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Income Inequality and Inequality in Health: Implications for Thinking About Well-Being

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**Income Inequality and Inequality in Health:
Implications for Thinking About Well-Being**

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Abstract

The constituents of wellbeing are understood to have a number of discrete dimensions: security of person, access to material resources, access to leisure pursuits and optimal physical and psychosocial health are a number of the more prominent constituents. Relying on a brief synthesis of the large empirical literature on the relationship between income and health, this paper draws attention to a strong and consistent dependence between the material resources available to an individual and individual health. The paper presents evidence to argue that on a population basis the causal direction of this relationship is dominated by the pathway from income to health status, rather than the opposite pathway, where health status determines income through effects on educational attainment and tenure of labour force participation.

In addition to the well-established relationship between an individual's access to material resources and individual health, the paper also summarizes evidence from an emerging body of empirical work which documents a relationship between the income distribution profile in a country, a structural characteristic of the economy, and the health of individuals. This evidence adds important nuance to the simple assumption that a rising economic tide lifts all boats evenly, and has implications for the emphasis given to policies which alter the distribution of income in mature market economies.

Introduction

Along with dimensions such as security of person, access to material resources and access to leisure pursuits, optimal physical and psychosocial health is a prominent constituent of the concept of well-being. This paper presents a brief summary of what we know about the consequences for health which arise as a result of an individual's position in the social hierarchy and of the distributional profile of material resources in a society. This paper will draw attention to a strong and consistent dependence between material resources and health. The paper will present evidence to argue that on a population basis the causal direction of this relationship is dominated by the pathway from income to health status, rather than the converse pathway, whereby health status determines income through effects on educational attainment and tenure of labour force participation. In addition, the paper will summarize a body of recent population health literature which is indicating that health may reflect the influences not only of absolute material resources, but also the relative distribution of material resources in a society.

Income and Health

Socioeconomic inequalities in health status are ubiquitous in industrialized countries. Rates of all-cause mortality, premature mortality and cause-specific mortality are consistently found to be lowest among the highest income members of a population and highest among those with the lowest levels of income. Societies

with steep gradients in income distribution have steep gradients in the distribution of health status. The incidence of infectious disease, the prevalence of chronic disorders and the prevalence of disability is also distributed inversely to income in developed economies. These broad patterns have been invariant over time, and seem to be unrelated to international differences in both the GNP share allocated to health care services and the mechanisms of finance, organization and delivery of health care.

To illustrate this phenomena, we provide three brief snapshots of the relationship between health and socioeconomic status in Canadian populations. Figure 1 reports the distribution of premature mortality (deaths to persons before age 75) for the population of Winnipeg classified to five equal sized groups on the basis of average neighbourhood income (22). Figure 2 reports the mortality experience for a complete cohort of Canadian males in the five years after age 65, classified on the basis of average earnings in the ten year period prior to retirement (2). Both examples illustrate the consistent pattern of increasing risk of mortality with declining material resources and emphasize that this pattern is a linear gradient, rather than a threshold effect associated simply with the insufficiency of material resources associated with poverty. While both of these examples use income as the measure of place in a social hierarchy, it is not at all clear that the implied material explanation is the sole or even the dominant mechanism at work.

Figure 3 reports results from the 1994 National Population Health Survey, showing the distribution of self-reported perceived health status (measured on a five point Likert scale: excellent, very good, good, fair and poor) and a composite index of health status (the Health Utilities Index) in relation to income decile (18). These results, adjusted for age differences over the income decile distribution, emphasize again the negative income gradient in health status.

There are a limited set of explanations for these observed associations. These examples can potentially be explained by a pathway which runs from health to socioeconomic status. In this framework, biological differences in vitality and health among individuals acts as a primary mechanism selecting working age adults into high, median and low income occupations and as a corollary mechanism, the onset of illness or disability will impair labour force participation for some individuals, resulting in downward socioeconomic migration. A competing explanation argues that the physical and material conditions of life, which are determined by occupational opportunities in working age adults, set the context in which individuals' health is determined and that relative deprivation in income or wealth produces relative deprivation in health and longevity. A third explanation diminishes the importance attached to material resources in producing health consequences, and argues instead

that the socioeconomic gradient in health status is the result of differences in the distribution of freely chosen health-damaging behaviors across income groups.

