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The Effects of Deficits in Health Status in Childhood and Adolescence on Human Capital Development in Early Adulthood

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Skills and Knowledge for Canada's Future: Seven Perspectives Towards an Integrated Approach to Human Capital Development

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Abstract / Executive Summary

Economists define human capital as the acquired skills and knowledge an individual can draw upon to generate outputs of value. Human capital may be applied to generate value in the labour market, or may applied to produce other valued individual or societal outcomes such as improved personal health or active civic engagement.

An important portion of human capital is acquired in childhood and adolescence, as a result of both formal education and the socialization experiences provided by families and peer groups. It is plausible to expect that health status in childhood and adolescence will influence human capital development, primarily through effects on educational attainment. Children with poor physical or mental health may be impaired in gaining maximum benefits from primary and secondary schooling and may have lower expectations for postsecondary educational attainment. Children with robust physical and mental health may have more energy and personal resources for responding to the relatively high expectations of the current education curriculum. These differences in the opportunity to gain human capital, determined by health status, have the potential to shape, in part, the socioeconomic mobility opportunities of individual birth cohorts.

In the paper, we review evidence of consequences to human capital acquisition for a selected range of child and youth health status and behavioural function measures: fetal alcohol exposure, lead exposure, low birth weight, delayed growth, childhood behavioural disorders and childhood functional limitations. The review presented in this section is not comprehensive. The health conditions are selected to indicate the importance of examining health status factors at specific stages of childhood in understanding the consequence for human capital development.

None of the health conditions described in this review has a high prevalence. For example, Fetal alcohol syndrome may affect 2-5 children per 1,000, the incidence of low birth weight is approximately 50 per 1,000 children and the prevalence of behavioural disorder is in the range of 50-80 per 1,000 children. It is important, however, to note that there is significant evidence for long-term effects on human capital attainment for each of the child health status factors considered in this review. While the prevalence of any one condition may be low, the cumulative prevalence of all childhood disorders that may have consequences for human capital attainment will be in the range of 15-25 percent of the population of children.

The paper concludes with a discussion of the policy implications of these findings. First, the paper notes that cross-national comparisons of literacy outcomes in late adolescence show clearly that public policy interventions can mitigate the effects of childhood health status deficits on human capital attainment. Second, these policy responses require intersectoral collaboration, integrating family policy, social welfare policy, education policy and public health policy and practice. Finally, these policy responses will be most successful if resources are targeted to the most vulnerable households and children.

1. Introduction

Economists define human capital as the acquired skills and knowledge an individual can draw upon to generate outputs of value. Human capital may be applied to generate value in the labour market, or may be applied to produce other valued individual or societal outcomes such as improved personal health or active civic engagement.

An important portion of human capital is acquired in childhood and adolescence, as a result of both formal education and the socialization experiences provided by families and peer groups. It is plausible to expect that health status in childhood and adolescence will influence human capital development, primarily through effects on educational attainment. Children with poor physical or mental health may be impaired in gaining maximum benefits from primary and secondary schooling and may have lower expectations for postsecondary educational attainment. Children with robust physical and mental health may have more energy and personal resources to respond to the relatively high expectations of the current education curriculum. These differences in the opportunity to gain human capital, determined by health status, have the potential to shape, in part, the socioeconomic mobility opportunities of individual birth cohorts.

In this paper, we assess the evidence for the influence of health status deficits in childhood and adolescence on human capital attainment. As will be outlined in the following sections of this paper, we define health status deficits broadly. Health status deficits include physical, mental and/or cognitive deficits arising from injury or insult during gestation and birth. Deficits in physical and/or mental health can also arise from physical or toxicological injury during periods of heightened developmental vulnerability in early childhood. Injury to physical or cognitive function can occur during later periods of childhood and during adolescence. This paper also takes the perspective that deficits in behavioural development, represented by syndromes such as hyperactivity or conduct disorder, also represent deficits in health and function, broadly defined.

We apply this definition of health to review a sample of the epidemiologic literature in two primary areas: 1) the potential for specific health status deficits to influence developmental outcomes (with the potential for these deficits in developmental outcomes to influence human capital attainment), and 2) the empirical evidence from longitudinal studies that have followed cohorts of children into adulthood to estimate the magnitude of effects on educational attainment and occupational attainment attributable to health status deficits in childhood.

