Income and Health Inequalities in Halton Region

November 2012
Reference:
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The purpose of this report is to explore the extent to which income is associated with health for residents of Halton Region. It has been shown in reports from other jurisdictions that differences in income can lead to health inequalities.

Given that Halton Region has the highest median household income of all health regions in Ontario, it was important to determine if Halton had greater or lesser inequalities in health due to these higher income levels. To determine this, 23 health status indicators were examined in relation to income for Halton Region. Depending on the health indicator, income was determined based on self-reported household income, or when that was not available, it was derived from the income level of the dissemination area in which the person lived in Halton.

For Halton residents it was found that most of these health indicators aligned with previously accepted associations between income and health status, while a few showed no income effect.

The health inequalities in Halton which showed results of greatest concern were:

- the percentage of current smokers was two times higher for adults in the low and middle income levels, compared to the highest income level;
- the percentage of adults whose last visit to the dentist was more than three years ago was 4.5 times greater in the lowest income level, compared to the highest income level;
- the chlamydia infection rate among females was 1.6 times higher in the lowest income group compared to the highest income group;
- the all-cause mortality rate was two times higher for adults in the lowest income group compared to the highest income group;
- the potential years of life lost (PYLL) due to premature mortality was 2.7 times higher for adults aged 25 to 74 in the lowest income group compared to the highest income group.

However, the relationship between income and health in Halton Region includes more than just the very wealthy and those living in poverty. For 18 of the 23 indicators there appeared to be a gradient of health in relation to income with improved health status for each income increment. Halton residents who have higher incomes or live in higher income areas are healthier than those with middle income, who are healthier than those with low income. This means that health inequalities affect all residents of Halton, not just those living in poverty.

While this report is focused on only income, which is just one social determinant of health, overall health status can be better understood through an analysis from various perspectives and pathways, including other determinants of health. However, income is generally accepted as the key social determinant of health that interacts with other social determinants and recognition of the health disparities associated with income is a necessary first step to address health inequities.
Introduction

Background

In the field of public health, the social determinants of health (SDOH) have received attention from all levels of government.

In 2011, the World Health Organization organized a conference, “Closing the Gap: Policy into Practice on Social Determinants of Health”, to discuss how political action should be implemented to address health inequalities resulting from disparities in social conditions in countries throughout the world.

In the 2010 Annual Report of the Chief Medical Officer of Health of Ontario, Dr. Arlene King further stressed the importance of understanding that the social determinants of health dictate the extent to which we have health inequity and health inequality in our society.¹

Several Ontario public health units including the City of Toronto,² Region of Peel,³ and the City of Ottawa⁴ have published local health status information that relate the social determinants of health to the health status of residents in their jurisdictions.

The Social Determinants of Health

The Public Health Agency of Canada has published a list of twelve key determinants of health, with supporting evidence for the link between each determinant and the health of Canadians.⁵ They are:

- Income and Social Status
- Social Support Networks
- Education and Literacy
- Employment and Working Conditions
- Social Environments
- Physical Environments
- Personal Health Practices and Coping Skills
- Healthy Child Development
- Biology and Genetic Endowment
- Health Services
- Gender
- Culture
Among the SDOH, income, education, and employment are often described collectively using the term ‘socioeconomic status’ to represent the link between a person’s position in society and the corresponding impact on their overall health. Of all the SDOH however, income is considered to have the greatest impact on health inequalities. It has been stated that,

“Income is perhaps the most important social determinant of health. Level of income shapes overall living conditions, affects psychological functioning, and influences health-related behaviours such as quality of diet, extent of physical activity, tobacco use, and excessive alcohol use.”

(Mikkonen and Raphael, 2010)

Income as a social determinant of health is a complex concept because it is linked to several of the other determinants such as employment conditions, personal health practices, education, and physical environment. Due to multiple interactions between income and other determinants of health, income inequalities can lead to health inequalities through several different pathways. An individual’s income level does not directly cause disease in the same way that having a genetic predisposition can cause a person to have high blood pressure for example, but income can indirectly influence several risk factors for disease. For example, inadequate income can lead to an inability to afford nutritious food which may compromise health.

In 1999, a Canadian document “Toward a Healthy Future: Second Report on the Health of Canadians” described that Canadians with a low income were more likely to die earlier and to suffer more illnesses than Canadians with higher incomes, regardless of age, sex, race and place of residence.

However, the more significant finding in the report was that not only was there a difference between the very poor and very wealthy, but that health improved on virtually all measures as levels of income and education increased. There was a ‘socioeconomic gradient’ present that showed Canadians have improved health at each rung up the income ladder.

**The Halton Report**

The purpose of this Income and Health Inequalities report is to explore the extent to which income is associated with health inequalities for residents of Halton Region.

This report presents the analysis of 23 health status indicators for Halton Region residents. The focus of the report is on adults aged 18 and over. The 23 indicators were selected on the basis of:

1. their use by other jurisdictions to describe health inequalities;
2. the availability of sufficient data at the local level, and
3. a combination of both health behaviours and health outcomes that are relevant to Halton residents.

While the relationship between household income and health inequalities can change when looking at children and youth, adults were chosen as the focus for this report to ensure a consistent approach and due to limitations of the data sources.

The data in this report support the Ontario Public Health Standards (OPHS) surveillance requirement to monitor the magnitude of specific risk factors over time, and to identify emerging trends and priority populations. It also supports the work of the Region of Halton and other community organizations that are concerned with the social determinants of health. This report will serve to gain a better understanding of the impact of income on the health of Halton residents.
3.0 Income Inequalities in Halton

Demographic Profile

A Dissemination Area is a small geographical area, which usually has a population of 400 to 700 persons. It is the smallest standard geographic area for which census data is published. All of Canada is divided into dissemination areas. In 2006 Halton Region had 662 dissemination areas. The dissemination areas fit within Halton’s 94 census tracts (that in turn fit within Halton’s 21 Our Kids Network neighbourhoods), that in turn fit within Halton’s 4 municipalities.

QAIPPE is the “Quintile of Annual Income Per Person Equivalent”. Statistics Canada calculates the average income per person for each dissemination area. Twenty-percent of dissemination areas with the lowest incomes have a QAIPPE of “1”, while 20% of the dissemination areas with the highest incomes are given a QAIPPE of “5”. Since these scores are based on a national ranking of dissemination areas, Halton does not have an equal number of dissemination areas in each of the quintiles. Halton only has 15 dissemination areas in the lowest income quintile compared to 312 in the highest (see Table 1).

In Table 1 Halton’s dissemination areas have been grouped into the five income quintile groups (QAIPPE 1 to 5). Table 1 shows the demographics for each of the five groups based on totals or averages of all the dissemination areas in the quintile group. For instance, population counts are the sum of the population in the dissemination areas in the quintile group. The percentages were calculated as an average of the percentage for each dissemination area (weighted by the size of the population in the area).

Table 1 shows that our lowest income groups (quintiles 1 & 2) also have the highest rates of lone parent families, seniors living alone, and recent immigrants; and the lowest rates of residents with a university degree. From a housing perspective we see that the lowest income groups (quintiles 1 & 2) also have the highest rates of rental dwellings 73% and 49%, and the highest rates of people spending over 30% of their income on housing (41% and 35%). As expected, the proportion of households below the low income cut-off (LICO) is highest in group 1 at 24.5%, and lowest in group 5 at 3.5%. The proportion of households living below the LICO and the average median household income show an income gradient across the income groups.
### Table 1: Key Demographic Characteristics by National Income Quintiles, Halton Region, 2006

