Education and Health: Building Indicators in International Comparison

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Introduction

Nowadays, we often analyze the benefits of education as a sesame to access employment – the higher your level of education and better your field of study, the better your chances of getting quickly a stable, well paid and rewarding job. Surely this is important and it is a consideration that nobody can ignore when it comes to making a choice of a pathway through school and a career. But it would be inappropriate to think of education and its role in life only in such terms. Education is a source of many other benefits both for the individual and for society.

In this brief article, we wish to draw the attention of the reader to the context for the development of indicators linking education and health, and to their interest in international comparisons. In itself and perhaps even more because of its impact on employment and quality of life, education is one of the recognized determinants of health (Sanni Yaya, 2010). This fully justifies the interest born by international organizations such as the World Health Organization (WHO), the Organisation for Economic Cooperation and Development (OECD) and the European Commission. In seeking to compare national situations on the basis of indicators jointly designed and calculated in the most standardized way possible, these organizations develop rich databases and metadata allowing us to learn from the relative "performance" of countries and to issue policy recommendations.

*What is an indicator? An **indicator** is a standardized measure, based on statistical data, which seeks to operationalize a concept to assess a situation, make comparisons over time and space, as a tool for decision making.*

The relationship between education and health is increasingly documented. Education can have a direct relationship with the state of health and health behaviours by bringing people to choose healthy lifestyles and to turn away from harmful health behaviours. Education can also

have an indirect relationship to health, to the extent that more educated individuals are more likely to have access to stable jobs that pay well, which give them ways and means towards a healthier life. But, let's clarify a point at the start: the concept of "determinant", as in the expression "determinants of health", will often be understood as reflecting a causal relationship between the situation of the given parameter, i.e. here the education level, and health status, that is to say that a higher level of education would "cause" a better state of health. Specific survey techniques and appropriate statistical tools help apprehend such causal relationships. However, such approaches are not commonly used in the presentation of indicators, whether in the field of health, education or other. "Indicators" tend rather to clarify relationships between different variables. It is true that such relationships may then be difficult to interpret out of a causal relationship, and could not easily lead to clear policy conclusions by themselves. But these relationships are taking an interesting dimension when we look at them in different national contexts, as we will present some indicators of relationships between education and aspects of health issues in international comparison. Note also the interest of monitoring indicators over time, through building time series.

We will look at some specific examples of the construction of relevant indicators showing the relationship between education and important aspects of health: **the individual's perception of their own health, obesity and life expectancy**. We saw above that we should not quickly infer causality when we show evidence of a relationship (which can be measured statistically by a *correlation* – a statistical measure of the relationship between two or more variables). As part of the presentation of indicators, we also discuss the concepts of *statistical control* – statistical suppression of the influence of an external element on each of the two related phenomena –, and approach issues with *subjective data* – data intrinsically linked to the perception of the individual – and *objective data* – data independent of any individual perception.

Under the OECD Indicators of Education Systems (INES) programme, an important place is given to the social benefits of education, several indicators being related to health. The examples in this article and the data underlying the figures come from several OECD publications, especially *Education at a Glance* [1], published annually.

1 – Education and self-reported good health

The first example is the indicator showing the relationship between the individual's perception of good health and education. The measure of the perception of health status is the percentage of adults (25-64 years) who consider themselves at least in 'good' health (on a scale of 4 or 5 points). *Subjective data* is typically treated in this manner. The adult population is divided into three groups by highest level of education: no high school diploma, high school graduates, and graduates of higher education. A small selection of countries was chosen to illustrate the point [2].

Figure 1 presents some interesting information. Color identifies the three levels of education: the length of the **blue** bar indicates the proportion of the adult population without a high school diploma who report being healthy – the "ranking" of countries, Ireland at the top of the figure to the Czech Republic at the bottom, is in decreasing order of the proportion of the population that reports being healthy; the **red** part of the bar is added to the blue bar to indicate the proportion of the population with a high school diploma who report being healthy – always a proportion higher than that of the population without a diploma; the **green** portion of the bar is added to the previous two to indicate the proportion of adults with a postsecondary credential who perceive themselves healthy – again, this proportion is higher than the previous two. The incremental change in health status associated with rising levels of education (12 to 44 percentage points among the countries included here) is called the "education gradient".