One perspective advanced in this paper is that the influence of child health status on human capital development is poorly understood and therefore given limited recognition in policy deliberations (52). There are strong macroeconomic imperatives for ensuring optimal human capital development outcomes in Canadian society. The aging population profile will increase the productivity expectations of active labour force participants. As the labour market demand for knowledge workers increases and the demand for manual labour declines, child and adolescent health status deficits in the cognitive and behavioural domains may become

increasingly consequential for understanding differences in young adult occupational attainment and labour force success.

In studies of the relationship between health and socioeconomic attainment and mobility, the effects of health on socioeconomic status are termed “health selection.” Health selection arises when current health status influences future socioeconomic status. For example, healthy individuals may be more successful and unhealthy individuals may be less successful in ascending socioeconomic hierarchies. As a further example, the onset of an illness resulting in work disability in an adult of working age can frequently result in a decline in socioeconomic position.

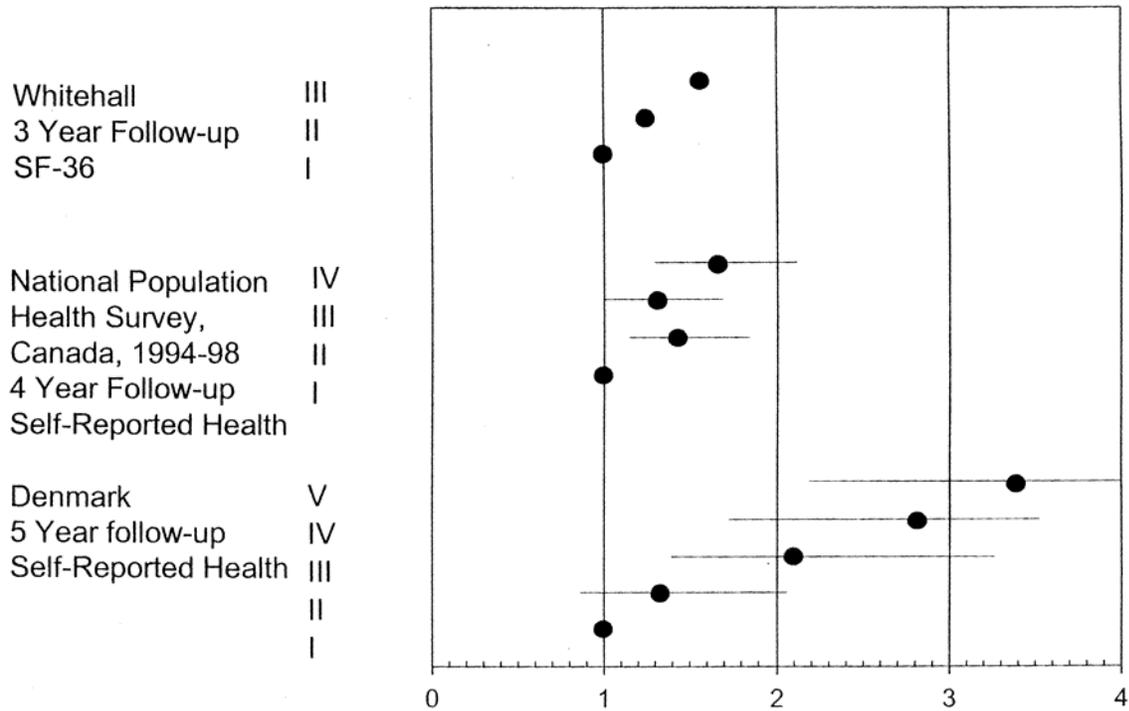
The Black Report, published in the United Kingdom in the early 1980s, first drew attention to the impact of health selection effects in accounting for observed socioeconomic health inequalities in the United Kingdom (1-2). Socioeconomic health inequalities in adult populations are frequently described as gradients. A gradient in population health status describes a monotonic pattern of increasing morbidity and risk of mortality with decreasing rank order in a socioeconomic hierarchy. There are a wide range of factors that produce socioeconomic health status gradients in populations. There is, for example, robust evidence, emerging from longitudinal observational studies of working age adults, that exposures embedded in work experiences are important causes of the development of gradients in health status across occupational groups ranked by socioeconomic position (54-56). There are a small number of prospective studies of young adults entering the labour market that have documented the health effects of adverse exposures in these early labour market experiences (57-62). Figure 1 depicts the emergence of differences in health status over three to five years of follow-up among three large samples of labour force participants in equivalent health at the beginning of the study period (51). In each of the Danish, British and Canadian samples, workers in lower-ranked occupations were more likely to report a decline in their health status over the follow-up period relative to workers in the highest-ranked occupations.

