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An analysis of public policy and programming focusing on the determinants of health and health outcomes that are effective in achieving the healthiest populations

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KEY MESSAGES

- Although major health inequalities exist in Canada, minimal action has been taken by municipal, provincial/territorial and federal levels of governments to narrow health inequalities through the social determinants of health (SDOH) and public policy.
- Income, housing, food insecurity and social exclusion are four major social determinants in generating and reproducing health inequalities over the life course (childhood, adulthood and the elderly stage).
- Low-income individuals and families have significantly higher rates of mortality, morbidity and healthcare use as compared with middle- and high-income groups. Health inequalities between the richest 20% and the poorest 20% have decreased from 1971 to 1996 in Canada; however, continued monitoring is needed given that income inequality has increased over the past decade.
- Food insecurity and unstable housing are associated with poor health and, in turn, mediate the link between income and health (hunger and unstable housing affect health and result from low income). Mortality rates among homeless and marginally housed individuals were much higher than expected on the basis of low income alone.
- Social exclusion is a powerful determinant of health inequalities; however, its effects are dependent upon which groups are compared. The health consequences of social exclusion are most unequal between Aboriginal and non-Aboriginal groups. Immigrant health favours recent arrivals over long-term residents. Compared with non-minority ethnic groups, minority racial/ethnic groups are more likely to experience social and health disadvantages. However, no clear association exists for health inequalities between minority racial/ethnic groups.
- Taking action on SDOH to narrow health inequalities offers new opportunities for the nursing profession to expand its role to include:
  - supporting initiatives that reduce child and adulthood poverty levels by increasing financial assistance and social wages (SDOH provided through public funds)
  - supporting initiatives that increase minimum wages to "living wages" to ensure that economic security, stable housing and food needs are met
  - supporting campaigns and social movements that advocate for progressive taxation, the right to food security and affordable housing, and the enforcement of laws that protect the rights of socially excluded groups
  - advocating for intersectoral action on health at municipal, provincial/territorial and federal levels of government to coordinate action undertaken by sectors outside the health sector
  - supporting political parties at provincial/territorial and federal levels of government that are receptive to taking action on SDOH (such as those that are pro-labour or pro-redistribution of wealth)
  - encouraging greater workplace democracy to increase the number of unionized workplaces since labour unions are important determinants of generous welfare states, narrower social inequalities and better population health

EXECUTIVE SUMMARY

The World Health Organization's Commission on Social Determinants of Health (CSDH), *Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health*, confirmed that "social justice is killing people on a grand scale" and that public policy action has the potential to narrow avoidable health inequalities. Although major health inequalities exist in Canada, minimal action has been taken by municipal, provincial/territorial and federal levels of governments to reduce these through the social determinants of health (SDOH).

To advance the role of nursing in reducing health inequalities, this paper conducts a scoping review to *assess the empirical association between social determinants and health outcomes and to identify public policies and political activities that reduce health inequalities*. Guided by the CSDH's conceptual framework, which emphasizes the "causes of the causes" to reduce social inequalities in health, this paper moves beyond the consideration of immediate causes such as medical treatments or lifestyle choices.

Three questions are addressed:

- What is the current scope of knowledge from Canadian research on SDOH, conceptualized as income, housing, food insecurity and social exclusion?
- What is the role of nursing in reducing health inequalities within Canada's political and economic contexts?
- Which policy recommendations have the potential to narrow health inequalities?

Scoping review methods consisted of five steps. First, the electronic database PubMed was searched using these keywords: "income" or "food insecurity" or "housing" or "social exclusion" and "population health" or "health inequalities" *and* "Aboriginal Peoples" or "First Nations" or "Métis" or "Inuit" *and* "Canada". Second, we screened potentially relevant studies and included them if the studies presented empirical findings and tested at least one SDOH measure. Third, we charted descriptive and empirical data using a coding template. Fourth, studies grouped by theme were coded as *positive* (social determinant of health is positively associated with health), *negative* (social determinant is inversely associated with health), *mixed* (social determinant is inconsistently related to health) or *no impact* (relation between social determinant and health is not significant). Effect size metrics were also extracted to compare the strength of associations between social determinants and health-related outcomes. Fifth, we searched government reports, international commissions and cost-benefit analyses to augment and inform our policy recommendations.

Current scope of SDOH research in Canada

A total of 109 studies met our inclusion criteria (income, n = 65; food insecurity, n = 6; housing, n = 9; social exclusion, n = 11; multiple SDOH, n = 18). Our central finding indicates a large, negative and statistically significant association between social determinants and health inequalities.

The association between income and health follows a clear gradient. Low-income Canadians have the highest rates of mortality, morbidity and healthcare use, and middle-income individuals and families have worse health outcomes as compared with the highest income groups. These findings remain significant regardless of whether income is measured at individual, household or neighbourhood levels. Despite non-significant results in the past, recent research finds that income inequality is an independent contributing factor to mortality in Canadian-born individuals but not immigrants.

Health inequalities between the richest 20% and the poorest 20% decreased from 1971 to 1996 in Canada. This encouraging trend needs monitoring given that income inequality has increased over the past decade. Canada's inclusive healthcare system appears to attenuate the impact of low income on health (for example, breast cancer survival).

Food insecurity and unstable housing are strongly associated with health inequalities and mediate the link between low income and health. As a result, hunger and unstable housing are often caused and exacerbated by low economic resources.

The health consequences of social exclusion are most unequal between Aboriginal and non-Aboriginal groups. Research findings support the "healthy immigrant effect," in that recent immigrants are healthier compared with long-term immigrant residents. Compared with non-minority ethnic groups, minority racial/ethnic groups are more likely to experience social and health disadvantages; however, no clear association exists for health inequalities between minority racial/ethnic groups.

Role of nursing in reducing health inequalities

Our scoping review results confirm the importance of low income, unstable housing, food insecurity and social exclusion in generating health inequalities in Canada. Taking action on these SDOH requires the collaboration of various government, civil and health actors. This collaboration introduces new opportunities for the nursing profession to expand its role to include advocacy, policy analysis and political activities. Support for nurses to engage in public health action includes theoretical and professional justifications.

Recent theoretical thinking calls upon nurses to uphold an "emancipatory ethic" and to apply a "critical care" perspective. The former involves identifying with socially excluded groups (for example, Aboriginal groups), challenging mechanisms of oppression (such as the legacy of colonization) and becoming active social change agents. The latter reincorporates the value of social justice that was characteristic of early public health nursing practice. Applying a critical care perspective challenges nurses to play an integral role in reducing health inequalities by engaging in political and economic environments and advocating through policy analysis, development and implementation.

Expanding the role of nurses to engage in SDOH has been documented in the profession's standards and competencies. Public health nurses have argued that practitioners have a professional obligation to engage in socio-political activities that improve the social conditions associated with health inequalities. On a similar yet stronger note, community health nurses in Canada have identified the reduction of health inequalities arising from social inequalities as a *practice standard* and *core competency* for nursing practice. Such a commitment requires nurses to address the root causes of health inequalities, identify which SDOH require action, uphold the principles of social justice and engage in advocacy in support of the most disadvantaged groups.

Policy recommendations to narrow health inequalities

To advance the role of nursing in narrowing health inequalities through public policy, we provide both specific and wide-ranging policy recommendations regarding SDOH to encourage intersectoral action at different levels and in different sectors of government:

- Support initiatives that reduce child and adulthood poverty by increasing financial assistance and social wages (SDOH provided through public funds). Target efforts toward groups most likely to be affected by poverty, including Aboriginal Peoples, the homeless, single mothers and their children, persons with disabilities, minority racial/ethnic groups, and recent immigrants. International evidence suggests that levels of poverty are highly amenable to public policy initiatives.
- Support initiatives that increase minimum wages to "living wages" to ensure that basic income, housing and food needs are met. Although living wage policies are relatively new in Canada, they have been implemented in the United States and the United Kingdom. Comparative evidence suggests that increasing wages to living levels leads to substantial improvements in health.
- Support campaigns and social movements that advocate for progressive taxation, the right to food security and affordable housing, and the rights of socially excluded groups to be protected (for example, in areas of employment, anti-discrimination and anti-racism).
- Advocate for intersectoral action on health inequalities at municipal, provincial/territorial and federal levels of government to coordinate SDOH policies. Given that public policies targeted at income, housing, food insecurity and social exclusion fall outside the health sector, intersectoral action is needed to effectively coordinate activities to narrow health inequalities.
- Support candidates and political parties at provincial/territorial and federal levels of government that are receptive to taking action on SDOH (such as those with pro-labour and leftist ideology). Comparative evidence finds that left-leaning political parties are more likely to support social democratic principles of equality such as poverty reduction.
- Encourage greater workplace democracy to increase the number of unionized workplaces. Labour unions are an effective mechanism for increasing wages and worker bargaining power, redistributing income, and improving employment security and occupational health standards.

1 CONTEXT

The World Health Organization's Commission on Social Determinants of Health (CSDH), *Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health*, confirmed that "social justice is killing people on a grand scale" and that public policy action has the potential to narrow avoidable health inequalities. Although major health inequalities exist in Canada, minimal action has been taken by municipal, provincial/territorial and federal levels of governments to reduce these through the social determinants of health (SDOH).

To advance the role of nursing in reducing health inequalities, this paper conducts a scoping review to *assess the empirical association between social determinants and health outcomes and to identify public policies and political activities that reduce health inequalities.* Guided by the CSDH's conceptual framework,[1] which emphasizes the "causes of the causes" to reduce health inequalities, the paper moves beyond the consideration of immediate causes such as medical treatments or lifestyle choices to consider contextual factors and structural factors. Whereas contextual factors refer to social, political and economic mechanisms that generate and reproduce social inequalities (such as the labour market, the welfare state, and political institutions), structural factors refer to systems of stratification that produce unequal access to power, prestige and wealth (such as social class, social exclusion and immigration). Accordingly, this framework implies that public policies and interventions must not limit themselves to intermediary determinants but also must address the social mechanisms and stratification systems that systematically produce an inequitable distribution of the "proximal" determinants of health between advantaged and disadvantaged groups.

Three research questions are addressed:

- What is the current scope of knowledge from Canadian research on SDOH, conceptualized as income, housing, food insecurity and social exclusion?
- What is the role of nursing in reducing health inequalities within Canada's political and economic contexts?
- Which policy recommendations have the potential to narrow health inequalities?

2 METHODS

Our report uses scoping review methods to collect, evaluate and present findings from the Canadian literature on SDOH.[2,3] This approach allows for the consideration of various research designs conducted at different levels, different sampling designs and study populations, and a wide range of health outcomes to assess the differential impact of social determinants.[4] We focus on four major SDOH: income, food insecurity, housing and social exclusion given their strong associations with health inequalities and extensive documentation in the Canadian literature (see, for example, articles on income,[5,6] food insecurity,[7-9] housing,[10] social exclusion[11] and the interaction of multiple SDOH[12,13]).

Our scoping review consisted of five steps. First, the electronic database PubMed was searched in October 2011 from the earliest year available to 2011 using these keywords: "income" or "food insecurity" or "housing" or "social exclusion" *and* "population health" or "health inequalities" *and* "Aboriginal Peoples" or "First Nations" or "Métis" or "Inuit" *and* "Canada." Second, we screened potentially relevant studies against these study inclusion criteria: (1) presented empirical findings and (2) tested at least one social determinant of health. Given the exploratory nature of scoping reviews, our inclusion criteria are based on relevance and not on study quality. Third, descriptive and empirical data from the included studies were charted using a coding template, entered into a database and summarized using descriptive statistics. Fourth, studies grouped by theme were coded such that statistically significant associations are considered *positive* (social determinant of health is positively associated with health), *negative* (social determinant is inversely associated with health), *mixed* (social determinant is inconsistently related to health) or having *no impact* (relation between social determinant and health is not significant). From studies that calculated effect size metrics (such as odds ratios, relative risks and hazard ratios), we extracted estimates and log-transformed them to compare the strength of the associations between SDOH and health-related outcomes. Lastly, to augment our review of the academic literature, we also conducted targeted searches for government reports, international commissions and cost-benefit analyses to inform our policy recommendations.

3 RESULTS

3.1 Descriptive characteristics

Preliminary keyword searches yielded a total of 1,289 records. Two reviewers (C. M. and E. N.) reviewed the abstracts and independently identified 417 potentially relevant studies. The full text of these 417 studies were reviewed by the authors and re-evaluated against our inclusion criteria to determine final eligibility. A total of 109 separate studies met our full inclusion criteria (income, n = 65; food insecurity, n = 6; housing, n = 9; social exclusion, n = 11; multiple SDOH, n = 18). We grouped summary characteristics of the reviewed studies by SDOH in Appendix A (tables A1–A5).

Table B1 details the key characteristics of our studies (Appendix B). Most of the studies conceptualized income as a social determinant of health (n = 65, 59.6%), were published since 2000 (n = 98, 89.9%) and used a cross-sectional study design (n = 53, 48.6%) with representative samples (n = 63, 57.8%) that were greater than 1,000 (n = 89, 81.7%). The majority of studies were conducted at the national (comparing individuals across Canada) and provincial levels (comparing individuals within a province) (n = 43, 39.5% and n = 39, 35.8%, respectively). Most studies focused on adults (n = 87, 79.8%) with samples comprising both sexes (n = 94, 86.2%). Only nine studies (8.3%) used a multi-level design. Regarding health outcomes, 44 studies (40.4%) focused on physical health, 21 on mental health and healthcare use (19.3%), nine only on mental health (8.3%), eight on cancer (7.3%), and 27 on "other" health outcomes (24.8%; self-reported health status, oral health, quality of life and health-related behaviours).