<table>
<thead>
<tr>
<th></th>
<th>Income Quintile (QAIPPE) ²</th>
<th></th>
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<th>Halton Total ²⁵</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1 (lowest)</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5 (highest)</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of Dissemination Areas</td>
<td>15</td>
<td>56</td>
<td>89</td>
<td>179</td>
<td>312</td>
<td>662</td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>10,521</td>
<td>33,117</td>
<td>53,882</td>
<td>141,565</td>
<td>195,408</td>
<td>439,256</td>
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</tr>
<tr>
<td>% of Population</td>
<td>2.4</td>
<td>7.5</td>
<td>12.3</td>
<td>32.2</td>
<td>44.5</td>
<td>100.0</td>
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<td>Average of the Median Income</td>
<td>20,956</td>
<td>27,174</td>
<td>31,315</td>
<td>34,345</td>
<td>39,882</td>
<td>35,646</td>
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<tr>
<td>Person</td>
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<tr>
<td>Average of the Median Household</td>
<td>37,579</td>
<td>51,820</td>
<td>66,549</td>
<td>83,685</td>
<td>114,838</td>
<td>92,411</td>
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<tr>
<td>Income</td>
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<td>Min of the Median Household</td>
<td>20,525</td>
<td>21,377</td>
<td>36,075</td>
<td>39,132</td>
<td>47,451</td>
<td>20,525</td>
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<tr>
<td>Income</td>
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<tr>
<td>Max of the Median Household</td>
<td>48,707</td>
<td>72,753</td>
<td>97,028</td>
<td>123,762</td>
<td>240,309</td>
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<td>Income</td>
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<tr>
<td>% of Households Living below</td>
<td>24.5</td>
<td>12.7</td>
<td>8.0</td>
<td>5.6</td>
<td>3.5</td>
<td>5.9</td>
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<tr>
<td>LICO (after-tax)</td>
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<tr>
<td>% Unemployed, 15 Years and</td>
<td>7.54</td>
<td>6.31</td>
<td>4.74</td>
<td>4.46</td>
<td>4.38</td>
<td>4.68</td>
<td></td>
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<tr>
<td>Over</td>
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<tr>
<td>% Lone Parent Families</td>
<td>27.8</td>
<td>20.5</td>
<td>17.1</td>
<td>11.6</td>
<td>8.2</td>
<td>11.8</td>
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<td>% of Children at Home Under</td>
<td>23.6</td>
<td>20.2</td>
<td>22.9</td>
<td>30.5</td>
<td>25.6</td>
<td>26.4</td>
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<tr>
<td>6 Years Old</td>
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<tr>
<td>% of Population 65+ Years Old</td>
<td>12.9</td>
<td>19.7</td>
<td>15.5</td>
<td>9.8</td>
<td>10.1</td>
<td>11.5</td>
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<tr>
<td>(Seniors) in Private Households</td>
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<tr>
<td>% of Seniors Living Alone</td>
<td>45.6</td>
<td>33.4</td>
<td>25.6</td>
<td>16.1</td>
<td>11.2</td>
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<tr>
<td>% Immigrant</td>
<td>34.2</td>
<td>25.2</td>
<td>22.2</td>
<td>25.5</td>
<td>23.9</td>
<td>24.6</td>
<td></td>
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<tr>
<td>% Recent Immigrant (2001-2006)</td>
<td>10.1</td>
<td>4.1</td>
<td>2.2</td>
<td>3.4</td>
<td>2.3</td>
<td>3.0</td>
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<tr>
<td>% Visible Minority</td>
<td>23.5</td>
<td>10.9</td>
<td>8.8</td>
<td>15.4</td>
<td>12.4</td>
<td>13.1</td>
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<tr>
<td>% No Knowledge of English or</td>
<td>1.9</td>
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<td>0.6</td>
<td>0.9</td>
<td>0.6</td>
<td>0.7</td>
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<tr>
<td>French</td>
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<tr>
<td>% Private Dwellings Rented</td>
<td>73.3</td>
<td>48.5</td>
<td>22.6</td>
<td>9.1</td>
<td>5.9</td>
<td>13.9</td>
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<tr>
<td>% with greater than 30% of</td>
<td>41.4</td>
<td>35.1</td>
<td>27.5</td>
<td>22.3</td>
<td>16.7</td>
<td>21.9</td>
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<td>income going towards housing</td>
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<tr>
<td>% with a University Degree</td>
<td>15.0</td>
<td>14.8</td>
<td>17.7</td>
<td>25.0</td>
<td>32.2</td>
<td>26.3</td>
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</table>

² QAIPPE is the quintile of annual income per person equivalent. Each quintile does not contain an equal proportion of Halton Region’s population. The 1st quintile represents the lowest income dissemination areas, and the 5th quintile represents the highest income dissemination areas.

⁵ Numbers do not add up due to suppression and rounding.

⁶ 82% of lone-parent families in Halton Region are female lone-parent families.

Defining Income Groups for the Health Indicators

Indicators Using Canadian Community Health Survey (CCHS) & the Rapid Risk Factor Surveillance System (RRFSS) Data

Income Level (Lower, Middle, Higher): Both CCHS and RRFSS surveys have questions about income as well as the health indicator information. Income level was calculated in the CCHS or RRFSS datasets using self-reported household income divided by household size, as a proxy for individual income adequacy. A similar approach is used by Statistics Canada in calculating income adequacy for the low income cut-off (LICO) measure. The lower cut-off used here for Halton was higher than for LICO 2006 to allow sufficient sample size in the lowest income category, see Table 2. In fact, the lowest income level used in this report combined the two lowest categories of income adequacy used by Statistics Canada. Direct comparisons with Statistics Canada categories are not possible especially as income was only available by income category in CCHS and RRFSS, unlike Census data that has exact household income.

Table 2: Income Level used for Analysis of RRFSS and CCHS Data

<table>
<thead>
<tr>
<th>Income Level</th>
<th>Total household income and household size criteria</th>
<th>CCHS Halton sample(^a) 2005-2010</th>
<th>RRFSS Halton sample(^b) 2007-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower</td>
<td>&lt; $29,999 if 1 or 2 people &lt; $39,999 if 3 or 4 people &lt; $59,999 if ≥ 5 people</td>
<td>12% (n=347)</td>
<td>12% (n=536)</td>
</tr>
<tr>
<td>Middle</td>
<td>$30,000 to $59,999 if 1 or 2 people $40,000 to $79,999 if 3 or 4 people $60,000 to $79,999 if ≥ 5 people</td>
<td>32% (n=950)</td>
<td>26% (n=1121)</td>
</tr>
<tr>
<td>Upper</td>
<td>≥ $60,000 if 1 or 2 people ≥ $80,000 if ≥ 3 people</td>
<td>57% (n=1700)</td>
<td>62% (n=2684)</td>
</tr>
</tbody>
</table>

\(^a\) For RRFSS, n=1,682 respondents did not provide their income (28% of the Halton sample)  
\(^b\) For CCHS, n=643 respondents did not provide their income (18% of the Halton sample)
Indicators Using Other Data Sources

Income Group (1 to 5): We do not have individual or household level income data for the mortality data, hospitalizations, emergency department visits or infectious diseases. Therefore a proxy for household income based on the neighbourhood level income has been used. An individual respondent’s reported 6-digit postal code of residence was used to assign them to a dissemination area. Each of the 662 dissemination areas in Halton has been assigned an income value from 1 to 5 (lowest to highest) by Statistics Canada, (the QAIPPE) see section 3.0. Table 1 shows the characteristics of each of these income groups, and Figure 1 shows where they are located in Halton Region. The QAIPPE is developed based on a ranking of every dissemination area in Canada, not just Halton Region, therefore each “quintile” or group does not contain an equal proportion of Halton Region’s population. Table 3 shows the population distribution in each income group. Given the relative economic affluence of Halton in comparison to other Regions in Canada we see a large percentage of our population in the two highest income groups (“4” and “5”).

Table 3: Distribution of Income Groups used for Analysis of Mortality, Hospitalizations, Emergency Department Visits, and Infectious Diseases Data

<table>
<thead>
<tr>
<th>Income Group (QAIPPE)</th>
<th># of Dissemination Areas (DAs)</th>
<th>Population Count</th>
<th>% of the Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (lowest)</td>
<td>15</td>
<td>10,520</td>
<td>2.4</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>33,135</td>
<td>7.6</td>
</tr>
<tr>
<td>3</td>
<td>89</td>
<td>53,890</td>
<td>12.4</td>
</tr>
<tr>
<td>4</td>
<td>179</td>
<td>141,525</td>
<td>32.6</td>
</tr>
<tr>
<td>5 (highest)</td>
<td>312</td>
<td>195,450</td>
<td>45.0</td>
</tr>
</tbody>
</table>

a n=11 dissemination areas missing QAIPPE data and not assigned to an income group. Individuals whose postal codes mapped to these dissemination areas were excluded from the analysis.

b The 2006 census counts were used as population counts for each year of data. Population counts were not available for non-census years at the dissemination area level. n=434,520 is the denominator used for one year. When combined data for 2003-2007 or for 2006-2010, or for 2007-2011 was used, then the denominator was n=2,172,600 representing 5 years of data.
Figure 1: Income Group Map of Halton Region, QAIPPE by Dissemination Area, 2006

Note: Some data have been suppressed by Statistics Canada, generally due to small populations.
4.0 Health Inequalities in Halton

The following section presents the analysis of 23 health status indicators for Halton Region adults by income level. Each indicator has a key message that summarizes the main finding with respect to income.

