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Despite a large and growing research literature documenting health disparities by socio-economic status (SES) and income inequalities, research on how these relationships play out moving from mid to later life is meager. Even less is known about how the early Baby Boom cohort compares with the Pre-Boomer cohort as they age in a period of accelerating inequalities, where the wealthy are becoming wealthier and the incomes of those in the middle and at the bottom are stagnating. In this paper, we follow individuals in two cohorts, those born 1947-1951 and those born 1932-36 over the period covering eight cycles of the National Population Health Survey in Canada from 1994/95 to 2008/09 with longitudinal data. The Early Boomer cohort is age 43- 47 in the first period, and 59-64 in 2008/09; the Pre-Boomer cohort is 58-62 in period 1 and 74-79 by 2008/09. We focus on the differences between the two cohorts in terms of self-reported health in a period characterized by dramatic welfare state restructuring, socio-demographic and family shifts, and global economic change. We ask whether health disparities are widening by SES, whether growing income inequalities matter to health in moving from mid to later life, and what implications there might be for Canada's aging population in future. Our findings reveal that socio-economic factors matter as determinants of health for both cohorts but more so for the Early Boomers than for the Pre-Boomers. Growing income inequalities may have serious and direct negative implications for cohorts transitioning in future from mid to later life.

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Interest in the future health and well being of the baby boom cohort is strong and increasing in both research and policy as the first edge of this cohort reaches age 65 in 2011.[1] Surprisingly little research has been done with a life course perspective looking toward the older years as individuals move from mid to later life.[2] A prospective approach is particularly needed as Seabrook and Avison (2012: 63) and others suggest in times of socioeconomic challenge and transition. This lack is especially curious given recurrent discourses, both political and public, about the "crisis" of population aging. It is often simply presumed in policy or media that the large baby boom cohort in Canada, born 1946-1966, will be similar in their health trajectories to those who are now older and face similar challenges. Yet, we know that aging over the coming decades may differ substantially from aging today (see, for example, Park (2011) on changing patterns of work, retirement and health, and Menard, Le Bourdais and Hamplova (2010) on changing families of older Canadians). Wister(2005) finds a health paradox associated with the large baby boom cohort as they age: The cohort is healthier in some ways, but more likely to be overweight, with the health risks that entails, than earlier cohorts. Other research suggests that growing up with more marital and common-law dissolution (Avison *et al.*, 2007) as well as enhanced risks of poverty (Turner, Wheaton and Lloyd, 1995) may take a toll on the baby boom cohort as they age, both physically and psychologically. And new research (McDaniel, Gazso & Um, 2013) finds that those in mid-life in the 2008 + recession have found their own financial prospects for their later years compromised while they additionally face the increased need to support both younger and older relatives.

[1]The last edge of the cohort, of course, will not reach 65 until 2031..
[2] A notable exception is Singh-Manoux *et al.* (2004) which relies on the Whitehall data.

How health disparities play out moving through life courses from mid to later life is not well understood, despite the large and growing research literature documenting health disparities by socio-economic status (SES) (Hertzman and Siddiqi, 2009; McDaniel, 2011; Seabrook and Avison, 2012; Singh-Mancoux *et al.*, 2004). Part of the challenge is the bi-directionality of the relationship of SES to health/well-being. SES is known to affect health and well-being in a complex time-dependent manner (House, 2002; Sacker *et al.*, 2007; Seabrook and Avison, 2012). But health and well-being also affects SES. People who are unwell are less likely to be as productive or as economically successful. When we focus on those in mid-life, the complexity increases for at least two reasons. First, those in mid-life have accumulated advantages or disadvantages that may impact their well-being. These life course accumulations may be 'bumpy' however when economic crises intersect with biographies, and accumulated advantages diminish. And secondly, mid-life individuals are not disconnected from older and younger relatives whose lives when linked are affected by misfortunes other cohorts experience. So, even if those in mid-life, when compared with youth, for example, may be less impacted by economic downturns, their linked lives may mean that mid-lifers provide support for youth, perhaps at the risk of compromising their own later life security.

Our interest in this paper is in comparing a sample cohort of the baby boom, the early boomers, those born 1947-1951, with a sample cohort of the pre-boomers, those born 1932-36, over the course of the fourteen to fifteen year period (1994-95 to 2008-09) when income inequalities were growing (see Heisz, 2007; Picot and Myles, 2005).

Our research questions are four:

- How do health disparities by socio-economic status play out moving from mid to later life among two cohorts of Canadians in the 1994/95 to 2008/09 period?
- How does the health of early boomers compare with pre-boomers as they age in a period of growing income inequalities?
- Are health disparities widening for these two cohorts?
- Are there implications for the future as more Canadians move into their later years?