3.2 Nature of empirical associations

Table B2 shows the associations found between social determinants and health-related outcomes in the 109 reviewed studies (Appendix B). These outcomes are coded by the extent to which income, food insecurity, housing, social exclusion and multiple SDOH exerted a positive, negative, mixed or no impact on health outcomes. Overall, three-quarters (n = 82, 75.2%) of the studies showed a negative association. Twelve studies (11.0%) found mixed results, 10 (9.2%) reported no impact and only five articles (4.6%) found a positive association (counterintuitive SDOH results). Each determinant is reviewed next in descending order of the negative associations found (as a percentage of the total studies for each determinant).

3.2.1 Food insecurity

All six studies focused on food insecurity found significant negative associations. Results showed that children from food-insecure families had higher levels of diabetes and rates of hospitalization as compared with food-secure families.[14] Household food insecurity was more prevalent among individuals with diabetes than among those without diabetes and was significantly associated with physical inactivity, current smoking, unmet healthcare needs, having a mood disorder, higher self-perceived stress[15] and poorer self-rated general health. Moreover, children and youth experiencing multiple episodes of hunger had higher odds of having chronic conditions and asthma versus their "never hungry" counterparts;[16] self-reported hunger was independently associated with symptoms of depression among injection-drug users;[17] and women reporting hunger in the past 30 days had significantly lower intakes of energy and a number of nutrients.[18] Using a longitudinal study design, Nakhaie and Arnold[19] found that insecurity about food has a direct effect on changes in self-reported health, supporting the idea that lower household incomes limit the access to food, which leads to malnutrition and related health problems.

3.2.2 Housing

Of the nine studies assessing the impact of housing on health, eight studies (88.9%) showed a negative association. Most studies conceptualized housing using dichotomous measures (such as stable versus unstable or owners versus renters) and found that unstable housing had an independent effect on high-risk behaviours[20] (like borrowing used needles and sex-trade involvement), HIV infection,[20-22] health service use,[23] accessing addiction treatment[24] and crack use.[25] Dunn[26] observed that housing demand, control and meaningfulness resulted in graded relations with self-reported health and mental health. Dwelling and building features – notably dwellings in taller and new buildings, with lower resale value and crowding, and dwellings on blocks with high residential density – were associated with occurrence of tuberculosis.[27] Conversely, Hwang and colleagues[28] found no health differences between individuals accepted into a supportive housing program and individuals in the usual care group.

3.2.3 Multiple SDOH

Reviewed studies concerned with the combined effects of SDOH numbered 18, 15 of which (83.3%) found a negative association. These studies conceptualized multiple SDOH using three combinations of determinants: (1) income and social exclusion, (2) housing and social exclusion, and (3) income and housing.

Income and social exclusion. The most common SDOH combination involved examining whether income and social exclusion were associated with health. Compared with high-income non-Aboriginal groups, low-income Aboriginal people were more likely to report suicidality[29] and to make emergency asthma visits during childhood.[30] Poor immigrant women were more likely than Canadian-born women to have poorer health, postpartum depression and unmet hospital needs.[31] Despite this finding, no association was observed between low-income immigrants and mental health services use (seeing a psychiatrist, family doctor, psychologist or social worker).[32] The incidence of neck and head cancers favoured immigrants with higher family incomes compared with their non-immigrants counterparts.[33] Area poverty was associated with preterm birth and small-for-gestational age at birth among Canadian-born but not foreign-born mothers.[34] The links between low income, race/ethnicity and health produced mixed findings. On the one hand, low-income non-White ethnic groups were more likely to experience negative outcomes, including higher rates of cardiovascular disease,[35] lower levels of cervical cancer screening[36] and lower rates of physical activity.[37] On the other hand, low income and race/ethnicity were not significantly related to childhood obesity.[38]

Housing and social exclusion. All four studies examining the concomitant health effects of housing and social exclusion focused on First Nations communities. Compared with non-First Nations communities, crowding among First Nations and Aboriginal groups was associated with higher rates of tuberculosis,[39] hepatitis A,[40] shigellosis[41] and hospitalization rates.[41,42]

Income and housing. Low income and disadvantaged housing were associated with increased risks of reporting an unmet healthcare need,[43] poorer general health status[44] and worse health among women.[45] Mortality rates among homeless and marginally housed individuals were much higher than expected on the basis of low income alone.[46] Using an ecological study design, Pilote and colleagues[47] found that increased income and renting led to increased rates of cardiac procedures; however, among patients with cardiac catheterization, these social determinants were not associated with the use of revascularization procedures.

3.2.4 Income

Sixty-five studies examined the differential effect of income on health, of which 48 (73.9%) reported negative associations. Compared with individuals, households and neighbourhoods with sufficient or high incomes, those with low incomes had higher rates of diabetes, [48-50] emergency room visits and hospitalizations,[51-57] mortality,[50,58,59] self-reported poor health, [60-69] obesity,[70] mental health disorders, [71-73] psychosocial morbidity,[74] lung cancer risk[75] and smoking.[76] Low income and absolute income, and not income inequality or relative income, were found to be significant predictors of poor health.[77,78]

Moreover, low-income individuals were less likely to visit physicians,[79] undergo coronary angiography, receive cardiac rehabilitation, be followed up by a cardiologist,[80] be physically active, [81-83] receive any dental care,[84] consume fruit and vegetables,[85,86] experience food security[87] or be vaccinated.[88] Negative associations were also observed among specific age groups. For example, infants born to poor women or residing in low-income neighbourhoods had lower birth weights[89] and higher mortality risks[90] than infants born into wealthier families and high-income neighbourhoods.

Income inequality findings were mixed and dependent on the level of analysis and population under study. The relation between income inequality and health was not significant when examined at provincial and metropolitan levels[91] or among samples including Canadian-born individuals and immigrants. However, when tested at the community level, income inequality was associated with alcohol use, tobacco use and age-specific all-cause mortality rates[92] and proved to be a significant predictor of health only among non-immigrants.[93]

Three studies found evidence that health inequalities between income groups are diminishing. From 1971 to 1996, differences declined between the richest 20% and the poorest 20% quintile in age-standardized expected years of life lost amenable to medical care[94] and in overall age-standardized rates of mortality from cervical cancer.[95] However, declines in health inequality were greater in the highest income group than in the lowest income group.[96]

Fifteen studies focused on income and health either found mixed associations (6 studies, 9.2%) or no impact at all (9 studies, 13.9%). Inconsistent findings included the following: spending for hospitals, specialists and prescription drugs was concentrated among higher income groups;[97] middle-income individuals were most likely to visit emergency rooms for dental problems;[98] high-income mothers were more likely than low-income mothers to experience adverse births associated with residential proximity to highways;[99] low income predicted only specific types of cancer;[100] and high income predicted mortality during follow-up at the individual level but was not significant at the neighbourhood level.[101]

Study results that showed no impact included these: no association was observed between low income and several cancer care and survival outcomes;[102-105] health-related quality-of-life measures were not associated with household income among the elderly;[106] income inequality had no effect on mortality at provincial and metropolitan levels;[91] household income was not related to the use of mental health services;[107] no differences were seen between the lowest and highest income quintiles in annual hospitalization rates for respiratory-related causes;[108] and income was not associated with mortality from community-acquired pneumonia among older persons.[109]

3.2.5 Social exclusion

The 11 studies that assessed social exclusion as a health determinant produced the most divergent findings (five found a negative association;[110-114] three, a positive association;[115-117] two, mixed results;[118,119] and one, no impact[120]). Divergent results are partly explained by the socially excluded group under consideration. For example, the negative impact of social exclusion on health was observed most often among Aboriginal groups, even after adjusting for income and other SDOH. Compared with non-Aboriginal groups, Aboriginal groups were more likely to experience cardiovascular disease,[121] suicidal ideation[112] and mortality due to AIDS.[113] Other reported negative associations were that Eastern European immigrants were more likely to commit suicide as compared with Canadian-born citizens[111] and that ethnic minority children experienced more risk factors for chronic disease than did Canadian children.[114]

Studies reporting positive associations between social exclusion and health revealed that new immigrants were advantaged despite their status as a socially excluded group. New immigrants fared better than their long-term counterparts with respect to risks of acute myocardial infarction and premature acute stroke.[116,117] Contrary to expectations, immigrant mothers were found to be accessing immunizations for their young children at least as well as non-immigrants in Ontario.[115] These positive associations could not be explained by the availability of healthcare services or income level.

Three studies conceptualized racial/ethnic status as a social determinant of health and reported contrasting results. Liu and colleagues found that visible minorities were both advantaged and disadvantaged depending on the health outcomes and racial/ethnic group under consideration. Compared with White people, visible minorities had lower rates of diabetes, hypertension, smoking and obesity. However, the authors also observed notable exceptions to this general trend: relative to the White population, Korean, Japanese and Latin ethnic groups were more likely to be physically active; Black, Latin, Arab and West Asian ethnic groups were more likely to be obese; and Black, Filipino and Southeast Asian groups had the highest levels of hypertension.[118] Among elementary schoolchildren, study participants of French Canadian family origin had the highest prevalence of smoking and poor diet.[119] Physical inactivity was highest among Portuguese, Italian and Haitian groups, and lowest among Eastern Europeans. While obesity was highest among Europeans, it was lowest among Asians, with the exception of South Asians. Counterintuitive results also revealed that being of Native Indian descent was not associated with an increase in mortality as compared with being of European descent, and Asian descent was associated with higher odds of mortality.[120]

3.3 Strength of SDOH associations

From SDOH studies reporting effect sizes, we extracted and compared 159 independent outcomes using forest plots. Each forest plot displays independent tests (such as adjusted odds ratios [ORs], relative risks [RRs] and hazard ratios [HRs]) of the most extreme comparison of the observed effect as a horizontal line representing the 95% confidence interval (CI). We could not synthesize findings using meta-analytic techniques owing to the heterogeneity of studies in terms of research design, operational definitions, study groups compared and health outcomes. Despite this heterogeneity, general findings emerged. The likelihood of disadvantaged health outcomes was significantly higher among low-income groups as compared with high-income groups (ORs ranging from 1.49 to 2.75; RRs ranging from 1.22 to 2.09; HRs ranging from 1.03 to 2.75) (see Appendix C, Figure C1 for ORs; remaining figures and forest plots not shown but available upon request). Compared with advantaged groups, graded associations were observed in disadvantaged groups between poor health outcomes and social exclusion (OR: 1.15–3.10), unstable housing (OR: 1.14–5.71) and food insecurity (OR: 1.43–6.08). The consequences of health inequalities were most pronounced among those experiencing multiple forms of social disadvantages (OR: 1.25–4.39; RR: 1.11–28.90), in particular, for Aboriginal groups living in crowded homes located on reserves.[41]

4 THE ROLE OF NURSING AND PUBLIC POLICY

The above results from our scoping review confirm the importance of low income, unstable housing, food insecurity and social exclusion in generating health inequalities between advantaged and disadvantaged groups in Canada. These findings augment previous evidence found in national and international contexts. We now turn our attention to what these findings mean for nursing practice and public policy.

4.1 The role of nursing in addressing SDOH

Taking action on SDOH requires the collaboration of various government, civil and health actors. This collaboration introduces new opportunities for the nursing profession to expand its role to include advocacy, policy analysis and political activities. Increasing the role of nursing in narrowing health inequalities has long been identified in Canada's nursing profession[122-124] and is well supported with theoretical and professional rationales.[125]

Recent nursing theory encourages its practitioners to take action on the social conditions that give rise to poor health outcomes.[126] This position represents a significant shift from focusing on individual characteristics to considering social determinants, or "upstream" factors.[127-130] Nurses have been called upon to uphold an "emancipatory ethic," which involves identifying with socially excluded groups (for example, Aboriginal groups), challenging mechanisms of oppression (such as the legacy of colonization) and becoming active social change agents.[131] The concept of "critical care" has also been advanced to reinvigorate nursing practice with a social justice agenda characteristic of early practice.[124] Applying a critical care perspective involves supporting the creation of supportive and sustainable political and economic environments through policy analysis and advocacy.

Nursing scholars have also argued that nurses have a professional obligation to engage in political activities that address the root causes of health inequalities.[132-134] According to Daiski,[133(p. 37)] "As nurses and health care practitioners on the frontlines… we need to advocate for social equity, adequate welfare and disability payments, wages that people can live on, affordable housing as a right, and social inclusion of the poor." This obligation may take the form of advocating for policy changes among political stakeholders to reduce poverty,[135,136] increase wages,[137] secure food needs[138] and improve housing conditions.[135]

Professional support for nurses to engage in SDOH has been recognized in the profession's standards and competencies. For example, the Canadian Nurses Association has published several important documents and SDOH papers[139-142] all of which encourage nurses to carve out a larger role in addressing the social causes of health inequalities. On a similar yet stronger note, community health nurses in Canada have identified the reduction of health inequalities arising from social inequalities as a *practice standard* and *core competency* for nursing practice.[143] This standard calls upon nurses – community and public health nurses in particular – to address the root causes of health inequalities, identify which social determinants require action, uphold the principles of social justice and engage in advocacy in support of those people who are most disadvantaged.[144]

Achieving this standard requires nurses to develop specialized policy development and analytical skills as core competencies.[144] The Registered Nurses Association of Ontario has also been a leader in promoting reduced health inequalities, producing several documents urging nurses to engage in social justice advocacy and incorporating SDOH into nursing practice. Yet, the integration of SDOH ideas and arguments into nursing curricula has been uneven to date, indicating that more efforts are needed to train nurses during undergraduate, master's and doctoral studies to move the field beyond an almost exclusive biomedical or socio-psychological emphasis.

