The health of Canada's children. Part II: Health mechanisms and pathways

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The present article provides models that explain how exposures to differing quality living circumstances result in health inequalities among children. Living circumstances – the social determinants of health – operate through a variety of mechanisms to shape children's health and cognitive, emotional and social development. Specific processes set children off on trajectories such that these exposures – in interaction with their environments – not only shape their health as children but also provide the foundations for their health status as adults. In addition to specifying the mechanisms that mediate the relationship between living circumstances and health outcomes, the article also identifies some of the economic and political factors that shape the quality of the living circumstances to which Canadian children are exposed.

La santé des enfants canadiens. Partie II : Les mécanismes et les voies de la santé

Le présent article fournit des modèles qui expliquent comment l'exposition à différentes qualités de conditions de vie suscite des inégalités dans la santé des enfants. Les conditions de vie, c'est-à-dire les déterminants sociaux de la santé, définissent par divers mécanismes la santé ainsi que le développement cognitif, affectif et social des enfants. Des processus précis orientent les enfants vers des trajectoires telles que cette exposition, en interaction avec leurs environnements, façonne non seulement leur santé pendant l'enfance, mais également les fondements de leur état de santé à l'âge adulte. En plus de préciser les mécanismes qui déterminent la relation entre les conditions de vie et les issues de santé, l'article présente également quelques-uns des facteurs économiques et politiques responsables de la qualité des conditions de vie auxquelles les enfants canadiens sont exposées.

Key Words: *Public health; Public policy; Social paediatrics*

Part I of the present series, "Canadian children's health in comparative perspective", provided various indicators of children's health and showed how these are related to family income. As family income increases, children's health improves. The health of low-income children is especially problematic (see addendum 1). Canada's rankings on health and determinants of health indicators compare unfavourably with other wealthy industrialized nations and suggest numerous areas for improvement. Because children's living circumstances are the primary determinants of their health, improving health requires an understanding of how living circumstances shape health as well as how these living circumstances come about. Once such understandings are achieved, responses to these challenges can be devised and implemented.

The present article considers the mechanisms and pathways by which exposures to differing quality living circumstances result in health inequalities among children. It also introduces the economic and political factors that determine the living circumstances of Canadian children. The next article in the present series explores how policy-makers can respond to these health inequalities, thereby improving the health of Canada's children.

SETTING THE STAGE

Bartley (1) places existing explanations for health inequalities into a useful typology (Table 1). These are the materialist, cultural/behavioural, psychosocial, life course and political economy. Each approach is relevant for understanding the determinants of children's health, but the key question is, "Which of these approaches are most useful for understanding – and acting upon – the health inequalities that exist among children?"

The literature on the determinants of health in general and the determinants of children's health in particular suggest an emphasis on the materialist and life-course approaches (2,3). The health of children is strongly related to living circumstances, of which family income is an excellent indicator. However, income, by itself, is not the cause of health inequalities. Rather, income is an excellent marker for a cluster of life circumstances such as quality of nutrition, clothing, housing, and educational and recreational opportunities (4). Income is also an excellent predictor of a variety of family characteristics and the quality of children's environments (5). All of these factors have been shown to be determinants of children's health and responsible for existing health inequalities.

Sloat and Willms (6) provide evidence that Canadian parents' socioeconomic position – of which income is a strong component – has a direct relationship with children's health and various developmental outcomes. Socioeconomic position also influences these outcomes by operating through mediating processes of family resources (eg, family functioning, parenting styles, maternal depression and parental

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TABLE 1
Explanations for the relationship between socioeconomic position and children's health

Explanation type	Influences
Materialist	Parental income and employment situations determine children's access to adequate diet, housing quality, and educational and recreational opportunities. Income and place of residence shapes the quality of schools, neighbourhoods and polluted environments
Cultural/behavioural	Parental beliefs, norms and values expose children to qualitatively inferior behaviours such as use of tobacco and alcohol, poor diet and lack of physical activities
Psychosocial	Children's perceived status, psychosocial stress, sense of control, family environment and social support influence health through their impact on bodily systems and functions
Life course	Events and processes starting before birth, and occurring during childhood influence both physical health and the ability to maintain health during childhood, adolescence and adulthood. Health and social circumstances influence each other over time
Political economy	Political processes and distribution of power affect distribution of economic resources, provision of citizen supports and services, and quality of physical environments and social relationships. Children from families with different income levels experience profoundly different exposures to health-influencing circumstances

Adapted from reference 1

engagement) and the opportunity structure (eg, community support, neighbourhood support, quality daycares and quality schools). At every level, lower socioeconomic position is associated with poorer quality mediators.

