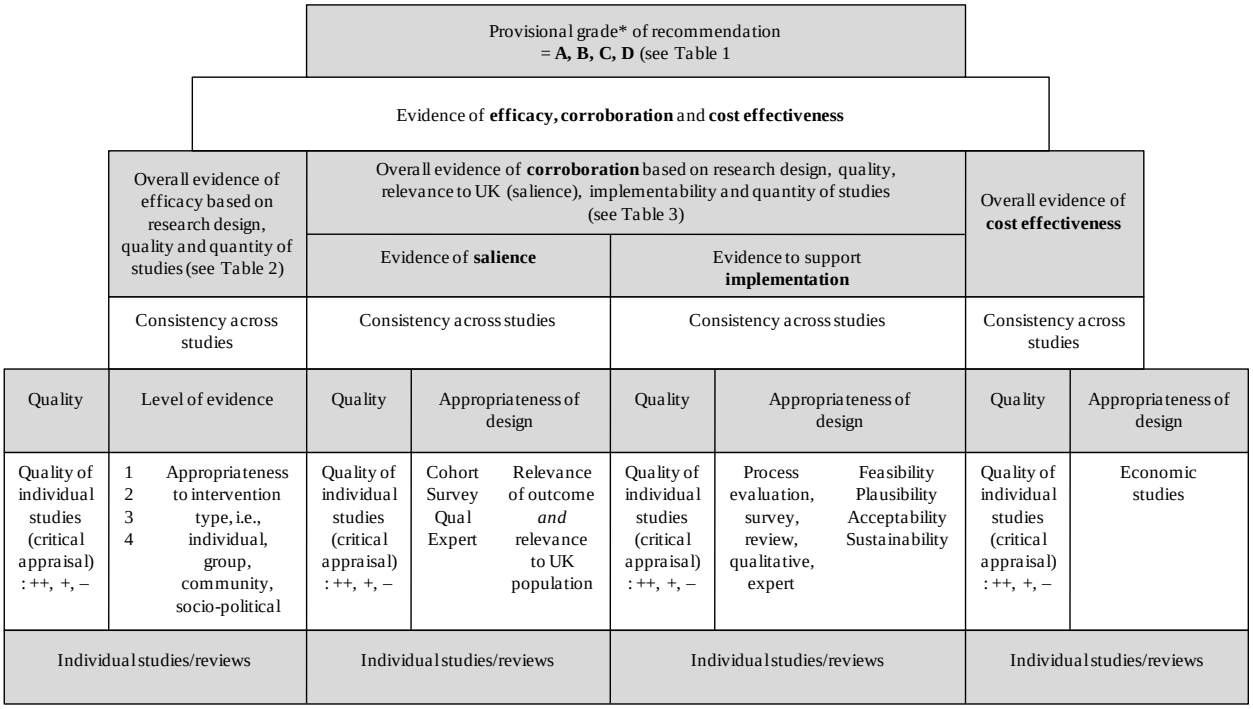
Table 2: Assessing Quality of Evidence

Study Quality	Diagnosis	Treatment/Prevention/Screening	Prognosis
Level 1: good-quality, patient-oriented evidence	Validated clinical decision rule SR/meta-analysis of high-quality studies High-quality diagnostic cohort study*	SR/meta-analysis or RCTs with consistent findings High-quality individual RCT† All-or-none study‡	SR/meta-analysis of good- quality cohort studies Prospective cohort study with good follow-up
Level 2: limited-quality patient-oriented evidence	Unvalidated clinical decision rule SR/meta-analysis of lower quality studies or studies with inconsistent findings Lower quality diagnostic cohort study or diagnostic case-control study	SR/meta-analysis of lower quality clinical trials or of studies with inconsistent findings Lower quality clinical trial Cohort study Case-control study	SR/meta-analysis of lower quality cohort studies or with inconsistent results Retrospective cohort study or prospective cohort study with poor follow-up Case-control study Case series
Level 3: other evidence	Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening		

*-High-quality diagnostic cohort study: cohort design, adequate size, adequate spectrum of patients, blinding, and a consistent, well-defined reference standard.
†-High-quality RCT: allocation concealed, blinding if possible, intention-to-treat analysis, adequate statistical power, adequate follow-up (greater than 80 percent).
‡-In an all-or-none study, the treatment causes a dramatic change in outcomes, such as antibiotics for meningitis or surgery for appendicitis, which precludes study in a controlled trial.
(SR = systematic review; RCT = randomized controlled trial)

APPENDIX 4: APPENDIX PYRAMID OF EVIDENCE BUILDING BLOCKS

Reproduced from: *Grading Evidence and Recommendations for Public Health Interventions: Developing and Piloting a Framework*, by A. Weightman, S. Ellis, A. Cullum, L. Sander, & R. Turley (2005, London: Health Development Agency).



* The final grade would take into account magnitude/effect size(s) (+ve or –ve)
Key to quality: ++, very low risk; +, low risk; –, high risk of confounding, bias or chance.

APPENDIX 5: EVIDENCE OF THE EFFICACY OF AN INTERVENTION

Evidence of the Efficacy of an Intervention – Did it Work?

Level of Evidence	Type of Evidence
1++	High quality meta-analyses, systematic reviews of RCTs (Including cluster RCTs), or RCTs with a very low risk of bias.
1+	Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.
1-*	Meta-analyses, systematic reviews of RCTS, or RCTS with a high risk of bias.
2++	High quality systematic reviews of, or individual high quality non-randomised intervention studies (controlled non-randomised trial, controlled before-and-after, interrupted time series), comparative cohort and correlation studies with a very low risk of confounding, bias or chance.
2+	Well conducted, non-randomised intervention studies (controlled non-randomised trial, controlled before-and-after, interrupted time series). Comparative cohort and correlation studies with a high risk of confounding, bias or chance.
2-*	Non-randomised intervention studies (controlled non-randomised trial, controlled before-and-after, interrupted time series), comparative cohort and correlation studies with a high risk of confounding, bias or chance.
3	Non-analytical studies (e.g., case reports, case series).
4	Expert opinion, formal consensus.