For the 13 indicators based on data from either RRFSS or CCHS, there is one indicator per page which includes three graphs showing the indicator by household income level for:

- all adults aged 18 and over;
- adults separated by sex; and
- adults aged 65 and over.

With the exception of influenza immunization and dental visits, there are no graphs for adults aged 18-64 as the rates and gradients were similar to that of all adults aged 18 and over.

For the 4 indicators that used data from the integrated Public Health Information System (iPHIS) or Intellihealth databases, the graphs were shown by income group based on dissemination area of residence and in some cases also presented based on other relevant factors (age, sex, or cause of death). The 2006 census data provided the population counts and the five income groupings for each of the 662 dissemination areas in Halton.
Self-Rated Health

Introduction

‘Self-rated health’ is a measure of an individual’s perception of his or her general health and is commonly used as a reliable predictor of health problems, healthcare utilization, and longevity. In Canada, higher rates of positive self-rated health have been associated with higher incomes.

Findings

In Halton Region, the percent of adults who rated their health as “Excellent” or “Very Good” increased across income levels. Adults in the higher income category had a significantly higher percent who rated their health as “Excellent” or “Very Good” (71%) compared to those in the middle (57%) and the lower income category (50%) (Figure 2a).

When self-rated health was analyzed by sex, a significantly higher percent of females in the higher income level rated their health as “Excellent” or “Very Good” (74%) compared to those in the middle (58%) and the lower income levels (47%) (Figure 2b). The income gradient was diminished for males. Males in the higher income category still had a significantly higher percent of people who rated their health as “Excellent” or “Very Good” (68%) compared to people in the middle (56%) and the lower income categories (54%) (Figure 2b).

Adults aged 65 years and older had a steeper income gradient than younger adults (Figure 2c) indicating that there is greater inequality in self-rated health for older adults.

Key Message

Adults in the higher income category had a higher percent of positive health ratings compared to middle and lower income categories. The income gradient persisted when analyzed by sex and age group. Females and adults aged 65 years and over had steeper gradients than males and adults aged 18-64, respectively.

Figure 2a: Percent of Adults who Reported their Health as “Excellent” or “Very Good”, By Income Level, Aged 18 and Over, Halton Region, 2007-2011

Figure 2b: Percent of Adults who Reported their Health as “Excellent” or “Very Good”, By Income Level, Males and Females, Aged 18 and Over, Halton Region, 2007-2011

Figure 2c: Percent of Adults who Reported their Health as “Excellent” or “Very Good”, By Income Level, Aged 65 and Over, Halton Region, 2007-2011

Source: Rapid Risk Factor Surveillance System (RRFSS), 2007-2011, Age standardized within each income level to the RRFSS sample
Self-Rated Mental Health

Introduction
The self-rated mental health indicator is used as a reflection of self-perceived psychological well-being. The current literature in the field shows unclear evidence as to whether there is an income gradient associated with self-rated mental health.

Findings
The higher income level had a significantly higher percent of adults who reported “Very Good” or “Excellent” mental health (84%) compared to the middle (76%) and lower (63%) income levels, indicating an income gradient for mental health (Figure 3a). When the data was analyzed by sex, females showed the same pattern for the higher (83%), middle (71%) and lower (61%) income levels, while males only had a significant difference between the higher (84%) and lower (65%) income levels (Figure 3b). When analyzed by age group, adults aged 18-64 years showed the same income gradient, with a significantly higher percent of adults reporting “Excellent” or “Very Good” mental health compared to the middle and lower income levels. For adults aged 65 years and older, there were no significant differences between the three income levels (Figure 3c).

Key Message
An income gradient for self-rated mental health was present; the higher income level had a significantly higher percent of adults who reported “Excellent” or “Very Good” mental health compared to the middle and lower income levels. When the data was analyzed by sex and age group, the gradient persisted for males and females, but not for adults aged 65 and over.

Source: Canadian Community Health Survey (CCHS), 2005-2010, Age standardized within each income level to the CCHS sample
Chronic Disease Risk Factors

Introduction
Chronic disease risk factors that were included in this analysis were smoking, self-reported overweight or obesity, smoking, physical inactivity, and heavy drinking. These four were chosen to be consistent with the approach used by the Canadian Institute for Health Information and Statistics Canada. The presence of more than one chronic disease factor was used to study the relationship between income and a potentially elevated risk of chronic disease; each of the risk factors alone have already been linked to chronic disease effects.

Findings
The percent of adults who had more than one chronic disease risk factor was significantly higher in the lower (54%) and middle (53%) income levels compared to the higher income level (39%) (Figure 4a).

When the data was analyzed by sex, the pattern remained the same for males, but a significant difference was only seen between the middle (59%) and higher income levels (44%) (Figure 4b). Females did not show a clear income gradient across the three income levels, although the higher income level still had a significantly lower percent of adults with more than one risk factor compared to the middle income level (Figure 4b). When the data was analyzed by age group, adults aged 65 years and over had a pattern that was similar (Figure 4c). These findings suggest that there is at least a moderate income effect since the higher income level consistently had the lowest percent of adults with more than one chronic disease risk factor.

Key Message
The higher income level had the lowest percent of adults who had more than one chronic disease risk factor. The rates for lower and middle income groups were similar, even when separated out by sex and age.

Source: Canadian Community Health Survey (CCHS), 2005-2010, Age standardized within each income level to the CCHS sample
Smoking

Introduction
Current smoker prevalence is an important health indicator because smoking is a well-known risk factor for lung cancer as well as other chronic diseases. Current smoker rates have long been linked to income, with a higher percent of smokers seen at lower income levels. In this report, current smokers are defined as adults who have smoked at least 100 cigarettes in their entire life and currently smoke cigarettes every day or some days (occasionally).

Findings
The percent of current smokers was significantly lower in the higher income category (12%) compared to the middle (22%) and the lower income category (25%), indicating an income gradient (Figure 5a).

The income gradient remained when analyzed by sex (Figure 5b).

Adults aged 65 years and older did not have an income gradient for smoking (Figure 5c). Adults aged 65 and older had much lower percentages of current smokers compared to the general population.¹⁵

Key Message
An income gradient was present for current smokers. The higher income category had a smaller percent of current smokers compared to the lower and middle income categories. When analyzed by sex and age group, the income gradient persisted for males and females but not for adults aged 65 and over.

Figure 5a: Percent of Current Smokers, By Income Level, Aged 18 and Over, Halton Region, 2007-2011

Figure 5b: Percent of Current Smokers, By Income Level, Males and Females, Aged 18 and Over, Halton Region, 2007-2011

Figure 5c: Percent of Current Smokers, By Income Level, Aged 65 and Over, Halton Region, 2007-2011

Source: Rapid Risk Factor Surveillance System (RRFSS), 2007-2011, Age standardized within each income level to the RRFSS sample
Overweight/Obesity

Introduction

Obesity is a major global health issue because it is a risk factor for a wide variety of chronic diseases such as diabetes, cardiovascular disease, hypertension, liver disease, as well as breast, colon, and prostate cancer. Body Mass Index (BMI) is a ratio of weight to height (kg/m²) and is the most widely used indicator of population health risks associated with obesity. A BMI under 18.5 is considered underweight, 18.5 to 24.9 represents healthy weight, 25.0 to 29.9 is overweight, and 30.0 and greater is obese.

The analysis in this report looks at both overweight and obesity rates combined (BMI ≥25.0). It is based on self-reported height and weight.

In current literature, the association between overweight/obesity and income is unclear as there are contradictory findings for whether overweight or obesity is associated with wealth or poverty.