The general pattern of findings from this research has confirmed that health-related social mobility effects exist, confirming that health status deficits in adulthood can have consequences for adult socioeconomic mobility. This evidence also indicates that health selection effects account for no more than 10-20 percent of the socioeconomic health status gradient observed in most developed country populations (2-8). The dominant process responsible for creating socioeconomic health status gradients in populations arises from the effects of socioeconomic disadvantage on health status. Most of this research on health-related social mobility has examined cohorts of working age adults and has therefore described the impact of health selection on socioeconomic mobility within the adult period of the life course.

There has been less attention paid to health-related social mobility between childhood and adulthood, where childhood health status might influence adult socioeconomic attainment. The growth of this area of inquiry has required the development of longitudinal research cohorts integrating measures of biology, behavioural development and health status and human capital attainment across the life course (13-17), novel conceptual frameworks (18) and new approaches to the analysis of stability and change in health at different stages of life. Given the complexity of mounting prospective cohorts that have enrolled subjects in childhood and

maintained follow-up into adulthood, there are relatively few sources of information on the influence of child and adolescent health on socioeconomic mobility outcomes in adulthood (9-12).

Figure 1 Odds Ratio for Decline in Health Status



Source: Mustard C.A., J. Lavis, and A. Ostry. 2005. "New Evidence and Enhanced Understandings: Labour Market Experiences and Health. In *Creating Healthier Societies: From Analysis to Action*, edited by J. Heymann, C. Hertzman, M. Barer, and R. Evans. New York: Oxford University Press, chap. 7, 173–201.

2. What Does Existing Research Tell Us About the Influence of Childhood Health on Human Capital Development?

There are a limited number of cohort studies that have measured health status in a representative sample of children and followed these children into adulthood. The UK National Child Development Study (NCDS), a cohort of 17,414 children born during a single week in 1958, has reported extensively on health-related social mobility (19-21). In Canada, the Ontario Child Health Study (OCHS) enrolled a sample of 3,200 children in 1983. These cohort members have recently been followed into adulthood, at ages 22-34 (22-23). Both the NCDS and the OCHS obtained measures of parental socioeconomic status, emotional and behavioural function and physical health in childhood as well as social and economic characteristics and measures of health and function obtained in early adulthood. Results reported from both cohorts have found health selection effects (24-27). At labour market entry, cohort members with poor health were more likely to be downwardly mobile and less likely to be upwardly mobile relative to their healthier peers over the follow-up period (intergenerational mobility).

In addition to this small but important body of literature based on long follow-up studies from childhood to adulthood, there is a larger body of literature that has estimated the impact of specific disorders and syndromes in childhood on pediatric and youth developmental outcomes. There are a range of disciplines contributing to this evidence. Epidemiologists are typically concerned with health outcomes, and so more attention has been spent examining the impact of child health on adult health rather than on human capital acquisition. Among social epidemiologists, there is a literature linking child health to the emergence of social inequalities in health in adulthood. Part of this literature describes the impact of child health on human capital acquisition. Pediatric epidemiology and the epidemiology of readiness to learn also contain findings relevant to human capital acquisition.

There are important definitional issues in examining the effect of child health on adult human capital acquisition. Aspects of childhood cognitive, emotional or behavioural health may be precursors of adult human capital as well as a component of adult human capital. So, for example, a childhood behavioural disorder like hyperactivity may lead to impaired academic performance in school, resulting in lower educational attainment in adulthood. This example is a model of pathway effects. Alternatively, hyperactive disorders in childhood may persist into adulthood as impulsive personalities with the potential that this adult trait impairs success in the labour market and in other socially desirable outcomes. In the remainder of this paper, the reader may generally assume that we are presenting evidence for pathway effects linking childhood health status to adult human capital.

In the following section, we review evidence of consequences to human capital acquisition for a selected range of child and youth health status and behavioural function measures. The review presented in this section is not comprehensive. The specific health conditions represented in the following discussion are not necessarily the most consequential for human capital attainment nor are the conditions represented the only pediatric health impairments that may influence human capital attainment. The health conditions are selected to indicate the importance of

examining health status factors at specific stages of childhood in understanding the consequence for human capital development.

