

## Unit Costs for the Health System Matrix Project

*BM 6.0, December 2014*

### **The unit costs used in the Matrix project are intended for analysis purposes only.**

They are not intended to be a measure of the actual cost of providing the service, nor reflect the variation in the cost of providing services to different populations, or in different regions. Very different assumptions were used for each health care service, and the availability and quality of supporting data varied significantly.

Therefore for many time series analyses we recommend that a comparison of trends in volume of services or number of encounter days may provide a more insightful picture of use of health care over time, rather than relying entirely on the trends in dollars of services.

The Health System Matrix 6.0 summarizes data from the BC Ministry of Health's administrative databases from 2002/03 to 2013/14. Data for physician services and prescription drugs dispensed from community pharmacies are reported to the Ministry in terms of dollars. Other health care services are reported in different workload units (days for residential care, assisted living and adult day programs; hours for home support; visits for professional home care and case management; and resource intensity weights for hospital inpatient and day procedure cases). In order to compare different bundles of services, it was necessary to provide a common workload measure for all services – the publicly funded dollars of health care. Therefore, the Matrix project needed to establish a set of annual unit costs for each of the major services, to convert workload units to dollars. Since physician services (MSP physician billings) and prescription drugs (PharmaNet and PharmaCare) are reported in 'current dollars' (ie including year to year inflation), the matrix project needed to establish a series of annual unit costs with inflation included, for each service and each year from 2002/03 to 2013/14.

The basic approaches used to establish the Matrix unit costs were:

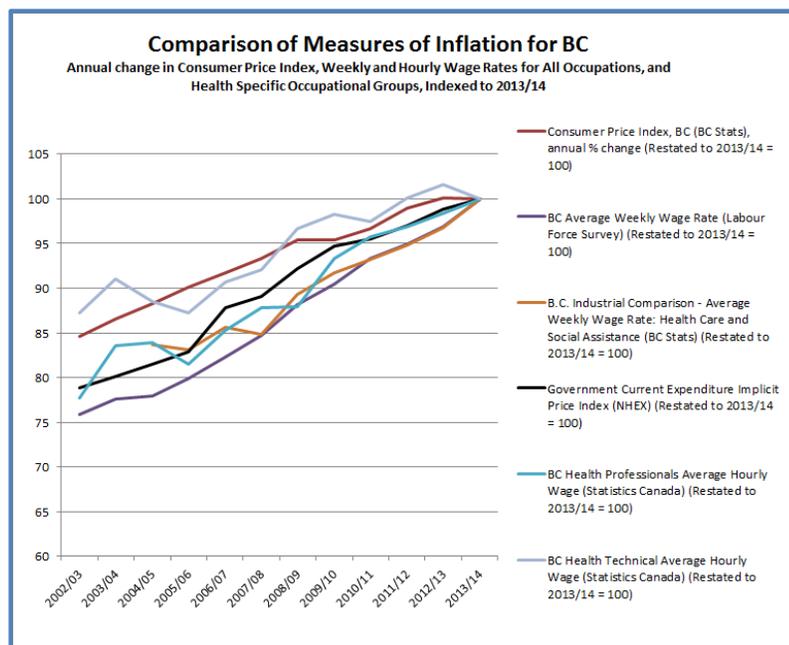
- Unit cost based on established Ministry policy, where available
- Unit cost calculated from financial expenditure and workload data in Ministry administrative databases, where reliable data is available
- Unit cost based on a national standard, or published information from BC or other Canadian jurisdiction.

### **Adjusting for Inflation**

Where information was not available for the full time series 2002/03 to 2013/14, estimates for missing years were extrapolated by applying a 'price index' to inflate or deflate the unit costs from the known values. In Canada there is no standard measure of 'inflation' for the health care sector. In the absence of a standard price index for the health care services in the matrix, many available indexes were considered, including government price index, consumer price index, and various indices of wage trends. Ultimately, the decision was made to use a single price index for all instances where a price index was used in the estimation. The Government Expenditure Implicit Price Index was chosen because it was used for National Health Expenditures, the 'inflation rate' was generally in the mid-range of other options, and it was available/published annually.