Context/Background

Socio-economic status (SES) is long recognized to be linked with health/well-being in multiple ways. It is one of the most reliable of predictors of health disparities (Hertzman and Siddiqi, 2009; Ross *et al.*, 2011; Seabrook and Avison, 2012). A burgeoning research literature documents health disparities by SES (Black Report, 1980; House, 2002; Ross *et al.*, 2012; Willson, 2009, as examples). In Canada, it is estimated that 25 % of all premature years of life lost is due to income inequality (Wilkins *et al.*, 2002). Yet, surprisingly few studies have been done among older or mid-life adults (e.g. 45-64 years of age) that follow the same individuals as they move from mid to later life. The Whitehall study (Black Report, 1980) is a significant exception, which found that hierarchy matters greatly to health outcomes, even without poverty or significant deprivation. Sacker *et al.* (2007: 812) make the need for longitudinal research explicit, "..most ...research relies on cross-sectional data despite widespread acknowledgement that socioeconomic conditions and health have a complex time-dependent relationship and analysis of this relationship requires longitudinal repeated-measures data." And Singh-Mancoux and colleagues (2004: 1073) suggest that because adult socio-economic position is a more

effective summary of life course social trajectories, it is important to examine accumulation of advantage and disadvantage over adult life courses.

Our additional interest here is in examining comparative life course trajectories of two cohorts whose biographies intersect with growing Canadian income inequalities at different historical and biographical moments. The broad outlines of our two sample cohorts' life course experiences are shown in Table 1. The Pre-Boomers, born 1932-36 are a small cohort born in the wake of the Great Depression. They came of age in the mid-1950s amid a post World War economic boom that produced a family wage on which an entire family could live, low unemployment, inexpensive housing, and the emergence of the Canadian welfare state. This cohort entered mid-life in the late 1970s/early 1980s when income inequalities were growing but the effects were "fully offset by the tax and transfer system" (Frenette, Green and Milligan, 2006:26). This cohort was age 58-62 in 1994-95 when we began to follow them.

By contrast, the early boomers, born 1947-51 are part of a large cohort born soon after the end of the World War II. They came into adulthood in 1969-73 when the economy was lagging somewhat, exacerbated by the large size of this cohort searching for post-secondary education and employment in a highly competitive market. They entered mid-life, age 45-49, in 1992-2000, the period during which we began following them. This is a period when income inequalities in Canada were increasing, and were not offset to nearly the same degree as in the 1980s by transfers and social welfare programs (Frenette, Green and Milligan, 2006:26). As well, by the early 2000s, the proportion of top 1% income tax filers had increased to 11% (compared to 7% in the 1980s and 8% in the 1990s) (Statistics Canada, 2013).

Age	Pre Boomers	Early Boomers	Contexts
Born	1932 – 1936		Small cohort, post-depressions
		1947 - 1951	Large cohort, post WWII
Age 22 (coming into adulthood)	1954 – 1958		Economy booming: family wage, low unemployment
		1969 – 1973	Economy lagging competition great for education/jobs
Age 45 - 49 Mid-life	1977 - 1985		Income inequalities growing but offset by social transfers
		1992 - 2000	1994-95 Fewer transfers/ Growing inequalities
Age 59 - 64 Late Mid-life	1991 - 2000		Significant growth in top 1% incomes
		2006 - 2011	2008+ economic slowdown
Age 70 - 74 Later Life	2006 - 2010		2008-09 Economic downturn and large income inequalities may have negative effects for both cohort samples
		2017 - 2025	

Table 1: Study cohort samples with key life course ages by dates, and significant contexts at each time period. Grey area is period of our longitudinal study.

Two theories define the relationship of SES to well-being. The first is fundamental cause theory (see Willson, 2009) which holds that SES shapes how we experience health risks, even as risk factors shift. People with higher SES have greater command of resources and social capital including knowledge and access to information that can benefit health, and have greater capacities to ward off threats to their health. The theory holds that health disparities by SES persist because people of higher SES are better positioned to act when new evidence emerges (e.g. risks of smoking or poor diet), thus, disparities remain. This is important sociologically and in terms of policy because SES would continue to be a central determinant of health and well-being even if various mediators between SES and health were reduced. This is how socio-economic differentials in health persist even with health care systems such as in Canada where all have equal access to medical care, regardless of income (Prus, 2011; Wilkins, Berthelot & Ng, 2002).

Willson finds support for fundamental cause theory in a longitudinal analysis of trajectories of SES and health in Canada and the U.S. A history of low income is found to increase the odds of experiencing a preventable disease in the United States but not in Canada. This suggests that the greater levels of inequality in the U.S. may matter as well as differing social policy regimes particularly universal public health insurance in Canada. Willson's research reveals that although the effects of SES and inequalities in societies matter greatly to health outcomes, they are not immutable and can be enhanced by policies and flattening of the income inequality distribution.

The second approach is that of population health and the social gradient which suggests that as inequalities increase, health suffers overall in populations but more so for lower SES groups (Wilkinson, 2006; Wilkinson & Pickett, 2006). Disparities are seen to widen as levels of inequality increase. And each social gradient has less good health than the one above it, consistent with the findings of the Whitehall study (Black Report, 1980). This complements and elaborates fundamental cause theory, theorizing not only the persistence of health disparities by SES but how these array on a continuum and change as inequalities increase.

In the few longitudinal empirical studies done, the strongest social gradients in health have been observed in the United States (McDonough, Worts & Sacker, 2009). Disadvantage in four OECD countries (Britain, Denmark, Germany and the U.S.) is found to have a strong effect on life course health trajectories with aging. By contrast, however, fewer differences are found in life course health trajectories for those with advantage, i.e. with higher SES. This lends support to the notion (Ferraro & Shippee, 2009; McDaniel & Bernard, 2011) that disadvantage is not the converse of advantage in a life course perspective on health.