Three conclusions emerge when considering first the top bar ("No control") for each country:

1. for any given level of education, the perception of good health varies considerably from one country to another;

2. in all countries, reporting being in good health increases with the level of education, but the benefits that are associated with higher levels of education still vary considerably from one country to another;

3. in all countries but one, the marginal gain in the perception of good health is higher among the population with a high school diploma compared to the population with no diploma than that obtained by the population with higher education compared to high school graduate (the red portion of the bar is longer than the green one). This is potentially useful information for policy makers about the relative "efficiency" of public health effort in secondary schools.

As the OECD advises, it is necessary to interpret these data "with caution, given the potentially significant cross-country bias (including cultural bias) in reporting one's health status" (OECD, 2010, p. 152). However, we cannot neglect what such "subjective" data tell us: in our lives, do we always make decisions that affect us based on "objective" data? Are we not more often carried by our perceptions, perhaps especially those relating to our health? These preliminary findings are the result of a direct reading of survey results, with no particular statistical processing, as the reading for each country is on the bars labeled "No control" (without *statistical control*).

To what extent this perception of health status does vary by level of education, with and without controlling for individual differences in gender, age and income? Note that, for each country, we present three horizontal bars. Above, we have presented a direct reading of the bar without *statistical control*. What do the other two bars give us? The relationship between education and the perception of being in good health may itself be influenced by underlying elements which, themselves, may affect both the level of education and the perception of health status – such elements could be considered as **"confounding" variables** because they could affect the observed relationship. One can think of age, for example: an "average" young person is often better educated than an older person; he/she will also probably more often be in better health – and more likely to perceive themselves as such – than an older person. One can also think that the person's gender may play some role, even if the analyst does not need to determine in advance what role – gender is also one of the determinants of health. Another determinant of health that may be a confounding variable in the relationship between education and health is income. It is itself correlated with the level of education. Trying to take into account explicitly the effect of such confounding variables is precisely the reason for the statistical exercises underlying the other two bars for each country. The question that arises is the following:

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Figure 1

Proportion of adults self-reporting good health, by the level of educational attainment. *Note*. Adapted from "Education at a glance 2011: OECD indicators," by OECD, 2011. Copyright 2011 by OCDE.
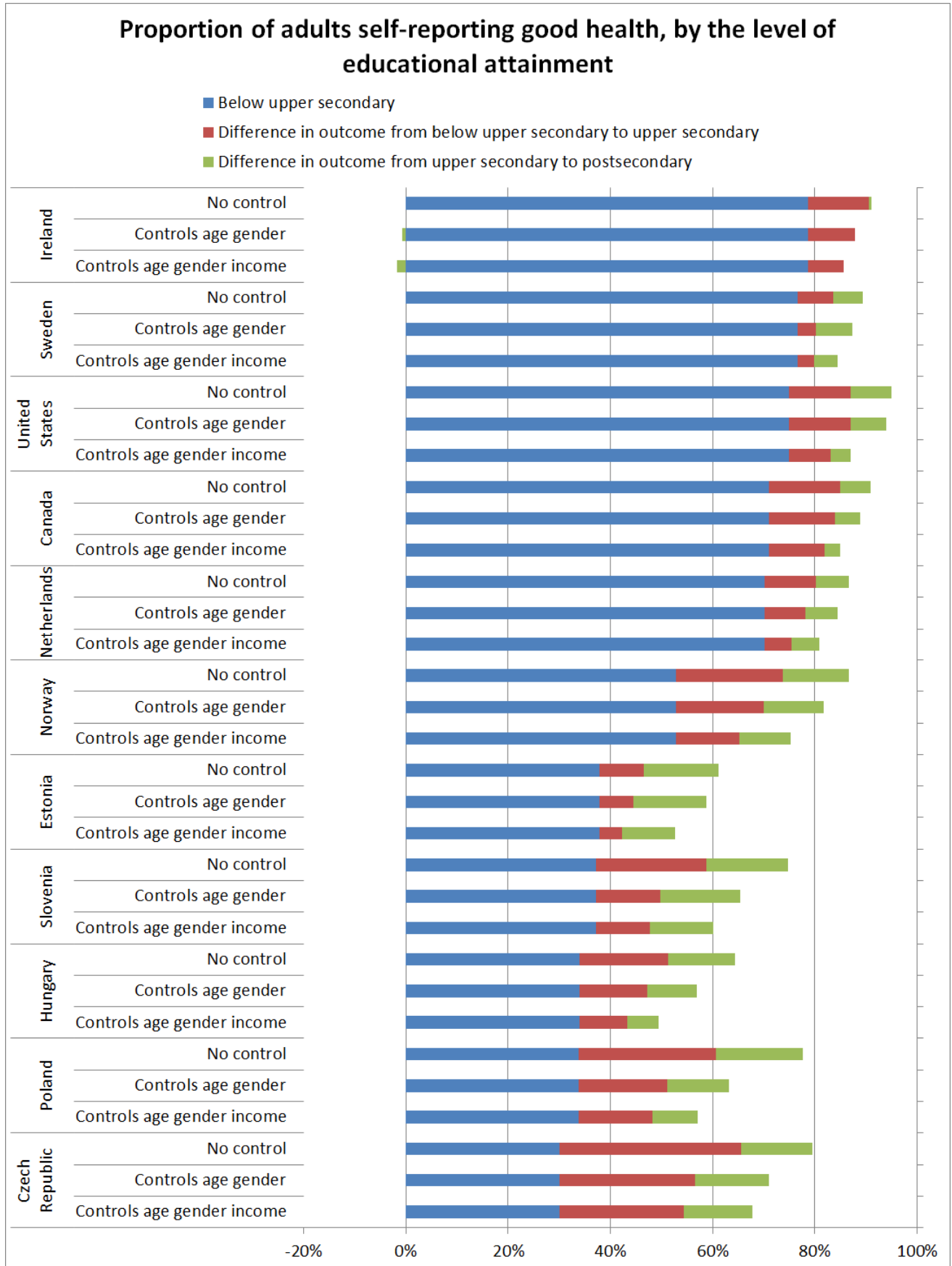
taking as a reference the population without a high school diploma, if we eliminate the effect of age and gender in populations with a higher level of education, what would be **the net effect** of a diploma or a degree on the perception of health status? The answer to this question is obtained using a regression analysis that allows us to "statistically control" for age and gender – a measure of the relationship between educational attainment and the perception of good health in conditions where the composition of the population by age and gender would be similar to that in the population with no high school diploma. The comparison of the bars "Controls age gender" and "No control" presents the following conclusions:

1. in all countries, irrespective of the level of education higher than no high school diploma (the blue bar), both the red and green portions of the bars are reduced, indicating that the different age-gender composition in both more educated groups plays a positive role in improving the perception of good health among the more educated populations;

2. however, since the red and green bars do not disappear completely, it remains after having been controlled, indicating a strong relationship between the level of education and the perception of good health;

3. notable differences remain between countries: for example, the combined effect of age and gender is almost nil in the United States and very low in Canada (one to two percentage points only), while it is a more important factor – up to nearly ten percentage points – in the Czech Republic, Poland and Slovenia.

Hence, the relationship does not seem to depend, primarily, upon differences in educational attainment between genders or between age groups.

In the same way, we can additionally "control" for the income effect. Recognizing that much of this effect can already be absorbed by the previous age-gender effect, we actually measure the additional effect of income. It proves significant in most countries and in a way that reinforces the effect of age and gender. It is highest, it seems, in countries where the age-gender effect was lower (U.S., Canada). The correlation between educational attainment and perceived health status tends to lose its intensity when income is controlled for, which suggests that income plays a significant role among the explanatory variables in this relationship.

In most countries, the correlation between education level and the perception of good health remains strong even after adjustment for age, gender and individuals' income. In other words, what individuals may acquire through learning and training – namely skills, and socio-emotional and cognitive skills – generates significant social benefits, regardless of the impact of these variables.

2 – Education and obesity

Obesity has been identified as a priority issue in public health. Our second example examines the relationship between educational attainment and a measure of obesity. In this case, it is an objective measure since respondents are asked in the survey to provide their size and weight [3]. The measure of obesity is the standard body mass index (BMI, the weight in kilograms divided by the square of the height in meters). According to the World Health Organization, adults with a BMI at or above 30 are considered obese.

