

Education and Longevity

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CIA Insight Statement





Introduction

Many studies have found there is a positive correlation between education and longevity. Robert Brown, FCIA, conducted a literature review for the Canadian Institute of Actuaries (CIA) that examined several of these studies and the results were consistent – the more education people have, the longer they live. And the higher their educational attainment, the longer they live in good health.

One study² looked at people in the United States (US) and found the difference in life expectancy between those with a college education and those without widened from 1990 to 2018. It found that while the differences in life expectancy by race got smaller, the differences by education widened for both Black and white people. This widening gap in life expectancy due to educational differences means education is now a more significant differentiator of life expectancy than race.

Historically, wealth has been believed to be the primary driver of life expectancy and longevity. But increasingly, studies are showing that while there is a relationship between wealth and longer life, educational attainment is the primary driver of differences in both wealth and longevity. Education affects longevity through its link to better employment, income generation and information gathering, which in turn influences the adoption of healthier lifestyles.

Education effect

Study after study around the world has shown that mortality rates are lower for people with higher education levels. The studies have different educational

In this report, we have summarized the findings from the 2021 CIA paper *Driving Longevity Through Educational Attainment – A Literature Review*.¹ Citations and additional details of the findings can be found in that paper. For ease of reading, we have not repeated those citations here. Where we refer to a paper directly, we do provide a citation.

¹ Brown R. 2021. [Driving Longevity Through Educational Attainment – A Literature Review](#). Canadian institute of Actuaries.

² Case A, Deaton A. 2021. "[Life expectancy in adulthood is falling for those without a BA degree, but as educational gaps have widened, racial gaps have narrowed.](#)" *Proceedings National Academy of Science*. 118(11).



Longevity – the length or duration of a person’s life. Longevity for an individual cannot be known until after death. Prior to that, we commonly use life expectancy as an estimate of a person’s longevity. When looking at longevity of a group (e.g., all Canadians), life expectancy is commonly used.

Life expectancy – the average number of years a person is expected to live. Some people will live longer and some will live shorter. Life expectancy at birth is the most commonly used value, but life expectancy can be calculated starting from any age. In this paper, the life expectancies are calculated based on a person aged 25 and the result is stated as the average age at death. Life expectancy is approximately the age at which there is a 50% chance of a person having died and a 50% chance of living longer. (We say approximately because the actual 50/50 point occurs at the statistical median – which usually occurs a few months later.)

classifications, but in general a low education is non-completion of high school, medium is completion of secondary education and high education is a post-secondary certificate or a college or university degree.³

In Organisation for Economic Co-operation and Development (OECD) countries, on average, standardized mortality rates for men with low education are 54% higher than men with high education (29% higher for women).⁴ And there is a large difference in the resulting life expectancy. The average difference in life expectancy at age 25 between low and high education groups is 8.3 and 5.3 years, for men and women, respectively.

The percentage of the various populations that attain higher education levels varies significantly between countries, but whether a country has a large population with a low level of education or a large population with a high education, the longevity differences remain – higher education leads to a longer life expectancy. Regardless of the definition of low, medium and high education used, the studies consistently find a significant difference in longevity. Looking

3 Statistics Canada has four education levels in their paper (cited in footnote 6). They split high education into two levels (E3 and E4). A post-secondary certificate or college diploma is medium-high (E3). University degree is high education (E4).

4 Lübker C, Murtin F. 2023. “[Changes in longevity inequality by education among OECD countries before the COVID-19 pandemic](#).” *BMC Public Health*. 23: 1646.



at the extremes, Cuba, which is a highly educated country, has a longer life expectancy than the US despite being so poor. In oil-rich but poorly educated Equatorial Guinea, people rarely reach 60.

About half of the shorter life expectancy of the lowest education group is due to death at young ages. The top causes of death among people under age 45 in Canada over the past twenty years are: accidents, cancer, suicide, heart disease and violence (homicide).