A large body of empirical research in the fields of epidemiology and population health have established that the effects of the socioeconomic distribution of health behaviors such as smoking and alcohol consumption do not account for a dominant component of the socioeconomic health gradient in developed societies. Similarly, while health selection effects can be demonstrated (and are dominant in the case of some disorders, such as serious mental health disorders) these effects have been shown to account for only a minority share of any observed socioeconomic health gradient.

The socioeconomic health gradient in Canada has been shown to be temporally persistent. Russell Wilkins, in comparing relative mortality across neighbourhood income rank for two time periods (1971 and 1986) for urban populations, found that while life expectancy increased over this period, the relative risk of mortality between the top and the bottom neighbourhood income quintiles did not moderate (1,3). It is important to note that this period of unchanging socioeconomic mortality differences coincides with the public policy experiment of universal health care insurance. Figure 4 also illustrates two additional patterns regularly observed in analyses of socioeconomic status and

health: first, that income-related gradients appear steepest in the middle period of the lifecourse, and second, that the socioeconomic gradients for males are steeper than those for females (24).

A final example to complete this necessarily brief overview is presented to illustrate that there can be significant temporal dynamics in the socioeconomic distribution of health. Figure 5 reports premature mortality rates for 12 regional health authority populations in Manitoba for two time periods (1985-89 and 1990-94) (23). Over these two time periods, life expectancy in Manitoba increased, displaying the simple correlation with economic growth that is consistently observed in developed countries. However, against this background of improvements in health status measured at the provincial level, there was strong evidence of widening inequality in health at the sub-provincial level. The two regions with the worst health status (indicated by premature mortality) in the period 1985-89 experienced a decline in health status over the subsequent observation period.

Does the Magnitude of Income Inequality have Consequences for Health?

The previous section briefly sketched the strong correlation between income (or other markers of socioeconomic status such as education and occupation) and health within countries. In something of a paradox, the correlation between GNPpc and health

is very weak in analyses comparing developed economies. Richard Wilkinson, in focusing on this paradox, has drawn attention to a number of issues (7,15,16,17). Figure 6 draws out two observations concerning the relationship between national income and health, observations which dispute the assumption that changes in national material circumstances are directly and linearly related to improvements in health. The first observation asks why a constant level of material resources (for example 5K income per capita) associates with different levels of life expectancy across birth cohorts. The second observation asks why, on a cross-national basis, the relationship between income and health tends to flatten with increasing levels of income.

A plausible explanation for the first observation rests with failure of price indices (which are a primary means of producing scales of economic resource equivalence over time) to adequately adjust for qualitative changes arising from economic growth. Work on the inadequacies of price indices has established that improvements in living standards are substantially underestimated by this method. The succession of new and higher curves in Figure 6 may be artifacts of the failure to measure the extent of qualitative improvements in the standard of living and accurate measures of living standards might conceivably resolve the rising parts of the family of curves at different points in time into one curve.

In the second observation, attention is drawn to the apparent diminishing returns to health with increases in income once economic growth has reached a certain point. At the flat of the curve, a stage has been reached when improvements in population health are no longer determined primarily by crude increases in the supply of basic necessities. Wilkinson has noted that changes in the main causes of death and in the social distribution of morbidity which occur in congruence with the flattening of the curve are consistent with a phenomena known as the epidemiologic transition (in the epidemiologic transition, mortality declines abruptly, fertility falls and causes of death shift from infectious to chronic diseases). The benefits to health from economic growth seem to change following the epidemiologic transition, with the possibility that important benefits thereafter may come in the form of qualitative improvements in standards rather than from increases in the absolute amount of increase in economic resources.

Wilkinson and others have focused attention on the particular qualitative dimension of *income inequality* as a potential determinant of health differences in affluent developed countries (5,6,10,11,14). Figure 7 displays the correlation of life expectancy and post-tax income inequality (measured by gini coefficients) for 11 developed countries in 1970. In this cross-national comparison, countries with the highest income inequality had the lowest life expectancy. This relationship is emphatically

much stronger than the relationship between GNPpc and health and supports Wilkinson's hypothesis that health is more prominently affected by qualitative features of a country's wealth (such as the income inequality profile) than by the absolute level of wealth following the epidemiologic transition.