The child health outcomes related to income include rates for infant mortality, low birth weight, childhood injuries, readiness to learn at time of school entry, functional health, and numerous mental health and social problems (7). The 'social gradient' refers to the consistent finding that health is related to income across the income distribution from wealthy to middle income to poor. Materialists argue health parallels living circumstances because "the social structure is characterized by finely graded scale of advantage and disadvantage with individuals differing in terms of their length and level of their exposure to a particular factor and in terms of the number of factors to which they are exposed" (4, page 102).

In addition to explaining differences in family and children's health across the distribution of living circumstances, the materialist approach is especially useful for understanding how children living in poverty are especially likely to experience adverse health and cognitive, affective and social developmental outcomes (8).

The life-course explanation is also important because evidence exists that experiences at one stage of the life course shape later health status (2). At any age, children's health is influenced by earlier exposures, including those experienced during pregnancy. Additionally, many chronic diseases of adulthood have their origins in children's experiences (9).

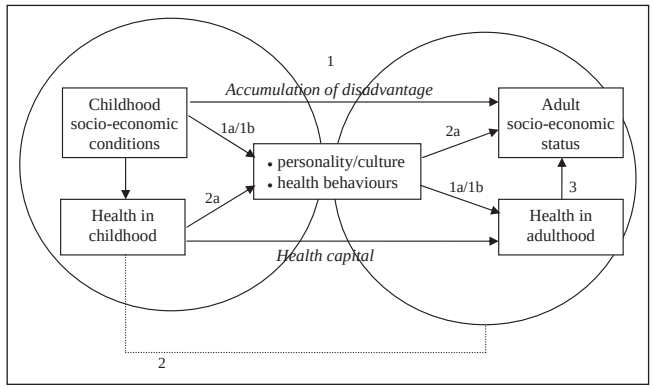

Figure 1) *Living conditions, socioeconomic inequalities and children's health. 1 – contribution of childhood socioeconomic conditions to socioeconomic health inequalities in adult life; 1a – independent effect of childhood socioeconomic conditions on adult health; 1b – independent effect of childhood socioeconomic conditions on adult health through health behaviours and personality/cultural factors; 2 – contribution of childhood health to socioeconomic health inequalities in adult life; 2a – contribution of childhood health to socioeconomic health inequalities in adult life through selection on health in childhood; 3 – selection on health in adult life. Adapted from reference 11*

Material living circumstances across the life course also shape the factors that comprise the cultural/behavioural and psychosocial models. The experience of psychosocial stress and familial and child attitudes associated with the adoption of risk behaviours are systematically related to living circumstances (see addendum 2) (10). Two important models illustrate the materialist approach to living circumstances and children's health.

LIVING CIRCUMSTANCES, SOCIOECONOMIC INEQUALITIES AND HEALTH

van de Mheen et al (11) lay out the basic materialist position (Figure 1). Childhood socioeconomic circumstances are strongly related to childhood health. These circumstances also set the child on a trajectory that, if left unchanged, will continue to accumulate socioeconomic advantage or disadvantage over time. Childhood circumstances have a direct influence on adult health and an indirect influence on adult health through mediating processes of personality and health behaviours. These mediating processes include psychological sense of personal control and efficacy, and the eventual adoption of health-threatening behaviours such as tobacco use, inadequate diet and alcohol use. Evidence in support of the basic tenets of this model is abundant with regard to adverse birth outcomes, readiness at school age to begin school, adults' psychological attributes and precursors of adult chronic diseases such as heart disease, respiratory disease and type 2 diabetes (12-14).

LIVING CIRCUMSTANCES AND HEALTH: LATENCY, PATHWAYS AND CUMULATIVE INFLUENCES

Hertzman's influential approach focuses on early child development and incorporates both a materialist and a

life-course perspective to explain how living circumstances shape children's health and their cognitive, emotional and social development (15). For example, diverse areas of children's functioning such as emotional regulation, sensory regulation, gross and fine motor skills, generalized brain development and hypothalamic-pituitary-adrenal function have been associated with socioeconomic position (5,16). According to Hertzman, "Long-term-exposure-to-expression relationships" (ie, associations of childhood circumstances with health outcomes) cluster into three generic patterns that, while probably overlapping, provide a heuristic method for examining the determinants of children's health (Table 2).