A US study over the period 1993 to 2001 revealed death rates for the most educated are consistently lower across various causes of death.⁵ For cancer and heart diseases, death rates among the least educated are about twice as high as the most educated. For accidents, the ratio is about 4:1. It is clearly demonstrated that the rates of death from the major causes are lower with better education. The gap between low and high education has also been widening for each of the major causes of death. For cancer and heart diseases, death rates decreased among the most educated, while staying flat for the least educated. For accidents, death rates increased among the least educated, and remained relatively stable for the most educated.

Over the past 15 to 20 years, the longevity gap between low and high education groups has widened. In Canada,⁶ the difference in life expectancy at age 25 between high and low education has grown from 6.4 years to 7.8 years for men (1996-2011). For women, the growth has been even greater – from 4.8 years to 6.7 years. While life expectancy improved at all education levels in Canada (unlike some other countries) the largest improvement was at higher education levels, especially among women.

The largest gaps in longevity occur between the lower educational levels. The difference in longevity between low and medium education groups is generally greater than between medium and high education groups. That effect is of particular significance for children from disadvantaged backgrounds where their home environment may not provide them with the skills and support to prosper at the higher education levels. According to the OECD, investing in high-quality education in the early years and supporting students from a disadvantaged background is a cost-effective strategy.

5 Anderson R.N, Jemal A, Murray T, Thun M.J, Ward E. 2008. "[Widening of Socioeconomic Inequalities in U.S. Death Rates, 1993–2001.](#)" *PLOS ONE*. 3(5): e2181.

6 Bushnik T, Martel L, Tjepkema M. 2020. "[Socioeconomic disparities in life and health expectancy among the household population in Canada.](#)" Statistics Canada. Catalogue 82-003-X.



People acquire various skills through their youth, most but not necessarily all from formal education. Those skills form a base for the future, setting the groundwork for occupation, lifestyle, income and other socioeconomic factors. For example, people with higher education are less likely to smoke, more likely to exercise and more likely to apply lifelong learnings to their benefit.

The distribution of behavioural risk factors varies significantly by education attainment. Smoking explains half of the recent widening of the educational difference in life expectancy in some European countries, especially for women. Prevalence of smoking among Canadian adults is almost four times higher for those who did not complete high school than for university graduates.⁷ Smoking is a very important risk factor for cardiovascular diseases and many types of cancer.

Improvements in education result in better employability, productivity, entrepreneurship and positive social connections. Individual skills improvement has been shown to lead to economic growth.

From a public finance perspective, the benefits of investing in upper-secondary education completion outweigh the costs in all OECD countries.⁸

Education, wealth and longevity

There is a long-held belief that wealth is a major predictor of longevity. Research shows that while there is a correlation between the two, wealth is not the primary driver of longevity.

When wealth and education were placed in the same mathematical model, it was found that educational differences closely predicted differences in life expectancy, while changes in wealth barely mattered.⁹

Education usually leads to greater wealth, the two of which then provide an environment that can lead to better health and to longevity. In other words, education is the main contributor towards wealth, health and longevity.

Higher income often leads to greater wealth, but not always. Many longevity studies are based on income rather than wealth. As a result, we discuss longevity in terms of education and income with income used as a proxy for wealth.

7 Public Health Agency of Canada. 2018. "[Key Health Inequalities in Canada: A National Portrait](#)." Ottawa

8 OECD. 2012. "[Equity and Quality in Education: Supporting Disadvantaged Students and Schools](#)." Paris: OECD Publishing.