4.2 The political economy of public policies

The increased role of nursing within work on SDOH represents a promising direction for advanced research and professional practice in Canada;[145] however, critical attention needs to be paid to the political economy of public policies and health inequalities. This situation invites nurses to focus on the links between power, politics and health inequalities, and to consider how policy power is distributed in Canada, why certain policies are favoured over others and whose interests governments serve.

According to Stevens and Hall,[146] the effectiveness of nurses in promoting SDOH depends on their ability to consider the political economy of health inequalities and to address the structural causes of poor health. In this regard, nurses are faced with the challenge of advancing social justice and health equality goals within the constraints of medical models, neo-liberal economics and conservative political systems. Viewing health inequalities from a political economy perspective exposes the "causal chains [that] run from macro social, political, and economic factors to the pathogenesis of disease."[147(p. 1685)] In particular, it sheds lights on how SDOH are largely influenced by governmental ideology (such as the ideological preference of political parties to favour neo-liberal or generous welfare policies) and power relationships (for example, the relative power of labour unions to mobilize workers to increase wages, promote egalitarian policies and strengthen welfare states).

The availability and quality of SDOH is heavily influenced by the ideology of the political parties at provincial and federal levels of governments in power. "Centre-left" and "left" political parties tend to support the redistribution of wealth, implement effective anti-poverty strategies and advocate for universal social and health programs for poor individuals and families and for those with disabilities. Strongly aligned with labour organizations, leftist political parties also advocate for progressive policies that support workers and other policy initiatives that reduce social inequalities in a population. Governmental ideology explains in part why there exists such strong evidence for SDOH on the one hand and so little government action to tackle SDOH on the other. Equally as important as credible evidence are the political and economic contexts under which SDOH are proposed.

The likelihood of reducing health inequalities through SDOH also reflects important power relationships in Canada, in particular, the impact of social class in determining societal levels of social inequality. In this regard, labour unions are instrumental for strengthening welfare states, implementing progressive public policies and narrowing health inequalities. Labour unions are associated with stronger social safety nets, active state labour market policies and greater employment protections for workers. Unions make a positive contribution to the health of workers by raising wages, improving benefits, giving workers a political voice (usually in support of leftist political parties), educating workers, and monitoring work safety and labour relations.

Given that taking SDOH into account is considered a marginalized approach to developing public policy,[148] nurses should engage in political activities that empower disadvantaged groups and shift power relations to implement more progressive public policies. This engagement includes taking action on the political factors affecting SDOH, such as facilitating union alliances among working-class actors, supporting leftist political parties and advocating for a stronger welfare state.

As reviewed here, nursing's mandate explicitly includes the reduction of health inequalities, and making progress on SDOH requires a political economy perspective. Next, we provide policy implications and recommendations to advance the role of nursing to include policy development, advocacy and implementation.

5. POLICY IMPLICATIONS AND RECOMMENDATIONS

To advance the role of nursing in narrowing health inequalities through public policy, we provide income-, housing-, food insecurity- and social exclusion-based policy recommendations that consider the political and economic contexts of SDOH.[149] Wide-ranging policy recommendations also are offered to encourage intersectoral action on health. Informed by our scoping review findings, we synthesized our policy recommendations from various sources, ranging from academic studies and government reports to international commissions and cost-benefit analyses. Where available, the potential social, economic and political costs and benefits of addressing SDOH are noted.

5.1. Income

Policy objective

- To narrow income-health gradients, recommended policies will reduce poverty, increase wages and financial assistance, and narrow the income distribution between the poor and the affluent.

Policy recommendations

- Reduce child and adulthood poverty levels by increasing (1) provincial and federal levels of financial assistance such as the Ontario Disability Support Program and Employment Insurance Benefits for those unable to work or temporarily in between jobs, and (2) the "social wage," or amenities provided from public funds (such as public transportation, social housing, post-secondary education, child care).[150] Target efforts toward groups most likely to be affected by poverty, including Aboriginal people, the homeless, single mothers and their children, persons with disabilities, minority racial/ethnic groups, and recent immigrants. Increases in financial assistance and social wages would mean that individuals and families would be less dependent on labour market earnings to avoid poverty. Comparative studies suggest that levels of poverty are highly amenable to public policy initiatives. Social democratic countries such as Sweden have achieved low levels of poverty rates through welfare state programs, as compared with other advanced democracies, and, as a result, exhibit higher levels of population health.[151,152]
- Increase public- and private-sector minimum wages to a "living wage" to narrow the income-health gradient. A living wage ensures that individuals and families can meet basic expenses such as stable housing and food security. While living wage policies are relatively new in Canada, they have been implemented in other countries such as the United States and the United Kingdom. Estimations of the potential health impact of living wage policies suggest that increases in wages are associated with substantial health improvements.[153,154]
- Support campaigns, social movements and political parties that advocate for progressive taxation (ensuring that the tax burden falls upon those individuals and corporations who make the most money). Progressive taxation has the potential to narrow income inequalities at national, provincial, metropolitan and community levels, leading to more egalitarian outcomes. To date, findings support the idea that progressive taxation is positively associated with global levels of well-being,[155] life expectancy at birth in Western Europe[156] and children's health outcomes within the United States.[157]
- Continue to support and strengthen Canada's universal healthcare system, which represents a type of "social wage" in that publicly funded, high-quality health insurance mitigates the negative health effects of low income. Comparative evidence shows that Canada's more inclusive healthcare insurance coverage translates into health advantages for its poor citizens when compared with their US counterparts.[158] Given that approximately 20% of total healthcare spending in Canada can be attributed to income disparities,[159] action is needed to support low-income individuals and families to increase their economic security and health outcomes.

- Encourage provincial governments to pass legislation similar to Quebec's Act to Combat Poverty and Social Exclusion (2004) and Newfoundland and Labrador's *Poverty Reduction Strategy* (2006). These anti-poverty strategies are designed to establish strong provincial social safety nets and reduce economic and social inequalities. Such initiatives provide the impetus to encourage the federal government to design and implement a similar strategy at a national level, which would integrate poverty reduction efforts across all federal departments and provincial/territorial governments. Investing in poverty reduction in British Columbia would reduce healthcare costs for the poorest 20% of families and save the province's public healthcare system 6.7% of its total spending each year, which is equivalent to $1.2 billion in annual provincial healthcare spending, or 0.6% of British Columbia's gross domestic product.[160]

5.2. Food insecurity

Policy objective

- To increase food security, recommended policies will reduce poverty, increase wages and make adequate food widely available.

Policy recommendations

- Reduce childhood and adult poverty levels to increase food security. Target efforts toward groups most likely to be affected by poverty, including Aboriginal people, the homeless, single mothers and their children, persons with disabilities, minority racial/ethnic groups, and recent immigrants. Given that poverty results in food insecurity, hunger and malnutrition, provincial and federal levels of governments must increase financial assistance rates to ensure poor individuals and families maintain food security.
- Increase public- and private-sector minimum wages to a "living wage" to increase the opportunity to achieve food security. A living wage ensures that individuals and families can purchase healthy foods (such as milk, fruits and vegetables), which can potentially lead to significant improvements in health.[154,155]
- Increase the "social wage," or amenities provided through public programs (such as affordable housing and child care).[151] As more essential services are provided through public programs, individuals and families will have more economic resources to avoid food insecurity. Provision of other SDOH such as affordable housing, education and child care would assist in offsetting these costs so that more resources could be devoted to meeting food needs.
- Advocate for federal and provincial governments to negotiate food security and right-to-food provisions in ongoing legislative changes to Canadian agriculture and food policy. For example, part of Quebec's *Act to Combat Poverty and Social Exclusion* focuses on actions to strengthen the social and economic safety net, including "facilitating dignified access, for persons living in poverty, to a food supply that is both sufficient and nutritious, at reasonable costs, and simple and reliable information enabling those persons to make enlightened dietary choices."[161]
- Support traditional food acquisition by Aboriginal people residing in remote communities (for example, encourage Aboriginal participation in the fishery sector) by taking into account Aboriginal conceptualizations of food harvesting, sharing and consumption. Such an approach has the potential to meet the unique food security considerations for Aboriginal groups.[162]

5.3 Housing

Policy objective

- To increase access to decent, affordable and permanent housing, recommended policies will reduce poverty and homelessness, increase wages, and promote the availability of social housing.

Policy recommendations

- Reduce childhood and adult poverty levels to increase access to decent and stable housing. Given that housing costs represent the single largest expenditure in household budgets and have the potential to induce poverty, public policies that reduce poverty represent an effective means to increase access to permanent housing, improve housing conditions and avoid overcrowding.
- Increase public- and private-sector minimum wages to a "living wage" to increase the opportunity to access decent housing. A living wage ensures that individuals and families can meet housing needs at an affordable price in a safe environment. Increases in living wages that take into account housing costs are predictive of better health outcomes.[154,155]
- Increase the "social wage," or amenities provided through public programs (such as all forms of publicly assisted social housing, including public housing, non-profit and co-operative housing, and supportive and affordable housing).[151] Increases in the social wage in the form of social housing mean that individuals and families will have more economic resources to avoid poverty and marginal housing conditions. The B.C. government found that investing in social housing saved future costs devoted to shelters and homelessness – the costs of service and shelter for homeless people ranged from $30,000 to $40,000 per year, as compared with $22,000 to $28,000 per year for social housing residents who were previously homeless.[163]
- Advocate at provincial and federal levels of government to implement a coordinated strategy to make housing affordable for disadvantaged Canadians. Canada is the lone G-8 country without a national housing policy.[164] Whereas Ireland and the Netherlands have coordinated policies that explicitly integrate housing, income assistance and poverty reduction strategies, the province of Ontario, for example, has no poverty strategy, and housing and income assistance operate in relative isolation of each other.[165]
- Support campaigns, social movements and political parties that support the "One Percent Solution," the call for federal, provincial/territorial and municipal governments to increase their budgetary allocation by 1% to housing programs by restoring and renewing housing spending.[166]

5.4 Social exclusion

Policy objective

- To promote the social inclusion of marginalized groups, recommended policies will reduce poverty, increase wages and the availability of social goods, and improve access to economic opportunities.

Policy recommendations

- Reduce childhood and adult poverty levels to alleviate the health burdens caused by social exclusion. Given that Aboriginal Peoples, visible minorities and immigrants are more likely to be unemployed, engaged in precarious work and earning lower wages, public policies that reduce poverty also increase opportunities for socially excluded groups to participate in Canadian life.
- Increase public- and private-sector minimum wages to a "living wage" so that socially excluded groups can meaningfully improve their living conditions. A living wage ensures that marginalized individuals and families can access other important SDOH. Living wages have a positive health effect among excluded Canadians.[154,155]

- Strengthen the enforcement mechanisms of the *Employment Equity Act* at federal and provincial levels. Removing discriminatory barriers will increase access to employment among Aboriginal people, minority racial/ethnic groups and immigrants, thus promoting greater economic inclusion.
- Remove barriers for transition foreign-trained immigrants to access regulated professions and trade. Revising and approving laws and regulations at municipal, provincial/territorial and federal levels of government represents a clear and direct policy option for new immigrants to be integrated within Canadian society. Currently, all immigrants (including recent ones) have higher unemployment rates and lower labour force participation rates, as compared with Canadian-born workers.
- Renew support for anti-discriminatory and anti-racism programs to increase the labour market participation of minority racial/ethnic groups. Minority racial/ethnic groups are more likely to live in low-income neighbourhoods, work in precarious jobs and experience health problems.
- Advocate for self-determination and control in Aboriginal communities to redress historical power inequalities. As recommended by the Senate Subcommittee on Population Health,[167] transferring decision-making power from Canadian governments to Aboriginal Peoples represents a potential solution to addressing health determinants. Evidence suggests that suicide rates in Aboriginal communities are lower when important governance and cultural continuity factors are present, such as land claims, self-government, educational services, health services, police and fire services, and cultural facilities.[168]

5.5 Wide-ranging SDOH

Policy objective

- To promote governmental action on SDOH, recommended policies encourage an intersectoral approach to health inequalities, support leftist political parties and encourage greater workplace democracy.