Following the same approach as in the previous section, we obtain Figure 2 covering the same set of countries. The blue bars represent the proportion of obese people among the population without a high school diploma. This proportion is used as the basis for measuring both the difference recorded in populations with higher levels of education, and the impact of controlling for age, gender and income. Again, the relationship between education and obesity is obvious and the differences between countries are too. In all the selected countries, the direct reading of the prevalence of obesity ("No control"), shows that longer schooling on average is associated with a lower incidence of obesity (both red and green bars moving in the opposite direction indicate a decrease of incidence). Only in the United States, there was no significant difference in incidence of obesity between those who have no qualifications and those with a high school diploma. The differences between countries are high: among the most vulnerable adults (those without a high school diploma), the incidence of obesity is 35% in the United States while it is 15% in Norway. The magnitude of the reduction in the incidence of obesity with higher levels of education does not seem closely linked with the national baseline for adults without a diploma.

Does the correlation between education and obesity depend on age or gender to a large extent? One hypothesis would be, for example, that younger generations (or wom-

Figure 2

Incidence of obesity among adults, by level of educational attainment. *Note.* Adapted from "Education at a glance 2013: OECD indicators," by OCDE, 2013. Copyright 2013 by OCDE.

Incidence of obesity among adults, by level of educational attainment
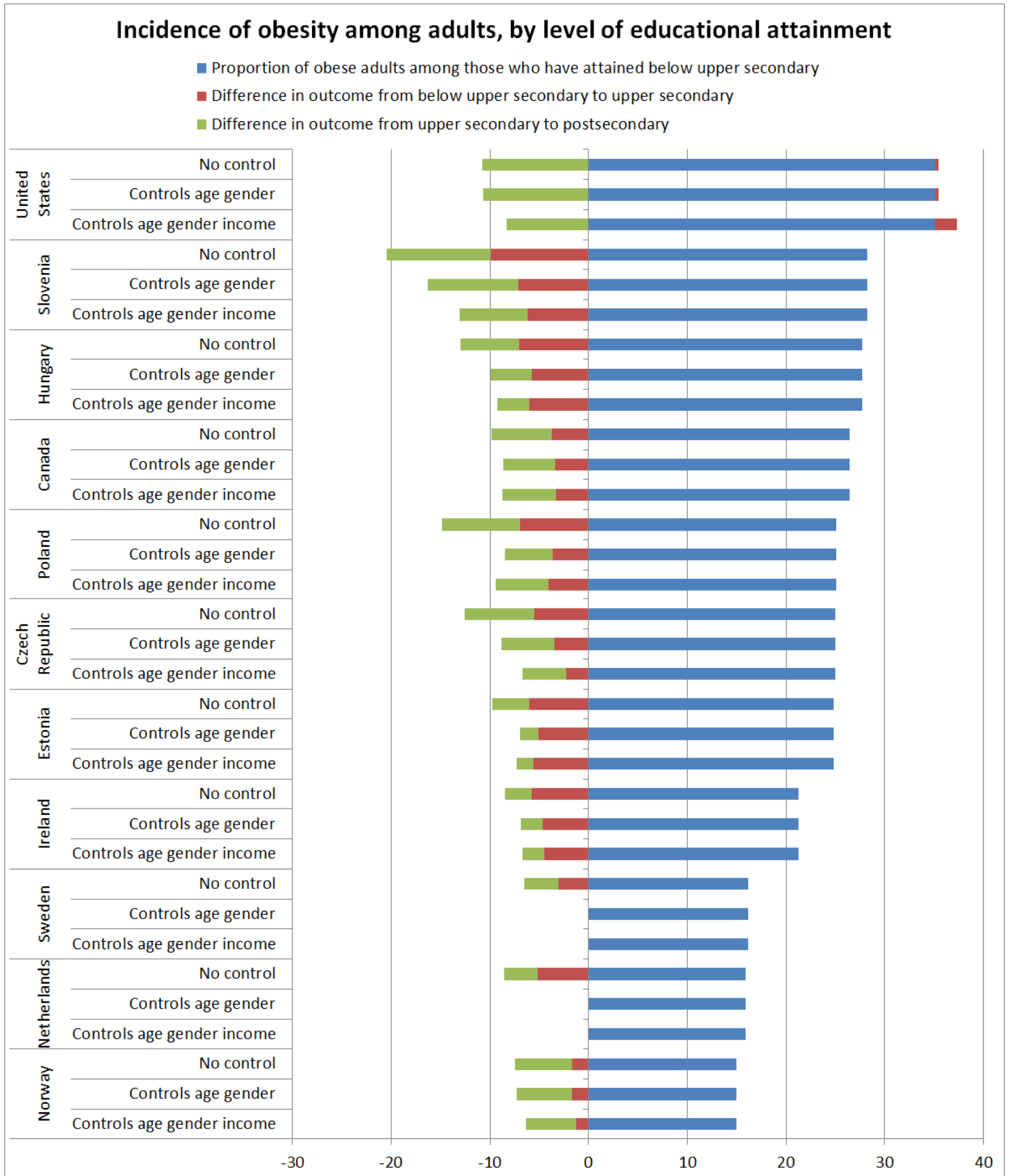
en) are less likely to be obese, and that they are also more educated than older generations (or men). Figure 2 produces estimates, calculated from a regression, that eliminate differences in composition of population groups by education level. It suggests that the relationship between education and obesity remains close, even after controlling for age and gender. When seeking to eliminate the confounding effect of age and gender first, then additionally the effect of income, we obtain the expected general model, i.e. an attenuation of the positive effect of higher education. This phenomenon is important in Slovenia, Hungary and the Czech Republic. It is, however, much limited or nonexistent in other countries, demonstrating that the level of education has a relationship with obesity in the adult population, largely independent of those variables.