* Studies with a level of evidence (-) should not be used as basis for making recommendations.
Source: NHS Health Development Agency. (2005). *Grading Evidence and Recommendations for Public Health Interventions: Developing and Piloting a Framework*. Adapted from SIGN (2001).

APPENDIX 6: EVIDENCE GRADING SYSTEM FOR PUBLIC HEALTH RECOMMENDATIONS

Class	Basis for Decision*
A [PH]	At least one 1++ study or consistent findings in a body of studies** principally rated as 1+ for efficacy***, with strong or moderate evidence of corroboration OR Consistent findings in a body of 2++ studies for efficacy, with strong evidence of corroboration
B [PH]	At least one 1++ study or consistent findings in a body of studies principally rated as 1+ for efficacy, with limited/no evidence of corroboration OR A single 1+ study for efficacy, with strong or moderate evidence of corroboration OR A single 2++ study or consistent findings in a body of studies principally rated at 2+ for efficacy, with strong evidence of corroboration OR Consistent findings in a body of studies principally rated as 2++ for efficacy, with moderate evidence of corroboration
C [PH]	Consistent findings in a body of studies principally rated as 2++ for efficacy, with limited/no evidence of corroboration OR A single 2++ study or consistent findings in a body of studies principally rated 2+ for efficacy, with moderate evidence of corroboration OR A single 2+ study for efficacy, with strong evidence of corroboration OR A body of level 3 or 4 evidence for efficacy, with strong evidence of corroboration
D [PH]	A single 2++ study or consistent findings in a body of studies principally rated 2+ for efficacy, with limited/no evidence of corroboration OR A single 2+ study for efficacy, with moderate evidence for corroboration OR A body of level 3 or 4 evidence of efficacy, with moderate/limited evidence of corroboration OR Formal consensus
D [GPP]	A recommendation based on experience of best practice by health professionals and expert groups

* See Tables 2 and 3 for key to study type, quality and strength of evidence.
** Body of studies = 3 or more, or a systematic review.
*** For national environmental/socio-political interventions, a body of 2+ studies is acceptable.
[PH] public health; [GPP] Good Practice Point.
Source: NHS Health Development Agency. (2005). *Grading Evidence and Recommendations for Public Health Interventions: Developing and Piloting a Framework*. Adapted from SIGN (2001).

APPENDIX 7: PARTNER NOTIFICATION REFERENCE CHART

Infection/syndrome	Reportable disease	Trace-back period	Who to notify/ evaluate	Special considerations
Chlamydia (LGV and non LGV serovars)	Yes	60 days	SP/NB	If no sexual partner(s) in the last 60 days, trace back to last sexual partner Partner notification is not required in most provinces and territories as a public health measure but is highly recommended for NGU, MPC, PID and epididymitis
Gonorrhea	Yes	60 days	SP/NB	
Chancroid	Yes	14 days	SP	
Non-gonococcal urethritis	No	60 days	SP	
Mucopurulent cervicitis	No	60 days	SP	
Pelvic inflammatory disease	No	60 days	SP	
Epididymitis	No	60 days	SP	
Primary syphilis	Yes	3 months	SP/NB	
Secondary syphilis	Yes	6 months	SP/NB	
Early latent syphilis	Yes	1 year	SP/NB	
Late latent syphilis/stage undetermined	Yes	Variable	SP/NB/CMC	
Genital herpes	In some jurisdictions	Current/ future	SP/NB	Partner notification is not required as a public health measure but is highly recommended
Trichomoniasis	In some jurisdictions	Current	SP	No need to test partners; treat as for index case
Human papilloma virus	No	Current/ future	SP	Partner notification is not required as a public health measure. Patients should be encouraged to notify their sexual partners, but there is no proof that this will lower the risk to the partner
Acute hepatitis B	Yes	Variable	SP/NSP/HC/ NB/CMC	All unvaccinated/non-immune contacts should be notified. May benefit from PEP[i] Newborns must receive HBIG and vaccine post-natally[ii]
Chronic hepatitis B	Yes	Variable	SP/NSP/HC/ NB/CMC	All unvaccinated/non-immune contacts should be notified. May benefit from PEP[8] Newborns must receive HBIG and vaccine post-natally[8,iii]
HIV/AIDS	Yes	Variable	SP/NSP/NB/ CMC	Start with recent sexual and needle-sharing partners; outer limit is onset of risk behaviour or to last known negative test Post-exposure prophylaxis may be considered by health care providers for individuals who have been in contact with HIV and appropriately timed initiation of antiretroviral therapy is associated with a better prognosis and is a prerequisite to prevention of further transmission of disease. Please consult with an expert in HIV

CMC=children of maternal case; HBIG=hepatitis B immunoglobulin; HC=household contacts; LGV=lymphogranuloma venereum; MPC=mucupurulent cervicitis; NB=newborns of infected mothers; NGU=non-gonococcal urethritis NSP=needle-sharing partners; PEP=post-exposure prophylaxsis; PID=pelvic inflammatory disease; SP=sexual partners

[i] *Canadian Immunization Guide.* 6th ed. Ottawa, ON: Public Health Agency of Canada; 2002. www.phac-aspc.gc.ca/publicat/cig-gci/index.html.
[ii] Ibid.
[iii] Ibid.