Policy recommendations

- Following the recommendations of *The Chief Public Health Officer's Report on the State of Public Health in Canada 2008: Addressing Health Inequalities*[151] and the Senate Subcommittee on Population Health,[168] advocate for intersectoral action on health at provincial/territorial and federal levels of government. Given that public policies targeted at income, housing, food insecurity and social exclusion fall outside the health sector, intersectoral action is needed to coordinate action undertaken by sectors such as Aboriginal affairs, citizenship, immigration, multiculturalism, health, human resources and public works as well as Statistics Canada. Evidence from North Karelia, Finland, shows that broad intersectoral actions reduced mortality rates associated with cardiovascular diseases.[169,170]
- As recommended in *The Chief Public Health Officer's Report on the State of Public Health in Canada 2008,*[151] reduce differential access to income, housing and food insecurity, and increase opportunities for socially excluded groups through universal policies or non-contributory benefits provided to all Canadian citizens without means-testing for need, such as poverty, disability and unemployment.
- Support political parties at provincial/territorial and federal levels of government that are receptive to taking action on SDOH (such as those with pro-labour and leftist ideology). Comparative evidence finds that leftist political parties are more likely to implement public policies that support SDOH that alleviate poverty, improve housing and increase food security. Leftist party governance also contributes to greater welfare generosity, which, in turn, shapes health inequalities.[171]
- Encourage greater workplace democracy to increase the number of unionized workplaces and collective agreement rates. Unions are an effective mechanism for increasing wages and worker bargaining power, redistributing income, and improving employment security and occupational health standards.[172] Moreover, labour unions also contribute to building strong welfare states and active labour market policies, which both lead to declines in infant mortality and increases in life expectancy.[172]

APPENDIX A

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Agha et al., 2007	To examine socio-economic disparities in ambulatory care-sensitive (ACS) and non-ACS admissions among birth cohorts in a universal health insurance setting.	Cohort/ Toronto, Ont./ N = 255,284 children	Income, defined as quintiles of mean neighbourhood income from the 1996 Canadian census	Highest versus lowest quintiles of socio-economic status	Low income was associated with 50% higher rates of ACS hospitalizations, including diagnoses of asthma and bacterial pneumonia, the leading causes of admission.
Alter et al., 2004	To explore how patients with acute myocardial infarction from different socio-economic backgrounds perceive their care in Canada's universal healthcare system and to correlate patients' backgrounds and perceptions with actual care received.	Cohort/ Ontario/ N = 2,256 patients	Income, defined as household annual income (three levels of categorical variables: <$29,999, $30,000–$59,999, >$60,000)	Low income versus intermediate income versus high income	Compared with patients in lower income groups, more affluent patients were more likely to undergo coronary angiography (67.8% versus 52.8%), receive cardiac rehabilitation (43.9% versus 25.6%) and be followed up by a cardiologist (56.7% versus 47.8%).
Alter et al., 2006	To examine the relationships among socio-economic status, other health factors and two-year mortality rates after acute myocardial infarction.	Cohort/ Ontario/ N = 3,407	Income, defined as household annual income (three levels of categorical variables: <$29,999, $30,000–$59,999, >$60,000)	Low income versus intermediate income versus high income	Income was strongly and inversely correlated with two-year mortality rate.
Auger et al., 2009	To evaluate community-level income inequality in relation to age- and cause-specific mortality.	Ecological/ Quebec/ N = 143 communities	Income, defined as tertiles of income inequality measured as the decile ratio, coefficient of variation and median share	Income inequality: low inequality versus moderate inequality versus high inequality	Income inequality was most strongly associated with alcohol-related mortality, followed by statistically significant but weaker inverse associations with tobacco-related and age-specific all-cause mortality.
Azagba & Sharaf, 2011	To examine the disparities in the frequency of fruit and vegetable consumption by socio-demographic and lifestyle characteristics.	Cross-sectional (CCHS)/ National/ N = 93,719	Income, defined as household income: low, low-middle, high-middle and high income	Low income versus high income	Low-income groups consume fruits and vegetables less frequently than do high-income groups.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Barnett et al., 2008	To identify long-term patterns of involvement in leisure time physical activity (LTPA) and to explore socio-economic and demographic predictors of distinct LTPA trajectories.	Longitudinal/ National/ N = 884–2,102	Income, defined as household income: low (<$15,000), average ($15,000–$29,999), high income (>$30,000)	Low versus average versus high income	Those with lower household income were significantly less likely to follow active (versus inactive) trajectories of LTPA.
Bhatti et al., 2007	To investigate the effect of socio-economic status on patients' use of dental services and dental insurance coverage.	Cross-sectional (CCHS)/ National/ N = 134,072	Income, defined as household income: < $15,000, $15,000–$29,999, $30,000–$49,999, $50,000–$79,999, $80,000+	Low household income versus high household income	Those with household incomes of $80,000 or more were 25% more likely to receive dental care than otherwise comparable individuals with household incomes less than $15,000.
Burra et al., 2009	To investigate socio-economic variation in ambulatory physician consultations for asthma and to assess possible effect modification of socio-economic position on the association between physician visits and air pollution.	Case-control/ Toronto, Ont./ N = 1,051,315 children aged 1–17; N = 2,018,277 adults aged 18–64 years	Income, defined as quintiles based on average household income at the census tract level using the 1996 Canadian census	Income quintile 1 versus income quintile 5	An income gradient in the number of physician visits was observed among children, adults and both sexes. The risk ratios for the low-income group were significantly greater than those for the high-income group in several of the models of sulphur dioxide and particulate matter.
Burrows et al., 2011	To examine individual measures of material and social disadvantage in relation to suicide mortality in Canada and to determine whether these relationships were modified by area deprivation.	Cohort, multi-level/ National/ N = 2,685,400	Income, defined as income adequacy quintile: ratio of family income to low-income cut-off in quintiles	Poorest quintile versus richest quintile	After accounting for individual and area characteristics, low income and higher suicide mortality were associated.
Butler et al., 2007	To examine socio-demographic, geographic and physical activity correlates of walking and cycling for non-leisure purposes (i.e. to work, school or errands).	Cross-sectional (CCHS)/ National/ N = 127,610	Income, defined as yearly household income: <$20,000, $20,000–$39,999, $40,000–$59,999, $60,000–$79,999, ≥$80,000	Income levels versus ≥$80,000 reference group	Low income was associated with both walking and cycling for non-leisure purposes, as was geographic location and other physical activity.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Cairney & Wade, 1998	To examine a series of hypothetical models that adjust the income adequacy of a sample of elderly Canadians to test how reductions in economic disparity translate into improved health outcomes.	Cross-sectional (GSS)/ National/ N = 1,943 elderly respondents aged 65 and over	Income adequacy, defined as household income and number of members in each household. Categories are numbered 1 through 5 representing lowest, low, middle, upper-middle and highest income groups, respectively.	Low income adequacy versus high income adequacy	Income adequacy was a significant predictor across all four health outcomes. Those in the lowest income adequacy group were more likely to report having "poorer" health or a specific morbid condition compared with those in higher income groups. The most dramatic effect was observed for self-reported health, where positioning everyone in the highest income adequacy category resulted in a 38% proportional reduction in the prevalence of reporting fair or poor health.
Chang et al., 2007	To assess the effects of socio-economic status on mortality in patients with acute myocardial infarction.	Cohort/ Alberta/ N = 5,622 patients who presented to a hospital emergency department with an initial episode of acute myocardial infarction	Income, defined as neighbourhood median household income. Median household income was grouped into quartiles Q1–Q4: <$38,796, $38,797–49,347, $49,348–62,839 and >$62,840.	Quartile versus quartile	Income profoundly affected the rate of emergency department presentation and the process and outcome of acute myocardial infarction care. For patients in the lowest quartile (versus the highest), the risk of presenting to the emergency department was 72% higher at one year, revascularization was lower and mortality was higher. Income was independently associated with one-year mortality after adjustment for baseline characteristics and one-year revascularization, and socio-economic status was especially influential in non-revascularized patients.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Choi & Shi, 2001	To assess the risk factors for diabetes mellitus by age and sex in Canada.	Cross-sectional (NPHS)/ National/ N = 69,494 persons aged 12 and over	Income adequacy, defined as household income and the size of the household; five categories: lowest income, lower-middle, middle, upper-middle and highest income.	Low household income versus high household income	Prevalence of diabetes increased inversely with income.
Cunningham et al., 2011	To measure the income-related inequalities and inequities (the inequalities that remain after accounting for differences in health need) in expenditure on fully publicly covered (hospital and ambulatory) and partly publicly covered (prescription drugs) services for those in their last year of life.	Cross-sectional/ British Columbia/ N = 58,820 deaths of B.C. residents aged 65 and older	Income, defined as household income percentile. Income quintile groups were based on 2003 household-specific income data that was validated using Canada Revenue Agency data by the B.C. Ministry of Health Services.	Lowest income quintile versus highest income quintile	In need-adjusted regression analyses, the highest income quintile had 11% lower hospital expenditures, 15% higher specialist expenditures and 23% higher prescription drug expenditures than decedents in the lowest income quintile. Spending for all types of care was concentrated among those with higher income before adjusting for need.
Curtis et al., 2001	To provide estimates of how the empirical association between child health and both low income and family status changes when the model is re-estimated with pooled data.	Longitudinal (Ontario Child Health Study)/ Ontario/ N = 1,317	Income, defined as low-average family income using Canada's low-income cut-off	Low-average income versus non-low-average income	Most outcomes (Health Utilities Index Mark 2) were more strongly related to low-average income (in 1982 and 1986) than to low current income in either year. The Impact of low income on child health was modest to large.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Dales et al., 2002	To investigate the mechanisms by which socio-economic status may influence asthma morbidity.	Cross-sectional/ National/ N = 2,968 children aged 5–19 years with repeated asthma	Income, defined as household income ranges, based on question: "What is your best estimate of the total income before taxes and deductions of all household members from all sources in the past 12 months?"	Household income of <$20,000 versus $20,000–$60,000 versus >$60,000	The mean annual period prevalence of a hospital visit was 25.0% among schoolchildren with household incomes of less than C$20,000 as compared with 16.0% among those with incomes of more than $60,000.
Dinca-Panaitescu et al., 2011	To assess the importance of income as a key socio-economic status marker in accounting for the increased prevalence of type 2 diabetes mellitus (T2DM).	Cross-sectional (CCHS 3.1)/ National/ N = 132,947	Income, defined as a series of six dummy variables used to characterize income: no income or <$15,000, $15,000–$29,999, $30,000–$49,999, $50,000–$59,999, $60,000–$79,999 and $80,000+ as reference category	Household income group versus household income group	The prevalence of T2DM in the lowest income group was 4.14 times higher than in the highest income group. Prevalence of diabetes decreased steadily as income rose. There was a graded association between income and diabetes, with odds ratios almost double for men (OR = 1.94, 95% CI: 1.57–2.39) and almost triple for women (OR = 2.75, 95% CI: 2.24–3.37) in the lowest income group compared with those in the highest income group.
Genereux et al., 2008	To evaluate whether proximity to a highway interacts with individual and neighbourhood socio-economic status (SES) to influence birth outcomes.	Cohort/ Montreal, Que./ N = 99,819 (all live singleton births)	Income, defined as neighbourhood SES for census tracts as a proportion of families below the low-income threshold	Poor neighbourhood versus wealthy neighbourhood	In wealthy neighbourhoods, proximity to a highway was associated with elevated odds of preterm birth, low birth weight and small-for-gestational-age birth. Counterintuitively, high-income mothers may be more likely than low-income mothers to experience adverse births associated with residential proximity to highway.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Gorey et al., 2010	To examine whether income has a differential effect on waits for surgical and adjuvant radiation treatment (RT) of breast cancer.	Cohort/ Ontario/ N = 929 breast cancer cases	Income, defined as residence-based income taken from censuses	Low income versus middle income versus high income	In Ontario, no significant associations were observed between lower income and longer surgical waits, lower access to adjuvant RT and longer RT waits.
Gorey et al., 2011	To examine the differential effects of income on colon cancer and survival.	Cohort/ Toronto, Ont. N = 930 colon cancer patients	Income, defined as residence-based income taken from censuses	Low income versus middle income versus high income	Income was not directly associated with lymph node evaluation, chemotherapy and survival.
Gorey et al., 2009	To re-examine the differential effect of income on the survival of women with breast cancer.	Cohort/ Ontario/ N = 929 female breast cancer cases	Income, defined as residence-based income taken from censuses	Low income versus middle income versus high income	No associations between income and breast cancer survival were observed in Ontario.
Gorey et al., 1997	To examine whether income has a differential effect on the survival of adults diagnosed with cancer.	Cohort/ Toronto, Ont./ N = 58,202	Income, defined as residence-based income taken from censuses	Low income versus middle income versus high income	No significant association was observed between income and survival for 12 of the 15 most common cancer sites.
Groome et al., 2006	To determine whether area-level income is associated with cause-specific survival and local-regional failure in laryngeal cancer.	Cohort/ Ontario/ N = 661 glottic patients; N = 495 supraglottic patients	Income, defined as median household income adjusted for household size from the Canadian census	Quintile versus quintile	Income was not related to either outcome for those with supraglottic cancer, but it was associated with glottic cancer. Compared with the highest income quintile, the relative risks for patients in the lowest socio-economic quintile were 2.75 (95% CI: 1.48–5.12) for cause-specific survival and 1.90 (95% CI: 1.24–2.93) for local-regional failure.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Haider et al., 2006	To determine whether income influences access to specialist care by a dermatologist for the management of acne.	Cohort/ Ontario/ N = 295,469 persons aged 12–27 with a new diagnosis of acne	Income, defined as median annual neighbourhood household income and coded into five income groups.	Quintile versus quintile	Of those in the lowest income group, 17% were referred to a dermatologist, as compared with 24% in the highest income group.
Hay, 1988	To analyze the relationship between income and health status.	Cross-sectional (CHS, 1978)/ National/ N = 1,979 males aged 15–64, identified as principal income earners	Income, defined as family income reported in $500 increments, ranging from $0 to $35,000 or more, coded into six categories	Low-income groups versus high-income groups	A direct positive relationship was observed between income and health, that is, the higher an individual's income, the better was that person's health. Income was consistently the best correlate of health status.
Hawker et al., 2002	To assess the effect of income on the potential need for, and the willingness to consider, hip and knee arthroplasty.	Cross-sectional/Ontario/ N = 3,307	Income, defined as annual household income: <$20,000, $20,001–$40,000, >$40,000	Household income versus household income	Lower income was independently associated with a greater likelihood of having the potential need for arthroplasty.
Hou & Myles, 2005	To examine the effects of neighbourhood socio-economic characteristics on individual health.	Cross-sectional (Statistics Canada and NPHS)/National/ N = 34,613 respondents aged 12 or older	Income, defined as (1) income inequality: mean logarithmic deviation, Theil index, squared coefficient of variation, Gini index and median share, coded into five quintiles, and as (2) neighbourhood median income, grouped into quintiles	Quintile versus quintile	Individuals in low inequality neighbourhoods reported better health than those living in higher inequality neighbourhoods. After controlling for individual-level socio-economic characteristics, the association between neighbourhood income inequality and the health outcome was not statistically significant. Individuals in the highest income group had close to three times higher odds of reporting better health than those in the lowest income group.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Huguet et al., 2008	To assess the independent effect of income on health-related quality of life among older adults.	Cross-sectional (JCUSSH)/National/ N = 755 respondents aged 65+ years	Income, defined as household income in quintiles and further adjusted for the number of people living in he household	Quintile versus quintile	Among the elderly population, health-related quality of life was not significantly associated with household income in Canada, after controlling for socio-demographic and health indicators.
Humphries & van Doorslaer, 2000	To measure the degree of income-related inequality in self-reported health by means of concentration indices.	Cross-sectional (NPHS 1994)/ National/ N = not available	Income, defined as household income; coded into income deciles	Decile versus decile	Significant inequalities in self-reported ill health existed and favoured the higher income groups – the higher the level of income, the better the level of self-assessed health.
Hwang et al., 2005	To examine the effects of age and sex on the relationship between neighbourhood income and alcohol-related hospitalizations.	Cohort/ Toronto, Ont./ N = annual rates of hospitalization for alcohol-related conditions per 10,000 individuals	Income, defined as mean household income; enumeration areas grouped into income quintiles	Quintile versus quintile	Rates of hospitalization with primary diagnosis of an alcohol-related condition were similar among men aged 20–39 in all income quintiles, but they were inversely related to income among men aged 40–64 (28.8 and 13.3 per 10,000 in the lowest and highest income quintiles). Among women aged 40–64, the lowest income quintile had the highest such hospitalization rate (12.1 per 10,000), but women in all other income quintiles had relatively low hospitalization rates (5.9–7.7 per 10,000).