'Latency effects' are about how specific exposures during pregnancy and early childhood manifest in both childhood and adult health status. 'Cumulative effects' identify how children living in advantaged or adverse living circumstances over time come to express different health and developmental outcomes. 'Pathways effects' draw attention to how children's life-course trajectories are shaped by previous circumstances and whether various societal institutions (eg, child care, communities, schools, etc) either maintain or shift these trajectories.

TABLE 2
Long-term-exposure-to-expression relationships cluster into three generic patterns

Latency – refers to relationships between an exposure at one point in the life course and the probability of health expressions years or decades later, irrespective of intervening experience. The effects of asbestos on elevating the risk of various cancers decades after exposure has ceased, is one vivid example of such a relationship
Cumulative – refers to multiple exposures over the life course whose effects on health combine. These may be either multiple exposures to a single recurrent factor (eg, chronic poverty or persistent smoking) or a series of exposures to different factors
Pathways – represent dependent sequences of exposures in which exposure at one stage of the life course influences the probability of other exposures later in the life course, as well as associated expressions. For example, the divorce of one's parents in early childhood may reduce readiness to learn at school entry, which may, in turn, affect school performance, which could affect later employment opportunities and thus socioeconomic trajectory through life

Adapted from reference 15

Latency effects

Biological embeddedness describes how specific exposures and experiences come to have long-lasting effects on health and developmental outcomes (17). Much of the evidence that cognitive, affective and social processes are set at early ages come from animal studies, and there is debate as to the permanence of these effects. What appear to be latency effects may actually be contemporaneous effects associated with the tendency of children to maintain their general life circumstances over time. The lack of longitudinal data that can isolate these effects makes interpretation difficult.

However, on the health side, there is clear evidence – based on human longitudinal studies – that early childhood and even prebirth experiences predispose children to either good or poor health regardless of later life circumstances (12). As one example, low birth weight babies are generally more susceptible to a variety of child health problems during childhood. In addition, low birth weight babies are more likely to experience cardiovascular disease and type 2 diabetes as adults – this is especially the case for those living under conditions of disadvantage (18). However, all is not determined by early childhood experiences. Among advantaged populations – which are less likely to have children of lower birth weight – low birth weight children are much less likely to show these health problems (19).

These latency effects result from biological processes during pregnancy associated with poor maternal diet, risk behaviours or experience of stress (20,21). Early childhood experiences, such as the experience of numerous infections or exposures to adverse housing conditions, also appear to have later health effects regardless of later life circumstances. Psychological health-related effects may also result from early experience. A general nonadaptive reaction to stress may be established during early childhood as well as a general sense of hopefulness and lack of control, both of which are important determinants of health (22).

Pathways effects

Hertzman and Power (15) point out that children's exposures at one point may not have immediate health effects but can lead to other experiences that do have health consequences. An important instance of this would be young children's lack of readiness to learn as they enter school. This by itself is not necessarily a health issue, but it leads to experiences that clearly are.

Socioeconomic position is strongly related to school readiness (13). Much of this has to do with the quality of parental interaction and the ability of parents to provide supportive, nourishing and stimulating environments. Lack of school readiness leads to adverse educational and employment attainments, both of which have clear health effects.

School readiness is, therefore, both a result of socioeconomic position as well as a predictor of later socioeconomic position, the latter of which is clearly related to health outcomes. One way of interrupting this sequence is to weaken the relationship between parents' socioeconomic position and children's developmental outcomes through the provision of early childhood education.

This intervention has been implemented in many nations. Willms (23) shows that the link between socioeconomic position and developmental outcomes is weaker in nations with well-developed early childhood education programs. In response to such data, Evans et al (24) argue that establishment of a comprehensive early childhood development program in Canada would be the single best means of improving Canadian health outcomes.

Cumulative effects

Cumulative effects are illustrated by findings that the longer children live under conditions of material and social deprivation, the more likely they are to show adverse health and developmental outcomes. These can be cognitive deficits

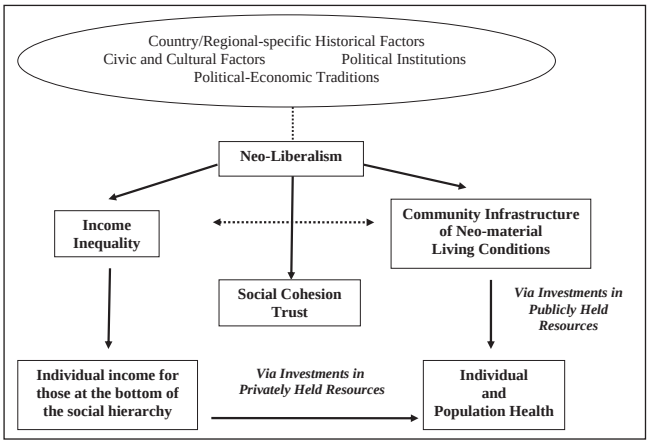

Figure 2) *A neo-material interpretation of national approaches to resource allocation. Adapted from reference 29*

that contribute to lack of school readiness for children (eg, physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication skills and general knowledge) on entering the education system (13). Cumulative adverse experiences during early childhood can predispose children toward learned helplessness in which children feel unable to act effectively on their world (25). Such helplessness is a strong determinant of health in general and a precursor of adopting health-threatening behaviours.