Recent work has examined the degree to which this cross-national pattern is also evident within countries. Figures 8 and 9 reproduce results from two recent national studies of the relationship between measures of income inequality and mortality. Ben-Shlomo and colleagues have recently reported the distribution of premature mortality (deaths before age 65) for 8464 geographic wards in the United Kingdom (4). For each ward, a measure of premature mortality was obtained for the period 1981-85 and a measure of deprivation was computed from the 1981 census. Wards were then aggregated within 369 Local Authorities, and the median of the ward deprivation scores and mean of ward mortality rates were computed. In addition, the interquartile range of ward deprivation score was computed for each Local Authority. Figure 8 presents the mean mortality rate for Local Authorities, simultaneously stratified by quartile of deprivation and quartile of variation in deprivation score. As expected, mortality rises with increasing deprivation. In addition, however, within a deprivation quartile, mortality increases with increasing variance of within-authority deprivation. The authors argue that these results support the hypothesis that variations in income

distribution contribute an additional effect on mortality in addition to the effect of deprivation alone. Individuals residing in areas with greater variation in deprivation characteristics appear to experience higher mortality than their counterparts in more homogeneous areas.

Figure 9 presents results from a similar study examining the relationship between income inequality and mortality in the United States (8). This work found that metropolitan areas with high income inequality had significantly greater age-adjusted mortality than those of low inequality, and that this relationship was independent of absolute levels of mean household income in these areas. These findings were robust across three different measures of the inequality of the income distribution (Gini coefficient, Atkinson Deprivation Index and the Theil Entropy Index). The magnitude of this relative income effect associated with the structure of the income distribution within geographic areas is substantial.

There have been a number methodologic challenges to this body of work. One criticism has been that the association between income inequality measures and population rates of mortality is overly sensitive to the choice of inequality measures. Additional concerns have been raised about the comparability of measures of income inequality across countries in international comparisons of this hypothesis. Neither of these methodologic concerns has

been found to be sufficiently robust to have standing as an artefact explanation for the observed association.

More recently, Gravelle has proposed an elegant argument that the relationship between the distribution of income in a society and an individual's risk of mortality may be a statistical artefact in the family of inferential threats known as the ecological fallacy (9). Gravelle has demonstrated the theoretical possibility that a positive correlation between population mortality and income inequality can arise at the aggregate level even if inequality has no effect on the individual risk of mortality. This hypothesis depends on a non-monotonic relationship between absolute levels of income and individual mortality risk, where the risk of mortality falls at a declining rate, rather than a constant rate, with increases in income. If the relationship between income and mortality risk follows this shape of diminishing returns, Gravelle has demonstrated that two populations with different income inequality profiles can generate different aggregate mortality rates which arise exclusively from the absolute income/mortality relationship and yet are spuriously correlated with income inequality. A number of research groups are currently engaged in empirical tests of this hypothesis, including Michael Wolfson and colleagues at Statistics Canada.

Does the relationship between income inequality and health

pertain in Canada? The answer to this question is not yet clear. Studies monitoring the profile of income distribution in this country have shown that inequality increased over the period 1970-90 when measured by market income (see Figure 10)(19). At the same time, however, the influence of growing inequality in market income has been mediated by tax and income transfer policies, such that post-tax, post-transfer household income inequality did not change over these two decades in Canada.

While the profile of relative stability in the Canadian income distribution is well-established, there has been very little research incorporating Canadian data on the income distribution and the distribution of health into international comparative studies. One study, by Humphries and van Doorslaer, found that health inequalities in relation to income in Canada were among the largest of 10 countries examined (Figure 12) (18). This study is based on the computation of an ill-health concentration index (see Figure 11), conceptually similar to a gini coefficient, which used a latent continuous measure of health status, such as the measure of perceived health status illustrated in Figure 3. Additional work is currently underway within Statistics Canada examining the relationship between provincial measures of income inequality and provincial measures of life expectancy.