Findings

There was no income gradient for adults who were obese or overweight. No significant differences were found in the percent of adults who were obese or overweight between the lower (54%), middle (55%), and higher income (53%) levels (Figure 6a).

When overweight and obesity rates were analyzed by sex, there was still no income gradient present for Halton adults. There were no significant differences in the percent of males who were obese or overweight between the lower (68%), the middle (67%), and the higher income category (71%) (Figure 6b). The same was true for females in the lower income level (44%), the middle (46%), and the higher income level (40%) (Figure 6b). Overall, females had a lower percent of overweight and obesity compared to males.

There was no income gradient for overweight and obesity when analyzed by age.

Key Message

Overall, there was no income gradient for Halton Region adults who were obese or overweight. No income gradient was found when overweight and obesity was analyzed by sex or age group.

Source: Rapid Risk Factor Surveillance System (RRFSS), 2007-2011, Age standardized within each income level to the RRFSS sample
Income and Health Inequalities in Halton Region

Figure 6b: Percent of Adults that are Overweight or Obese, By Income Level, Males and Females, Aged 18 and Over, Halton Region, 2007-2011

Figure 6c: Percent of Adults that are Overweight or Obese, By Income Level, Aged 65 and Over, Halton Region, 2007-2011

Source: Rapid Risk Factor Surveillance System (RRFSS), 2007-2011, Age standardized within each income level to the RRFSS sample
Physical Activity

Introduction
Physical activity is associated with health benefits such as reducing the risk of being overweight and obese or having heart disease. Income is an important factor to consider when looking at physical activity levels of adults because of potential links between income level and the types of physical activity a person engages in, as well as access to facilities.

Findings
The findings for physical activity showed an association between higher income and a higher percent of adults reporting being “Active” or “Moderately Active”. The higher income level had a significantly higher percent of adults who reported being “Active” or “Moderately Active” (56%) compared to the middle income level (47%) (Figure 7a). When the data was analyzed by sex, there appeared to be a similar income gradient for males, but not for females (Figure 7b). When the data was analyzed by age, those aged 65 and over had a significantly lower percent who reported being “Active” or “Moderately Active” compared to those aged 18-64, but showed a similar pattern in relation to income (Figure 7c).

Key Message
There was a weak income effect for physical activity between the middle and higher income level, showing that higher income was associated with a higher percent of adults who reported being “Active” or “Moderately Active”. This pattern was seen for males, but not females when the data was analyzed by sex.

Source: Canadian Community Health Survey (CCHS), 2005-2010, Age standardized within each income level to the CCCHS sample
Alcohol Intake (Heavy Drinking)

Introduction
Heavy drinking and subsequent intoxication can lead to a variety of chronic diseases such as liver cirrhosis, acute brain damage, as well as cancer from continuous long-term exposure. Additionally, excessive alcohol intake has also been linked to unintentional injuries, suicide, deaths from impaired driving collisions, and a complex two-way relationship with depression. The evidence for the relationship between income level and heavy drinking is unclear since heavy drinking has been linked to individuals in both low and high income categories.

Findings
Overall, income did not significantly affect the percent of adults who reported consuming 5 or more drinks on one occasion at least once in the past month. It appeared that middle and higher income may be associated with increased heavy drinking; however, the differences between income levels were not statistically significant (Figure 8a). A similar pattern was seen when the data was analyzed by sex (Figure 8b). Other factors such as age and sex may be more important than income as predictors of heavy drinking behaviour. Males had higher percentages of heavy drinkers compared to females (Figure 8b), and adults aged 65 years and over had a very small percent of heavy drinkers (Figure 8c).

Key Message
Overall, no association was found between income level and the percent of adults who reported consuming 5 or more drinks on one occasion at least once in the past month.

Source: Canadian Community Health Survey (CCHS), 2005-2010, Age standardized within each income level to the CCHS sample
Fruit and Vegetable Intake

Introduction
The consumption of an adequate amount of fruit and vegetables is often used as a proxy for a healthy diet, which is closely linked to the risk of chronic health problems such as diabetes, obesity, and heart disease. Studying the relationship between the consumption of fruit and vegetables and income level is important from a public health perspective because of factors such as affordability of, and access to, healthy foods, as well as education surrounding the importance of fruit and vegetables in our daily diet.

Findings
While adults in the highest income level appeared to have a higher proportion of people who ate five or more fruit and vegetables daily, the differences between income levels was small, and not statistically significant (Figure 9a).

When analyzed by sex, there appeared to be an association with income for females. Those in the highest income category had a significantly higher proportion of people who ate five or more fruit and vegetables daily (50%) compared to females in the middle income category (40%; Figure 9b). For adults aged 65 and over, there were no significant differences between the three income levels (Figure 9c).

Overall, income level does not appear to significantly affect the proportion of people who reported eating five or more fruit and vegetables daily. The intake of five or more fruit and vegetables daily is low for all adults, regardless of income level, age, or sex.

Key Message
Overall, income did not appear to significantly affect the proportion of people in each income level who reported eating fruit and vegetables five or more times daily. The intake of fruit and vegetables five or more times daily was low for all adults in Halton Region, regardless of income level, sex, or age.

Source: Rapid Risk Factor Surveillance System (RRFSS), 2007, 2009, 2011, Age standardized within each income level to the RRFSS sample
Diabetes

Introduction

Diabetes is a serious chronic disease because it is associated with risk factors such as overweight and obesity, inadequate physical activity and an unhealthy diet. Additionally, diabetes can lead to several health complications such as heart disease, stroke, blindness, kidney failure, and high blood pressure. Like many other health problems, a higher prevalence of diabetes has been linked to people in lower income levels. This analysis includes both Type 1 diabetes and Type 2 diabetes, however, based on previous analysis of the CCHS data, most respondents with diabetes (96%) are likely to have type 2 diabetes.21

Findings

The percent of adults living with diabetes did not differ significantly between the three income levels (Figure 10a). There was still no income gradient present when the data was analyzed by sex (Figure 10b), however, there was a slight income effect when analyzed by age group (Figure 10c). For adults aged 65 years and over, the percent of adults in the lower income level living with diabetes (20%) was significantly higher than the higher income level (7%) (Figure 10c). Overall, the prevalence of diabetes in Halton Region was fairly low overall, which makes it more difficult to see significant differences by income, despite an income gradient that was found in another Canadian study.21

Key Message

Overall, there was no significant income gradient found for diabetes. For adults aged 65 years and over, the lower income level had a significantly higher percent of adults living with diabetes compared to the higher income level.

Source: Canadian Community Health Survey (CCHS), 2005-2010, Age standardized within each income level to the CCHS sample
Falls

Introduction
This indicator is used to monitor the percent of adults who have had a fall such as falling down stairs, off a ladder, or tripping and falling down over something left on the floor in the past 12 months.

Findings
There was no apparent trend by income level present for the proportion of adults in each income category who reported having had a fall in the past 12 months. There were no significant differences in the percent of adults reporting falls in the past 12 months between the higher income level (19%), the middle (24%), and the lower income level (17%) (Figure 11a). There was still no income gradient present when the data was analyzed by sex (Figure 11b), nor when it was analyzed for adults aged 65 and over(Figure 11c).

Source: Rapid Risk Factor Surveillance System (RRFSS), 2008-2010, Age standardized within each income level to the RRFSS sample
Activity Limitation

Introduction
Activity limitation is defined by the frequency with which an individual experiences activity limitations imposed on them by a condition(s) or by long-term physical and/or mental health problem(s) that has lasted or is expected to last 6 months or more. Previous findings from the National Population Health Survey have shown an association between low income and activity limitation. This relationship may be related to the fact that those with disabilities face greater challenges with employment and have lower incomes as a result.

Findings
An income gradient was present for activity limitation in Halton adults. The lower income level had a significantly higher percent of adults who “Sometimes” or “Often” experience long-term limitations in their activities (49%) compared to adults in the middle (33%) and higher income (28%) levels (Figure 12a). The gradient remained when the data was analyzed by sex (Figure 12b). When analyzed by age group, there was no income gradient in activity limitation for adults aged 65 years and over (Figure 12c).