Hertzman and Power (15) suggest that the policy response provided by the latency argument is to intervene, 'the earlier the better'. The message of the pathways view is 'to intervene at strategic points in time'. The suggestion of the cumulative model is 'intervene wherever there is an effective intervention'. But these arguments beg two questions: "Why is such intervention required?" and "Why are there such great differences in life circumstances among Canadian children?" To answer these questions requires attention to the political economy of Canadian children's living circumstances.

THE POLITICAL ECONOMY PERSPECTIVE

> Canadians working in early child development often ask themselves, 'Why don't we just give up and move to Sweden?' (26, page 843).

While attempts can be made to intervene in the processes by which living circumstances come to shape health, perhaps the primary focus should be on understanding why Canadian children differ so much in their living circumstances. Should we not concern ourselves with reducing the variation that exists among Canadian children in income and wealth, food and housing security, and quality of community environments? Political economists argue in the affirmative, suggesting that health inequalities are actually health inequities because they are both 'unfair' and 'avoidable'.

The political economy approach extends the materialist and life-course approaches by examining how the broader social, political and economic context creates health advantageous or disadvantageous living conditions (27). Nations differ profoundly in how their institutions distribute income and wealth among the population and the extent to which governmental authorities allocate greater national resources to aspects of social infrastructure (28). (Social infrastructure indicators include spending on – and quality of – health care and social services, educational facilities and libraries, employment and training opportunities, and supports for the unemployed, those with disabilities or other forms of disadvantage.) Nations that have a more equitable economic distribution are also the ones that allocate more resources to social infrastructure, and it appears that these nations provide superior living circumstances and health outcomes for children (28). (Within the United States, for example, states that expend a greater percentage of revenues on these programs show superior health status than those spending less [28].)

Canada has a less skewed distribution of income and wealth among the population and spends somewhat more on social infrastructure than the United States. Not surprisingly, Canadian children enjoy better health than American children as measured by rates of infant mortality, low birth weight, teenage pregnancy and deaths from childhood injuries (see the first article in the present series). However, Canada does not do as well on these indicators as many European nations where distribution of economic resources is more equitable, low-income rates are lower and support for early childhood education is better.

Lynch (29) provides a model that, while developed initially to explain health-related effects of income inequality, illustrates many of these issues (Figure 2). Of special relevance for the health of Canadian children is the component of the model euphemistically termed 'individual income for those at the bottom of the social hierarchy'. This term refers to those living in poverty, and Canada's child poverty rates are among the highest of the member nations of the Organisation for Economic Co-operation and Development. Low income among children is associated with a range of health threats that can be understood through recourse to both van de Mheen's and Hertzman's models.

Children live in poverty as a result of decisions by societies on how to allocate resources. Children are poor as a direct result of their parents receiving low wages or if their parents are unemployed or on some form of social assistance, from rather limited benefits. In nations with greater inequality – this includes Canada – there is simultaneously limited investment in community infrastructure via investments in publicly held resources such as daycare, education, housing, public transportation and recreational facilities, among other areas (28). These limited commitments affect the health of children living in poverty most severely, but also affect many children who, for example, do not have access to quality early childhood education.

Greater income inequality and poverty rates are usually associated with societal messaging as to the benefits of neo-liberal public policy approaches to resource organization

and distribution. Neoliberalism is the belief that the marketplace – rather than governments' policy-making – should be the primary arbiter of how economic and other resources are distributed (30). It suggests limiting governmental intervention in a wide range of areas. However, nations that intervene more in influencing citizens' lives are more likely to enact policies that support children's health (28).

Figure 2 also depicts that whether a nation chooses to take this path is related to many factors such as history, traditions, institutions, and organization of civic society and culture.

These factors help to explain why nations such as Sweden, Norway and Denmark proactively act to meet the needs of children through provision of early childhood education and child care, poverty-reducing labour policies (ie, wage protection, employment training, etc), and provision of strong supports to families (eg, baby bonuses, housing subsidies, child care, etc), while Canada does less in these areas.