9 Lutz W, Kebede E. 2018. "[Education and Health: Redrawing the Preston Curve](#)." *Population and Development Review*. 44(2): 343-361

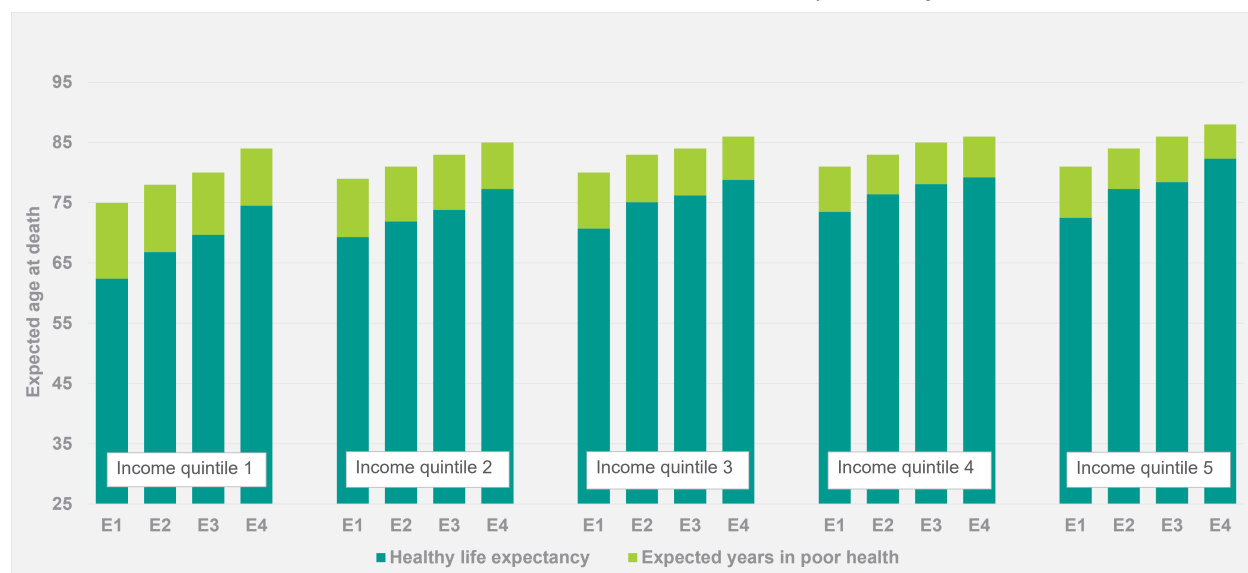


Of course, education does not always lead to greater wealth, nor does it always lead to a long life. While there are highly educated people in the lowest earnings group and people with low education in the highest earnings group, they are more the exception than rule.

In Canada, people with low income and high education have a longer life expectancy than those with high income and low education. For the lowest income quintile¹⁰ in Canada, females aged 25 with the highest level of education had a future life expectancy eight years more than those with the lowest education level. For males, it is nine years longer. Those with higher education don't just have a longer expectation of life, they also have more of those years in good health. Similar results occur at each earnings level – the more education, the longer life expectancy and the more years spent in good health.

Charts 1 and 2 show the expected age at death for people aged 25 in 2011, based on their relative income level and education level. The future years of life are split between the average number of years in good health (dark green) and the years in poor health (light green). At each income level, higher education led to a longer life expectancy and later average age at death. Higher education also led to more years spent in good health and fewer years in poor health.

Chart 1: Effect of income and education* on future life expectancy in Canada – males