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
James et al., 2007	To examine neighbourhood income differences in deaths amenable to medical care and public health over a 25-year period.	Longitudinal (CMD)/ National/ N = not available	Income, defined as neighbourhood income quintiles on the basis of the census tract percentage of population below Canada's low-income cut-offs	Poorest quintile versus richest quintile	From 1971 to 1996, differences between the richest and poorest quintiles in age-standardized expected years of life lost (EYLL) amenable to medical care decreased 60% in men and 78% in women, those amenable to public health increased 0.7% in men and 20% in women, those from ischemic heart disease decreased 58% in men and 38% in women, and those from other causes decreased 15% in men and 9% in women. Changes in the age-standardized EYLL difference for deaths amenable to medical care were significantly larger than those for deaths amenable to public health or due to other causes for both sexes.
Janssen et al., 2006	To examine associations between individual- and area-level measures of SES and obesity, unhealthy eating and physical inactivity among adolescents by using a multi-level analytic approach.	Cross-sectional/ National/ N = 6,684 youth in grades 6–10	Income, defined as material wealth and perceived family wealth	Wealth (low versus medium versus high); perceived wealth (very well off versus quite well off versus average versus not very well off versus not at all well off)	Individual-level SES measures were inversely associated with obesity. The odds for unhealthy eating were increased for those living in an area with a low percentage of residents with a high school education. The odds of being physically inactive increased with decreasing levels of material wealth and perception of family wealth.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Kirkpatrick & Tarasuk, 2003	To compare food expenditure patterns between low-income households and higher income households in the Canadian population and to examine the relationship between food expenditure patterns and the presence or absence of housing payments among low-income households.	Cross-sectional/ National/ N = 9,793 households	Income, defined as low-income households using Statistics Canada's low income measures	Low-income households versus other households	Total food expenditures, expenditures at stores and expenditures in restaurants were lower among low-income households as compared with other households. Among low-income households, the purchase of milk products and meat and alternatives was significantly lower for households that had to pay rents or mortgages than for those without housing payments.
Kulkarni et al. 2008	To study the factors associated with health-related quality of life in Canadian children with hydrocephalus, using a comprehensive model of determinants of child health, including socio-economic factors.	Cross-sectional/ National: three hospitals (Toronto, Vancouver, Halifax)/ N = 340 children aged 5–18 years	Income, defined as total annual household income >$100,000, and neighbourhood affluence, defined as median family income from census data	Household income >$100,000 versus household income <$100,000	Adjusted multivariate linear regression models demonstrated that the most important determinants of poorer health-related quality of life included lower family income.
Kwong et al., 2006	To examine the association between introduction of Ontario's Universal Influenza Immunization Program and changes in vaccination rates over time in Ontario, as compared with the other provinces combined.	Cross-sectional (NPHS 1996/ 97, CCHS 2000/01, 2003)/ N = 73,402 (NPHS); N = 35,187 and N = 133,026 (CCHS)	Income, defined as household income and based on the number of people in the household and total income from all sources in the previous 12 months; four income groups: lowest, lower-middle, upper-middle and highest	Lowest versus lower-middle versus upper-middle versus highest	Between 1996/97 and 2000/01, the increase in the overall vaccination rate in Ontario was higher among people who had a higher household income.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Landy et al., 2008	To examine socio-economically disadvantaged (SED) postpartum women's health, and health service needs and usage patterns in the first four weeks post-hospital discharge, and to compare them with more socio-economically advantaged (SEA) postpartum women's health, health service needs and usage patterns.	Cross-sectional/ Ontario/ N = 1,000	Income, defined as gross family income <$20,000 per year	SED versus SEA	When compared with the SEA women, the SED women were more likely to be discharged from hospital within the first 24 hours after giving birth, less likely to report very good or excellent health and had higher rates of symptoms of postpartum depression.
Lipman et al., 1994	To examine the relation between low income and child psychosocial morbidity.	Cross-sectional survey with follow-up/ Ontario/ N = 2,503 in 1983; N = 1,076 in 1987 (children aged 4–16)	Income, defined as family income level; coded into 10 levels, ranging from <$5,000 to >$60,000	Low income versus other income levels	There was a significant relation between low income and psychosocial morbidity, with a threshold at an income level of less than $10,000.
Lipscombe et al., 2010	To examine the impact of income on mortality trends among people with diabetes.	Cohort/ Ontario/ N = 843,629	Income, defined as median household income level; coded into income quintiles.	Quintile versus quintile	Mortality declined overall among people with diabetes from 1994 to 2005; however, the decrease was substantially greater in the highest income group than in the lowest, particularly among those aged 30–64.
Mao et al., 2001	To examine socio-economic status and lung cancer risk.	Case-control/ National/ N = 3,280 newly diagnosed cases; N = 5,073 controls	Income, defined as family income adequacy, based on average annual household income in the five years preceding the survey	Low income versus lower middle versus upper middle versus high income	Compared with high income adequacy, an increased lung cancer risk was found among low-income males and females.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Marra et al., 2004	To investigate the relationship between socio-economic status and self-rated health in a sample of patients with rheumatoid arthritis.	Cross-sectional/ National/ N = 313 rheumatoid arthritis patients	Income, defined as self-reported annual household income (<$20,000, $20,000–$50,000, >$50,000) and neighbourhood income (median neighbourhood income at the census tract level)	Household/neighbourhood income versus household/neighbourhood income	Lower levels of household income, but not neighbourhood income, were associated with poor self-reported health.
McIntyre et al., 2003	To document whether or not low-income lone mothers compromise their own diets to feed their children.	Cross-sectional/ Atlantic provinces/ N = 141 low-income lone mothers; N = 333 children	Income, defined as annual household income; low income coded using Statistics Canada's low-income cut-off	One sample of low-income women	Mothers' dietary intakes and the adequacy of intake were consistently poorer than their children's intake overall and during the course of a month. Low-income lone mothers compromised their own nutritional intake to preserve the adequacy of their children's diets.
McLeod et al., 2003	To determine whether income inequality, household income and their interaction are associated with health status.	Longitudinal (NPHS 1994, 1996, 1998)/ National/ N = 6,456	Income, defined as (1) individual household income, coded into five groups; (2) income inequality, defined as percentage of total household income accruing to the households in the bottom 50% of the income distribution in a given area; and (3) average area household income	Household income versus household income	Income inequality was not associated with health status. Low household income was consistently associated with poor health. The combination of low household income and residence in a metropolitan area with less income inequality was associated with poorer health status than was residence in an area with more income inequality.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Mustard & Roos, 1994	To describe socio-economic differences in use of prenatal medical care and birth weight.	Cohort/ Winnipeg, Man./ N = 13,349 women who had hospital admissions	Income, defined as average household income from 1986 Canadian census, aggregated to the geographic unit of the enumeration area	Quintile versus quintile	Infants born to women in the poorest income quintile had lower birth weights than infants born to wealthier women. Lower use of prenatal care by poorer women accounted for a small proportion of the difference in birth weight.
Newbold et al., 1995	To determine whether the distribution of hospital service use corresponds to the needs within Canada.	Cross-sectional (GSS)/ National/ N = 13,000+	Income, defined as household income; coded into five groups: <$15,000, $15,000–$25,000, $25,000–$35,000, $35,000–$50,000, >$50,000	Quintile versus quintile	Household income had a positive and significant effect on the incidence of hospital use.
Ng et al., 2004	To examine whether income-related differentials in cervical cancer mortality diminished from 1971 to 1996.	Ecological/ National/ N = age-standardized rate of death from cervical cancer per 100,000 women	Income, defined as neighbourhood income; death registrations were assigned to census tracts and assigned to income quintiles based on their proportion of the population below the Statistics Canada low-income cut-off values	Quintile versus quintile; interquintile versus interquintile	From 1971 to 1996, the overall age-standardized cervical cancer death rate per 100,000 women (and 95% CI) declined from 5.0 (4.5–5.6) to 1.9 (1.7–2.1), the interquintile rate ratio diminished from 2.7 (1.8–4.2) to 1.7 (1.1–2.6) and the interquintile rate difference decreased from 4.6 (2.8–6.4) to 1.1 (0.2–1.9).
Pan et al., 2009	To examine the influences of various individual, social and physical environmental factors on physical activity participation by sex, age and socio-economic status.	Cross-sectional/ National/ N = 5,167 respondents aged 15–79 years	Income, defined as household income; coded into four groups: <$20,000, $20,000–<$50,000, $50,000–<$80,000, >$80,000	Quartile versus quartile	People of both sexes with higher family income level had increased odds of having sufficient physical activity.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Patten et al., 2006	To describe the epidemiology of major depression in Canada.	Cross-sectional (CCHS 1.2)/National/ N = 36,984	Income, defined as individual income; coded into five groups: lowest, lower-middle, middle, upper-middle, highest	Quintile versus quintile	The prevalence of major depression was not related to level of education but was related to income: 8.5% in lowest income group versus 3.2% in highest income group.
Qi et al., 2006	To explore the associations between individual characteristics (income and education) and health behaviours and use of preventive screening.	Cross-sectional (NPHS)/ National/ N = 13,756 persons aged 20+ years	Income, defined as annual household income; income groups collapsed into five categories: <$20,000, $20,000–39,999, $40,000–59,999, $60,000–79,999, $80,000+	Quintile versus quintile	Lower levels of income were associated with blood pressure checks. Higher levels of income were associated with healthier behaviours.
Quinonez, 2009	To estimate the prevalence of hospital emergency room visits for dental problems not associated with trauma and to explore the characteristics that influence such visits.	Cross-sectional/ National/ N = 1,005 Canadians aged 18+ years	Income, defined as individual income; coded into five groups: <$20,000, $20,000–$40,000, $40,000–$60,000, $60,000–$80,000, $80,000+	Quintile versus quintile	Those in the lower-middle income group (not those in the lowest income group) were the most likely to make emergency room visits for dental problems. Most likely this was because those in the lowest income group are often eligible for government dental care programs.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Roos et al., 2004	To assess the influence of individual and contextual socio-economic variables on mortality between two Canadian provinces.	Cross-sectional/ Manitoba (N = 8,032) and Nova Scotia (N = 2,116)	Income, defined as (1) household income, coded into three groups: <$20,000, $20,000–$40,000,<$40,000; and (2) contextual level: neighbourhood household income, neighbourhood dwelling value	Household income versus neighbourhood household income	Higher income individuals were less likely to die during follow-up. No significant direct effect was found between neighbourhood income and mortality.
Ross et al., 2000	To compare the relation between mortality and income inequality in Canada.	Ecological/ National/ N = 10 provinces; N = 53 metropolitan areas	Income, defined as income inequality: percentage of total household income received by the less well off 50% of households	Province versus province; metropolitan area versus metropolitan area	Income inequality was not significantly associated with mortality.
Ross et al., 2011	To investigate whether aging amplifies, diminishes or sustains socio-economic inequalities in health.	Cross-sectional/ National/ N = 13,682 adults aged 20+	Income, defined as household-size-adjusted income, coded into five groups: lowest, lower-middle, middle, upper-middle, highest	Household income group versus household income group	Health-related quality of life (HRQL) was consistently highest for the most affluent men and women and was lower, in turn, for middle and lower income groups. The grading of HRQL by social position appears to be "set" in early adulthood and is stable through middle age and later life.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Schaffer et al., 2006	To report on the lifetime prevalence and illness characteristics of bipolar disorder.	Cross-sectional (CCHS: Mental Health and Well-Being)/ National/ N = 36,984 respondents aged 15+ years	Income, defined as low income adequacy: total household income <$15,000 for 1 or 2 household residents, <$20,000 for 3 or 4 residents, <$30,000 for 5 or more residents	Low income adequacy versus high income adequacy	Low income adequacy was significantly associated with the presence of a bipolar disorder diagnosis.
Seguin et al., 2003	To determine whether inadequate income itself has an impact on infant health.	Longitudinal/ Quebec/ N = 2,223 mothers of five-month-old children	Income, defined as household income using Statistics Canada definitions of sufficient (above the low-income threshold), moderately inadequate (60%–99% of the low-income threshold) and very inadequate income (<60% of the low-income threshold)	Sufficient income versus moderately inadequate versus very inadequate income	Compared with infants in households with sufficient incomes, those in households with lower incomes were more likely to be judged by their mothers to be in less than excellent health (moderately inadequate incomes: adjusted OR = 1.5, 95% CI: 1.1–2.1; very inadequate incomes: adjusted OR = 1.8, 95% CI: 1.3–2.6). Infants in households with moderately inadequate incomes were more likely to have been admitted to hospital (adjusted OR = 1.8, 95% CI: 1.2–2.6) than those in households with sufficient incomes, but the same was not true of infants in households with very inadequate incomes (adjusted OR = 0.7, 95% CI: 0.4–1.2).