2.1 Fetal Alcohol Exposure

Fetal alcohol spectrum disorder (FASD) refers to the range of outcomes associated with all levels of fetal alcohol exposure. Sokol et al. (48) have reviewed the evidence on its consequences and the disease burden in the United States. In addition to physical effects, FASD can include longer reaction times, inattention, hyperactivity and developmental delay at preschool ages; learning problems, attention and impulsivity problems, memory deficits, distractibility, restlessness, lack of persistence and mood disorders during school ages; and attention problems, executive functioning deficits leading to difficulty with problem solving and functioning in everyday life, adult antisocial syndrome, and alcohol, drug and nicotine dependence in adulthood. Alcohol exposure is considered the most common cause of mental retardation and the leading preventable cause of birth defects in the United States. While fetal alcohol exposure is difficult to measure, it is currently thought that social drinking levels during pregnancy can lead to reduced academic and social functioning in exposed children. FASD is associated with low socioeconomic status, older mothers, and in the United States strongly with African-American and especially with American Indian/Alaska Native status.

It has proven difficult to precisely estimate the incidence of FASD because exposure (alcohol consumption) is difficult to measure and the signs and symptoms of FASD are easily overlooked. One estimate suggests the incidence of FASD may be as high as 1 in 100 births in the United States (48). Fetal alcohol syndrome, or FAS, involves more severe symptoms, and is thought to have an incidence rate between 0.5 and 2 per 1,000 births in the United States (28, 39). There is some evidence that the United States has unusually high incidence rates (28), but there is no national estimate for Canada (31). However, unless there is a large, unmeasured disease burden, the relatively low prevalence of both FAS and FASD means that these disorders will not be significant factors in human capital acquisition in the general population.

2.2 Childhood Lead Exposure

Compared to fetal alcohol exposure, childhood lead exposure is easier to measure, and therefore better understood. The mechanisms and consequences of lead toxicity have been reviewed by Lidsky et al. (38). Lead can substitute for calcium in many biochemical processes, and many of its diverse toxic effects can be traced to this property. Once absorbed, lead persists in the blood for weeks, in the brain for years and in bone for decades. Children can be exposed environmentally, by breastfeeding and during gestation. Since lead accumulates in bone, it can contaminate the fetal blood supply and breast milk years after maternal lead exposure ends. This maternally-derived lead can be the dominant source of fetal lead poisoning. Environmental lead exposure during childhood occurs by respiration and ingestion. Children are especially sensitive to lead toxicity. They absorb lead more efficiently by ingestion, and once absorbed, a greater amount reaches the brain as compared to adults, particularly before the age of 5. The developing nervous system is also much more vulnerable to lead toxicity.

Although only high levels of exposure produce identifiable physical symptoms, lower levels of exposure remain neurotoxic. Among the consequences of lead toxicity are lowered IQ, impaired neuropsychological functioning and impaired academic achievement. Since parental socioeconomic status is negatively associated with lead and positively associated with IQ, researchers have attempted to isolate the effect of lead. There is evidence, however, that lead has greater effects on children who are socioeconomically disadvantaged, which would mean that previous studies may have underestimated its effects in these children.

One possible mechanism by which social disadvantage might exaggerate the toxicity of lead is that deficiencies in iron, calcium, zinc and protein increase lead absorption, and these deficiencies are more likely in disadvantaged children. Nondietary mechanisms, however, are needed to explain the observation that lead-exposed rat pups show neurological damage and spatial learning deficits if they are raised in isolation with little stimulation, but if exposed to the same amount of lead and raised in groups with enriched environments, they were largely protected (46).

It should also be noted that global tests such as IQ, which is the most common outcome in studies of childhood lead exposure, are insensitive to many forms of brain damage, and neuropsychological tests of more focused aspects of cognitive function typically reveal greater effects. Social and behavioural problems may be a result of lead poisoning, or might be a consequence of reduced cognitive function and academic difficulty. However, in a study of pre-school-aged children who could not yet have experienced academic difficulty, their social/emotional functioning scores on the Bayley Scales of Infant Development were negatively associated with lead exposure.