Our sample of countries is reduced, but it is still somewhat surprising that the correlation between the perception of good health and the reality of not being obese is low. Although it is not shown here, it is interesting to note that, in the case of obesity, the education gradient is usually greater for women than for men.

3 – Education and life expectancy

The life expectancy of a population is also an important indicator of health. It is somehow a good summary indicator of the health of a population – or, seen from another angle and in the historical perspective of continued growth in life expectancy, the ability of a health system to control health risks throughout life. Again, the level of education appears to be closely associated with life expectancy. Here, we look at the life expectancy at the age of 30, i.e. the number of additional years a person can, on average, expect to live when he/she reaches the age of 30 years. Calculated from vital data (birth and death rates by age), life expectancy is a typical "objective" indicator, depending only on observed facts. The importance of gender differences leads us to directly present this perspective in Figure 3.

In all countries, the education gradient is clear – the red and green bars reflect additional years of life expectancy associated with higher levels of education. In all countries and at all levels of education, life expectancy at age 30 is significantly higher among women [4]. However, except in the Netherlands, education is a factor associated with an increase in life expectancy significantly higher for men than for women. This means that the difference in life expectancy by gender is larger among those whose education

level is lower than among those whose education level is higher.

Differences among the countries for which we present the data are important. In four European countries (Estonia, Hungary, Poland and Czech Republic), life expectancy for men at the lowest level of education is substantially below 40 years, even though these are the four countries where the gains associated with higher levels of education are highest. Overall, among the countries presented, the higher gains in life expectancy associated with the level of education among men lead to a reduction in the average gap in life expectancy between men and women from 7 ½ years to 3½ years.

Interestingly, with continued lengthening of life expectancy, the focus has recently been put on the "quality" of the extended years of life. New statistical developments are taking place to measure **life expectancy in good health** – are the years gained in longevity years of healthy life? The statistical concept is not yet fully stabilized and several methods underlying the necessary calculations are under study. In Canada (Statistics Canada), there are, apparently, two approaches: the disability-adjusted life expectancy, for which the calculation uses data from the activity limitation survey, and health-adjusted life expectancy, for which the calculation uses a health index, itself based on the current conditions of morbidity and mortality (Statistics Canada, 2014a). International developments are also significant, such as those of the World Health Organization, the Organisation for Economic Cooperation and Development and the European Commission (Eurostat) [5]. For the moment, we do not yet know of a measure of life expectancy in good health by level of education – it would certainly be a very interesting and relevant statistical development.

Since we saw the significant relationship between life expectancy and level of education, it is interesting to note that the gap between life expectancy and healthy life expectancy, both calculated at birth, is also significant. According to the most recent data for Canada, based on death tables from 2005 to 2007, healthy life expectancy for men was 68.9 years for a total life expectancy of 78.3 years, while these values were 71.2 years and 83 years respectively for women – the difference in life expectancy between men and women is reduced by half when one considers the adjustment taking into account the state of health (Statistics Canada 2014b).

These examples show the importance of using sophisticated statistical methods to occasionally to understand and

Additional years of life expectancy at age 30, by level of educational attainment and gender. *Note.* Adapted from "Education at a glance: OECD indicators," by OCDE, 2012a. Copyright 2012 by OCDE.

