Education

Overview

A desired outcome common to many charitable programs is the greater educational attainment of its clients. Advancement in education is associated with significant short- and long-term benefits, the most obvious being the well-evidenced increase in personal income. However, beyond greater income for the individual, there are additional benefits of educational attainment, affecting not only the individual but society as well, as it relates to reductions in costs to public systems[1]. In this paper we explore the incremental benefits (and to a smaller extent, the costs) of educational advancement, particularly as they relate to income and foregone income, mortality, quality of life, the public and private health care system, social assistance, crime, and tuition.

Income

Income

We use multiple sources of data from Statistics Canada's 2016 Census of the Population to generate estimates of the incremental improvement in annual income as an individual advances to higher levels of education. Statistics Canada provides 'average earnings or employment income' by province or territory, age group, and level of education[2]. Age groups are broken up into intervals of five years from age 15 to age 64 (15 to 19, 20 to 24…60 to 64) while education data are categorized such that we define six types of education: no high school, high school, apprenticeship or trades, college or other non-university, university below bachelor's, and bachelor's or above; there are also data for all age groups and all educations. We collapse the six categories of education into four by merging apprenticeship or trades, college or other non-university, and university below bachelor's into one overarching category we call simply college[3]. We inflate all income figures from 2016 CAD to 2022 CAD.

We adjust the foregoing income values in two ways. First, because the age-weighted data for income across all age groups include the incomes earned by individuals as young as fifteen, and we believe this should bias the data downwards as at these young ages most individuals will not have yet even had a chance to graduate from high school, let alone from different levels of post-secondary, we attempt to factor out the incomes of individuals ages 15 to 24 from the age-weighted data. Organized by these same age and education groupings, Statistics Canada reports also the number of individuals of each age group and with each type of education[4]. For each province or territory (and for Canada as a whole) we calculate, for each of our four

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[1] Hankivsky, O. (2008). *Cost estimates of dropping out of high school in Canada.* The Canadian Council on Learning.

[2] *Average earnings or employment income, by age group and highest certificate, diploma or degree (x 1,000).* (2019, September 18). Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3710015201

[3] We weight the incomes of the different subcategories of the college category by the number of individuals who attained to those education levels; these latter data come from the source cited in the next footnote.

[4] *Highest certificate, diploma or degree (15), major field of study - classification of instructional programs (CIP) 2016 (82), age (9) and sex (3) for the population aged 15 years and over in private households of Canada, provinces and territories, Census Metropolitan Areas and Census Agglomerations, 2016 - 25% sample data.* (2017, November 29). Statistics Canada. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/dt-td/Rp-eng.cfm?TABID=1&LANG=E&A=R&APATH=3&DETAIL=0&DIM=0&FL=A&FREE=0&GC=01&GL=-1&GID=1341679&GK=1&GRP=1&O=D&PID=110633&PRID=10&PTYPE=109445&S=0&SHOWALL=0&SUB

categories of education, the percentage of individuals ages 15 to 64 who are ages 15 to 24. We estimate the average annual income among individuals ages 25 to 64 at each level of education by the following formula:

$$i_{25-64} = \frac{i_{15-64} - \left(\left(\frac{i_{15-19} + i_{20-24}}{2}\right) * \%_{15-24}\right)}{1 - \%_{15-24}}$$

where i_{x-x} is annual income for individuals of a particular age range, and $\%_{15-24}$ is the percentage of individuals ages 15 to 64 who are ages 15 to 24.

The above calculations give us annual income data by educational level for individuals ages 25 to 64. The second adjustment we make to these data is to account for differences in employment types and statuses across education levels, based on the idea that, typically, individuals at higher levels of education are more likely to be employed and employed full-time than individuals at lower levels of education[5], such that income data derived only from employed individuals would underestimate the actual differences in income earned between the average individual, employed or not, at a lower level of education and the average individual, employed or not, at a higher level of education.

We collect provincial and territorial data on the total number of people ages 25 to 54 and 55 to 64 at each education level, the number of those people who are in the labor force, the number of people who are in the labor force who are employed, as well as the number of people who are employed full-time versus part-time[6]. Summing the data for individuals ages 25 to 54 and individuals ages 55 to 64, we calculate, for each level of education, the percentage of total individuals who are in the labor force, the percentage of individuals in the labor force who are employed, and the percentages of individuals who are employed who are employed full-time versus part-time. Elsewhere, we collect provincial and territorial data on the average number of full-time versus part-time hours worked per week by individuals ages 25 and older[7]. From these data, we compute ratios of the number of part-time to full-time hours, which we use subsequently as a proxy for the relative earnings of a full- versus a part-time worker. We adjust our income data for individuals ages 25 to 64 by the following formula, accounting for employment type and status:

$$ia_{25-64} = i_{25-64} \times \%_{lf} \times \%_{e} \times (\%_{ef} + (\%_{ep} \times er))$$