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Sin et al., 2003	To determine whether disparities in rates of emergency visits for asthma would be less apparent across the income gradient in a healthcare system that provides free access to outpatient and hospital services.	Longitudinal/ Alberta/ N = 90,845	Income, defined as very poor, poor and non-poor groups	Very poor versus poor versus non-poor	Very poor children were 23% more likely to have had an emergency visit for asthma than those from non-poor families, adjusted for a variety of factors.
Steele et al., 2007	To explore the relationships between education level, income level and mental health services use among people with a mental illness.	Cross-sectional (CCHS 1.2)/National/N = 3,101	Income, defined as a continuous income variable, adjusted for household size using the indirect method of standardization	Low income versus high income	Household income did not independently predict mental health services use.
Stephenson et al., 2011	To assess the effect of socio-economic status on annual hospitalization rates in a large cohort of pediatric and adult patients with cystic fibrosis.	Longitudinal/ Ontario/ N = 1,174	Income, defined as average household income quintiles (Q1–Q5)	Quintile versus quintile	No statistically significant differences in annual hospitalization rates for respiratory-related causes were found between the lowest and highest income quintiles of cystic fibrosis patients.
To et al., 2009	To measure health outcomes among children with asthma.	Longitudinal/ National/ N = 10,148 children	Income, defined as total household income and number of household members, coded into three groups: low, middle, high	Low-income versus middle income versus high-income groups	Low income adequacy in 1994/95 significantly predicted hospitalization and health services use in 1996/97. Having current asthma and living in low-income families had a significant impact on the health status of children.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Vafaei et al., 2010	To test the relative income hypothesis across health regions.	Ecological (CCHS 3.1)/ National/ N = 130,000	Income, defined as (1) income inequality (ratio of number of people with income <$15,000 to those making >$80,000, and (2) absolute income (percentage of people with income >$30,000	Health region versus health region	Across Canadian health regions, health status in populations was a function of absolute income but not relative income.
Vrbova et al., 2005	To test the hypothesis of whether an association exists between SES and mortality subsequent to hospital admission for community-acquired pneumonia.	Cohort/ Ontario/ N = 60,457	Income, defined as median neighbourhood income	Quintile versus quintile	Income was not associated with mortality from community-acquired pneumonia in older persons.
Wang et al., 2009	To assess the effect of SES on health during the first year after newborn discharge among infants with complex chronic conditions.	Longitudinal/ Ontario/ N = 512,768 infants	Income, defined as neighbourhood income quintile	Quintile versus quintile	Infants with complex chronic conditions living in the lowest income neighbourhoods had a 1.24-fold higher hospitalization rate than those living in the highest income neighbourhoods.
Wilkins et al., 2008	To determine the distribution of mortality rates across various groups by income.	Cohort/ National/ N = 2.7 million	Income, defined as total pre-tax, post-transfer income from all sources pooled across all family members, and the ratio of total income to Statistics Canada's low-income cut-off, adjusted for family and community size	Quintile and decile versus quintile and decile	Compared with people of higher income status, mortality rates were elevated among those of lower income status.

Table A1: Canadian research on income and health-related outcomes (N = 65)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Wilson et al., 2001	To test the importance of socio-economic factors as a determinant of health.	Cross-sectional (Santé Québec)/ Quebec/ 1987, N = 19,576; 1992-93, N = 23,564)	Income, defined as household income; coded into three groups: $1–$29,999, $30,000–39,999, $40,000+	Household income group versus household income group	In 1987 and 1992-93, those in the lowest income group had significantly higher odds of being in the unhealthy category than those in the highest income group.
Wilson et al., 2010	To determine how often Ontarians are screened for diabetes, to estimate screening efficiency based on the number needed to screen in order to diagnose one diabetes case and to examine the population effectiveness of screening as estimated by the number of undiagnosed diabetes cases.	Cross-sectional (CCHS 1.1)/ Ontario/ N = 37,400	Income, defined as quartiles	Medium/high income versus low income	Men with low incomes were significantly less likely to undergo serum blood glucose testing (adjusted hazard ratio: 0.86, 95% CI = 0.75–0.98).
Winget et al., 2010	To investigate patient characteristics associated with not having a consultation with an oncologist and not receiving adjuvant chemotherapy.	Case-control/Alberta/ N = 772 patients	Income, defined as median neighbourhood income (Q1–Q4)	Lowest quartile versus highest quartile	Patients living in the lowest median income quartile neighbourhoods were twice as likely to not have a consultation with an oncologist, as compared with patients living in the highest median income quartile neighbourhoods.

Abbreviations: CCHS = Canadian Community Health Survey; CHS = Canada Health Survey; CI = confidence interval; CMD = Canadian Mortality Database; GSS = General Social Survey; JCUSSH = Joint Canada/United States Survey of Health; NPHS = National Population Health Survey; OR = odds ratio

Table A2: Canadian research on food insecurity and health-related outcomes (N=6)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Anema et al., 2010	To examine the prevalence and correlates of self-reported hunger among a cohort of injection drug users.	Cross-sectional/ Vancouver,B.C./ N = 1,053	Self-reported hunger, defined as a "yes" response to this statement: "I am hungry, but don't eat because I can't afford enough food."	One sample of food-insufficient injection drug users	Self-reported hunger was independently associated with: unstable housing and symptoms of depression.
Gucciardi et al., 2009	To determine the household food insecurity prevalence in Canadians with diabetes and its relationship with diabetes management, self-care practices and health status.	Cross-sectional (CCHS 3.1)/ Population-based/ N = 6,237 (national); N = 2,523 (Ontario)	Household Food Security Survey Module: food security status as food-secure |or food-insecure	Food-insecure individuals with diabetes versus food-secure individuals with diabetes	Household food insecurity was more prevalent among individuals with diabetes than among those without diabetes. Household food insecurity was significantly associated with physical inactivity, lower fruit and vegetable consumption, current smoking, unmet healthcare needs, having been an overnight patient, having a mood disorder, having effects from a stroke, lower satisfaction with life, lower self-rated general and mental health, and higher self-perceived stress.
Kirkpatrick et al., 2010	To examine the effects of hunger – an extreme manifestation of food insecurity – on subsequent health outcomes among children and youth.	Longitudinal NLSCY1994–2004/05)/ National/ N = 5,809 children aged 10–15 years; N = 3,333 youth aged 16–21 years	Hunger, defined as a "yes" response to this question: "Has [the child] ever experienced being hungry because the family has run out of food or money to buy food?"	Children and youth ever being hungry versus children and youth never being hungry	Among children, both ever being hungry and multiple episodes of hunger were associated with poorer general health but not with chronic conditions or asthma. Higher odds of chronic conditions and of asthma were observed among youth who experienced multiple episodes of hunger as compared with those who were never hungry.

Table A2: Canadian research on food insecurity and health-related outcomes (N=6)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Marjerrison et al., 2011	To examine the prevalence of food insecurity in households with a child with insulin-dependent diabetes mellitus (IDDM), to investigate whether food insecurity is associated with poorer IDDM control, and to describe the household characteristics and coping strategies of food-insecure families with a child with IDDM.	Cross-sectional (CCHS 2.2)/ Sydney and Halifax, N.S./ N = 183 families	Household Food Security Survey Module: food security status as either food-secure or food-insecure (based on two or more affirmative responses)	Children from food-insecure households versus children from food-secure households	Food insecurity was associated with IDDM. In multivariate analysis, only child's age and parents' education were independent predictors of IDDM. Children from food-insecure families had higher rates of hospitalization.
Nakhaie & Arnold, 2010	To examine the importance of multiple forms of social capital and individual-level variables, including food insecurity, for the functional health status of adult Canadians.	Longitudinal (NPHS) 1996–2000/ National/ N = 9,442	Food insecurity. scored as 0–3: 0 = never lacked money to buy food; 1 = sometimes lacked money but always got food; 2 = sometimes lacked food; 3 = often lacked food	One sample of Canadians aged 25 and over	Insecurity about food has a direct effect on changes in health status, which is affected by income, daily smoking and age.
Tarasuk & Beaton, 1999	To examine the relationship between food insecurity and nutritional adequacy among women in families receiving emergency food assistance.	Cross-sectional/ Toronto, Ont./ N = 153 women	Food insecurity, assessed using the 30-day scale items from the U.S. Department of Agriculture's Food Security Module	Food-insecure women versus food-secure women	Women who reported hunger in their households during the past 30 days also reported systematically lower intakes of energy and a number of nutrients. Low levels of intake associated with severe household food insecurity were in a range that could put women at risk of nutrient deficiencies.

Abbreviations: CCHS = Canadian Community Health Survey; NLSCY = National Longitudinal Survey of Children and Youth; NPHS = National Population Health Survey

Table A3: Canadian research on housing and health-related outcomes (N = 9)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Corneil et al., 2006	To examine the relationship between housing status and risk of HIV infection among injection drug users.	Cohort/ Vancouver, B.C./N = 1,548	Stable housing, defined as living in an apartment or house at the time of interview Unstable housing, defined as living in a single room occupancy hotel, shelter, recovery or transition house, jail, or on the street, or having no fixed address	Unstable housing versus stable housing	HIV incidence rate was elevated among those who reported residing in unstable housing. Unstable housing remained marginally associated with elevated risks of HIV infection after adjustment for potential confounders. Residing in unstable housing was independently associated with several HIV-risk behaviours including borrowing used needles and sex-trade involvement.
Dunn, 2002	To investigate the relation between housing, socio-economic status, and self-reported general and mental health.	Cross-sectional/ Vancouver, B.C./ N = 650 households from 12 neighbourhoods	Social and economic dimensions of housing: demand, control and material (affordability, dwelling type); meaningfulness (pridein dwelling, home as a refuge) – dimensions of everyday life as they occur in the domestic environment	One sample of households	In bivariate analyses, measures of housing demand, control and meaningfulness exhibitedstrong and significantly graded relations with self-reported health and somewhat less strong relations with mental health. In logistic regression analyses, housing demand and control variables made significant contributions to self-reported health, both general and mental health.
Fischer et al., 2006	To examine possible differences between crack users and non-crack users across Canada.	Cohort/ Vancouver, Edmonton, Toronto, Montreal and Quebec City/ N = 677	Unstable housing, defined as no permanent housing, transitional housing or homeless	Permanent housing versus no permanent housing	Crack users were more likely to have no permanent housing, have illegal and sex-trade income, indicate physical health problems and hepatitis C virus antibodies, use walk-in clinics, use heroin, and to have been arrested and in detention (in past year).