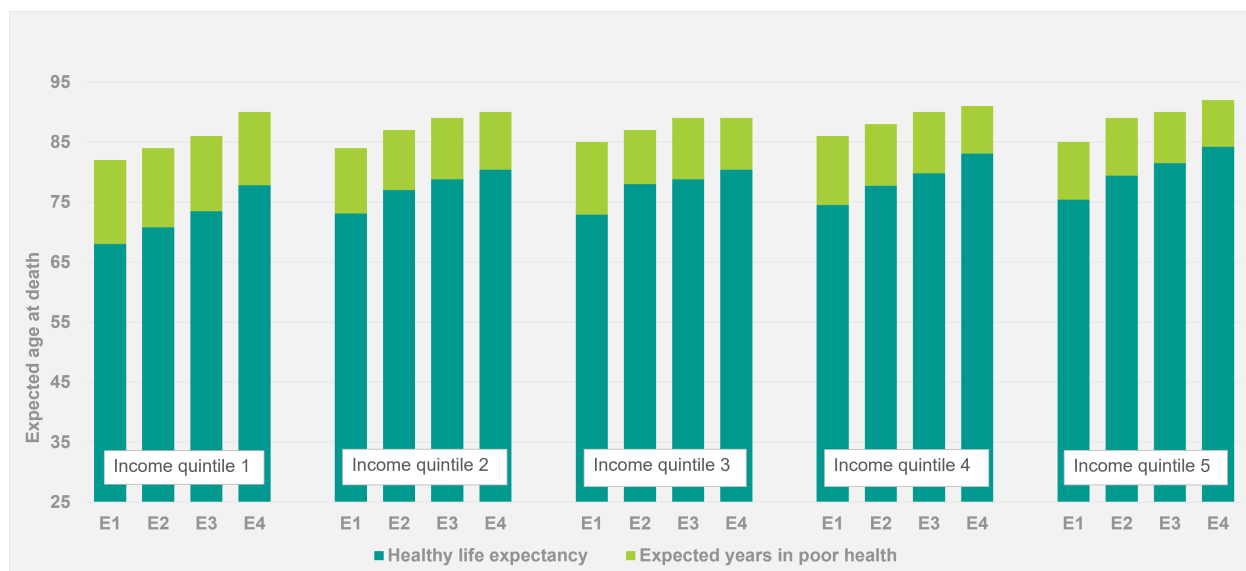


* E1 – did not complete high school; E2 – completed high school; E3 – obtained post-secondary certificate or college diploma; E4 – obtained university degree.

¹⁰ Here, quintiles split people into five groups based on their income level. The 20% of the population who have the lowest income are in quintile 1. The 20% of the population with the highest income are in quintile 5. The rest are in the middle three groupings.



Chart 2: Effect of income and education* on future life expectancy in Canada – females



* E1 – did not complete high school; E2 – completed high school; E3 – obtained post-secondary certificate or college diploma; E4 – obtained university degree.

Income levels also have an impact on longevity. Most of that occurs between the bottom two income quintiles – those in the bottom 20% of income and those in the next 20%. But when we look at healthy life expectancy, income has a roughly similar effect as education. Higher income leads to a longer life in good health. Lower income leads to a longer end of life period in poor health. More income or more wealth provides the means for better health care and better lifestyle, both of which can lead to better longevity.

Global differences

The average expected age at death for people aged 25 among 23 countries analyzed by the OECD was 74 for men with a low education and 82 for men with a high education, a difference of eight years. The average expected age at death was 81 for women with a low education and 86 for women with a high education, a difference of five years. Those differences by education level can vary significantly by country. For instance, in 2016, the gap in life expectancy between the bottom and top education level varied from about two years to 17 years for men and from about one year to 12 years for women.¹¹

Different studies make use of different methods for measuring life expectancy and education with the result that the absolute numbers can vary between

¹¹ Murtin F, Lübker C. 2022. "Educational inequalities in longevity among OECD countries around 2016." *OECD Papers on Well-being and Inequalities*. No. 8. Paris: OECD Publishing.



studies. But for all countries reviewed and all methods of measurement, there is a definite improvement in longevity as education levels increase.

Health adjusted life expectancy

The health-care systems in Canada and the US do a poor job of prevention. But higher education has been shown to lead to a healthier lifestyle and thereby to a lower average cost for health care. Improved education is a preventive measure – possibly suggesting that increased spending on schools might, to some degree, be a better expenditure than increasing spending on health care, especially high-tech and expensive health care. Certainly, it appears that increases in education can double as investments in long-term health.