Key Message
There was greater activity limitation for adults in the lower income level compared to the middle and higher income levels, indicating an income gradient. When analyzed by age group, the gradient remained for males and females, but not for adults aged 65 years and over.

Source: Canadian Community Health Survey (CCHS), 2005-2010, Age standardized within each income level to the CCHS sample
Dental Visits

Introduction
The dental visits indicator has a direct link to income because adults in Ontario are generally responsible for financing their own dental care either through a workplace or personal insurance policy, or out of pocket payments. This report looks at the percent of adults who had their last dental visit more than three years ago; having a dental visit more than three years ago was used as a marker for underutilization of dental care services.

Findings
There was a significant income gradient across all income levels for the percent of adults who had their last dental visit more than three years ago. The proportion of adults who had their last dental visit more than three years ago was highest for the lowest income level (18%), followed by the middle (8%) and highest income level (4%) (Figure 13a). All differences between income levels were significant.

The income gradient remained when the data was analyzed by sex (Figure 13b). Males in the lowest income category had a significantly higher proportion of adults who had their last dental visit more than three years ago (26%) compared to the middle (10%) and highest income categories (5%). The income gradient was flatter for females compared to males. Females in the lowest income level had a significantly higher proportion of adults who had their last dental visit more than three years ago (13%) compared to those in the highest income level (4%).

When analyzed by age group for adults aged 65 and over, the income gradient remained (Figure 13c).

Key Message
There was a significant income gradient across all income levels for the percent of adults who had their last dental visit more than three years ago. The gradient persisted when analyzed by sex and age group.

Figure 13a: Percent of Adults Whose Last Dental Visit was More Than 3 Years Ago, By Income Level, Aged 18 to 64, Halton Region, 2009 and 2011

Source: Rapid Risk Factor Surveillance System (RRFSS), 2007-2011, Age standardized within each income level to the RRFSS sample

Figure 13b: Percent of Adults Whose Last Dental Visit was More Than 3 Years Ago, By Income Level, Males and Females, Aged 18 to 64, Halton Region, 2009 and 2011

Figure 13c: Percent of Adults Whose Last Dental Visit was More Than 3 Years Ago, By Income Level, Aged 65 and Over, Halton Region, 2009 and 2011
Influenza Immunization

Introduction
The National Advisory Committee on Immunization recommends that priority for the seasonal flu vaccine should be given to those persons at high risk, those capable of transmitting the disease, and those who provide essential community services. As a result, vaccination rates are drastically different for priority groups such as adults aged 65 and over—a group that has an increased risk for influenza-related complications. This report presents influenza immunization data separately for adults aged 18-64 years and adults aged 65 and over to account for the targeted influenza vaccine program in Ontario.

Findings
There was no income gradient in influenza immunization. There were no significant differences in the percent of adults vaccinated for influenza between the lower, middle, and higher income levels for both age groups and by sex (Figures 14a, 14b, and 14c). The obvious finding for influenza immunizations was the difference between the two age groups. The percent of adults who were vaccinated for influenza was significantly higher for adults aged 65 years and over compared to younger adults.

Key Message
There was no income gradient for the percent of adults who were vaccinated for influenza for adults aged 18-64 years or 65 years and over. Adults aged 65 years and over had a significantly higher percent of adults who were vaccinated for influenza compared to younger adults.

Source: Rapid Risk Factor Surveillance System (RRFSS), 2007-2011, Age standardized within each income level to the RRFSS sample
Chlamydia Infection

Introduction
Sexually transmitted infections (STIs), including chlamydia, are important to prevent as they can cause serious complications such as pelvic inflammatory disease and infertility. Chlamydia is the most common STI and accounts for 90% of the STIs reported to Halton Region Health Department. Because infections are often asymptomatic, the rates shown here are likely underestimated. Chlamydia infection rates are defined as the number of cases per 100,000 population per year. The rates for Halton residents were averaged over five years from 2007-2011.

Findings
For males and females combined, chlamydia infection rate appears to decrease as income increases (Figure 15a). However, when the data was analyzed by sex, the income gradient was only present for females, not for males (Figure 15b). For females, there were significantly lower rates of Chlamydia infection in the highest three income groups compared to the lowest income group.

From 2007-2011, Halton had significantly lower rates of chlamydia infection compared to Ontario (141 cases per 100,000 versus 254 cases per 100,000 population). It is interesting to note that the chlamydia infection rate for the lowest income group in Halton (192 cases per 100,000 population) was still lower than the overall Ontario infection rate for the same time period.

Key Message
The income gradient for Chlamydia infection was only present for females, not for males. For females, there were significantly lower rates of Chlamydia infection in the highest three income groups compared to the lowest income groups.

Graph Footnotes
Age standardized to the 1991 Canadian population.
Rate is per 100,000 population per year.
Residents of Correctional Facilities removed from the analysis.
Income groups are based on the national quintiles of income by dissemination area from Statistics Canada, 2006.
2007-2011 population counts have been estimated using the 2006 Census, Statistics Canada.
Hospitalizations and Emergency Department Visits

Introduction
The hospitalization rate is the total number of hospital separations (discharges, transfers and deaths) per 100,000 population per year. The emergency department visits are also expressed as a rate and is the number of visits per 1,000 population per year. Both hospitalizations and emergency department visits for Halton residents were averaged over 5 years from 2006-2010. Hospitalizations and emergency department visits relate to number of events rather than number of people. Emergency department visits included only unscheduled visits.

Findings
Hospitalizations
In the lowest income group, the age-standardized rate for all hospitalizations was 114 per 100,000, the highest among all income groups. This rate was 50% higher than in the most affluent income group, which had a rate of 78 per 100,000 population (Figure 16a). The lowest income group had a significantly higher rate of hospitalization compared to all 4 of the other income groups, while the highest income group had a significantly lower rate of hospitalizations than the other 4 income groups. There were no differences in hospitalization rates amongst the middle 3 income groups.

Emergency Department (ED) Visits
In the lowest income group, the age-standardized rate for all ED visits was 757 per 1,000, the highest among all income groups. This rate was 70% higher than in the most affluent income group, which had a rate of 438 per 1,000 (Figure 16b). The lowest income group had a significantly higher rate of hospitalization compared to all the other income groups, while the highest income group had a significantly lower rate of hospitalizations than the other 4 income groups. There was a stepwise drop in ED visits for each decrease in income, with the exception of income groups 2 and 3.

Key Message
Hospitalizations showed a gradient with income, with the lowest income group having the highest rate of hospitalizations and the other 4 income groups with lower and more similar rates. Emergency department (ED) visits had a steeper gradient with income, and as income increased there was a consistent stepwise decrease in ED visit rates.

Figure 16a: Hospitalizations, By Income Group, All Ages, Halton Region, 2006–2010
Figure 16b: Emergency Department Visits, By Income Group, All Ages, Halton Region, 2006–2010

Source: National Ambulatory Care Reporting System, 2006-2010, Canadian Institute for Health Information, Intellihot, MOHLTC, August 9, 2012. Age standardized to the 1991 Canadian population. Hospitalization rate is per 100,000 population per year; whereas the Emergency Department Visit rate is 1,000 per population per year. Income groups are based on the national quintiles of income by dissemination area from Statistics Canada, 2006. 2006-2010 population counts have been estimated using the 2006 Census, Statistics Canada.
All-Cause Mortality

Introduction
Mortality rate is defined as the number of deaths per 100,000 population per year. The mortality rates for Halton residents were averaged over five years from 2003-2007. Since neoplasms (all causes of cancer) and diseases of the circulatory system are the two leading causes of death for Canadians and Halton residents, these disease-specific mortality rates have also been shown in relationship to income.

Findings

All-Cause Mortality
There were gradients in the overall mortality rates for both males and females across income groups for Halton (Figure 17a). However, males had a steeper, more defined gradient with the highest mortality rate (977 per 100,000) in the lowest income group and a stepwise decrease in rates to the highest income group (437 per 100,000). The income gradient for females was not as well defined, although females in the lowest income group had a mortality rate that was significantly higher than females in all other income groups (639 per 100,000 in the lowest income group down to 336 per 100,000 in the highest income group).