Price Indices considered for Matrix

Index	Source	Comments
<b>Selected Index</b>		
Government Current Expenditure Implicit Price Index	CIHI National Health Expenditures, Appendix B.1	Price index for overall BC government expenditures, not specific to health, but reflects health of economy and financial constraints. In comparison to the trends of the other indices that were considered, this index was chosen because it generally appeared to be in the middle of the range of other indices, reflected the general change in BC health wages but with a relatively smooth year to year pattern of change and without any years of negative growth. Published from a reliable source each autumn, in time for the annual updates.
<b>Other indices considered</b>		
Consumer Price Index	Statistics Canada	Includes goods and services that the consumer purchases for food, shelter, clothing, etc. The health and personal care component consists of prescribed and non-prescribed medicines, eye care goods, other health care goods, eye care services, dental care, other health care services, and personal care (soap, toiletry and cosmetics, oral hygiene and other personal care items). Excludes the publicly funded health care services in the Matrix.
BC Average Weekly Wage Rate	Statistics Canada, Labour Force Survey	Includes all occupations in the province. Highest rate of inflation of any index considered.
BC Industrial Comparison - Average Weekly Wage Rate: Health Care and Social Assistance	BC Stats, Statistics Canada, Labour Force Survey	Health and social assistance is a broad category of occupations. Considerable year to year variation with some negative year to year changes.
Professional occupations in health, nurse supervisors and registered nurses [D0-D1] (Physicians, allied health, pharmacists, therapy professionals, registered nurses), fiscal year average of monthly rates	Statistics Canada, cansim-2820069-eng-835202525703	Specific health care professions, broad category of professionals. Considerable year to year variation with some negative year to year changes.
Technical, assisting and related occupations in health [D2-D3] (medical technologists, dental care and health care technical care including practical nurses)' fiscal year average of monthly rates	Statistics Canada, cansim-2820069-eng-835202525703	Specific health care professions. Considerable year to year variation with some negative year to year changes.



## Methodology to Produce Unit Costs for 2002/03 to 2013/14

### Acute Care Inpatient and Day Procedures

- CIHI estimates the relative workload of treating a patient through its annual updates of the 'resource intensity weight' (RIW) methodology, and generates a RIW for every inpatient and day procedure case discharge.
- To convert the RIW to dollars, CIHI estimates the 'average cost of a hospital stay' which is the 'cost per weighted case' (CPWC). (<http://yourhealthsystem.cihi.ca/hsp>) The Ministry uses the latest published 'average cost of a hospital stay' rounded to the nearest \$50 to estimate the dollar value of hospital inpatient and day procedure care for all years of data that use the same version of RIW (usually the latest 5 years of data). This approach estimates the cost of care without inflation (because the CPWC is held constant).
- The Matrix project estimated the unit cost (per RIW) including inflation, for all years by applying the Government Expenditure Implicit Price Index to the latest 'average cost of a hospital stay' published by CIHI.

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
CIHI BC Average cost of hospital stay 2012/13, ourhealthsystem.ca MOH uses this value for all RIW2014 analysis, all years. Matrix decision: use this for 2013/14, and deflate other years.												5,517
Government Current Expenditure Implicit Price Index, British Columbia, 1975 to 2014. (1997=100) NHEX Appendix B.1	114	115	117	119	126	128	133	136	138	140	142	144
Restated to 2013/14 = 100	79	80	81	83	88	89	92	95	96	97	99	100
Estimated CPWC deflated by Government Current Expenditure Implicit Price Index, BC: 2013/14 = 100	\$ 4,349	\$ 4,422	\$ 4,494	\$ 4,575	\$ 4,844	\$ 4,915	\$ 5,087	\$ 5,223	\$ 5,271	\$ 5,351	\$ 5,452	\$ 5,517
Final BC CPWC (rounded to the nearest \$50)	\$ 4,350	\$ 4,400	\$ 4,500	\$ 4,550	\$ 4,850	\$ 4,900	\$ 5,100	\$ 5,200	\$ 5,250	\$ 5,350	\$ 5,450	\$ 5,500

### Emergency Department Visits

#### ED Facility Costs

- Facility costs for Emergency Department visits were based entirely on the standard BC Interprovincial billing rates established by CIHI and the provinces.
- Other approaches were considered, including using HAMIS data to calculate direct costs and applying a direct to indirect cost ratio from CIHI data to estimate the total facility cost. Alternatively, calculated rates were compared to published Alberta rates. All of these approaches yielded wide variations in cost per ED visit that were not supportable.