Statistics Canada looked at the relationship between income and education on life expectancy as well as on health adjusted life expectancy.¹² A longer life expectancy is not necessarily good for society if it is accompanied by an equal number of years living in poor health. Charts 1 and 2 above show that the average time spent in poor health decreases with higher education as well as decreases with higher income. Since income is also related to educational level, we can say that education is a significant driver of healthy longevity.

People with a higher education have been shown to have a lower likelihood of developing dementia. If they do develop dementia, it is at older ages, and they consequently experience fewer years with dementia. Improving educational levels could thereby help relieve the strain on long-term care and reduce future long-term care costs.

Education and health-care spending

A US study estimated the effect of Americans achieving a college degree compared with advances made in biomedicine between 1996 and 2002. The estimates indicated many more lives would have been extended from the increase in education than from the medical advances. That should not be taken as suggesting we transfer medical funding to education. Medical advances will primarily benefit people who are currently over age 40 (as well as provide both current and future benefits to those under 40) while education improvements will mostly benefit people currently under age 20 – that is, those who are actively receiving their education. There are enormous future potential benefits from improvements in education, but we will need to wait.

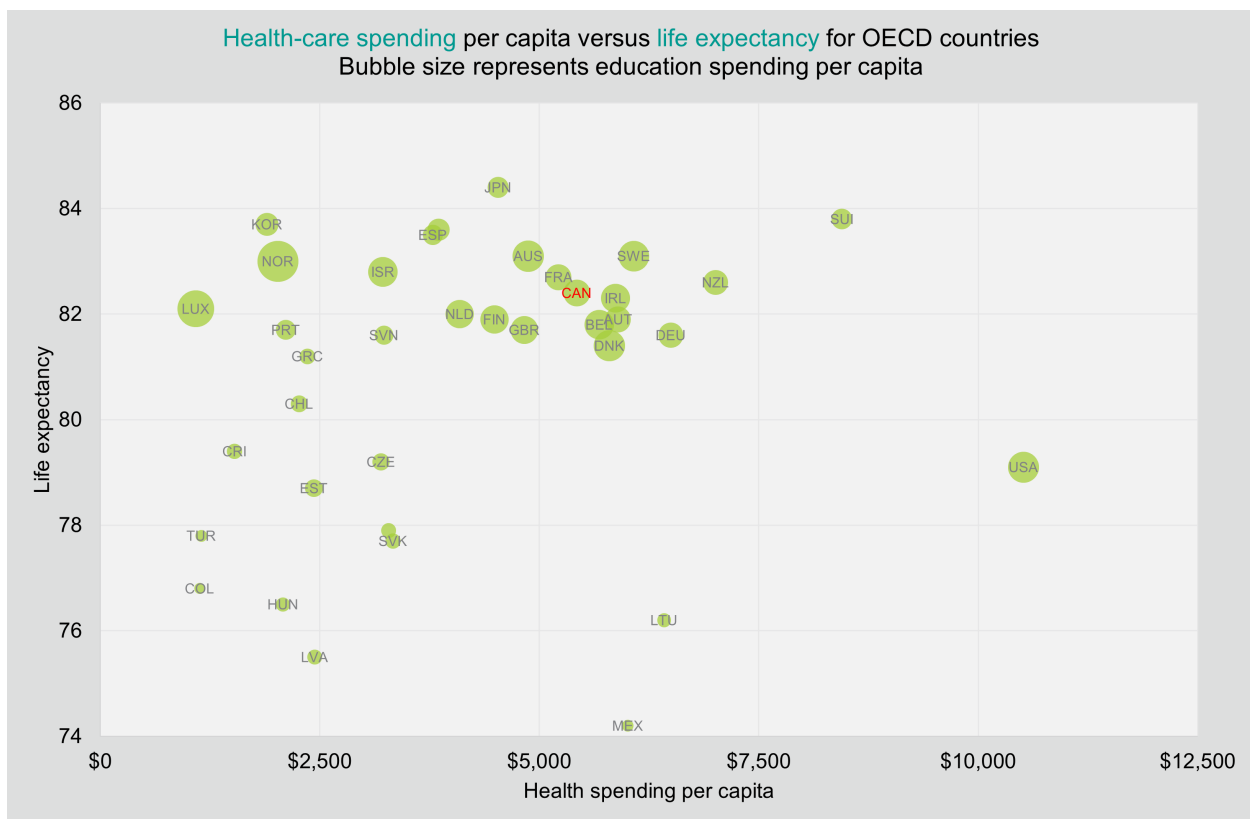
¹² Bushnik T, Martel L, Tjepkema M. 2020. [“Socioeconomic disparities in life and health expectancy among the household population in Canada.”](#) Statistics Canada. Catalogue 82-003-X.