where ia_{25-64} is annual income of individuals ages 25 to 64 at a particular education level, adjusted for employment status and type; i_{25-64} is our former, unadjusted estimate of the annual income of individuals ages 25 to 64; $\%_{lf}$ is the percentage of total individuals at a particular education level who are in the labor force; $\%_{e}$ is the percentage of individuals in the labor force who are employed; $\%_{ef}$ is the percentage of individuals who are employed who are employed full-time; $\%_{ep}$ is the percentage of individuals who are employed who are employed part-time; and er is the ratio of part-time to full-time hours. By this first method we estimate provincial and territorial annual incomes, adjusted by employment type and status, of individuals ages 25 to 64 whose highest level of education was no high school, high school, and college.

=0&Temporal=2017&THEME=123&VID=0&VNAMEE=&VNAMEF=&D1=0&D2=0&D3=0&D4=0&D5=0&D6=0

[5] Uppal, S. (2017). *Young men and women without a high school diploma*. Statistics Canada.

[6] *Labour force characteristics by educational degree, annual.* (2022, January 07). Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410011801&pickMembers%5B0%5D=1.1&pickMembers%5B1%5D=2.10&pickMembers%5B2%5D=4.1&pickMembers%5B3%5D=5.3&cubeTimeFrame.startYear=2017&cubeTimeFrame.endYear=2021&referencePeriods=20170101%2C20210101

[7] *Average usual and actual hours worked in a reference week by type of work (full- and part-time), annual.* (2022, January 07). Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1410004301

We use a second source of Statistics Canada data to estimate annual income figures for individuals ages 25 to 64 at different levels of education, including, because this second source of data allowed for it, a bachelor's level of education and an above bachelor's level of education[8]. We collect provincial and territorial data on average annual income, at different levels of education, from wages, salaries and commissions; we use these data to generate separate estimates of income levels. We define five levels of education: no high school; high school; college; university, bachelor's; and university, above bachelor's. Again, the college level of education includes apprenticeships or trades, college or other non-university, and university below bachelor's[9]. All income data are inflated from 2016 to 2022 CAD.

Following the convention described earlier, and based on the same data, we adjust our average wages, salaries and commission income values by accounting for differences in employment type and status among individuals of different levels of educational attainment. By this second method we estimate provincial and territorial annual average incomes, adjusted by employment type and status, of individuals ages 25 to 64 whose highest level of education was no high school, high school, college, university (bachelor's), and university (above bachelor's).

The foregoing work yields us two sets of estimates of the annual income of individuals ages 25 to 64 at different levels of education. From these data, we estimate the improvement in income from moving from a lower level of education to a higher one. Our estimates of the annual income at each level of education are the average of available data points from our two sets of estimates of annual incomes. We then calculate the difference in annual income between different levels of education. We present in Table I our estimates of annual incomes of individuals in Ontario at different levels of education, and the incremental differences in incomes as one advances in education. These values will vary by province or territory; we provide these in the context of Ontario to demonstrate their general directions.

Table I – Annual Income by Education, Ontario ($)

		value of advancement from:			
	annual income	no high school	high school	college	university, bachelor's
no high school	20,254				
high school	31,514	11,260			
college	45,467	25,213	13,953		
university, bachelor's	65,382	45,128	33,868	19,915	
university, above bachelor's	81,285	61,031	49,771	35,818	15,903

Based on federal and provincial or territorial taxation rates, we estimate how much of this income would remain with clients versus go to income tax, assuming for clients a taxed income commensurate with the level of education to which they advance. We assume for the baseline income level (a key term in our taxation function – see the Income Tax methodology paper) the annual income expected for an individual

[8] *Employment income statistics (7), highest certificate, diploma or degree (11), work activity during the reference year (5), age (10) and sex (3) for the population aged 15 years and over in private households of Canada, provinces and territories, Census Divisions and Census Subdivisions, 2016 Census - 25% sample data.* (2018, March 28). Statistics Canada. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/dt-td/Rp-eng.cfm?TABID=2&LANG=E&A=R&APATH=3&DETAIL=0&DIM=0&FL=A&FREE=0&GC=4615042&GL=-1&GID=1260343&GK=3&GRP=1&O=D&PID=111840&PRID=10&PTYPE=109445&S=0&SHOWALL=0&SUB=0&Temporal=2017&THEME=123&VID=0&VNAMEE=&VNAMEF=&D1=0&D2=0&D3=0&D4=0&D5=0&D6=0

[9] And again these data are weighted by the number of individuals who attained to each level of education, using this time data restricted to individuals ages 25 to 64, from *Education highlight tables, 2016 Census.* (2017, November 23). Statistics Canada. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/edu-sco/Table.cfm?Lang=E&T=11&Geo=00&SP=1&view=2&age=2&sex=1

with the level of education they would have if not for their advancing to a higher level of education. We present in Table II our estimates of the value of income and income tax for individuals advancing from and to different levels of education. These values will vary by province or territory; we provide these in the context of Ontario to demonstrate their general directions.