Discussion

As outlined in this paper, the distribution of health status in

relation to structures of socioeconomic hierarchy in a society is a relevant measure of well-being. To this point in time in Canada, portraits of the distribution of health in relation to socioeconomic status have been exceedingly rare. But the limited information available does indicate that the processes which shape the distribution of inequalities in health appear to be sufficiently independent of the processes which drive overall economic well-being to warrant increased attention to the measurement of socioeconomic inequality in health in addition to the traditional measurement of changes in absolute levels of health in a population.

Do measures of health belong in a measure of economic well-being? From one perspective, health is a central component of the stock of human capital, which like education and occupational skill training, is an important determinant of current economic well-being. And like education, the health of a population has a strong intergenerational component, with contributions to future economic well-being. Health-enhancing investments in the developmental period of the human lifecourse, during childhood, have consequences for individual productivity during the period of labour force participation and for health and function at the end of the lifecourse (20-21). It has been decisively established that the level of health in a population is not a simple derivative function of the economic resources of a society. Given that two populations can achieve the same level of health against

very different profiles of economic resources, this argues for the independence, rather than the dependence, of health as a measure of economic well-being.

At the end of the day, however, health is a component of overall well-being, rather than a constituent of the economic component of overall well-being. The most appropriate approach may be to construct a distinct index of health, to parallel and complement an index of economic well-being. An index of health could be constructed to reflect the same four dimensions articulated in the CSLS framework: flows, stock, inequality and insecurity (with credit for this idea to M McCracken). Measures of population health status at different points in the life course would constitute the component elements of measures of flows and stock. Measures of health stock might include public and private expenditures on health research and development, capital investments in the health care system and in environment and pollution control technologies. An index of health stock might also include measures of the prevalence of health-enhancing behaviors in the population, which can be understood to predict future health status.

Measures of the distribution of health in relation to measures of socioeconomic status would be components of the inequality dimension and would balance established measures of absolute changes in population health, such as the year-over-year trend in

life expectancy. The dimension of the index focusing on health insecurity might emphasize the measurement of the comprehensiveness of publicly funded health insurance programs, the proportion of health expenditures paid by private household sources and the structure and source of disability insurance benefits in the country.

As a minimum starting point, the national statistics agency should assemble time series profiles of a number of measures of socioeconomic health inequality from currently available data sources. The relative mortality analyses for urban income quintiles pioneered by Russell Wilkins should be replicated for the 1991 and 1996 census years. In addition, a program of analyses should be structured around the National Population Health Survey, reporting concentration indices for disability and for measures of generic health status, applying an appropriate level of geographic aggregation.

The emerging international evidence identifying a relationship between health and the income distribution characteristics of a society, in addition to the relationship between health and the absolute level of income obtained by an individual, adds important nuance to the simple assumption that a rising economic tide lifts all boats evenly. A number of strands of explanation have been offered to account for the process by which income inequality, as a characteristic of the collective economic

environment, may act to influence individual health. Income inequality may be associated with a set of social processes and economic policies that systematically underinvest in physical and social infrastructure and with these underinvestments then having consequences for health. Alternatively, large disparities in income distribution may have direct consequences on people's perceptions of their relative place in the social environment, leading to behavioral and cognitive states which influence health. Income inequality is a structural characteristic of the economy, and although income inequality is not measurable at the level of the individual, disparities in the distribution of income may affect disease processes that occur in individuals. If policies that alter the distribution of income are to be judged at least partly by their effects on population health, it becomes important to fully understand the independent contributions of absolute income effects as well as the effects of disparities in the income distribution on individual health.