The impact of lead on human capital acquisition in the general population will have changed substantially over the last several decades, since efforts to reduce environmental lead have been successful and child blood lead levels have decreased accordingly (49). However, recent research suggests that while IQ decreases with increasing lead exposure, the drop in IQ is steepest at the lowest levels of exposure, such that considerable toxicity occurs below levels officially considered safe in most jurisdictions (35). It is now thought that there is no safe level of lead exposure.

2.3 Birth Weight

Birth weight is determined by gestational weight gain and by gestational age at birth, and one should try to distinguish between newborns who are light for gestational age and those who are premature. It is also important to distinguish between the consequences of unusually low birth weight and relationships that occur throughout the normal range of birth weights. One of the difficulties in research on the consequences of birth weight is discriminating between birth weight as a consequence of the fetal environment and birth weight as an indicator of subsequent growth patterns. This distinction is important for understanding mechanisms and proposing interventions.

Many aspects of physiology are determined during gestation in response to the uterine environment. For example, there is evidence that the number of muscle fibres is determined

during gestation, and that although each fibre can grow larger through exercise, this does not fully compensate, so that grip strength in midlife is positively associated with birth weight, independently of postnatal, childhood and adult body size (34).

In the British 1946 birth cohort, Richards et al. (43) observed that birth weight was associated with increasing cognitive function at age 8, and that these differences in cognitive function persisted at ages, 11, 15, 26 and 43. They also observed that birth weight was associated with increased educational achievement in a manner consistent with hypothesized mediation by childhood cognitive ability. Further analyses showed that this relationship was independent of subsequent body size (44).

In the 1958 British Birth Cohort, Jefferis et al. (33) observed that birth weight was positively associated with both math scores and achieved education level. This association was independent of parental social class, parental education, parity, gestational age, maternal age and breastfeeding. They noted, however, that the effect of birth weight on achieved education level was smaller than that of social class, and that the effect of birth weight was constant over time whereas that of social class increased during childhood. The effect of birth weight also did not depend on parental social class, nor did the effect appear to be the result of disability or preterm birth.

Unlike many measures of poor child health which have showed declining temporal trends in incidence and prevalence, the incidence of low birth weight has generally remained unchanged in most jurisdictions. The current incidence of low birth weight in Canada is approximately 5 per 100 births. The incidence is approximately 1.5 to 2 times greater among lower socioeconomic status women compared to higher socioeconomic status women (53). Relative inequalities in low birth weight between social classes in England and Wales did not change over the period 1993-2000, a period of rising incidence of low birth weight (41).

2.4 Breastfeeding

Breastfeeding is thought to promote cognitive development, and thereby educational achievement, by supplying specific long-chain fatty acids needed for brain and eye development during gestation and the first year of life which the infant cannot produce for itself after birth (45). Childhood and adolescent cognitive ability is associated with length of breastfeeding independent of parental commitment to education (29). At age 53, word-reading ability remains associated with length of breastfeeding, but this appears to be mediated by adolescent cognitive function and educational achievement (45).

2.5 Delayed Growth and Rates of Maturation

Delayed growth is likely to be due to poor nutrition, which is growth-limiting, and to disrupted sleep patterns, which reduce growth hormone secretion. Since nutrition and sleep are needed for physical, cognitive and emotional development, as well as for academic success, it may be that delayed growth is indicative of an important role for childhood health in intergenerational social mobility (40). Dose-response relationships between air pollution and child growth have also been observed, but the mechanisms, if any, that would explain this association are

unknown (30). However, it may be that delayed growth is merely a marker of parental socioeconomic status with greater precision than that of survey indicators such as parental occupational status and household crowding, such that the association between delayed growth and achieved socioeconomic status is due to residual confounding by parental socioeconomic status (40). Because of the complexity of the putative mechanisms, and the difficulty of accurate and precise measurement of the relevant factors, causal inferences remain speculative.

Boys who grow slowly, as measured by their height at age 7, achieve lower levels of educational qualification and show a greater number of unemployment spells of three months or greater between the ages of 22 and 32. This association with unemployment does not appear to be due to social class at birth, household crowding, parental height, adult height (delayed growth is not always accompanied by decreased adult height), achieved education, behavioural problems at age 11 or chronic illness or disability in youth (40).

Rapid childhood growth appears to increase, and late adolescent weight gain to decrease, cognitive function in early adulthood, and some plausible neuroendocrine pathways have been proposed to connect childhood skeletal growth and cognitive development (43).