Table II – Annual Value of Income and Income Tax, by Education, Ontario ($)

	income				income tax			
	no high school	high school	college	university, bachelor's	no high school	high school	college	university, bachelor's
high school	9,002				2,258			
college	20,158	11,156			5,055	2,798		
university, bachelor's	34,961	26,238	15,428		10,167	7,630	4,486	
university, above bachelor's	46,431	37,865	27,249	12,099	14,600	11,906	8,568	3,804

Foregone Income

We consider the opportunity costs of educational attainment, in part, by accounting for the income that a person gives up, if only temporarily, by staying for longer in school. Our values of foregone income adhere closely to those described in the section above, on income. If a person is moving from no high school to high school, for example, the value of the income they forego, we say, is the amount of income we expect they would have had as someone without a high school education, minus what they might have earned as a student working, potentially, during the school year and summer months. We have already identified our estimates of the annual earnings of individuals with no high school, high school, college, university (bachelor's), and university (above bachelor's) educations. We describe now our estimates of the typical earnings of students while in school.

We reference Statistics Canada data on school-year and summer earnings of postsecondary students ages 15 to 24[10]. Inflating all dollar figures to 2022 CAD, we calculate that, in Canada as a whole, female students earned $3,870 over the 34-week school year (September through April) while male students over this same period earned $3,510. Organizing the data instead by ages, students ages 15 to 19 earned $2,797 over this period while students ages 20 to 24 earned $4,282. Considering income earned over the summer months (May through August), the average student in Canada earned $5,407, with considerable provincial variability, ranging from $4,687 in Ontario to $8,467 in Saskatchewan. Though these data are drawn from postsecondary students, we use them to estimate earned income of postsecondary and high school students alike, variable by gender and geography.

First, we compute several ratios: the ratios of earnings between females and males, and between males and females; the ratio between the earnings of students ages 15 to 24 and students ages 20 to 24; and finally the ratios of earnings of students in each province compared to those in Canada as a whole. These ratios respectively are 0.91 ($3,510 over $3,870), 1.10 ($3,870 over $3,510), 0.65 ($2,797 over $4,282), and, in the case of Ontario for example, 0.87 ($4,687 over $5,407). We calculate the expected annual earnings of students in high school, combining school-year and summer earnings, by the formula:

$$earnings = \left(e_{15-19} \times r_g \times r_p\right) + \left(e_{summer} \times r_g \times 0.5\right)$$

where e_{15-19} are the school-year earnings of a student ages 15 to 19; r_g is the ratio of female-to-male or male-to-female earnings, depending on what gender of student is being analyzed; r_p is the ratio of the average student's earnings in a given province to that in Canada as a whole; and e_{summer} are the summer earnings of an average student in a given province, which are multiplied by 0.5 to account for the fact that a high school student's summer is half as long as a postsecondary student's summer. This formula relies on our assumption that a high school student earns an income while in school that is comparable to that of a postsecondary student ages 15 to 19. We believe this is reasonable.

[10] Marshall, K. (2010). *Employment patterns of postsecondary students*. Statistics Canada.

We calculate the expected annual earnings of students in postsecondary, combining school-year and summer earnings, by the formula:

$$earnings = \left(e_{20-24} \times r_g \times r_p\right) + \left(e_{summer} \times r_g\right)$$

where e_{20-24} are the school-year earnings of a student ages 20 to 24; r_g is the ratio of female-to-male or male-to-female earnings, depending on what gender of student is being analyzed; r_p is the ratio of the average student's earnings in a given province to that in Canada as a whole; and e_{summer} are the summer earnings of an average student in a given province.

Once we have estimated how much money annually we think high school and postsecondary students earn, the final step is to subtract these values from the income we expect they would have earned if they had not been in school. If we are considering students who at baseline have not graduated yet from high school, then should the students remain in school, foregone income during their high school tenure is the income typical of a person with no high school education minus what they stand to earn as high school students. If the same students progress to college or university at the bachelor's level, foregone income during their college or bachelor's tenure is the income typical of a person with no high school education minus what they stand to earn as college or bachelor's students. If we are considering students who at baseline have graduated from high school, then should the students progress to college or university at the bachelor's level, foregone income during their college or bachelor's tenure is the income typical of a person with a high school education minus what they stand to earn as college or bachelor's students.