Figure 17a: All-Cause Mortality Rate, By Income Group, Males and Females, All Ages, Halton Region, 2003-2007

Key Message
The age-standardized rate of mortality for those in the lowest income group was almost twice the rate of those in the highest income group. This pattern held for mortality rates related to diseases of the circulatory system. However, for cancer, the income gradient was slightly less steep overall. The relationship between cancer and income was more well-defined for males that females.

Age standardized to the 1991 Canadian population. Rate is per 100,000 population per year.
Income groups are based on the national quintiles of income by dissemination area from Statistics Canada, 2006.
2003-2007 population counts have been estimated using the 2006 Census, Statistics Canada.
Cancer Mortality

Cancer death rates for females were not significantly different across each of the 5 income groups (Figure 17b). For males, the lowest cancer mortality rate was 150 per 100,000 for those in the highest income group and the highest rate was 282 per 100,000 (almost twice the rate) for those in the lowest income group (Figure 17b). There were significant differences in cancer mortality rates in males between income groups 1 and 4, and income groups 1 and 5, as well as between income groups 4 and 5. There were no differences in cancer mortality rates for those males in income groups 2, 3, and 4.

![Graph showing cancer mortality rates for males and females by income group](image)

**Figure 17b: Cancer Mortality Rate, By Income Group, Males and Females, All Ages, Halton Region, 2003-2007**

Mortality Due to Diseases of the Circulatory System

There were gradients in mortality rates due to diseases of the circulatory system for both males and females across income groups for Halton (Figure 17c). However, males had a steeper, more defined gradient with the highest mortality rate (286 per 100,000) in the lowest income group and a stepwise decrease in rates to the highest income group (131 per 100,000). The income gradient for females was not as well defined, although females in the lowest income group had a rate that was significantly higher than females in all other income groups (194 per 100,000 in the lowest income group down to 86 per 100,000 in the highest income group).

![Graph showing mortality rates for diseases of the circulatory system by income group](image)

**Figure 17c: Mortality Rate for Diseases of the Circulatory System, By Income Group, Males and Females, All Ages, Halton Region, 2003-2007**

Age standardized to the 1991 Canadian population. Rate is per 100,000 population per year.
Income groups are based on the national quintiles of income by dissemination area from Statistics Canada, 2006.
2003-2007 population counts have been estimated using the 2006 Census, Statistics Canada.
Premature Mortality

Introduction
Potential years of life lost (PYLL) measures the additional years a person would have lived if he or she had not died prematurely (before the age of 75). In practice, this means that a person who died at age 50 would have lost 25 potential years of life. It is an alternative to mortality rates and gives more weight to deaths that occur in younger people. Neoplasms (cancers), followed by injuries (both intentional and unintentional), and then circulatory diseases are the most important causes of potential years of life lost (PYLL) for Canadians. The PYLL rate is defined as the number of potential years of life lost due to premature death per 100,000 population per year. The rates for Halton residents were averaged over five years from 2003-2007.

Findings
All Causes
The PYLL is shown for ages 0 to 24 and 25 to 74 separately as there were significant differences in the relationship of PYLL and income by age. The highest PYLL all-cause mortality rate for adults aged 25 to 74 was 8,037 per 100,000 in the lowest income group, with a significant stepwise decrease in rates to 2,961 per 100,000 in the highest income group. For males, the rates for each income group were higher and the income gradient steeper compared to females (data not shown).

Key Message
Adults aged 25 to 74 in the lowest income group had more years of life lost due to premature death compared to those in the most affluent group. This income gradient was also seen for specific causes of death—cancers, diseases of the circulatory system, and injuries. The income gradient was not as well defined for diseases of the circulatory system.

Age standardized to the 1991 Canadian population. Rate is per 100,000 population per year.
Income groups are based on the national quintiles of income by dissemination area from Statistics Canada, 2006.
2003-2007 population counts have been estimated using the 2006 Census, Statistics Canada.
Cancer

For PYLL rates due to all causes of cancer there was a significant and consistent decrease in the potential years of life lost for each stepwise decrease in income. The age-standardized rate for Halton adults aged 25 to 74 in the lowest income group was almost twice that of those in the highest income group (2,889 versus 1,500 per 100,000 per year).

Injuries

For PYLL rates due to injuries there was a significant and consistent decrease in the potential years of life lost for each stepwise decrease in income. The age-standardized rate for those in the lowest income group was more than triple the rate compared to those in the highest income group (2,309 per 100,000 versus 726 per 100,000).

Diseases of the Circulatory System

For PYLL rates due to diseases of the circulatory system the rates were lower than cancer and injuries and the income gradient was slightly less defined. There were significant differences between each income group with the exception of income groups 2 and 3. Similar to injuries, the age-standardized rate for those in the lowest income group was more than triple the rate of those in the highest income group (1517 per 100,000 versus 499 per 100,000).

Age standardized to the 1991 Canadian population. Rate is per 100,000 population per year.
Income groups are based on the national quintiles of income by dissemination area from Statistics Canada, 2006.
2003-2007 population counts have been estimated using the 2006 Census, Statistics Canada.
Health Inequalities Related to Income Exist in Halton

The analysis presented in this Income and Health Inequalities report shows that income-related health inequalities do exist in Halton Region. Some of the findings presented in this report align with previously accepted associations between income and health status, while others do not show any income effect.

The health indicators that showed a significant income gradient:

- Self-rated Health
- Self-rated Mental Health
- Chronic Disease Risk Factors
- Smoking
- Physical Activity (Males)
- Diabetes (Age 65 & Over)
- Activity Limitation
- Dental Visits
- Chlamydia Infection
- Emergency Department Visits
- Hospitalizations
- All-Cause Mortality
- Cancer Mortality (Males)
- Circulatory Disease Mortality
- All-Cause Premature Mortality (Ages 25-74)
- Cancer Premature Mortality (Ages 25-74)
- Circulatory Disease Premature Mortality (Ages 25-74)
- Injuries Premature Mortality (Ages 25-74)

Sex differences in the association between income and health

All cause cancer mortality rates had a much steeper income gradient for males than for females. The diminished income gradient for females maybe because while overall cancer mortality tends to be higher for lower income groups, breast cancer rates tend to be higher in women with higher income, thus making the overall gradient less steep for females.29

Chlamydia infection rates and income also showed a difference by sex; with an income gradient present for females, but not for males. Although chlamydia rates are usually higher in females than males, it is unclear why the income gradient was found only for females.

Findings for Older Adults

For the health indicators that used CCHS and RRFSS data, an analysis by income level was done for those aged 65 and over. For most indicators, the pattern with income did not change when examining older adults separately. One exception was for smoking, where there was no longer an income gradient. Rates of smoking were low across all income groups for seniors. Another health indicator that showed differences for those aged 65 and over was diabetes. Rates of diabetes overall increased in older adults, especially for those with lower incomes, resulting in an income gradient for this age group, but not for all adults combined.
Both lower and middle income groups are equally less healthy for some indicators

Another interesting finding was that for some health indicators the rates for the middle income group were not statistically significantly different from the rates of the lower income group. This was found to be true for self-rated general health, smoking, chronic disease risk factors, and self-rated mental health. The higher income group for these four indicators showed a significant health benefit compared to both middle and lower income groups.

Several indicators were not related to income

There were some health indicators for which no relationship was found with income. These were:

- Overweight & Obesity
- Physical Activity (Females)
- Alcohol Intake (Heavy Drinking)
- Fruit and Vegetable Intake
- Diabetes (Ages 18-64)
- Falls
- Influenza Immunization
- Chlamydia Infection (Males)
- Cancer Mortality (Females)
- All-Cause Premature Mortality (Ages 0-24)

While an income gradient was not observed for obesity and overweight in Halton Region, if we look at the larger picture of overall rates of obesity in Canada, a male gradient with income has been observed (higher income males have higher rates of obesity), while there is no obvious gradient for females. Most concerning was not the lack of gradient with income but the actual rates themselves, with 39% of Halton women and 69% of Halton men overweight or obese.

The findings for daily fruit and vegetable consumption in Halton Region were different from what we would expect to see in terms of an income gradient. A recent analysis of a sample of over 90,000 Canadians from the Canadian Community Health Survey revealed a socioeconomic gradient for frequency of fruit and vegetable consumed in which low income groups consumed fruit and vegetables less frequently than high income groups in Canada. Perhaps the more important finding was that consumption of fruit and vegetables was very low overall regardless of income, with less than 50% of Halton adults eating fruit and vegetables at least five times daily.