Framing this study is a life course perspective (McDaniel & Bernard, 2011) with four guiding principles: 1) that our daily experiences form a trajectory that begins at birth and stretches to death; 2) that life course patterns unfold in a multiplicity of interconnected realms; 3) that social bonds form throughout lives and link our lives to others and to institutions that affect life courses; and 4) that a variety of local and national contexts shape life courses, and are shaped by them. In this study, we rely on the first and fourth principles. We examine how self-reported health changes in moving from mid to later life and how contexts, specifically socio-economic status and inequalities shapes those changes as people born at different times age.

Self-reported health is a respondent's health status as they perceive it. Self-reported health (SRH) has been found to be a useful indicator of the overall health and well-being of individuals and populations. As a measure of health, SRH has been found to have both reliability and validity (Idler & Benyamini, 1997; Prus, 2011). It is a well-established assessment of overall health (Idler, Russell & Davis, 1992), and has been found to be a strong predictor of mortality (Mossey & Shapiro, 1982; van Doorslaer & Gerdtham, 2003) as well as disability (Mansson & Rastam, 2001), functional limitation (Idler & Benyamini, 1997), health-related behaviours (Cott et al., 1997), and health care utilization (Pinquart, 2001). Banks *et al*. (2006) have found that SRH measures are almost identical to biologically obtained measures. Of course, no measure is without limitations. Any subjective measure of health can be affected by threshold tolerance differences among individuals or groups. The meaning and reporting of SRH also can vary across groups.

Our interest in self-reported health, a well established health indicator, stems from empirical evidence that suggests that self-reported health changes over the life course. McDonough, Worts and Sacker (2009), for example, find for Germany and the U.S. that self-rated health remains relatively stable in young adulthood, declines in mid-life, and becomes more stable again in later life. But for Britain and Denmark, there is a steady decline in self-reported health over working life courses. We aim to explore the trajectories in Canada from mid to later life in two sample cohorts.

Methods and Data

Data analyzed here are from Canada's National Population Health Survey (NPHS), over eight of the cycles (1994/95 to 2008/09). We focus particularly on a comparison of individuals in two sample cohorts, as described earlier (see Table 1): those born 1947-51, the Early Boomers, and those born 1932-36, the Pre-Boomers. The Boomer cohort is age 43-47 in the first NPHS wave, and 59-64 in the 2008/09 wave. The Pre-Boomer cohort is 58-62 in wave 1 and 74-79 in 2008/09. The original 17,276 respondents were randomly divided into two half datasets. One was used as an exploratory dataset and the other a confirmatory dataset. Multilevel mixed-effects regression modeling was performed using all available data. The final models tested from the confirmatory half of the dataset were constrained to persons aged 16 to 95 in order to avoid unstable or outlying data. This process of model validation helps to strengthen the reliability of the overall results (see Fox, 2008).

Our dependent variable is self-reported health, a standard measure found consistently across all cycles of the NPHS and used with strong reliability and validity in a large number of studies (for example, Maio and Kemp, 2010; Sacker *et al.*, 2007; White *et al.*, 2011; as well as in research cited above Respondents are asked to rate their health relative to others of their own age on a five point scale (0 = Poor , 1 = Fair, 2 = Good , 3 = Very Good and 4 = Excellent). With health being most often reported as "very healthy," the data show some negative skew. The amount of skew in the marginal distribution, however, does not pose any overt bias to the maximum likelihood estimates (Gelman & Hill, 2007) and was therefore not transformed.

Covariates and predictors in the models were drawn from the available data in the NPHS as well as other Statistics Canada sources. These include socioeconomic variables such as educational attainment, labour force status, and relative income, as well as gender and income inequality measures. Educational attainment is measured as the highest level of education

achieved. The variable consists of 14 levels ranging from “no schooling” to “earned doctorate.” This variable demonstrated some variation across time, with educational attainment increasing in some cases across the eight waves. For this reason, educational attainment was considered time-variant in our analysis. The effect of unemployment and not being in the labour force were modelled as time-varying as well, with the reference category being employed and/or working. Time based interaction variables were also constructed to evaluate the possible compound effects of these conditions over time and to evaluate any differences in the effect of being unemployed that might be related to the point in the life course at which an individual experienced unemployment. Household income was incorporated into our models using the NPHS derived household income ratio, that incorporates both family size and urban or rural residence. These data come from Statistics Canada’s calculations of low income cut-offs (LICO), the level at which a family’s major financial expenditure is spent on basic needs. Below this level families are defined as living in low income. Total household income is then evaluated against specific LICOs to establish a ratio for each household. This ratio then becomes a continuous distribution rather than a categorical variable. It is treated in our models as time variant.

Gender was dummy coded with males representing the reference category. The gender by age, time and age by time interaction terms were also constructed to evaluate possible differences in trajectories between males and females across the life course. The three-way interaction (female by age by time) permits deeper analytical insight on later life trajectories by accounting for possible differences that might occur between women and men over long periods of time and particularly in later-life course years. To assess the possible health benefits of living in an intimate union, persons who reported being married or cohabiting were dummy coded against a baseline group who reported that they lived in another kind of household. This variable

was treated as time-variant as there was evidence, not surprisingly, of change in living arrangements across the eight NPHS waves .