We believe that students at above the bachelor's level of university earn more during the school year than do bachelor's or college students. We find that the average income of a graduate student in Canada is $26,653[11]. A study out of Georgetown University finds that 40 and 76 percent of undergraduate and graduate students respectively work more than 30 hours a week while in school[12]. From the same Statistics Canada study that provided us with income data among postsecondary students, we find that 46.6 percent of postsecondary students ages 20 to 24 were employed during the school year[13]. We use the ratio of employed graduate students to employed undergraduate students from the Georgetown University study to estimate what percentage of graduate students, in Canada, are employed, multiplying this ratio by 46.6 percent. Finally, we multiply the result of the foregoing by $26,653 to estimate the average income among graduate students (including those not working) in Canada – $23,599. This value we would subtract from the expected income of a person who, as the case may be, formerly had no high school, or was, alternately, a high school, college, or university (bachelor's) graduate.

We provide in Table III our estimates of annual foregone income for female and male students in Ontario, contingent on what baseline level of education they progress from and to what level of education they progress. These values will vary by province or territory; we provide these in the context of Ontario to demonstrate their general directions. Foregone income we assume applies only for how long it takes the person to complete the level of education to which they're advancing, after which the more long-lasting benefit of a greater income due to a higher level of education takes effect.

[11] *Graduate student salaries in Canada.* (2022, June 25). glassdoor. https://www.glassdoor.ca/Salaries/graduate-student-salary-SRCH_KO0,16.htm

[12] Carnevale, A.P., Smith, N., Melton, M., & Price, E. W. (2015). *Learning while earning: The new normal.* Georgetown University: Center on Education and the Workforce.

[13] Marshall, K. (2010). *Employment patterns of postsecondary students.* Statistics Canada.

Table III – Annual Foregone Income by Starting and Prospective Education, Ontario ($)

	foregone income							
	baseline: no high school		baseline: high school		baseline: college		baseline: university, bachelor's	
	female	male	female	male	female	male	female	male
high school	14,998	15,930						
college or university (bachelor's)	10,995	12,637	22,254	23,897	36,208	37,850		
university (above bachelor's)	-3,344	-3,344	7,915	7,915	21,869	21,869	41,783	41,783

Based on federal and provincial or territorial taxation rates, we estimate how much of foregone income would have remained with clients versus have gone to income tax, assuming for clients a taxed income commensurate with the level of education from which they advanced. We assume for the baseline income level (a key term in our taxation function – see the Income Tax methodology paper) the annual income expected for an individual with the level of education they would have if not for their advancing to a higher level of education. We provide in Table IV our estimates of the value of foregone income and foregone income tax, for individuals advancing from and to different levels of education. These values will vary by province or territory; we provide these in the context of Ontario to demonstrate their general directions.

Table IV – Annual Value of Foregone Income and Foregone Income Tax, by Education, Ontario ($)

	foregone income							
	baseline: no high school		baseline: high school		baseline: college		baseline: university, bachelor's	
	female	male	female	male	female	male	female	male
high school	11,991	12,736						
college or university (bachelor's)	8,790	10,104	17,792	19,106	28,948	30,261		
university (above bachelor's)	-2,674	-2,674	6,328	6,328	17,484	17,484	32,370	32,370
				foregone income tax				
high school	3,007	3,194						
college or university (bachelor's)	2,204	2,534	4,462	4,791	7,260	7,589		
university (above bachelor's)	-671	-671	1,587	1,587	4,385	4,385	9,413	9,413

Health

Research has shown that individuals with higher levels of education tend to live longer than those with lower levels of education, on average for 6 to 9 more years[14]. Specifically as it relates to high school completion, those who do not finish their high school education are more likely to die from cardiovascular disease, cancer, and infection[15]. Economic perspectives on the association between education and health suggest that advancement in education creates value for individuals and society through improvements in morbidity and mortality and reduced public spending on health care. We explore those outcomes here.

Mortality

We use data from Bushnik, Tjepkema, & Martel (2020) to estimate lesser mortality associated with advancement in education[16]. The authors report life expectancy and Health Adjusted Life Expectancy (HALE) data at age 25 for a 2011 cohort of male and female individuals who attained to different levels of

[14] Muennig, P., & Fahs, M. (2001). The cost-effectiveness of public postsecondary education subsidies. *Preventive Medicine*, *32*, 156-162.

[15] Wong, M. D., Shapiro, M. F., Boscardin, W. J., & Ettner, S. L. (2002). Contribution of major diseases to disparities in mortality. *The New England Journal of Medicine*, *347*(10), 1585-1592.

[16] Bushnik, T., Tjepkema, M., & Martel, L. (2020). Socioeconomic disparities in life and health expectancy among the household population in Canada. *Statistics Canada: Health Reports*, *31*(1), 3-14.

education, including no high school, high school, college, and university or above. Compared to life expectancy which is based solely on mortality, HALE in addition to mortality accounts for loss of life related to morbidity – i.e., what portion of a person's life was spent with diminished health, due to illness, injury, etc.