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
<b>Emergency Department Visits: Facility Costs</b>												
Interprovincial Billing rate for Emergency Department Visit (facility costs)		\$ 110	\$ 153	\$ 158	\$ 164	\$ 169	\$ 231	\$ 238	\$ 238	\$ 260	\$ 270	\$ 287
Final Facility Average Cost of Emergency Department Visit	\$ 110	\$ 110	\$ 153	\$ 158	\$ 164	\$ 169	\$ 231	\$ 238	\$ 238	\$ 260	\$ 270	\$ 287

#### ED Physician Costs

Physician costs for Emergency Department visits were based on three methodologies:

- Actual MSP physician billings for ED visits (MSP) vary by categories of time of day and 3 levels of care.
- Shadow billings for ED visits submitted by physicians on Alternate Payment Plans (APP) do not include a fee. Matrix estimated fee based on reported categories of time of day and levels of care translated to MSP categories, and MSP average fees.
- National Ambulatory Care Reporting System (NACRS): Matrix included any NACRS ED visits which were not already counted in MSP and APP streams, based on the patient identifier and date. NACRS does not report costs. Matrix estimated fee based on reported categories of time of day and levels of care translated to MSP categories, and MSP average fees.

## Residential Care

- The average cost of a residential care day is calculated from Residential Care expenditures reported by the health authorities in HAMIS, divided by the number of residential care days reported in the continuing care databases, rounded to the nearest dollar. Actual cost of a residential care day can vary by care needs of the patient (transitional / convalescent, long term, palliative), and location.
- The calculated unit costs correspond closely to the average cost of a residential care day reported by Statistics Canada from their residential care survey (from 2002/03 to 2008/09 CANSIM Table 107-5511). The Statistics Canada average includes Publicly funded and private pay Residential Care days.

<b>Residential Care Days Trends</b>	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
RC Days (HCC MOH data)	9,125,720	8,804,483	8,484,603	8,517,426	8,703,295	8,938,001	9,095,257	9,342,640	9,385,931	9,538,809	9,534,979	9,758,553
<b>Residential Care Expenditures</b>	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
HAMIS reported HA Expenses by Sector for Residential Care	\$ 1,213	\$ 1,255	\$ 1,209	\$ 1,273	\$ 1,352	\$ 1,423	\$ 1,526	\$ 1,577	\$ 1,622	\$ 1,727	\$ 1,783	\$ 1,841
<b>RC Unit Costs based on HAMIS data provided for BM5.0 (rounded to nearest dollar)</b>	<b>\$ 133.00</b>	<b>\$ 143.00</b>	<b>\$ 142.00</b>	<b>\$ 149.00</b>	<b>\$ 155.00</b>	<b>\$ 159.00</b>	<b>\$ 168.00</b>	<b>\$ 169.00</b>	<b>\$ 173.00</b>	<b>\$ 181.00</b>	<b>\$ 187.00</b>	<b>\$ 189.00</b>

## Home Support

- The historic unit costs used by the Ministry were in the range of \$30 to \$32 per home support hour. To generate the unit costs for the matrix, the decision was made to use HAMIS data where reasonable. A review of HAMIS expenditures and HCC volumes at the health authority level showed relatively little change in 'calculated unit cost' over time, based on the 'adjusted' series which removed outlier years by health authority.
- Using this approach, a calculated 'adjusted' BC average (based on HAMIS data and hours reported in the HCC data warehouse) averaged around \$41. The calculated rates for VCHA, VIHA, NHA rates were generally higher and rates for IHA and FHA were generally lower than this calculated average, and there was little change over time.
- Because there was no data to support trending the annual unit costs, a constant unit cost of \$41 was set for all years. This is higher than the ministry 'standard' rates likely because it includes overheads.