Age and the effects of age in this analysis are modelled at both the individual and population levels. Three age related measures are used. Taken together, these measures have both linear and non-linear properties, which give good empirical fits to the observed data across life courses. The age and mean age variables are individual-level variables. Mean age is a contextual variable (Monette, 2010; Snijders & Bosker, 2012) that gives each respondent an estimate of health relative to his or her average age peers. This enables an estimate of the age-variable health effects compared with the individual level effects. To explore the complexity of the relationships between these variables and our dependent variables, time dependent interaction terms were constructed. The age by time interaction is a population level variable that enables comparisons of the two sample cohorts of interest here, the Early Boomers and the Pre-Boomers. The effect of age by time was included in the models as this variable directly accesses the individual- specific and population level questions of whether Early Boomer relative to Pre-Boomer cohorts are experiencing and reporting health issues in similar or different ways. Specifically, this variable allows us to ask whether a person of a particular age relative to another person of the same age, differing only by where there are located in time (the two sample cohorts), should expect to see differences in health trajectories. The age by time interaction also behaves as a non-linear variable. This opens the door to analyse possible changes in age related slopes in successive waves of the NPHS.

Time was zeroed on the first wave of the NPHS at its midpoint, between the 1994 and 1995 data points. The same midpoint strategy is used for each corresponding wave, making a unit increase in time approximately a 2 year interval change. The reason for this determination of

time is to provide a suitable match of time to the Gini coefficients by year obtained from Statistics Canada (n.d.). The Gini coefficient is reported on a yearly basis and is retrospective.

We use the Gini coefficient as a measure of income inequality. The Gini coefficient varies between 0 and 1. If the Gini is 0, income or wealth is considered to be shared on a completely equal or egalitarian basis. As the Gini coefficient approaches 1, income or wealth is more found at the top of the distribution. Historical Gini coefficients were obtained through Statistics Canada`s online archives (Statistics Canada, n.d.). The Gini coefficient used here is the national Gini for total household income, considering all family units, for the years 1992 through 2009. The values were then matched to the midpoint of each wave of the NPHS, taking the average value of the Gini coefficient for each of the wave year NPHS. Thus, for wave 1, the Gini used is the mean of the Gini for 1994 and 1995. This provides a more representative value than the endpoints of the specific years. To study the compound effects of income inequality over time, a variable of Gini by time interaction was created and inputted in our models. This gives a trajectory effect of the Gini coefficient.

Linear multilevel mixed-effects regression modeling was performed using all available data. These models were developed longitudinally with specific measurements being nested within the individual that the measurements were made upon. Random intercepts were estimated for individuals and a random slope coefficient was estimated by including a random effect of time in the model at level 2. This hierarchical structure led to the following level 1 model:

$$Y_{ij} = \gamma_{0j} + \gamma_{1j} X_{ij} + \pi Z_i + R_{ij} \qquad (1)$$

The Y_{ij} are the individual measurements made upon individual *j* at time *i;* γ_{0j} is the individual-specific intercept for individual *j*; π is the 1 x *n* column vector of regression coefficients for the *n*

x 1 vector of predictor variables Z_i, for individual *j* at time *i*. The R_{ij} represents the independent and normally distributed level 1 residuals for individual *j* at time *i*. The individual specific regression intercepts and the random slope coefficients at level 2 can be expressed as:

$$\gamma_{0j} = \beta_0 + U_{0j} \qquad (2)$$

$$\gamma_{1j} X_{1j} = \beta_1 + U_{1j} \qquad (3)$$

In this case, β_0 is the ordinary least squares (OLS) intercept (mean intercept) and β_1 is the OLS slope (mean slope) for all individuals. The U_{0j} values are the estimated random deviations from the mean intercept for individual *j*, and the U_{1j} values can be understood as the random interaction between individual *j* and time, at time *i*.

Missing Data, Data Weights and Model Validation

In an effort to avoid potential biases due to survey design, attrition, and various forms of missing data, sampling weights provided by Statistics Canada for the NPHS were used. As our model is longitudinal, the measurements are grouped by individuals over time. The weights were therefore applied at level 2 in the model, on the individual. To evaluate death related attrition, the models were compared with modified competing models where persons known to have died during the course of the NPHS were imputed as possessing a value of 0 for self-reported health. Results showed no change in the estimated level 1 or level 2 parameters. The possible bias of survey design was evaluated by regressing the residuals from the final regression models on the sampling weights (Rabe-Hesketh & Skrondal, 2006; Wu, 2010). No relationship was observed between the size of the residuals and the probability of being included in the NPHS. This same

technique was used to ensure that the patterns of missing data were not related to the size of the residuals.

Standard model validation followed from dividing the dataset into an exploratory half and confirmatory half. In this process, the research questions are first examined in exploration and then tested on the confirmatory half of the dataset (Fox, 2008; Good and Hardin, 2006). The findings presented here were obtained following a three step process of testing our research questions. The whole eight wave dataset was converted to long format and then randomly sampled, without replacement, to obtain two equal half datasets. The exploratory dataset was then randomly sampled again to produce a 10% sample (of the total size of the complete dataset), upon which the modeling procedure was carried out. All theoretically proposed variables were initially entered into the regression model. In a stepwise fashion, a backwards elimination approach was employed, eliminating one variable at a time in order to strengthen the model. At each step the model was evaluated using both Akaike's and Bayesian Information Criteria (AIC, BIC), Likelihood Ratio (LR) tests and regression diagnostics to evaluate improvement of fit versus loss of fit or information. The exploratory models were built on the 10% sample, refined with the exploratory half of the dataset and then tested with the confirmatory half of the dataset. This approach provides major strengthening of the validity of results through careful stepwise evaluation and through model validation on a related, but independent dataset.