We collect life expectancy data for males and females of different levels of education. From these data, we are able to calculate the incremental differences in life expectancy between levels of education. We present our estimates in Table V.

Table V – Life Expectancy from Age 25 by Education Level, and Differences in Life Expectancy

		difference in life expectancy, baseline:		
	life expectancy	no high school	high school	college
male				
no high school	53.5			
high school	56.6	3.1		
college	59.0	5.5	2.4	
university or above	61.3	7.8	4.7	2.3
female				
no high school	58.9			
high school	61.8	2.9		
college	64.0	5.1	2.2	
university or above	65.6	6.7	3.8	1.6

Quality of Life

We collect from Bushnik, Tjepkema, & Martel (2020) HALE data for males and females of different levels of education. From these data, we are able to calculate the incremental differences in HALE between levels of education. HALE incorporates life lost due to mortality as well as morbidity. By subtracting life expectancy data from Table V from HALE data we are able to isolate the number of years of life lost due exclusively to morbidity. We make the assumption that 20 and 80 percent of life lost due to morbidity is due respectively to mental versus physical health problems. Our estimates of the value of moving from a lower level of education to a higher level of education are based on the incremental difference in years of life lost due to mental versus physical health-related morbidity between levels of education, multiplied by our assumption about the value of one year of life – $100,000 (see the Quality of Life methodology paper).

The foregoing yields us lifetime values of mental versus physical health-related morbidity improvements from advancing in education. We estimate annual values by dividing lifetime values by the unique life expectancy value associated with the level of education that is advanced to. We present in Table VI education level-specific values of years of life lost due to morbidity from age 25, as well as our estimates of the annual values of mental versus physical health-related morbidity improvements for individuals in Ontario who advance from and to different levels of education.

Table VI – Years of Life Lost due to Morbidity from Age 25 by Education Level, and Annual Mental versus Physical Health-Related Values of Education Advancement

		difference in YLL morbidity, baseline:			annual value of advancement ($), baseline:					
					no high school		high school		college	
	YLL morbidity	no high school	high school	college	mental health	physical health	mental health	physical health	mental health	physical health
male										
no high school	10.1									
high school	8.1	2.0			707	2,968				
college	8.1	2.0	0.0		678	2,712	0	0		
university or above	6.7	3.4	1.4	1.4	1,109	4,437	457	1,827	457	1,827
female										
no high school	12.3									
high school	10.2	2.1			680	2,718				
college	9.8	2.5	0.4		781	3,125	125	500		
university or above	8.4	3.9	1.8	1.4	1,189	4,756	587	2,195	427	1,707

Public Health Care

In the context of the public health care system rather than personal health, we could find no comparable studies on differences in public health care spending across education levels; these exist in the U.S. context as it relates to Medicaid and Medicare[17], but the non-universality of the American system compared to Canada's universal system means the applicability of U.S. results to the Canadian context is questionable. We therefore opt for a different strategy to estimate public health care costs for individuals of different education levels, matching income quintile data – for which health care cost estimates do exist – to education level data.

Canadian Institute for Health Information provides data on annualized public health care costs of Canadians as a whole separated into income quintiles[18]. Thus, in 2011, health care costs per person in the lowest, second, third, fourth, and highest income quintile were $4,220, $3,820, $3,650, $3,650, and $3,350; inflated to 2022 CAD, these values are $5,205, $4,712, $4,502, $4,502, and $4,132. From Statistics Canada, we collect data on the upper limit of annual income by decile, for each province, in 2010[19]. From these data we identify the upper limits of income by quintile (the second decile is the first quintile, the fourth decile is the second quintile, etc.) – these are the maximum annual incomes above which an individual would no longer be considered a representative of a particular quintile but of one above it. Elsewhere from Statistics Canada we collect provincial data on the number of individuals ages 15 or older, as well as individuals ages 15 to 24, with various education levels – no high school, high school, college, university or above – and at various levels of annual earnings (under $5,000, $10,000-$14,999, $15000-$19,999, $20,000-$29,999, $30,000-$39,999…$60,000-$79,999… $100,000-$124,999, $125,000 and over)[20]. For each province (and for Canada as

[17] Levin, H. M., Belfield, C. R., Muenning, P., & Rouse, C. (2007). The costs and benefits of an excellent education for all America's children. *Center for Benefit-Cost Studies of Education*, *20*; DeBaun, B., & Roc, M. (2013). *Well and well-off: Decreasing Medicaid and health-care costs by increasing educational attainment*. Alliance for Excellent Education.

[18] Allin, S., Corscadden, L., Gapanenko, K., & Grignon, M. (2013). *Lifetime distributional effects of publicly financed health care in Canada*. Canadian Institute for Health Information.