<b>Home Support Hours (excluding CSIL)</b>	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Ministry standard rates (for determining client's costs)	\$ 30.00	\$ 30.00	\$ 30.00	\$ 30.00	\$ 32.00	\$ 32.00	\$ 32.00	\$ 34.00	\$ 34.00	\$ 34.00	\$ 34.00	
Adjusted HAMIS expenditures (each year include only HAs with reasonable 'trends' in \$ and hours (\$M))				\$ 261	\$ 284	\$ 293	\$ 303	\$ 322	\$ 320	\$ 226	\$ 335	\$ 346
Adjusted Volumes ('000)				6,603	6,897	7,025	7,105	6,979	7,518	5,626	8,000	8,445
Estimate of Unit cost based on adjusted HAMIS \$ and adjusted Volumes.				\$ 39.5	\$ 41.1	\$ 41.8	\$ 42.6	\$ 46.1	\$ 42.6	\$ 40.1	\$ 41.8	\$ 41.0
<b>Final Unit Cost per HS Hour (rounded to nearest \$0.50)</b>	<b>\$ 41.00</b>											
Unit Costs Index (2013/14 = 100)	100	100	100	100	100	100	100	100	100	100	100	100

## Community Services for Independent Living (CSIL)

- Clients in the Community Services for Independent Living (CSIL) program provided funding to enable them to organize their own home support. The annual CSIL per hour rates are set by the Ministry.

<b>CSIL Home Support Hours</b>	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Basis for Unit Costs per CSIL Hour	\$ 25.00	\$ 25.00	\$ 25.00	\$ 25.00	\$ 25.00	\$ 25.00	\$ 25.00	\$ 25.60	\$ 25.60	\$ 27.63	\$ 28.63	\$ 29.50
Methodology of time series: Ministry standard rates												
<b>Final Unit Cost per CSIL Hour</b>	<b>\$ 25.00</b>	<b>\$ 25.60</b>	<b>\$ 25.60</b>	<b>\$ 27.63</b>	<b>\$ 28.63</b>	<b>\$ 29.50</b>						

- Based on these unit costs for home support and CSIL and the volumes of hours reported by health authorities in HCC MRR, the estimated total expenditures on home support is a relative close match to HAMIS reported expenditures for 2005/06 to 2013/14.

### Assisted Living

- Assisted Living was introduced in the around 2002/03 and became widely available around 2006/07. Up to 2005/06, the Ministry used a standard per day unit cost of \$55 per day. Actual costs to the health authority vary by ownership (HA owned, or contracted out), client contribution and location.
- A review of HAMIS expenditures and HCC volumes at the health authority level showed relatively little change in 'calculated unit cost' over time, based on the 'adjusted' series which removed outlier years by health authority.
- However, there were considerable differences in the 'calculated' unit cost between health authorities, ranging from over \$60 (NHA and IHA) to around \$21 in VIHA. FHA's values were close to the standard \$55 over multiple years. A calculated 'adjusted' BC average produced an unsupportable series with a significant downward trend which was not evident in any HA results.
- Final decision was to use the 'standard' \$55 for all years, until there is reasonable evidence to support a trend. This decision is parallel to the decision to keep home support unit costs constant over time.

Assisted Living Days	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Final Unit Cost per AL Day (rounded to nearest \$0.50)	\$55.00	\$55.00	\$55.00	\$55.00	\$55.00	\$55.00	\$55.00	\$55.00	\$55.00	\$55.00	\$55.00	\$55.00

### Adult Day Programs

- A review of HAMIS expenditures and HCC volumes at the health authority level from 2005/06 to 2013/14 showed a general upwards trend in 'calculated unit cost' over time, based on the 'adjusted' series which removed outlier years by health authority. The trend paralleled the trend in the Government Expenditures Implicit Price Index.
- Final decision was to use the calculated average unit cost for 2013/14, and apply the Government Expenditures Implicit Price Index to generate the unit cost series back to 2002/03.