References

1. Wilkins, R., Adams, O., and Brancker, A. Changes in mortality by income in urban Canada from 1971 to 1986*. *Health.Rep.* 1(2):137-174, 1991.
2. Wolfson, M.C., Rowe, G., Gentleman, J.F., and Tomiak, M. Career earnings and death: a longitudinal analysis of older Canadian men. *J.Gerontol.* 48(4):S167-S179, 1993.
3. Wilkins, R. Policy-relevant health information: the Canadian experience in assessing socio-economic differentials in mortality. In: *Adult Mortality in Developed Countries: From Description to Explanation*, edited by Lopez, A.D., Caselli, G., and Valkonen, T. Oxford: Clarendon Press, 1995, p. 307-326.
4. Ben-Shlomo, Y., White, I.R., and Marmot, M.G. Does the variation in the socioeconomic characteristics of an area affect mortality? *Br.Med.J.* 312(Apr 20):1013-1014, 1996.
5. Kaplan, G.A., Pamuk, E.R., Lynch, J.W., Cohen, R.D., and Balfour, J.L. Inequality in income and mortality in the United States: analysis of mortality and potential pathways. *Br.Med.J.* 312(Apr 20):999-1003, 1996.
6. Kaplan, G.A. People and places: contrasting perspectives on the association between social class and health. *Int.J.Health.Serv.* 26(3):507-519, 1996.
7. Wilkinson RG. *Unhealthy Societies: the afflictions of inequality*. Routledge, New York, 1996.
8. Lynch JW, Kaplan GA, Pamuk ER, Cohen RD, Heck KE, Balfour JL, Yen IH. Income inequality and mortality in Metropolitan areas of the United States. *American Journal of Public Health* 1998;88:1074-1080.
9. Gravelle H. How much of the relation between population mortality and unequal distribution of income is a statistical artefact? *BMJ* 1998;316:383-5.
10. Kennedy BP, Kawachi I, Prothrow-Smith D. Income distribution and mortality: cross-sectional ecological study of the Robin Hood Index in the United States. *BMJ* 1996;312:1004-7.
11. Wilkinson, R.G. Commentary: a reply to Ken Judge: mistaken criticisms ignore overwhelming evidence. *Br.Med.J.* 311(Nov 11):1285-1287, 1995.
12. Davey Smith, G., Wentworth, D., Neaton, J.D., Stamler, R., and Stamler, J. Socioeconomic differentials in mortality risk among men screened for the multiple risk factor

- intervention trial: II. Black men. *Am.J.Public.Health.* 86(4):497-504, 1996.
13. Davey Smith, G., Neaton, J.D., Wentworth, D., Stamler, R., and Stamler, J. Socioeconomic differentials in mortality risk among men screened for the multiple risk factor intervention trial: I. White men. *Am.J.Public.Health.* 86(4):486-496, 1996.
 14. Davey Smith, G. Income inequality and mortality: why are they related? *Br.Med.J.* 312(Apr 20):987-988, 1996.
 15. Wilkinson, R.G. Income distribution and life expectancy. *Br.Med.J.* 304:165-168, 1992.
 16. Wilkinson, R.G. The epidemiological transition: from material scarcity to social disadvantage? *Daedalus.* 123(4):61-77, 1994.
 17. Wilkinson RG. Health inequalities: relative or absolute material standards? *BMJ* 1997;314:591-5.
 18. Humphries KH, van Doorslaer E. Income-related health inequalities in Canada. Unpublished manuscript, 1998.
 19. Beach CM, Slotsve GA. Are we becoming two societies? C.D. Howe Institute, Toronto, 1996.
 20. Barker, D.J.P., Martyn, C.N., Osmond, C., Hales, C.N., and Fall, C.H.D. Growth in utero and serum cholesterol concentrations in adult life. *Br.Med.J.* 307:1524-1527, 1993.
 21. Barker, D.J.P. and Osmond, C. Infant mortality, childhood nutrition and ischaemic heart disease in England and Wales. *Lancet.* 1:1077-1081, 1986.
 22. Roos, N.P. and Mustard, C.A. Variation in health and health care use by socioeconomic status in Winnipeg, Canada: does the system work well? yes and no. *The Millbank Quarterly* 75:89-111, 1997.
 23. Mustard CA, Derksen S. A Needs-based Funding Methodology for Regional Health Associations. Manitoba Centre for Health Policy and Evaluation. Report 97.01, Winnipeg, Manitoba. January 1997.
 24. Mustard CA, Derksen S, Berthelot JM, Wolfson M, Roos LL. Age-Specific Education and Income Gradients in Morbidity and Mortality in a Canadian Province. *Social Science and Medicine* 1997;45:383-397.