[19] *Upper income limit, income share and average of adjusted market, total and after-tax income by income decile.* (2022, March 23). Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1110019301

[20] *2011 National Household Survey: Data tables: Income in 2010 (34), age groups (10B), sex (3), and highest certificate, diploma or degree (11) for the population aged 15 years and over in private households in Canada, provinces, territories, Census Metropolitan Areas and Census Agglomerations, 2011 National Household Survey.* (2013, September 11). Statistics Canada. https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/dt-td/Rp-eng.cfm?TABID=2&LANG=E&A=R&APATH=5&DETAIL=0&DIM=0&FL=A&FREE=0&GC=01&GL=-1&GID=1118296&GK=1&GRP=0&O=D&PID=106637&PRID=0&PTYPE=105277&S=0&SHOWALL=0&SUB=0&Temporal=2013&THEME=98&VID=0&VNAMEE=&VNAMEF=&D1=0&D2=0&D3=0&D4=0&D5=0&D6=0

a whole) we subtract ages 15 to 24 data from ages 15 or older data to isolate the data on individuals ages 25 or older. Based on the province-specific upper limits of income quintiles, we calculate how many – and then what percentage of – individuals ages 25 or older in each province, with each level of education, fall into each quintile of annual income.

From Canadian Institute for Health Information we collect data on provincial and territorial public health expenditures from 2000 to 2021[21]. We use these data for two purposes. First, we recognize that per capita health care costs have risen over the years in a way that is not reducible to regular inflation alone. Thus, after inflating 2011 and 2021 provincial and territorial per capita public health care costs both to 2022 CAD, we compare the 2021 costs to 2011 costs to identify by what factors, unrelated to regular inflation, 2011 health care cost data should be adjusted upwards. Second, we compare per capita public health care spending by province or territory each to the value for Canada as a whole, to identify, compared to Canada as a whole, how much more or less each province or territory spends on health care.

We estimate province-specific annual costs of public health care per individual with no high school, high school, college, and university or above using the following formula:

$$annual\ cost = ((\$5{,}205 \times \%_{Q1}) + (\$4{,}712 \times \%_{Q2}) + (\$4{,}502 \times \%_{Q3}) + (\$4{,}502 \times \%_{Q4}) + (\$4{,}132 \times \%_{Q5})) \times t \times pt$$

where $\%_{Qx}$ is the percentage of individuals with a particular level of education whose earnings are commensurate with a particular income quintile; t is the non-inflation-related adjustment factor for the increase in health care spending over time since 2011; and pt is the province-specific ratio of provincial or territorial health care costs relative to those for Canada as a whole. We provide in Table VII our estimates of annual costs of public health care for individuals in Ontario at different levels of education, and the incremental differences in costs as one advances in education. These values will vary by province or territory; we provide these in the context of Ontario to demonstrate their general directions.

Table VII – Annual Public Health Care Costs by Education, Ontario ($)

	annual cost of health care	value of advancement from:		
		no high school	high school	college
no high school	5,591			
high school	5,460	131		
college	5,356	235	104	
university or above	5,202	389	258	154

Private Health Care

We consider the effect on private health care costs of educational attainment using provincial and territorial data on household spending on health care[22]. These data, similar to public health care data, are organized by income quintile. In order to translate household spending into per person spending, we collect provincial and territorial data on the number of families and persons in those families in 2019, and elsewhere the number of households – one- versus multi-person – by income quintile[23]. From the first set of data we

[21] *National health expenditure trends*. (2021, November 4). Canadian Institute for Health Information. https://www.cihi.ca/en/national-health-expenditure-trends

[22] *Household spending by household income quintile, Canada, regions and provinces*. (2021, January 22). Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1110022301

divide the number of persons in Census families by the number of families, to get the number of people per multi-person household (per family). From the second set of data we divide, for each income quintile, the number of multi-person households by the total number of households, to get the percentage of households that are multi-person. We estimate the number of people per any type of household, by province or territory and income quintile, by a weighted average of the number of people per multi-person household and the number of people per single-person household (i.e., 1 in this latter case).

We estimate per person private health care costs by dividing these costs per household by our estimates of the number of people per household. Similar to our approach in the context of public health care, we match quintile data to education level data and estimate province-specific annual costs of private health care per individual with no high school, high school, college, and university or above by a weighted average of the province-specific costs of private health care per individual in each income quintile, where the data are weighted by the percentage of individuals of each education level that are in each income quintile. We provide in Table VIII our estimates of annual costs of private health care for individuals in Ontario at different levels of education, and the incremental differences in costs as one advances in education. These values will vary by province or territory; we provide these in the context of Ontario to demonstrate their general directions.