Table A3: Canadian research on housing and health-related outcomes (N = 9)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Hwang et al., 2011	To examine changes in health status, quality of life, substance use, healthcare use and residential stability among homeless and vulnerably housed individuals who applied for a supportive housing program.	Cohort/ Toronto, Ont./ N = 112	Supportive housing, defined as subsidized housing in conjunction with site-based social services	Supportive housing versus waiting list (usual care group 0)	Individuals who were accepted into the housing program experiencedsignificantly greater improvements in satisfaction with living situation as compared with individuals in the usual care group. There were no significant differences in other quality-of-life measures, health status, healthcare use or substance use between the two groups over time.
Kim et al., 2009	To evaluate hepatitis C virus incidence among injection drug users with and without stable housing.	Cohort/ Vancouver, B.C./ N = 3,074	Stable housing, defined as living in an apartment or house at the time of interview, and unstable housing, defined as living in a single room occupancy hotel, shelter, recovery or transition house, jail, on the street, or having no fixed address	Injection drug users with stable housing versus injection drug users with unstable housing	In a multivariate Cox regression model, unstable housing remained independently associated with hepatitis C virus infection.
Palepu et al., 1999	To describe the relationship between socio-demographic characteristics and HIV status of a cohort of injection drug users on their self-reported health service use.	Cohort/ Greater Vancouver, B.C./ N = 1,103	Unstable housing, defined as living in the past six months in a hotel with single-occupancy rooms, boarding room, hostel, transition house, or jail or on the street	Unstable housing versus stable housing	Injection drug users with unstable housing were more likely to report emergency department and hospital use, past 6 months (1.44; 1.11-1.86);

Table A3: Canadian research on housing and health-related outcomes (N = 9)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Palepu et al., 2010	To examine whether accessing addiction treatment was associated with attaining stable housing in a prospective cohort of injection drug users.	Cohort/ Vancouver, B.C./ N = 992	Attaining stable housing, defined as two consecutive "stable housing" designations (i.e. living in an apartment or house) during the follow-up period	Unstable housing versus stable housing	Addiction treatment was inversely associated with attaining stable housing. Receipt of income assistance, daily crack use and daily heroin use were negatively associated with attaining stable housing.
Wanyeki et al., 2006	To determine whether dwelling and building features, residential density, and crowding are independently associated with tuberculosis occurrence in a low-incidence setting.	Case-control/ Montreal, Que./ N = 595 case dwellings; N = 5,095 control dwellings	A dwelling, defined as a single household residence, and buildings, which contain one or more dwellings	Dwellings with tuberculosis versus random sample of dwellings	Dwelling and building features – notably dwellings in taller and new buildings, with lower resale value, and on blocks with high residential density – as well as crowding, were associated with tuberculosis occurrence, after adjustment for socio-demographic factors.
Weber et al., 2001	To assess risk factors associated with HIV prevalence and incidence among gay and bisexual men in two prospective Canadian cohorts.	Cohort/ Vancouver, B.C. and Montreal, Que./ N = 1,373	Unstable housing was defined as living in a hotel, boarding house, group home or on the street or having no fixed address.	Stable housing versus unstable housing	Men who were HIV-seropositive at baseline were more likely to report living in unstable housing than those who were HIV-negative.

Table A4: Canadian research on social exclusion and health-related outcomes (N = 11)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Chandrasena et al., 1991	To compare the characteristics of immigrant and Canadian-born patients who committed suicide while receiving active psychiatric therapy either in hospital or as outpatients.	Case-control/ Ontario/ N = 94 Canadian-born patients; N = 23 foreign-born patients	Immigrant status, defined as "yes" or "no," and Eastern European and Western European origins	Canadian-born versus foreign-born	Eastern Europeans were overrepresented, and significant differences were found in age distribution, stress, level of education, social isolation and methods of suicide.
Guttman et al., 2008	To investigate access to effective primary healthcare services in children of new immigrants to Canada by assessing immunization coverage at age 2.	Cohort/ Ontario/ N = 98,123 children	Landed immigrant status, defined as immigration category	Children of immigrant mothers versus children born to non-immigrant mothers	Children of immigrant mothers were more likely to have up-to-date immunization coverage than children born to non-immigrant mothers. Those from the regions of Southeast and Northeast Asia were most likely to be up to date. Period of immigration was not associated with coverage.
Khan et al., 2008	To compare hospital mortality among patients of Asian (originating from Asia or Southeast Asia), Native Indian and European descent admitted to the intensive care unit.	Cohort/ British Columbia/ N = 7,331	Race/ethnicity, defined as Asian (South Asian or East Asian), Native Indian or European	Ethnic group versus ethnic group	After adjusting for potential confounders, Native Indian descent was not associated with an increase in mortality as compared with European descent. Asian descent was associated with significantly higher mortality. After adjusting for case mix, this difference was no longer seen. For patients admitted for chronic obstructive pulmonary disease exacerbation, Asian descent was associated with a substantial increase in mortality.

Table A4: Canadian research on social exclusion and health-related outcomes (N = 11)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Lemstra et al., 2009	To determine whether Aboriginal cultural status is independently associated with lifetime suicidal ideation.	Cross-sectional (CCHS)/ Saskatoon, Sask./ N = 5,948	Aboriginal status, defined as First Nations and Métis people	Aboriginal people versus Caucasian people	High-income Aboriginal people had similar low levels of suicidal ideation as compared with high-income Caucasian people. After adjustment for household income, the odds of lifetime suicidal ideation for Aboriginal people decreased from 3.28 to 1.99.
Lima et al., 2006	To determine whether Aboriginal and non-Aboriginal persons respond differently to HAART (highly active antiretroviral treatment) by measuring HIV plasma viral load response, CD4 cell response and time to all-cause mortality.	Cohort/ British Columbia/ N = 622	Aboriginal status, defined as Aboriginal ethnicity	Aboriginal persons versus non-Aboriginal persons	Cox proportional hazards models controlling for clinical characteristics found that Aboriginal status had an increased hazard of mortality (HR = 3.12, 95% CI: 1.77–5.48) but did not with HIV plasma viral load response (HR = 1.15, 95% CI: 0.89–1.48) or CD4 cell response (HR = 0.95, 95% CI: 0.73–1.23).
Liu et al., 2010	To examine the prevalence of cardiovascular risk factors in various Canadian ethnic groups.	Cross-sectional/ (CCHS)/ National/ N = 371,154	Visible minorities, defined as Chinese, Japanese, Korean, South Asian, Filipino or Southeast Asian, Black, Latin, Arab, West Asian, Aboriginal and "other"	Ethnic group versus ethnic group	Compared with White people, people from visible minorities had a lower prevalence of diabetes mellitus, hypertension, smoking and obesity but a higher prevalence of physical inactivity. Most vis¬ible minorities were less likely to smoke and to be obese, and were more likely to be physically inactive. Hypertension was more prevalent among those of Filipino or Southeast Asian background and those of Black ancestry.

Table A4: Canadian research on social exclusion and health-related outcomes (N = 11)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
O'Loughlin et al., 2007	To describe the prevalence and co-occurrence of lifestyle risk factors for chronic disease by family origin.	Cohort/ Montreal, Que./ N = 2,362	Family ethnic origin, defined as French Canadian, Middle Eastern/North African, Asian, European, South American, Central American/ Caribbean, others	Family ethnic origin versus family ethnic origin	The prevalence of smoking and poor diet was highest among participants of French Canadian family origin. Physical inactivity was highest among those of Portuguese, Italian and Haitian family origin. Obesity was highest among Europeans. The prevalence of smoking was lowest among Haitians, poor diet was lowest among South Asians and physical inactivity was lowest among Eastern Europeans.
O'Loughlin et al., 1998	To describe the prevalence and correlates of physical inactivity and of participation in organized sports at and outside school among elementary schoolchildren in multi-ethnic, low-income urban neighbourhoods.	Cohort/ Montreal, QC/ N = 2,108 students aged 9–12 years	Family ethnic origin, defined as French Canadian, Middle Eastern/North African, Asian, European, South American, Central American/ Caribbean, others	Family ethnic origin versus family ethnic origin	Being of European or Central American/Caribbean family origin was independently correlated with obesity in boys. Girls of Asian family origin were protected from being overweight.
O'Loughlin et al., 1999	To determine the risk of acute myocardial infarction (AMI) among new	Cohort/ Montreal, Que./ N = 2,285 students aged 9–13 years	Family ethnic origin, defined as French Canadian, Middle Eastern/North African, Asian, European, South American, Central American/Caribbean, others	Family ethnic origin versus family ethnic origin	Children of Asian family origin were less active. Socio-economic status was related to participation in organized sports outside school.

Table A4: Canadian research on social exclusion and health-related outcomes (N = 11)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Saposnik et al., 2010a	To determine the risk of acute myocardial infarction (AMI) among new immigrants as compared with long-term residents and, among those who develop AMI, their short- and long-term mortality rates.	Case-control/ Ontario/ N = 965,829 new immigrants; N = 3,272,393 long-term residents	New immigrant status, defined as thosewho received a new OHIP number at any time between 1995/04/01 and 2006/03/31; long-term residents, defined as those aged 16–65 years who had an active OHIP number for five years or more during this same time period	New immigrants versus long-term residents	The incidence rates of AMI were 4.14 per 10,000 person-years among new immigrants and 6.61 per 10,000 person-years among long-term residents. New immigrants appeared to be at lower risk of AMI than did long-term residents.
Saposnik et al., 2010b	To determine the risk of acute stroke associated with recent immigration.	Case-control/ Ontario/ N = 965,829 new immigrants; N = 3,272,393 long-term residents	New immigrant status, defined as those who received a new OHIP number at any time between 1995/04/01 and 2006/03/31; long-term residents, defined as those aged 16–65 years who had an active OHIP number for five years or more during this same time period	New immigrants versus long-term residents	The incidence rates of acute stroke were 1.69 per 10,000 person-years among new immigrants and 2.56 per 10,000 person-years among long-term residents. New immigrants appeared to be at lower risk of premature acute stroke than did long-term residents.

Abbreviations: CCHS = Canadian Community Health Survey; CI = confidence interval; HR = hazard ratio

Table A5: Canadian research on multiple social determinants of health (SDOH) and health-related outcomes (N = 18)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Anand et al., 2001	To establish the relative prevalence of risk factors, atherosclerosis and cardiovascular disease (CVD) through a population-based study among people of Aboriginal and European ancestry in Canada.	Cross-sectional/ Hamilton and Toronto, Ont.; Edmonton, Alta./ N = 301 Aboriginal people; N = 326 of European ancestry	Aboriginal status, defined from a comprehensive list of Six Nations Band members; income, defined as annual income <$20,000 versus >$60,000	Aboriginal and income versus European and income	Aboriginal people had significantly more carotid atherosclerosis and higher frequency of CVD than did those of European descent, and also had significantly higher rates of unemployment and lower annual household income. For any given income level, Aboriginal people had higher rates of risk factors and CVD as compared with those of European ancestry.
Anand et al., 2006	To examine the relationship between social disadvantage, cardiovascular risk factors and cardiovascular disease among men and women from diverse ethno-racial backgrounds.	Cohort/ Hamilton and Toronto, Ont.; Edmonton, Alta./ N = 1,285	Ethnicity, defined as European, Chinese, South Asian and Aboriginal origins; social disadvantage index, includes income	Ethno-racial groups versus ethno-racial groups	Social disadvantage was higher among non-White ethnic groups. Cigarette smoking, glucose, overweight, abdominal obesity and C-reactive protein test results were higher among individuals with higher social disadvantage, whereas systolic blood pressure, lipids, norepinephrine and atherosclerosis were not.
Auger et al., 2011	To examine the relation between income inequality and mortality, and the modifying effects of characteristics such as immigration.	Ecological/ Quebec/ N = 2 million	Income inequality, defined as Gini coefficient, Atkinson index, coefficient of variation; immigrant status, defined as non-immigrant, long-term immigrant (>10 years) or recent immigrant (<10 years)	Low, moderate and high levels of income inequality; immigrants versus Canadian-born individuals	Income inequality was associated with mortality in Canadian-born individuals but not immigrants.

Table A5: Canadian research on multiple social determinants of health (SDOH) and health-related outcomes (N = 18)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Bryant et al., 2009	To examine the extent to which predictors of unmet healthcare needs are consistent with various paradigmatic approaches (e.g. structural-critical, social capital, social support and lifestyle) that consider such issues.	Cross-sectional/ British Columbia/ N = 2,536	Income, defined as >$40,000 versus <$40,000; housing tenure, defined as owners versus renters	Lower income versus higher income; owners versus renters	Reporting less than $40,000 annual income was related to having an unmet need (OR = 1.71, 95% CI: 1.34–2.20). Renters had almost twice the risk of reporting an unmet healthcare need as compared with homeowners (OR = 1.86, 95% CI: 1.47–2.34).
Clark et al., 2002	To assess the association between housing density, isolation and the occurrence of tuberculosis (TB) in First Nations communities.	Ecological/ National/ N = 602 First Nations communities	First Nations communities; housing density, defined as the average number of persons per room in a community; household income, expressed in Canadian dollars	Housing-dense communities versus housing-non-dense communities	The rate of TB occurrence was 18.9 per 100,000 in communities with an average of 0.4–0.6 persons per room, while the rate was 113.0 per 100,000 in communities with 1.0–1.2 persons per room. Overcrowded housing has the potential to increase exposure of susceptible individuals to infectious TB cases, and isolation from health services may increase the likelihood of TB.
Clarke et al., 2008	To examine ethnic differences in the pathways to suicidality.	Cross-sectional (CCHS 1.1)/ National/ N = 61,673	Ethnicity, defined as Anglophone White, Francophone White and foreign-born White people, visible minorities, and Aboriginal people; household income, defined in five levels	Ethnic and income groups versus ethnic and income groups	Francophone White and Aboriginal persons were more likely to report suicidality as compared with Anglophone White persons, whereas those in a visible minority group and foreign-born white persons were least likely. Disadvantages in income, income and education, and income and its combined effect with depression and alcohol dependence/abuse led to high rates even among the low-risk visible minority group.