Findings

Statistical modelling of self-reported health was done with a series of regression models (see Tables 2-5) for individual-level as well as population level interpretation. Our focus here is on

the population level results. The level 2 portion of the statistical models is used to discuss variance and covariance only.

We first examine findings for all cohorts in the NPHS data before looking specifically at our two sample cohorts.

Self-Reported Health

Model development for self-reported health relied on the 10% and the exploratory half of the NPHS to construct a testable model. We then validated it using the confirmatory half of the NPHS. This led to 8,187 total individuals modelled over 14 years. This number of individuals produced 42,021 observations, with a mean number of observations per individual greater than 5. This provided a substantial amount of complete or near complete data over waves of the NPHS under study here. The model estimates the level 1 parameters as fixed effects with the exception of time and the intercept. These fixed effects can be interpreted as the expected or mean effect of the covariate on a given individual from the population (all Canadians) from which they have been drawn. The model estimates are found in Table 2.

Dependent Variable:	Self Reported Health			
Number of Observations/Clusters	Level 1	42021	Level 2	8187
Covariates	Coefficient	p-value	95% Confidence Interval	
Age	-0.125	<.001	-0.143	-0.107
Average Age	0.114	<.001	0.096	0.133
Not In the Labour Force	-0.129	<.001	-0.164	-0.095
Female	-0.060	0.009	-0.105	-0.015
Household Income Ratio	0.042	<.001	0.029	0.056
Education	0.025	<.001	0.019	0.030
Gini Coefficient	0.616	0.451	-0.986	2.219
Age Over Time	-0.001*	0.039	-0.001*	0.000
Household Income Ratio Over Time	-0.001	0.416	-0.004	0.002

Gini Coefficient Over Time	0.471	<.001	0.371	0.571
Female By Age Over Time	0.001*	0.005	0.001*	0.000
Intercept (level 1)	2.043	<.001	1.380	2.705

Random Effects Variances and Covariances	Estimate	Standard Error
Intercept	0.426	0.015
Slope	0.007	0.001*
Intercept by Slope	-0.021	0.002

Table 2: Regression Coefficients and Random Effects Variance and Covariance for Self-Reported Health

Note: Where estimates fell below the three significant digits permitted by Statistics Canada, an asterisk appears to indicate non-zero rounding.

The value of each coefficient here is understood in the context of all the other variables. The Gini here is both an interaction with time (trajectory over time) and a main effect.

Time

Time by itself as a covariate in this multilevel model was a non-significant level 1 predictor of self-reported health. The random effect of time was included without the level 1 predictor. By allowing this, the model has a zero mean effect of time given that random effect estimates of individuals with time at level 2 are constrained to have a mean of zero as well (Snijders & Bosker, 2012). From equation (3) we have set $\beta_1 = 0$, due to its lack of statistical significance. The random effect of time is highly significant with a *t*-statistic much larger than 7 (T(slope) = 0.007 / 0.001 = 7. However we have rounded the standard error up from a value that would have otherwise rounded to zero). The overall variance of slopes remains small. There is, however, a large amount of variance in the intercept with a *t*-statistic of approximately 28.4, indicating a significant amount of variation among individual observations.

Demographic and Socioeconomic Status Predictors

For self-reported health, women report an average difference of 0.06 units less than men on the self-reported health scale. The 2-way interactions of sex with time