Adult Day Program Days	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Adjusted HAMIS expenditures (each year include only HAs with reasonable 'trends' in \$ and hours (\$M))				\$ 13.1	\$ 14.2	\$ 16.3	\$ 15.9	\$ 10.4	\$ 10.6	\$ 12.2	\$ 16.9	\$ 17.3
Adjusted Volumes ('000)				178.7	185.1	200.5	195.5	125.8	126.9	131.2	189.0	194.8
Estimate of Unit cost based on adjusted HAMIS \$ and adjusted Volumes.				\$ 73.6	\$ 76.8	\$ 81.4	\$ 81.2	\$ 82.6	\$ 83.7	\$ 92.7	\$ 89.7	\$ 89.0
Index of change over time (2013/14 = 100)				83	86	91	91	93	94	104	101	100
Price Index used for final Unit Costs: Government Current Expenditure Implicit Price Index (NHEX) (Restated to 2013/14 = 100)	79	80	81	83	88	89	92	95	96	97	99	100
Final Unit Cost per ADP Day (rounded to nearest \$0.50)	\$70.00	\$ 71.50	\$ 72.50	\$ 74.00	\$ 78.00	\$ 79.50	\$ 82.00	\$ 84.50	\$ 85.00	\$ 86.50	\$ 88.00	\$ 89.00

### Professional Home Care Services

- A review of HAMIS Home Nursing (functional centre 71235) expenditures determined that reporting was inconsistent over this time period 2005/06 to 2013/14, with 2013/14 considered to be most complete year. The volume of visits from HCC MRR are considered to be reliable. Therefore calculation of unit cost from HAMIS data only available for 2013/14.
- The decision was made to use the calculated unit cost for 2013/14, and apply a price index to generate the series back to 2002/03. The Government Expenditures Implicit Price Index was selected, which paralleled trends in the BC Nursing Union average wages.

Professional Home Care Visits (Nursing, OT, PT)	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Home Nursing Expenditures, Community Sector (HAMIS) (\$M)												\$ 268
Home Nursing Visits (including OT/PT/Other) ('000)												1,042
Calculated Unit Cost												\$ 257
Price Index used for final Unit Costs: Government Current Expenditure Implicit Price Index (NHEX) (Restated to 2013/14 = 100)	79	80	81	83	88	89	92	95	96	97	99	100
<b>Final Unit Cost per PHC Visits (rounded to nearest \$)</b>	<b>\$203.00</b>	<b>\$206.00</b>	<b>\$209.00</b>	<b>\$213.00</b>	<b>\$226.00</b>	<b>\$229.00</b>	<b>\$237.00</b>	<b>\$243.00</b>	<b>\$246.00</b>	<b>\$249.00</b>	<b>\$254.00</b>	<b>\$257.00</b>

### Case Management

- Using HAMIS reported HA expenditures and Case Management volumes reported in HCC MRR, calculated an average of \$344 per visit.
- Using the same approach as other services, the Government Expenditures Implicit Price Index was used to generate the unit cost trends to 2002/03.
- Up to 2012/13, the Matrix has partial case management data for a few years for some health authorities. Data for 2013/14 is considered to be quite complete.

Case Management	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
HAMIS reported HA Expenditures for Case Management (HCC Sector) \$ Millions												\$ 58.28
Case Management Visits (BC total)												169,373
Average unit cost of Case Management Visit												\$ 344.00
Price Index used for final Unit Costs: Government Current Expenditure Implicit Price Index (NHEX) (Restated to 2013/14 = 100)	79	80	81	83	88	89	92	95	96	97	99	100
<b>Final Unit Cost per Case Management Visit (rounded to nearest \$)</b>	<b>\$ 271.00</b>	<b>\$ 276.00</b>	<b>\$ 280.00</b>	<b>\$ 285.00</b>	<b>\$ 302.00</b>	<b>\$ 306.00</b>	<b>\$ 317.00</b>	<b>\$ 326.00</b>	<b>\$ 329.00</b>	<b>\$ 334.00</b>	<b>\$ 340.00</b>	<b>\$ 344.00</b>

### Summary

The unit costs used in the Matrix project are intended for analysis purposes only, to estimate the relative values of services in a health care bundle.

As the graph to the right shows, very different assumptions were used for each health care service. Over the 11 years, the ED facility unit cost per visit (based on the interprovincial billing rates) more than doubled, compared to residential care (based on HAMIS) which increased 42%, and CSIL’s ministry set rates which increased 18%. The unit costs are not intended to be a measure of the actual cost of providing the service, nor reflect the variation in the cost of providing services to different populations, or in different regions.