Table VIII – Annual Private Health Care Costs by Education, Ontario ($)

	annual cost of health care	value of advancement from:		
		no high school	high school	college
no high school	885			
high school	943	-58		
college	996	-111	-53	
university or above	1,104	-220	-161	-108

Social Assistance

We consider rates of social assistance receipt among individuals with different levels of education. In its 2016 report covering the years 2009-2013, Employment and Social Development Canada (ESDC) provides data on the number of social assistance users, in aggregate and in different subgroupings, in the provinces and territories[24]. First, we collect data from 2013 on the total number of cases (as distinct from recipients, which includes children and dependents affected by a single case) of social assistance in each province or territory. These data are generally available for all provinces and territories, except Northwest Territories and Nunavut which did not have 2013 data available but instead had, respectively, 2008 and 2010 data available.

The next type of data we look for are comparably less common. In some provinces – Alberta, Newfoundland, Ontario, Prince Edward Island, Quebec, and Saskatchewan – cases of social assistance are organized by highest level of education achieved by the head of the family. In these provinces, we calculated what percentages of overall cases of social assistance involved someone with no high school, high school, college, or university or above. However, the categories used by ESDC often did not follow our own categorization scheme, and included categories such as primary education, secondary education (which included some high school, not necessarily the completion of it), and postsecondary (which could be college or university).

[23] *Census families by family type and family composition including before and after-tax median income of the family*. (2021, July 15). Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1110001701; *Distributions of household economic accounts, number of households, by income quintile and by socio-demographic characteristic*. (2022, April 06). Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=3610010101

[24] *Social assistance statistical report: 2009-13*. (2016). Employment and Social Development Canada.

Using our earlier data (see the public health care section) on the percentages of people in the lowest income quintile (the people we believe most likely to receive social assistance) whose education was no high school, high school, college, or university or above, we calculate, among those with a high school education or less, what percentages had no high school versus high school, and among those with a postsecondary education, what percentages had college versus university or above. When we have data on the number of social assistance claimants whose highest level of education was primary school versus secondary school, we add up those values and multiply, respectively, by what percentage of low income persons with a high school education or less have no high school versus high school. When we have data on the number of social assistance claimants whose highest level of education was postsecondary, we multiply this value respectively by what percentage of low income persons with a postsecondary education have college versus university or above. In other cases (for other provinces) it is as simple as directly using the figures provided by ESDC. After estimating how many social assistance claimants had no high school, high school, college, or university or above, we divide each of these count data by the total number of claimants of all education levels, to get the percentage of overall claimants who had each level of education[25]. For all other provinces or territories for which education data were not available, and for Canada as a whole, we use population-weighted averages of the results for the provinces that did have education data.

We multiply province-specific total number of cases of social assistance by our estimates of the percentages of claimants with no high school, high school, college, or university or above to get estimates of the number of claimants with these different levels of education. We calculate, for each province or territory, rates of social assistance use by level of education by dividing our estimates of the number of claimants with no high school, high school, college, or university or above by the total number of people ages 15 and above in each province or territory, in 2013, with these levels of education[26]. We calculate the average cost of social assistance per person with no high school, high school, college, or university or above by multiplying rates of social assistance receipt by our estimates of province-specific average annual social assistance values per person (see the Social Assistance methodology paper). We provide in Table IX our estimates of per capita annual costs of social assistance for individuals in Ontario at different levels of education, and the incremental differences in costs as one advances in education. These values will vary by province or territory; we provide these in the context of Ontario to demonstrate their general directions.

Table IX – Annual Social Assistance Costs by Education, Ontario ($)

	annual cost of social assistance	**value of advancement from:**		
		no high school	high school	college
no high school	2,337			
high school	1,167	1,170		
college	345	1,991	822	
university or above	168	2,168	998	177

Crime

[25] We calculate percentages because there were always a number of claimants whose education was unknown, such that tallying up the counts for each level of education would not sum to the total number of social assistance cases.

[26] We use data on the population ages 15 and above because a small contingent of claimants of social assistance were categorized as <20 years of age. We use Statistics Canada data cited earlier (Labour force characteristics by educational degree, annual..) to estimate what percentages of individuals 15 and older have no high school, high school, college, or university or above. We multiply those percentages by provincial or territorial populations ages 15 and above in 2013 to get the estimated number of people ages 15 and above with each level of education.

We use the results from Levin, Belfield, Muennig, & Rouse (2007) and Lansford, Dodge, Pettit, & Bates (2016) to estimate the effects on crime of educational attainment[27]. The authors of both studies explore the effect on arrests of high school graduation.

Levin, Belfield, Muennig, & Rouse find that among their sample of individuals who did not complete high school, the annual number of violent crime, property crime, or drug offenses arrests per 1,000, at age 20, were 14.02, 42.95, and 60.04, or 0.014, 0.043, and 0.060 arrests annually per person. Compared to these individuals who did not complete high school, those who did complete high school had 19.6 percent fewer violent crime arrests, 10.4 percent fewer property crime arrests, and 11.5 percent fewer drug offense arrests. We apply these percentage reductions to the arrest rate data for individuals who did not complete high school, to find comparable arrest rate data for individuals who did complete high school – 0.011, 0.039, and 0.053 violent crime, property crime, and drug offenses arrests annually per person. Taking the difference between the number of arrests for each type of crime for individuals with and without a high school education, we get 0.003, 0.005, and 0.007 fewer violent, property, and drug crime arrests per individual with a high school education.