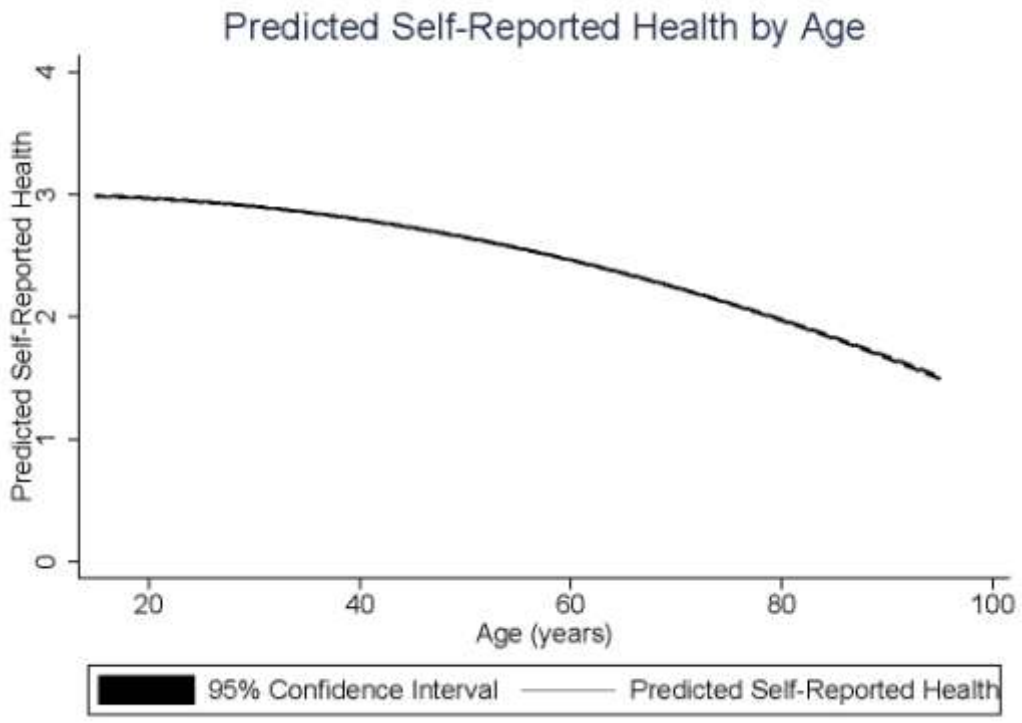

Figure 1: Predicted Trajectory of Self-Reported Health across the Life Course

and other variables did not approach significance, indicating the expected trajectory of men and women in the study could be considered equivalent. There was a 3-way interaction term that was significant. Interpretation of that variable is discussed below with the age variables. Not surprisingly, we find, as shown in Figure 1, the predicted trajectory of self-reported health by age declines, but not sharply so.

Educational attainment and household income ratio were highly significant predictors of self-reported health. This is consistent with the social gradient of health, found in other studies. For each unit increase in education, there is a corresponding increase of 0.025 units in self-

reported health. The expected increase in self-reported health as predicted by an individual's household income ratio was 0.042 units for each level an individual's household income rises above its relative LICO. The household income ratio interaction with time was not statistically significant, but remained in the model as the model's explanatory power was not substantially improved[3] by its removal. Thus the household income ratio *per se* did not have a significant health impact trajectory over the life course of those in the NPHS.

The relationship between not in the labour force and self-reported health was highly significant. Those who are not in the labour force report on average a difference of -0.129 units below those who are in the labour force. Of course, this could be reverse causality in that people with poor health may, of necessity, have to drop out of the labour market. There was no statistically significant relationship found between unemployment and self-reported health. This is a somewhat surprising finding given previous findings of a negative effect of unemployment on health. But much of that research compared the unemployed with the employed at one point in time. It may be that the health effects of unemployment, if of short duration, on health over the life course, are negligible. The interaction terms for not in the labour force and unemployment with time were also not significant and remained out of the model.

Income Inequality

The Gini coefficient, as a measure of income inequality, is found to have an odd relationship with self-reported health. The effect of the Gini alone on health is not found to be statistically significant. The interaction of the Gini with time, however, was highly significant. The Gini with time effect may indicate that individuals' self-reports of very good or excellent

[3] As determined by changes in AIC, BIC, Likelihood Ratio tests and regression diagnostics.

health increases substantially even in the presence of increasing inequalities (this can be thought of as increasing from zero, see Table 3). While it is possible that there is a small, but weak, positive or negative effect of the Gini alone, over time this effect is overcome by people's apparent tendency to report better health as time passes. This may be a function of their relative self-assessment compared to others born at a similar time. The linear relationship found in our analysis has an average slope of 0.203 expected units on the self-reported health scale between successive time points.

Age Related Variables

Age and age-related processes are strongly related to self-reported health. The combined effect of age and average age provides a mean trajectory for a persons` health as they move around their mean age in the NPHS. This slope is the coefficient for age and was estimated to be -0.125. This small slope is subject to the age by time interaction. Changes in self-reported health are smallest in youth and steeper in later life. The rate of increase in slope is proportional to the age by time interaction whose estimated effect is -0.001*. These unequal slopes again describe observed differences between the Early Boomer and Pre-Boomer cohorts, to which we now turn.

Early Boomers versus Pre-Boomers

We turn now to focus specifically on our two sample cohorts. The expected differences between how Early Boomer and Pre-Boomer cohorts report their health is related to the predicted differences in the age with time interaction. As before, an exact value is not provided given the disclosure guidelines of Statistics Canada. However, the nature of the difference between the two groups is visible in Figure 2 below and can be explored through an example. Table 4 also shows

the predicted mean scores for each group, given our model, broken down by time across the eight cycles of the NPHS.

Dependent Variable:		Self-Reported Health	
Time	Gini Coefficient	Gini Coefficient By Time	Net Effect
0	0 – not significant	(0.471 x 0.403) x 0	0
1	0	(0.471 x 0.416) x 1	0.196
2	0	(0.471 x 0.427) x 2	0.402
3	0	(0.471 x 0.430) x 3	0.608
4	0	(0.471 x 0.427) x 4	0.804
5	0	(0.471 x 0.430) x 5	1.013
6	0	(0.471 x 0.429) x 6	1.212
7	0	(0.471 x 0.431) x 7	1.421