The impact of Halton’s economic affluence on health inequalities

It is important to consider the demographic characteristics of Halton Region when interpreting the results presented in this report.

One characteristic that makes Halton Region unique is the high level of affluence. According to the 2006 Census, Halton Region had the highest median household income ($83,000) when compared with all other health units in Ontario. Due to the known association between higher levels of income and health, health outcomes are expected to be fairly positive on average.

Additionally, the proportion of the population in each income group is quite different with about 60% of households surveyed (CCHS, RRFSS) in the uppermost household income category (see Table 1) and over 75% of Halton’s population living in dissemination areas that fall into the two highest income quintiles (see Table 3). Because only a very small proportion of our population is in the lowest income groups, it was thought that the income effect may be more difficult to demonstrate in Halton Region in comparison with other regions in Ontario. Despite this, many of the health indicators showed a significant income gradient and were similar results to other jurisdictions (see Appendix C).
Comparing Halton to other jurisdictions

One of the purposes of this report was to determine if Halton had similar patterns of inequalities in health related to income as in other jurisdictions. Overall, our results were quite similar to other jurisdictions (Toronto, Peel, Ottawa, and nationally).

Self-rated health was consistently higher for higher income groups for Toronto\(^2\), Peel\(^3\), and in the Pan-Canadian study of 15 Census Metropolitan Areas (CMAs)\(^4\). The relationship of hospitalizations, emergency department visits, mortality rates, and premature mortality (PYLL) with income in Halton was also consistent with what has been described in national-level studies\(^28\).

We did not find a relationship between fruit and vegetable intake and income in Halton. This was consistent with findings from Peel and Ottawa. Neither Halton nor Ottawa found a relationship between overweight and obesity rates and income, however Peel and Toronto did find a relationship but it was inconsistent between the two reports\(^2\)\(^3\). The differences across jurisdictions are further described in Table 4 (Appendix C). Smoking and physical activity had similar results in Halton as other jurisdictions, with the exception of Peel, where the gradient was reversed and explained in their report as occurring as a result of the large proportion of immigrants in Peel and the ‘healthy immigrant effect’\(^3\). Forty-nine percent of Peel’s population are immigrants\(^3\), compared to 24% of Halton’s population\(^12\).

Comparisons of the remaining health indicators across other jurisdictions (Toronto, Peel, Ottawa, and nationally) are provided in Table 4 (Appendix C).

Limitations

It is possible that the true extent of the health inequalities presented in this report are actually underestimated. The health indicator data from the RRFSS and CCHS databases is based on telephone surveys and it is likely that most marginalized groups in Halton Region are underrepresented. In addition, for the other health indicators such as mortality, hospitalizations, emergency department visits, and infectious diseases, the use of neighbourhood income as a proxy for household income tends to lessen the relationship between income and health\(^32\).

Future Work

This report on income and health inequalities in Halton Region focused on just one of the twelve social determinants of health outlined by the Public Health Agency of Canada\(^5\). While income may in some instances serve as a proxy for education level or employment status, the social determinants of health are complex and the associations presented in this report may be different for factors other than income. Future work may include analysis by other determinants of health such as education level, immigration, employment status, ethnicity, and marital status; which would provide valuable information for the Region of Halton’s public health planning and programming.
6.0 Conclusion

The findings presented in this report show that most of the health indicators examined had a significant income gradient in which lower income was associated with poorer health. These relationships provide an example of the extent to which social determinants such as income can impact specific health outcomes. This report provides a starting point in understanding the health disparities between population groups categorized by income. These disparities highlight that health inequalities are present in Halton Region despite the overall high level of economic affluence.

The Region of Halton places great importance on health equity for its residents, and provides programs and resources that raise awareness of health inequalities and address inequities. Given that health equity is an important Regional initiative, having a wide range of health indicators that showed a significant income gradient is a concerning finding that warrants further discussion. The solution for reducing health inequalities is not an obvious or simple one, nor only a local one. The interactions between income, other determinants, and health status are complex. However, the recognition of the health inequalities associated with income is a necessary first step in ensuring the good health of all residents of Halton Region.
**95% Confidence Interval** is the range within which the true value lies, 19 times out of 20. Confidence intervals are presented as error bars in the graphs. Assessment of significant differences between income groups, across the gradient, was based on whether the confidence interval of each group overlapped with the confidence interval of another income group.

**Age Standardization** is a technique based on weighted averaging which removes the effects of differences in the distribution of age in two or more populations. The standardized rates are not intended to provide an estimate of the true rate; rather they reflect the rate that would have resulted had the observed rates within each age group had been experienced by the standard population.

Dissemination Area is a small geographical area, which usually has a population of 400 to 700 persons. It is the smallest standard geographic area for which census data is published. All of Canada is divided into dissemination areas. In 2006 Halton Region had 662 dissemination areas. The dissemination areas fit within Halton’s 94 census tracts (that in turn fit within Halton’s 21 Our Kids Network neighbourhoods), that in turn fit within Halton’s 4 municipalities.

**Gradient** is a term used to describe the relationship between a health indicator and income. For the purposes of this report, it occurs when the 95% confidence intervals for the lowest income group and the highest income group do not overlap, and the rates of the middle income group(s) were between the rates at each of the extremes.

**QAIPPE** is the “Quintile of Annual Income Per Person Equivalent”. Statistics Canada calculates this average income per person for each dissemination area. The lowest income dissemination areas have a QAIPPE of “1”, while the highest income areas are given a QAIPPE of “5”. Since these scores are based on a national ranking of dissemination areas, Halton does not have an equal number of dissemination areas in each of the quintiles. Halton only has 15 dissemination areas in the lowest income quintile compared to 312 in the highest (see Table 1).

**Sex** defines people based on their biological characteristics, whereas gender is a socially constructed concept. From a social determinants of health perspective, certain health conditions can be associated with gender, and from a biological perspective, certain health conditions can be associated with sex. The data sources used in this report only collects information on sex, and not gender.
8.0 Appendix B – Data Sources, Limitations, and Statistical Methods

Data Sources

i) Rapid Risk Factor Surveillance System (RRFSS)

RRFSS is an ongoing, monthly telephone survey conducted for the Halton Region Health Department. It is administered to adults aged 18 and over who live in private households. Within households, the adult with the most recent birthday is selected to participate in the survey. Since 2001, 1200 Halton Region residents have been surveyed on a yearly basis (100 per month) about health-risk behaviours, as well as knowledge, attitudes, and awareness of different important public health topics. Random digit dialling is used to select households. Individuals who live in a household without a landline telephone (about 12% of all Ontario households) are not reached through RRFSS.

The data used for this report was collected between 2007 and 2011 and only for respondents aged 18 and over, which provided a total sample of 5,896 for Halton Region. However, 1,682 (28%) of survey respondents did not provide their income, reducing the sample to 4,341. A subset of indicators was chosen from RRFSS based on the relevance to income and health in Halton. Not all indicators had data for every year. The following seven self-reported health indicators were based on RRFSS data with the corresponding years of data:

- Self-Rated Health (2007-2011)
- Smoking (2007-2011)
- Overweight/Obesity (2007-2011)
- Falls (2008-2010)
- Dental Visits (2009, 2011)
- Influenza Immunization (2007-2011)

ii) Canadian Community Health Survey (CCHS)

The Canadian Community Health Survey (CCHS) is a cross-sectional survey conducted by Statistics Canada that collects information related to health status, health care utilization, and health determinants for the Canadian population. The target population for the CCHS is all Canadians aged 12 and over, and excludes individuals living on First Nations Reserves and Crown lands, institutions, Canadian Forces bases, and in some remote areas. Households were randomly selected as was the individual within a household.