Although delayed growth rates do not necessarily imply short adult stature, in the 1958 British Birth Cohort it appears that the positive association of height and occupational status at age 23 cannot be fully explained by the father's occupational class at birth or age 16 (42). This finding may reflect a mechanism by which both human capital acquisition and adult height are limited by childhood health factors (37).

2.6 Childhood Behavioural Maladjustment

Like delayed growth, boys' behavioural maladjustment at age 11 also predicts unemployment at ages 22 to 32. Here the mechanisms may be more obvious, since behavioural maladjustment at age 11 likely precedes poor technical and social job performance (40). Using data from the Ontario Child Health Study, Mustard et al. (24) observed that hyperactivity at ages 4-16 was associated with decreased upward occupational mobility in young adulthood for boys, with decreased upward educational mobility for boys and girls, and with increased downward educational mobility for boys. Hyperactive disorders affect 5-8 percent of children. Emotional problems at ages 4-16 were associated with increased downward occupational mobility in young adulthood in girls, decreased upward educational mobility in girls and boys, and with increased downward educational mobility in boys.

Indirect evidence of a similar mechanism is provided by the history of abortion and crime in the United States (32, 36). Abortion was legalized in the United States in 1973 (five states legalized abortion in 1970), and crime rates dropped dramatically in the 1990s when a sharp reduction in the number of unwanted boys aged 18-24 may have occurred. Birth rates fell by approximately 5 percent with the legalization of abortion, and the decrease was greater among teenage and minority women. By 1980, 1.6 million abortions were being performed annually. The number of infants put up for adoption also decreased dramatically. The decreases in crime appear to be timed according to the date of legalization across states, and the magnitude of the crime decrease appears to be proportional to the number of abortions. Canadian data have

shown a similar effect (47). Behavioural maladjustment, to which parental commitment can contribute, appears to be a predictor of poor labour market performance, of which criminality is an extreme example.

2.7 Illness that Interrupts Education

Using data from the 1958 birth cohort, self-rated health and extended sickness absence from school at age 16 was examined for its association with parental occupational status at age 16 and with the cohort's own occupational status at ages 23 and 33. Modest health-related effects on mobility during the two periods are observed for men, but not for women (19). Two methodological concerns with this evidence are whether occupational status at ages 23 and 33 are equally valid as measures of socioeconomic trajectory and whether there is residual confounding by parental socioeconomic status.

2.8 Functional Limitation

Functional limitations are defined as impairments in sensation, anatomy or physiology that result in limitations in normal function. Vision deficits, for example, can result in limitations in reading and mobility functions. Functional limitations were reported by 10.6 percent of subjects in the Ontario Child Health Study. These limitations were not associated with occupational mobility, but were associated with increased downward and decreased upward educational mobility in boys, and a similar, but weaker and not statistically significant pattern was seen for girls (24). Using the same data, Boyle et al. (25) estimate that a functional limitation in 1983 (at ages 4-16) is associated with about 1 year less educational achievement when adjusted for a wide variety of child, family and neighbourhood factors.

3. Discussion

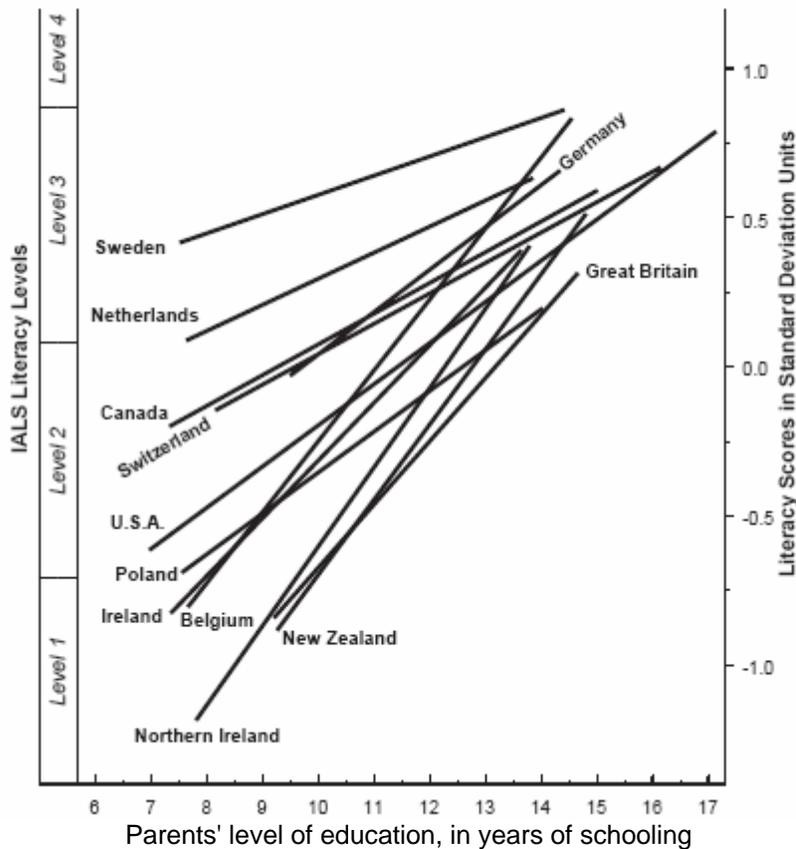
In summary, this review has considered evidence for the long-term persistence of health status deficits in childhood on human capital attainments in young adulthood. The review has considered only a selected range of dimensions of child health. Of the factors reviewed, none has a high prevalence. For example, fetal alcohol syndrome may affect 2-5 children per 1,000, the incidence of low birth weight is approximately 50 per 1,000 children and the prevalence of behavioural disorder is in the range of 50-80 per 1,000 children.