Table 3: Net effect of Income Inequality over Time on Self-Reported Health

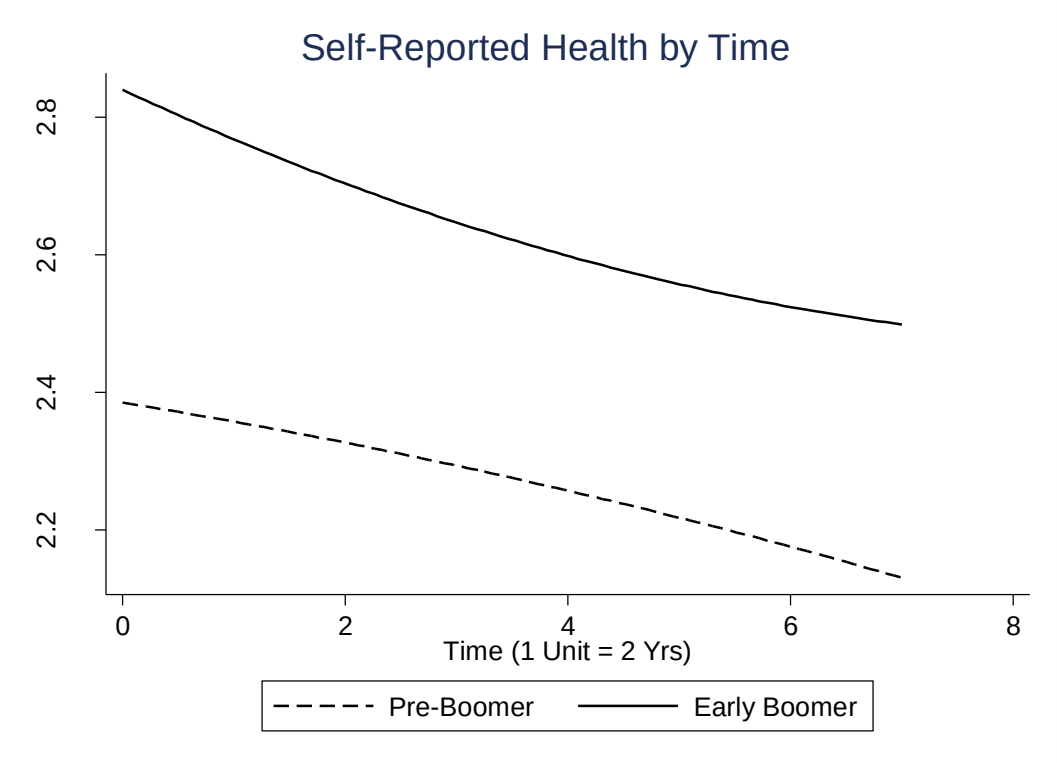

Figure 2: Trajectories of Self-Reported Health for Pre-Boomer and Early Boomer cohorts across the NPHS time scale

Using the expected difference of 15 years between our sample cohorts and our rounded parameter estimate, we find that the Early Boomer cohort is entering into later life with better health than the Pre-Boomers. This is estimated by predicting self-reported health for persons of the same age at a 15 year different time period. The expected age with time interaction was -0.001* and the difference in time would be 7.5 units in the model, or 15 years. That suggests the Early Boomer cohort ranks 0.008 units higher on the self-reported health scale when age is held constant. The possibility that this is a random finding is marginal given that the obtained *t*-statistic for this parameter was only moderate (-2.07, with $p < .039$). This is consistent with other research and may be a function of life course experiences. The Pre-Boomers, although entering adulthood at a time when jobs were plentiful and cost of living relatively low, were a cohort born on the heels of the Great Depression, and may have taken up smoking as youths. They would have been children, age about 9-12 at the time of WWII and likely affected by the stresses of that time and the smoking culture. The Early Boomers, although facing intense competition for jobs as young adults, may have been more attentive to illness prevention, although as Wister's (2005) research has found, the Boomers are more prone to being overweight.

In addition, the interactions of age with time for females (the 3-way interaction) was also found to be statistically significant. The expected direction of the effect was opposite to that of the general age by time interaction. The rounded estimate would lead to an equal, but opposite expected effect that would cancel out the overall cohort effects for women. The actual values are not equal and the net effect of this variable is to correct or reduce the expected difference between women, based on their age over time. This suggests that the difference between how men and women report their health changes over time with men reporting poorer health than

women across the life course. This value was less likely to have been observed by chance than the 2-way interaction of age with time as the obtained *t*-statistic for this parameter was moderate to large in size (2.80, with $p < .005$).

Dependent Variable:	Self-Reported Health		
Time	Early Boomer	Pre-Boomer	% Difference
0	2.796	2.337	20
1	2.788	2.384	17
2	2.766	2.395	15
3	2.674	2.311	16
4	2.550	2.209	15
5	2.521	2.179	16
6	2.501	2.160	16
7	2.539	2.168	17

Table 4: Self-Reported Health of Early Boomer, Pre-Boomer and Percentage Difference in Cohorts Across Time

The regression model for self-reported health was applied to Early Boomer and Pre-Boomer samples extracted from the full dataset. This produced two subsamples comprised of 395 and 648 individuals with total observations equalling 2,165 and 3,885, and mean numbers of observations per individual over the 8 cycles of 5.5 and 6 respectively. Quasi-hierarchical analysis of the models was carried out. The results can be found in Table 5.[4]

For the Early Boomer and Pre-Boomer cohorts a series of findings are apparent. The largest differences between the cohorts' respective coefficients occur in socioeconomic factors. A much larger benefit for the Early Boomer cohort is apparent from an increase in

Dependent Variable:		Self Reported Health				
Number of Observations/Clusters:	Early	Level 1	3885	Pre-	Level 1	2165

[4] Once again, all parameter estimates for the subsamples either fell within the confidence intervals of the full dataset model or the overlap of the confidence intervals indicated that the estimates obtained from the sub-samples did not differ from those of the full dataset more than what could be considered to have occurred by chance.