The data used for this report was collected between 2005 and 2010 and only for respondents aged 18 and over, which provided a total sample of 3,640 for Halton Region. However, 643 (18%) of survey respondents did not provide their income, reducing the sample to 2,997 in Halton. The following six self-reported health indicators used CCHS data:

- Leisure Time Physical Activity
- Activity Limitation
- Alcohol Intake (Heavy Drinking)
- Chronic Disease Risk Factors
- Self-Rated Mental Health
- Diabetes
iii) Other Data Sources

Intellihealth is an internet-based data portal managed by the Ontario Ministry of Health and Long Term Care (MOHLTC). It provided access to a number of different data sources used this report, including:

- The National Ambulatory Care Reporting System (NACRS, produced by the Canadian Institute of Health Information [CIHI]) for Emergency Department Visits;
- The CIHI Discharge Abstract Database (DAD) for data on hospital separations ("Hospitalizations"); and
- The Office of the Ontario Registrar General for vital statistics data, which includes deaths.

NACRS, DAD and the vital statistics data related to specific events (e.g. circulatory diseases, cancers, and injuries) are classified according to Canadian Enhancement of the International Classification of Disease, Tenth Revision. This set of standard codes is used to classify diseases, illnesses and injuries based on codes published by the World Health Organization.

iPHIS (Integrated Public Health Information System) is an information system for infectious diseases that are reportable to public health in Ontario, under the Health Protection and Promotion Act (HPPA). iPHIS is a client-focused, centrally managed database application that is used by front-line public health professionals in Ontario for case and contact follow-up and outbreak management of reportable diseases as well as surveillance. For this report, iPHIS was used to extract Chlamydia infection cases for Halton.

The Postal Code Conversion File is a digital file created by Statistics Canada to link Canada Post Corporation six-digit postal codes to census geographic units (including dissemination areas). Where one postal code mapped to multiple disseminations areas, assignment of the dissemination area was based on a single link indicator based on population distribution. This file was used to determine the dissemination area associated with the postal code of each individual case for the following indicators: Chlamydia Infection, Emergency Department Visits, Hospitalizations, and Mortality Rates. The Canadian Census data was then used to assign a quintile for household income based on the dissemination area of residence.

The Canadian Census is conducted every five years by Statistics Canada. The census is designed to provide information about people in Canada by their demographic and social characteristics. The analysis for this report uses data from the 2006 census, as the 2011 census data was not available at the time this report was being prepared. The census data provided the population counts and the QAIPPE (quintile of annual income per person equivalent) for each of the 662 dissemination areas in Halton. Since the QAIPPE is developed based on a ranking of every dissemination area in Canada, not just Halton Region, each “quintile” or group does not contain an equal proportion of Halton Region's population (see table 1).

Limitations Of The Data

For both RRFSS and CCHS, self-reported data have a number of limitations. People do not always remember their behaviours, and may under-report or over-report certain behaviours or characteristics that they think are undesirable. For example, people may not remember how many times they exercised in the past week. In addition, surveys do not always provide a representative picture of the whole population. Both RRFSS and CCHS under-represents people of low income, people with low education, new immigrants, and will miss people not living in households, such as those in correctional facilities, homeless, or in hospital. Thus the percentages may not represent the true estimates for the general population as respondents may have different characteristics than people who have not been included in the survey.
The estimates for the CCHS health indicators are based on three survey cycles (2005, 2007-08, 2009-10) which are combined at the data-level in order to obtain a sample size large enough to analyze the data by small sub-groups. Similarly, the estimates for RRFSS health indicators are based on up to five years of data (2007 to 2011), when available. However, by combining years of data we may be hiding changes over time in and between the sub-groups. Finally, even with five years of data, the Halton sample was small, especially for CCHS, and may not have been able to detect true differences where they actually exist.

The data contained within Intellihealth and iPHIS are coded based on the place of residence of the person in question, rather than on the location of where the event occurred. Within each dissemination area (DA) there could be a wide range of differing household incomes which were not captured by grouping all residents of a DA into the same income group.

In addition, Halton residents that visited an emergency department, were hospitalized, or died outside of the province were excluded. The data may be limited by missing postal code information, and errors or biases in the coding, especially as it relates to diagnosis or the cause of death. In general, between 9-11% of the data (depending on the health indicator) was missing a valid Halton Region postal code and had to be excluded from the analysis.

Lastly, population counts were not available for non-census years at the dissemination area (DA) level. As a result the 2006 census population counts were used as the denominator for mortality data, hospitalizations, emergency department visits, and infectious disease data spanning 2003 through to 2011.

**Statistical Methods**

All analyses were performed with Stata software (version 12, 2012, Stata Corporation, College Station, Texas). Analyses of CCHS and RRFSS data utilized the sampling weights for each survey. The sampling weights account for differential probability of selection and response. If a respondent did not respond to a survey question relevant to the analysis presented, they were excluded from both the numerator and the denominator.

**Age-Standardization of Rates**

A greater proportion of older adults have low incomes compared to adults aged 25 to 64. Given that older adults may also have higher rates of certain health conditions, this would mean that the higher rates of poor health outcomes in low income areas may just reflect the fact that this group is older in age. Therefore, to remove this effect of age and allow for comparisons between income groups, rates had to be age-standardized. However, these standardized rates are not intended to provide an estimate of the true rate; rather they reflect the rate that would have resulted had the observed rates within each age group in the current income groups been experienced by the standard population. This age standardization procedure controlled for differences in age structure among income groups and between men and women.

Standardization by 5-year age group was done by means of the direct method, with the total survey sample as the standard population for CCHS and RRFSS, and the 1991 Canadian population as the standard population for infectious disease, emergency room visits, hospitalizations, and mortality.
95% Confidence Intervals

A 95% confidence interval (CI) refers to the range of values that has a 95% chance of including the ‘true’ estimate. A large CI means that there is a large amount of variability or imprecision. CI’s are presented as error bars in the graphs.

Assessment of significant differences between income groups, across the gradient, was based on whether the confidence interval of each group overlapped with the confidence interval of another income group. This method is more conservative ($\alpha < 0.01$) than the conventional method of significance testing ($\alpha < 0.05$). However, the multiple comparisons performed in the analysis were not taken into consideration when choosing the level of significance to test, which means that a more conservative test is appropriate. ï

The confidence intervals for CCHS prevalence estimates were calculated using bootstrap weights provided by Statistics Canada.

For the purpose of this report, the term “gradient” was used when the 95% confidence intervals for the lowest income group and the highest income group did not overlap, and the rates of the middle income group(s) were between the rates at each extreme.
### Table 4: A Comparison of Income Gradients across Jurisdictions (Halton, Toronto, Peel, Ottawa, and Canada-wide)**

<table>
<thead>
<tr>
<th>Health Indicator</th>
<th>Halton</th>
<th>Toronto</th>
<th>Peel</th>
<th>Ottawa</th>
<th>Pan-Canadian (15 CMA’s)</th>
<th>Other Canada-wide Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Rated Health</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td></td>
<td></td>
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<td>Smoking</td>
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<td></td>
</tr>
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<td>✓ and ✓ and</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Activity</td>
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<td>✓</td>
<td></td>
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<td></td>
</tr>
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<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
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<td></td>
<td></td>
<td></td>
<td>✓ 21 (Ages 30+ only)</td>
<td></td>
</tr>
</tbody>
</table>

✓ = indicates a gradient where higher incomes are related to improved health behaviours or better health outcomes  
✓ = indicates a gradient where lower incomes are related to improved health behaviours or better health outcomes  
✗ = indicates no gradient with income  
**CMA = Census Metropolitan Area  
* Attributed to the large portion of low income immigrants in Peel, known as the 'healthy immigrant effect'  
** Data sources and time periods differ between health indicators and jurisdictions.
Table 4: (con't)

<table>
<thead>
<tr>
<th></th>
<th>Halton</th>
<th>Toronto²</th>
<th>Peel³</th>
<th>Ottawa⁴ (15 CMA's)</th>
<th>Other Canada-wide Studies</th>
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</thead>
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<td>Falls (Self-Reported)</td>
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<td>Activity Limitation</td>
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<td>Dental Visits</td>
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</tr>
<tr>
<td>Influenza Immunization</td>
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<td></td>
<td></td>
<td>✓</td>
<td>Ages 65+ only</td>
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<td>Premature Mortality (PYLL)</td>
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</table>

More severe falls, based on hospitalizations
Ages 65+ only
Both males & females, Ages 15-24

Gradient for lung cancer (higher rates in lower income groups). Gradient is REVERSED for breast & prostate cancer.
For ischemic heart disease