While the prevalence of any one condition may be low, the cumulative prevalence of all childhood disorders that may have consequences for human capital attainment will be in the range of 15-25 percent of the population of children. Of equal importance, there is significant evidence for long-term effects on human capital attainment for each of the child health status factors considered in this review.

4. Policy Implications

This paper will now turn to a focus on the primary policy approaches that have been applied in developed country settings to mitigate the effects of health status deficits in childhood on human capital attainment.

Figure 2 : Socio-economic gradients for youth literacy scores for 12 countries that participated in IALS by 1997.



Source: Willms, J. Douglas. 2003. "Literacy Proficiency of Youth: Evidence of Converging Socio-economic Gradients." *International Journal of Educational Research* 39: 247-252.

There is good evidence that some of the negative impact of these health status deficits can be mediated by social, educational and clinical interventions. One important body of evidence comes from cross-national comparisons of human capital attainment. Some of the most interesting work in this field has been done by Douglas Willms, comparing literacy in youth at age 16 across socioeconomic status groups for a sample of 12 OECD countries (52). This work shows that some countries have achieved relative equality in literacy achievements across socioeconomic groups (Sweden and the Netherlands) while other countries have human capital outcomes which are very unequal across the socioeconomic hierarchy (Figure 2). Willms's

work has also shown that gradients in literacy converge at higher levels of socioeconomic status in the developed economies. In other words, youth from relatively advantaged backgrounds tended to have high literacy scores in every country, or in every jurisdiction within a country, whereas, across countries, youth from less advantaged backgrounds tended to vary considerably in their literacy skills.

Socio-economic gradients in developmental outcomes such as literacy are a useful tool for informing policy, as they call attention not only to the level of learning but also to inequality in the distribution of literacy skills. The analyses of socio-economic gradients in literacy skills provides good evidence that it is possible to achieve both high levels of proficiency and equality of proficiency among groups of differing socio-economic status.

What are the characteristics of an effective policy approach to mitigating the factors that impair societal achievement in literacy attainment in early adolescence? These factors include attributes of the household environment, the nature and quality of publicly provided resources and programs, and the health and function of children and adolescents. Willms has stated that “raising the literacy bar requires a comprehensive policy strategy aimed at safeguarding the health development of infants, strengthening early childhood education, improving the learning environments in schools and local communities, reducing segregation and the effects associated with poverty and creating a family-enabling society”(53).

This summary points to two key features of the policy response to inequalities in child and adolescent developmental outcomes relevant to optimal human capital formation. The first characteristic is the intersectoral policy requirement, integrating family policy, social welfare policy, education policy and public health policy and practice. The second characteristic points to the importance of targeting programs and resources to high-risk and or vulnerable households and children.