		Boomer		Boomer	
		Level 2	648	Level 2	395
Block	Covariates	Early Boomer	Pre-Boomer	Relative Proportion	
1	Age	-0.083	-0.081	1.02	
	Average Age	0.067	0.113	0.59	
	Not In the Labour Force	-0.189	-0.251	0.75	
	Female	-	-	-	
	Household Income Ratio	0.070	0.009	7.78	
	Education	0.026	0.036	0.72	
	Gini Coefficient	-	-	-	
	Household Income Ratio Over Time	-0.008	0.011	-0.73	
	Age Over Time	0.002	0.001	2.00	
	Gini Coefficient Over Time	-	-	-	
	Female with Age Over Time	-	-	-	
	Intercept (Level 1)	2.785	-0.239	-11.65	
2	Age	-0.083	-0.074	1.12	
	Average Age	0.067	0.105	0.64	
	Not In the Labour Force	-0.186	-0.266	0.70	
	Female	-0.082	0.214	-0.38	
	Household Income Ratio	0.068	0.013	5.23	
	Education	0.025	0.04	0.63	
	Gini Coefficient	-	-	-	
	Household Income Ratio Over Time	-0.007	0.01	-0.70	
	Age Over Time	0.002	0.001	2.00	
	Gini Coefficient Over Time	-	-	-	
	Female with Age Over Time	0	0	-	
	Intercept (Level 1)	2.869	-0.324	-8.85	
3	Age	-0.081	-0.112	0.72	
	Average Age	0.047	0.117	0.40	
	Not In the Labour Force	-0.197	-0.276	0.71	
	Female	-0.081	0.214	-0.38	
	Household Income Ratio	0.069	0.019	3.63	
	Education	0.025	0.038	0.66	
	Gini Coefficient	13.679	13.013	1.05	
	Household Income Ratio Over Time	0.010	0.005	2.00	
	Age Over Time	-0.007	0.009	-0.78	
	Gini Coefficient Over Time	-1.236	-0.586	2.11	
	Female with Age Over Time	0.001	0.000	-	
	Intercept (Level 1)	-1.788	-4.123	0.43	

Table 5: Regression Coefficients for Early Boomer, Pre-Boomer and Relative Proportion (early boomer coefficient divided by pre-boomer) Between Cohorts by SES predictors, SES predictors and gender, and full variable models

the household income ratio. Low household income ratios are more strongly related to poorer health for the Early Boomer cohort than for the Pre-Boomers.

While the Gini over time variable for both sample cohorts is negative, the effect for the Early Boomer cohort is double that of the Pre-Boomers and statistically significant with a large *t*-statistic of -3.05 ($p < .002$). The fact that the interaction effect of Gini with time dominates over the main effect of the Gini suggests that over time and life courses, as the Gini moves from 0 upward, indicating greater degrees of inequality, is an unhealthy state of affairs for individuals. The reason why the values seem large is due to the very small changes in the Gini itself, and is only made sensible in light of other observed effects in the model. The coefficients, for example, of age and age interactions are equally large. It is the effect of the interaction of Gini with time that stands out as important as it suggests that with even small changes in income inequality over time, there are serious health effects.

The conditions necessary for healthy transitions to later-life for the Early Boomer and Pre-Boomer cohorts are not the same. Socio-economic status and income inequalities are found to matter, more so for the Early Boomers than for the Pre-Boomers.

Summary and Conclusions

This study examined the relationships between socio-economic status, income inequality and differences between two specific sample cohorts, the Early Boomers and Pre-Boomers in Canada in self-reported health as they move from mid to later life.

The relation of inequality to health as measured by self-reported health is less than straightforward. A couple of factors may account for this. First, the regression model for self-reported health was established over a large segment of the lifespan. This may lead to the average or fixed effect of the Gini coefficients being hard to determine given its difference in operation over this time. The cohort differences in the Gini coefficient suggest that its effect is

greater for the Early Boomer cohort than for the Pre-Boomer cohort. This suggests that there may be peak periods in life courses where health outcomes are more affected by income inequalities, while the overall effects are more linear.

Second, the pathways by which inequality affects self-reported health may be in flux as well. The sample cohort differences point to the possibility that the there is less impact of income inequality on self-reported health in the past than recently. People in the past may have been less aware that their quality of life/health was related to how much money they made, or how well they were doing relative to others in income. Accessibility to media, and what is known as status-seeking behaviour may account for these changes with time. The theory (Levine, Frank and Dijk, 2010) predicts that increased expenditure of top income earners, and the increased visibility of this spending, leads to those just below them in the income scale to spend more as well, then the next group also spends more, and so on. This can increase sensitivity to income inequalities and their growth.

Overall, the benefits of having a good income relative to others, being in the labour force or employed and being well educated continue to be important determinants of health and health related quality of life over the life course. This was consistent across health measures and for the two sample cohorts. However, it appears that socio-economic factors are only part of the story. Large increases in income inequalities may have serious and direct negative implications for cohorts transitioning from mid to later life. With self-reported health being strongly related to both socio-economic status and increasing inequalities over time, particularly affecting the well-being of the Early Boomers what we may have observed in the past regarding mid to later life transitions both socially and economically may no longer apply for future cohorts, or even to the later Boomers.

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