Lansford, Dodge, Pettit, & Bates (2016) do not distinguish by category of crime, but instead simply report the percentages of individuals in their sample with and without a high school education who from age 18 to 27 had been arrested – 20.6 versus 65.4 percent. The authors do not indicate how many arrests this involves on average, so we assume only one arrest over ten years from age 18 to 27. We multiply 20.6 and 65.4 percent each by 1 divided by 10 to estimate the annual number of arrests per person with or without a high school education – 0.021 versus 0.065. Taking the difference between the number of arrests for individuals with and without a high school education, we get 0.045 arrests per individual with a high school education.

We multiply arrests differences by our estimates documented elsewhere of the costs per different category of crime (see the Crime methodology paper). This gives us estimates of the additional annual costs of crime incurred by individuals who did not complete high school, compared to those who did. We present in Table X raw costs per crime and our estimates from the different studies of additional crime costs owing to high school non-completion; offender income is split into income and tax following the conventions described in the Income Tax methodology paper.

[27] Levin, H. M., Belfield, C. R., Muennig, P., & Rouse, C. (2007). The costs and benefits of an excellent education for all America's children. *Center for Benefit-Cost Studies of Education*, *20*; Lansford, J. E., Dodge, K. A., Pettit, G. S., & Bates, J. E. (2016). A public health perspective on school dropout and adult outcomes: A prospective study on risk and protective factors from age 5 to 27. *The Journal of Adolescent Health*, *58*(6), 1-15.

Table X – Costs per Crime and Annual Additional Crime Costs, High School Non-Completion ($)

raw costs per crime

	victim costs	CJS costs	offender income
all crime	86,980	7,499	3,004
violent crime	209,435	18,185	8,322
property crime	50,421	3,780	905
drug crime	22,711	714	0

crime costs, high school non-completion

			offender income	
	victim costs	CJS costs	income	income tax
Levin, Belfield, Muenning, & Rouse (2007)				
violent crime	576	50	18	5
property crime	225	17	3	1
drug crime	157	5	0	0
Lansford, Dodge, Pettit, & Bates (2016)				
all crime	3,897	336	108	27

Comparing our two sets of results, we estimate the annual difference in the costs of crime between individuals with and without a high school education by taking the average of the results of each study, where in the Levin, Belfield, Muennig, & Rouse case the costs of crime are taken to be the sums of the costs of violent crime, property crime, and drug offenses. We estimate that compared to high school graduates, individuals who do not graduate high school incur $2,427, $204, $65, and $16 annually in greater victim, criminal justice system, and offender income (split into income and tax) costs. At present our model is limited to the effect on crime of advancing from no high school to a high school education; we do not have comparable data on the effect on crime of advancing still further to higher levels of education.

Tuition

Postsecondary education is costly and this should be considered another trade-off to staying in school longer. From Statistics Canada we collect provincial and territorial data on the average annual cost of a university education at and above the bachelor's level[28]. Costs are inflated to 2022 CAD and when these data are missing for a province or territory we use the Canadian value. OCAS reports the annual cost of a bachelor's level education as well as a college diploma in Ontario, based on which we compute a ratio of the cost of a college versus a bachelor's level university education[29]. We estimate the annual cost of college tuition by multiplying our bachelor's level tuition values by this ratio. We provide in Table XI our estimates of the annual cost of tuition for a college, university (bachelor's), and university (above bachelor's) education. These costs would apply for every year during which a person is expected to be in school.

[28] *Canadian undergraduate tuition fees by field of study.* (2021, September 08). Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=3710000301

[29] *Paying for college: Tuition and financial assistance.* (n.d.). OCAS. https://www.ontariocolleges.ca/en/colleges/paying-for-college

Table XI – Annual Costs of Tuition by Level of Postsecondary Education ($)

	annual cost of tuition		
	college	university, bachelor's	university, above bachelor's
Canada	2,769	7,037	7,856
Alberta	2,717	6,905	7,381
British Columbia	2,527	6,423	10,220
Manitoba	2,102	5,343	5,684
New Brunswick	3,302	8,393	7,347
Newfoundland	1,273	3,236	2,970
Northwest Territories	2,769	7,037	7,856
Nova Scotia	3,735	9,492	10,669
Nunavut	2,769	7,037	7,856
Ontario	3,284	8,346	10,267
Prince Edward Island	2,877	7,311	5,454
Quebec	1,354	3,442	3,620
Saskatchewan	3,535	8,984	4,935
Yukon	1,657	4,211	7,856