Table A5: Canadian research on multiple social determinants of health (SDOH) and health-related outcomes (N = 18)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Dunn & Hayes, 2000	To investigate ways in which material and meaningful factors related to housing (in conjunction with other dimensions of the social environment) could operate to produce systematic inequalities in health status across social strata.	Cross-sectional/ Vancouver/ N = 322 (Mount Pleasant); N = 206 (Sunset)	Housing, defined in terms of material and meaningful dimensions of the home; income, defined as annual household income	Housing and income in Mount Pleasant versus housing and income in Sunset	Material and meaningful dimensions of housing and the home were associated with health status.
Hwang et al., 2009	To examine mortality in a representativenationwide sample of homeless and marginally housed people living in shelters, rooming houses and hotels.	Case-control/ National/ N = 15,100	Collective dwellings, defined as shelters, rooming houses and hotels; income, in income adequacy fifths	Homeless and marginally housed individuals versus individuals with incomes in the lowest fifth of the distribution	Mortality rates among the homeless and marginally housed were substantially higher than rates in the poorest income group.
Jin & Martin, 2003	To test the hypothesize that hepatitis A is more common in Aboriginal communities because of poverty, crowded housing, and inadequate or substandard water and sewage systems.	Cross-sectional/ British Columbia/ N = 49,756	Aboriginal status, defined as First Nations reserves in B.C.; crowded housing, defined as population per housing unit	On-reserve versus general population	Crude incidence rate on-reserve was 31 per 100,000 persons per year, twice as high as in the general population of B.C. (15.1 per 100,000). Higher incidence of hepatitis A was associated with more persons per housing unit.
Johnson-Down et al., 1997	To assess the prevalence of obesity and/or under-nutrition and to evaluate diet and activity patterns among schoolchildren from an ethnically diverse, low-income urban population.	Cross-sectional/ Montreal, Que./ N = 498 children aged 9–12 years	Ethnicity, defined as mother's country of origin: Canada, Europe, Central/South America, Asia, other; income sufficiency, defined as insufficient, sufficient and high	Ethnic and income groups versus ethnic and income groups	Dietary fat intake was higher in children with mothers born in Canada. Intake of vitamins A, C, iron and folate was directly related to income sufficiency.

Table A5: Canadian research on multiple social determinants of health (SDOH) and health-related outcomes (N = 18)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Lofters et al., 2011	To determine how predictors of low cervical cancer screening (reflective of socio-demographics, the healthcare system and migration) varied by region of origin for Ontario's immigrant women.	Cross-sectional/ Ontario/ N = 455,864 immigrant women	Immigrant women's region of origin, defined as East Asia and Pacific, Eastern Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, USA, Australia and New Zealand, Western Europe; income, defined as neighbourhood income quintiles	Immigrants and neighbourhood income quintile versus immigrants and neighbourhood income quintile	Residence in the lowest income neighbourhoods was significantly associated with lack of cervical cancer screening.
McDonough et al., 2002	To research the social patterning of women's health by examining pathways through which social structure may be linked to health.	Cross-sectional NPHS/ National/ N = 6,000	Income adequacy, defined as household income for the past 12 months, adjusted for family size and expenditures on basic needs, four levels; housing tenure, defined as owner and renter	Low income versus high income; renters versus owners	The partly adjusted effects of the socio-economic variables on self-rated ill health confirm the health disadvantage of women living in rental housing and those with lower household income.

Table A5: Canadian research on multiple social determinants of health (SDOH) and health-related outcomes (N = 18)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Pilote et al., 2003	To evaluate the effect of socio-economic status (SES) on access to cardiac procedure after acute myocardial infarction in a universal healthcare system.	Cohort/ Quebec/ N = 62,364	Income, defined as income level and low-income families using Statistics Canada's threshold; housing, defined as proportion of rented dwellings and average rent	Income quintile versus income quintile; rent quintile versus rent quintile	After adjustment for individual-level predictors of cardiac catheterization use, average rent (OR per $100 difference = 1.57, 95% CI: 1.36–1.80) and proportion of renters in the area (OR = 2.2, 95% CI: 1.21–3.73) were independent SES predictors. Patients in low SES areas (median family income: C$30,809) were less likely to undergo cardiac catheterization than patients in high SES areas (median: C$92,169) (men: 33%, compared with 47%; women: 18%, compared with 47%).
Rosenberg et al., 1997	To compare the incidence and hospitalization rates for shigellosis between registered status Indians and the rest of the population in Manitoba, Canada.	Ecological/ Manitoba/ N= 353 registered status Indians; N = 160 (from general population)	Indian status, defined as registered Indians under the federal Indian Act; housing density, defined as the average household density and calculated by dividing the total population in the community by the total number of houses	Registered status Indians versus general population	Status Indians had shigellosis incidence and hospitalization rates that were 29 and 12 times as high, respectively, as those of the rest of the population. Household crowding, lack of piped water and inadequate sewage disposal were significantly associated with increased incidence of shigellosis on reserves.
Sin et al., 2004	To determine the relationship between high birth weight and risk of emergency visits for asthma during childhood.	Cohort/Alberta/ N = 96,359	Aboriginal status; income, defined as annual family income <C$27,210	Aboriginal status versus non-Aboriginal status; low income versus non-low income	Factors associated with an elevated risk for emergency asthma visits during childhood included male sex (RR = 1.26, 95% CI: 1.22–1.30), Aboriginal status (RR = 1.20, 95% CI: 1.11–1.29) and low-income status

Table A5: Canadian research on multiple social determinants of health (SDOH) and health-related outcomes (N = 18)

Study	Study characteristics		Social determinant of health measure		Findings
	Objective	Study design/ location/ sample size	Conceptual definition	Groups compared	
Smith et al., 2007	To explore a recent immigration-low income interaction for depression in both sexes.	Cross-sectional CCHS/ National/ N = 41,147	Immigrant status and recent immigrant status, defined as "yes" or "no;" Income adequacy, defined as low income and middle/high income	Immigrant status versus non-immigrant status; recent immigrant versus non-recent immigrant; low income versus middle/high income	The depression rate for recent immigrants was 5.24%, 3.87% for men and 6.64% for women. The depression rate among low-income individuals was 14.52%, 10.79% for men and 17.07% for women. The lowest rate of depression was among low-income recent immigrant males (2.21%), whereas the highest rate was among low-income non-recent immigrant females (11.05%).
Sword et al., 2006	To describe immigrant women's postpartum health, service needs, access to services and service use during the first four weeks following hospital discharge, as compared with women born in Canada.	Cross-sectional/ Ontario/ N = 1,250	Immigrant status, defined as women born in Canada ("yes" or "no"); cultural group; income, defined by seven levels	Immigrant women versus women born in Canada	Immigrant women were significantly more likely than Canadian-born women to have low family incomes, low social support, poorer health, possible postpartum depression, learning needs that were unmet in hospital and a need for financial assistance.
Vu et al., 2010	To determine whether characteristics of neighbourhoods in which children live (such as socio-economic disadvantage, physical infrastructure, programs and services, social disconnection, smoking prevalence, and overcrowding) are related to hospitalization rates from birth to age 6, independent of individual-level factors.	Longitudinal, multi-level/ Saskatoon, Sask./ N = 8,504 children	Aboriginal status, defined as registered Indian or other; income, defined as proportion of low-income families	Non-Aboriginal status versus Aboriginal status	Aboriginal children, children in low-income families and those with adverse birth outcomes had significantly higher rates of hospitalization. Children living in economically disadvantaged neighbourhoods, neighbourhoods in poor physical condition and neighbourhoods with higher average household size had significantly higher rates of hospitalization.

Abbreviations: CCHS = Canadian Community Health Survey; CI = confidence interval; NPHS = National Population Health Survey; OR = odds ratio; RR = relative risk

APPENDIX B

Table B1: Descriptive profile of empirical research on social determinants of health in Canada

	Number of studies	Percentage of total studies
Theme		
Income	65	59.6
Food insecurity	6	5.5
Housing	9	8.3
Social exclusion	11	10.1
Multiple social determinants	18	16.5
Year of publication		
1985–1989	1	0.9
1990–1994	3	2.8
1995–1999	7	6.4
2000–2004	27	24.8
2005–2009	45	41.3
2010–2011	26	24.9
Study design		
Ecological	7	6.4
Cross-sectional survey	53	48.6
Longitudinal survey	10	9.2
Case-control	11	9.2
Cohort	28	25.7
Multi-level design		
No	100	91.7
Yes	9	8.3
Sampling procedure		
Representative/probability	63	57.8
Convenience	46	42.2
Sample size		
$n < 100$	2	1.8
$100 \leq n < 200$	6	5.5
$200 \leq n < 1{,}000$	12	11.0
$n \geq 1{,}000$	89	81.7
Region of study		
National	43	39.5
Provincial	39	35.8
City	27	24.8

Table B1: Descriptive profile of empirical research on social determinants of health in Canada

	Number of studies	Percentage of total studies
Study populations		
Age		
Adults	87	79.8
Children	17	15.6
Elderly	5	4.6
Sex		
Men and women	94	86.2
Men only	2	1.8
Women only	13	11.9
Dependent variables		
Physical health	44	40.4
Mental health and healthcare access/use	21	19.3
Mental health	9	8.3
Cancer	8	7.3
Other	27	24.8

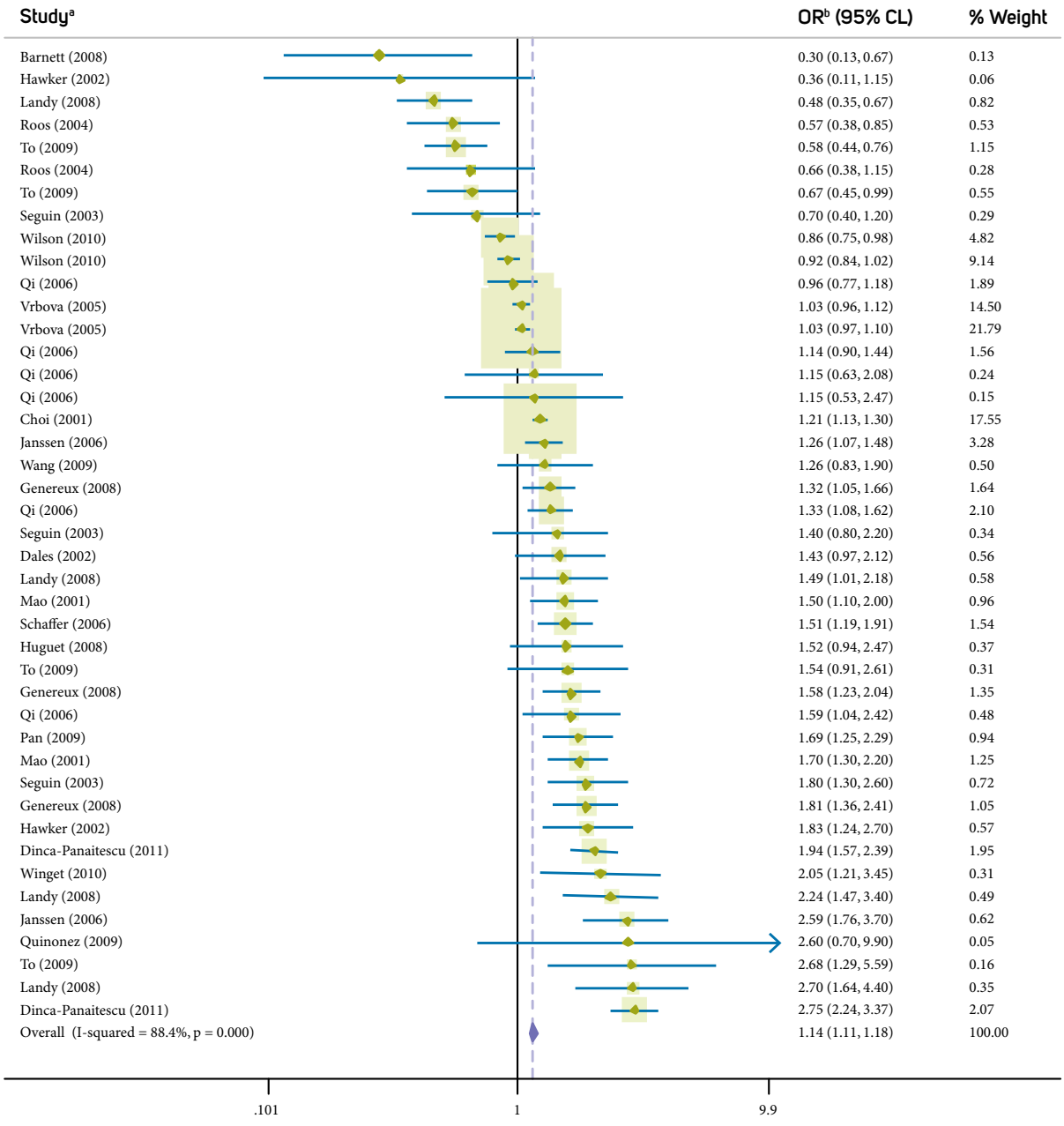
Table B2: Findings of 109 empirical studies grouped by social determinant of health

Social determinant	Positive impact[a]	Negative impact[b]	No impact[c]	Mixed impact[d]	Total
	Number (and percentage of total for determinant)				
Income	2 (3.1)	48 (73.9)	9 (13.9)	6 (9.2)	65 (100)
Food insecurity	0	6 (100.0)	0	0	6 (100)
Housing	0	8 (88.9)	0	1 (11.1)	9 (100)
Social exclusion	3 (27.3)	5 (45.5)	1 (9.1)	2 (18.2)	11 (100)
Multiple	0	15 (83.3)	0	3 (16.7)	18 (100)
Total	5 (4.6)	82 (75.2)	10 (9.2)	12 (11.0)	109 (100)

[a] Positive association exists between social determinant and health-related outcome.
[b] Negative association exists between social determinant and health-related outcome.
[c] Social determinant is not associated with health-related outcome.
[m] Social determinant is inconsistently related to health-related outcome.

APPENDIX C

Figure C1: Impact of income on health (43 independent outcomes)



Abbreviations: CL = confidence limits; OR = odds ratio

[a] Each study is identified by first author only (and year of publication).

[b] An odds ratio greater than 1 indicates that disadvantaged health outcomes are more likely to occur among low-income groups (with high-income group as the reference group).

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