On both dimensions, Canada has a record of accomplishment. The National Child Benefit is a strong example of intersectoral policy-making with a strong emphasis on targeted programs. The National Child Benefit (NCB) initiative is a partnership among the federal, provincial and territorial governments and First Nations that aims to help prevent and reduce the depth of child poverty, support parents as they move into the labour market and reduce overlap and duplication of government programs. The NCB combines two key elements: monthly payments to low-income families with children and benefits and services designed and delivered by the provinces and territories to meet the needs of families with children in each jurisdiction. Under the NCB, the Government of Canada has increased the benefits it pays through the NCB Supplement to low-income families with children, regardless of their source of income. Provinces and territories have the flexibility to adjust social assistance or child benefit payments by an amount equivalent to the NCB Supplement. Expenditures reductions on social assistance benefits are expected to be allocated by provinces and territories to pay for new and enhanced benefits and services for low-income families with children. The extent to which these reallocations have been made is unevenly documented across provincial and territorial jurisdictions and there is little known of the impact of these reinvestments. The NCB seeks to reduce provincial expenditures on social assistance and income security programs. The key

feature of the federal-provincial agreement is that these provincial resources are to be reallocated to provide child development services to low income households.

A good example of a public program targeting resources to high-risk and vulnerable households is the federal Canadian Prenatal Nutrition Program (CPNP). CPNP funds community groups to develop or enhance programs for vulnerable pregnant women. Through a community development approach, the CPNP aims to reduce the incidence of unhealthy birth weights, improve the health of both infant and mother, and encourage breastfeeding. CPNP enhances access to services and strengthens intersectoral collaboration to support the needs of pregnant women facing conditions of risk. As a comprehensive program, the services provided include food supplementation, nutrition counselling, and support, education, referral and counselling on health and lifestyle issues. CPNP targets those women most likely to have unhealthy babies due to poor health and nutrition. Over 95 percent of projects target pregnant women living in poverty, teens, or women living in isolation or with poor access to services. Other client groups targeted include women who abuse alcohol or drugs, women who live with violence, women with gestational diabetes, Aboriginal women, and immigrant and/or refugee women.

In 2001/02, over 44,650 women participated in CPNP projects. The annual budget for the non-reserve portion of CPNP was \$30.8 million as of 2002/03. Prior to the establishment of the Public Health Agency of Canada, there were approximately 350 CPNP projects funded annually by the Population and Public Health Branch of Health Canada serving over 2,000 communities across Canada. In addition, over 550 CPNP projects are funded by the First Nations and Inuit Health Branch of Health Canada in Inuit and on-reserve First Nations communities.

5. Implications for Future Research Directions

There are perhaps two primary priorities for future research directions arising from the perspectives offered in this paper.

First, more emphasis should be given to the development of longitudinal population surveys that integrate health and function measures with labour market participation measures. Canada has strong national longitudinal survey programs measuring health and function (The National Population Health Survey and the Longitudinal Survey of Children and Youth), and separately, strong survey programs in labour force participation (the Survey of Labour and Income Dynamics). The current weakness of these national survey programs is that these two strengths are not integrated. In Canada, this could be accomplished by continuing the NLSCY, supplementing the SLID measurement of health and function among respondents aged 15-24 or further strengthening the NPHS labour market measures. A very important benefit of extending the NLSCY into the early adult life course period will be the creation of a research database that will support understandings of the pathways leading from childhood health status to early adult human capital attainment.

Second, there is an ongoing need to assess the economic consequences of public policies focused on mitigating the impact of social, economic and health disadvantage on child and adolescent developmental outcomes. Large F/P/T programs (such as the National Child Benefit) have a wide range of potential social, economic and developmental outcomes. Accurately measuring the costs and consequences of these programs and precisely attributing program effects is an important research mandate in support of strengthened policy development in this area.

Table 1: Childhood health factors by stage of life course and dimensions of human capital and their sequelae in young adulthood.

Since health is an important part of human capital, factors such as cognitive function might be both predictors and outcomes, particularly at secondary school age.

Fetal →	Perinatal →	Preschool →	School →	Young Adulthood
Alcohol Tobacco Illicit drugs Disease Injury Growth Abortion Maternal age Maternal nutrition Lead	Birth weight Gestational age Ponderal index	Breastfeeding Growth Nutrition Serious injury Serious illness Hearing Sight Lead exposure Exercise Emotional health Behavioural health Psychosocial stress Pregnancy	Cognitive function Growth Nutrition Serious injury Serious illness Academic success Sickness absence Sight Hearing Exercise Emotional health Behavioural health Psychosocial stress	Cognitive function Educational achievement Labour market attachment Occupational status Earned income Workplace disability Emotional health Behavioural health

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