For readers who wish to place these issues in an even broader political economy perspective, Figure 3 introduces some issues that are taken up in later articles in the present series. Coburn (30) outlines how economic globalization – the integration of economies across national states and certainly an important Canadian public policy concern – is associated with both neo-liberal-oriented policy-making and the power of capital (investment monies) to shape public policy (Figure 3, label A). These forces interact with a nation's form of the welfare state and the market (Figure 3, label B) to create public policy approaches that shape the quality of living circumstances (eg, income inequality, poverty, and differential access to numerous social resources including work type, education, health care, housing, transportation, nutrition, etc) that are important determinants of children's health (Figure 3, label C). The end result of these public policy approaches is quality of health status and well-being as well as a nation's overall economic wealth (Figure 3, label D). Coburn's analysis draws attention to whether increasing emphasis on market approaches to public policy may be influencing – for the worse – the determinants of children's health.

A recent volume provides compelling evidence that this is the case (31). Income inequality among Canadian families is increasing, and the housing and food security situation of many Canadian families is declining. Minimum wages and social assistance levels are not keeping up with the rate of inflation. Indeed, the Organisation for Economic Co-operation and Development has identified Canada as one of the wealthy industrialized nations showing the greatest recent increases in family poverty and income inequality (32). Is children's health suffering as a result? As shown in the first article of the present series, there is evidence to suggest that this may be the case.

CONCLUSIONS

Materialist and life-course explanations focus on how Canadian children experience systematically different life circumstances that become translated into health differences. These processes involve the operation of latent, pathway and cumulative effects that link a variety of specific exposures to both child and adult health outcomes.

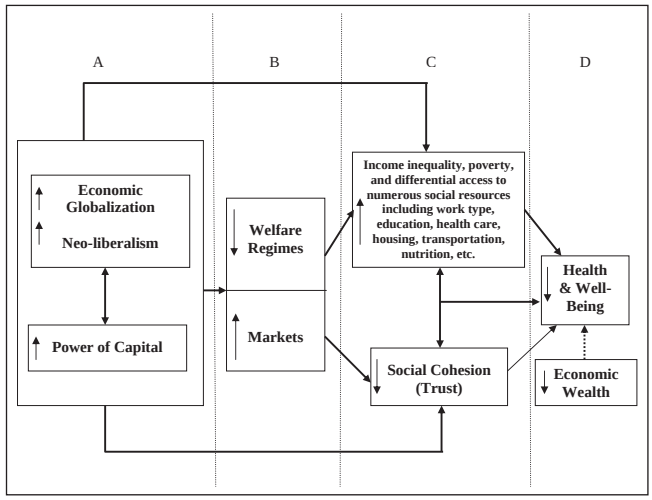

Figure 3) *Globalization, welfare states and population health. Adapted from reference 30*

Political economy explanations focus on how societies distribute resources to the population, thereby creating differences in living circumstances among Canadian children. There is evidence that Canada has greater inequality in children's living conditions than many other wealthy developed nations. These differences show themselves in generally poorer indicators of Canadian children's health compared with other wealthy developed nations.

Political and economic models place these issues in broader frameworks of economic distribution that are influenced by globalization and other forces. These latter models suggest the importance of understanding the nature of the welfare state in each nation and how this shapes public policy-making. These public policy activities influence the extent of inequality in living conditions and the health-related experiences of children in Canada.

In the next article of the present series, public policies that governments could implement to improve the living conditions of children are considered. These include policies that provide adequate income for families with children, develop family-friendly labour policies, implement active employment policies for parents requiring training and support, provide adequate social safety nets, and improve the provision of health and social services to children.

ADDENDUM 1: There is debate as to whether the focus should be on understanding the 'social gradient' by which health differences are seen across the entire distribution of factors such as income, wealth or education, or whether the focus should be on the situation of those at the bottom of these distributions, eg, those living in poverty. Adopting the first course of action can lead to a greater understanding of how determinants work at a variety of levels but may also lead to a minimizing of the very adverse, unhealthy and unpleasant living situations of those at the bottom of the distribution.

ADDENDUM 2: Unhealthy attitudes and behaviours are also seen as reflecting the adoption of maladaptive coping mechanisms in response to material and social deprivation. The psychosocial and cultural/behavioural explanations are attractive to many because they suggest that interventions at these levels can be effective in promoting health and preventing illness even if the material conditions of the lives of citizens cannot be improved. It may be that such efforts will generally be ineffective without substantially improving the material quality of people's lives (31).

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