Chart 3 compares the effect of education spending and health-care spending on life expectancy in 38 countries. The horizontal axis shows the average health-care spending per capita in 2018. The vertical axis shows the average life expectancy in 2019. One would expect to see a general pattern moving from the lower left to the upper right – increasing life expectancy as total health-care expenditures (public and private) increase. And we do have that general pattern.

But the size of the bubbles is the main story here. The area of the bubble represents the relative amount of public spending on education per capita in 2018. The larger the bubble, the more funds were devoted to education. Note that the larger bubbles are almost all in the top half of the chart – signalling that higher expenditures on education may be having a more significant effect on life expectancy than health-care spending in these countries.

Chart 3: Health care and education spending (2018-2019) effect on life expectancy



It is important to note that spending on health care and education do not necessarily lead to better quality, better access or better results. Looking at the upper left quadrant of Chart 3, the smaller bubbles suggest that those countries



(e.g., Chile, Portugal, Slovenia, Greece) are accomplishing better educational effects on longevity than the countries with larger bubbles. Of course, per capita spending on education is partly influenced by the size of the school-aged population to the total population.

Should longer life expectancy be a public goal?

While many individuals may be delighted to have a longer life, is that in the best interests of society? If a longer life is accompanied by increasingly poor health, it could result in driving up health-care costs and create a burden on younger generations. Longer life expectancy also increases the cost of social security programs (such as the Canada and Québec Pension Plan and Old Age Security) and defined benefit pension plans.

People living on only registered retirement savings plans and personal savings will either have to delay retirement or reduce how much they withdraw in each year of a longer period of retirement. Younger generations will need to wait longer to receive an inheritance, which might be smaller than in the past due to a longer life of their parents/grandparents.

The key is providing for a longer healthy life expectancy. Or more specifically, a longer life expectancy with a shorter period of poor health. This would result in a longer period of productive contribution to the economy. Retirement ages could be increased, making it easier for people to save for retirement while keeping the cost of public retirement systems in check. And with shortened periods of poor health, the costs on the health-care system would be reduced. All of which has a positive effect on younger generations who will not have to shoulder as large a financial burden for supporting seniors.

Public policy implications

Higher education leads to more than just longer life expectancy. It leads to better health and to longer *healthy* life expectancy. Among the better educated, fewer people smoke and there is less obesity. That results in better health and lower health-care costs placed on the public.

To achieve a healthier longevity, social policies should focus on ways to help keep people in school to at least graduate from secondary education. Support in the early years for those with learning issues and those from disadvantaged backgrounds could lead to improvements in overall educational attainment, which leads to increases in economic productivity and better health.



Educational failure results in increased costs on society. People with lower education are more likely to cost society more in social programs, crime prevention and punishment and health-care costs. If automation takes over their jobs, they are less likely to be able to find alternative employment and end up needing social support.

There is growing evidence that investments in education can be counted as investments in health care. But that should not necessarily result in redirecting future health-care spending to education. The investment in education is a long-term investment in health care with potentially a long delay before the returns can be measured. Health-care investment tends to have a shorter pay-back period. So, a balance is likely needed.



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