Figure 3
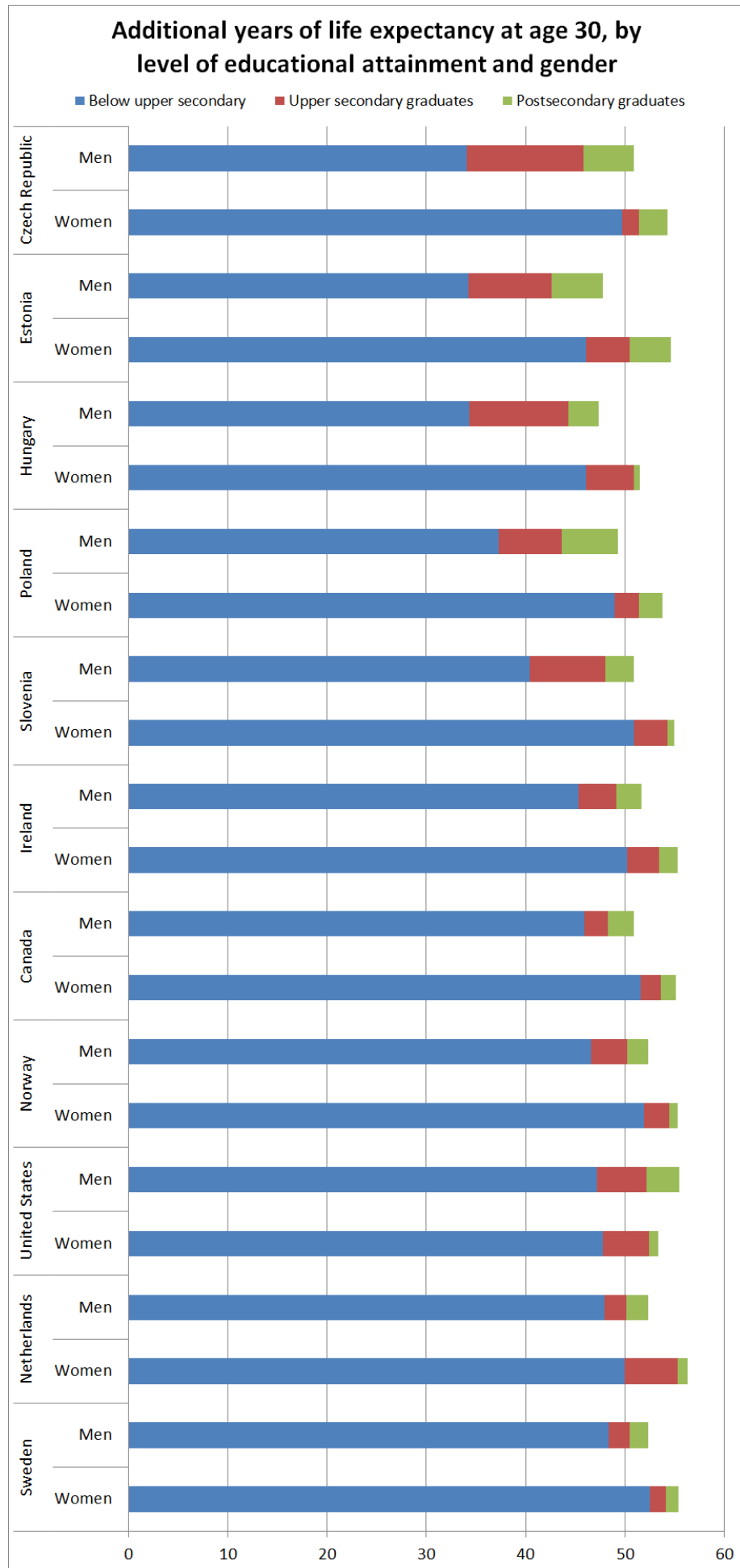
analyze important relationships at the heart of our social life and our economy. Globalization also makes the involvement of international organizations in understanding and analyzing these relationships in the context of international comparisons more urgent, which allows sharing of national experiences and taking advantage of exemplary situations.

Notes :

[1] For more information on Education at a glance, see OCDE. (2014, June).

[2] A larger number of countries can be found in (OECD, 2011).

[3] Let's rather say that it is a "more" objective measure as it still relies on an informed ("honest") response of the interviewee..

[4] Only one exception would be the life expectancy slightly higher among American men with postsecondary education.

[5] See, for example, two chapters on healthy life expectancy in (OECD, 2012b).

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