

Are the Dimensions of the Human Development Index (HDI) Important in Explaining Subjective Well-being (SWB)?

Motivation

- GDP per capita is a poor proxy measure of human well-being because it ignores important dimensions like health, education, inequality, and so on (van den Bergh & Botzen, 2018).
- Although the Human Development Index (HDI) includes health and education, it has been widely criticized due to the equal and identical weighting scheme as well as for ignoring subjective well-being (SWB) (Yang, 2018).
- SWB is inherently important and contributes to lives well lived (OECD, 2013).
- SWB measures allow policymakers to identify human wants and needs. These measures also allow policymakers to identify specific predictors of human well-being leading to improved quality of social services, especially in health and education (Anand, 2016).

Research Questions

- What is the relationship between SWB and the dimensions of the HDI?
- Does the role of the HDI dimensions diminish when socio-demographic characteristics such as age, employment status, and marital status are considered?

Cantril Ladder Question

Using a scale of 0 to 10, where 0 means "Very dissatisfied" and 10 means "Very satisfied", how do you feel about your life as a whole right now?

(Statistics Canada, 2014a, p. 20)

Data

- The Canadian Community Health Survey (CCHS) "is a cross-sectional survey that collects information related to health status, health care utilization and health determinants for the Canadian population" (Statistics Canada, 2014b, Description section, para. 2).
- I conduct a cross-sectional study on the 2014 CCHS for individuals who are aged 15 or above.
- After removing respondents with missing data, there are 53,818 observations in the resulting database.

Methodology

- The HDI is specified as "the geometric mean of normalized indices for each of the three dimensions" (income, health, and education), and each has equal weight (UNDP, 2019, p. 2).

$$HDI = (x_{Health} \cdot x_{Education} \cdot x_{Income})^{1/3} \quad (\text{UNDP, 2019, p. 2})$$

- I estimate the relative importance of each of the three dimensions by using a life satisfaction regression approach.

$$S_i^* = \beta_0 + \beta_1 \ln(y_i^{income}) + \beta_2 y_i^{health} + \beta_3 y_i^{education} + \gamma G_i + u_i$$

S_i^* : the continuous latent variable underlying the ordinal Cantril Ladder score of individual i

y_i^k : the attainment in each dimension

G_i : a vector of socio-demographic controls such as age, marital status, and employment status

u_i : the error term follows a standard logistic distribution

- Notes: An ordered logit model is used because the responses to the life satisfaction question are ordinal.
- $\beta_0 = 0$ because the ordered logit model does not have an intercept.
- Following the literature, I employ the logarithmic transformation of income to linearize the regression.

Life Satisfaction Regression Model

Table 1. Results of Life Satisfaction Regression Model (2014 CCHS)

Cantril Ladder Score (Dependent Variable)	Coefficient	Marginal Effects at the Means (Very Dissatisfied)	Marginal Effects at the Means (Very Satisfied)
Equalized Income	0.2651*** (0.015)	-0.00066*** (0.000)	0.03795*** (0.002)
Health	4.9109*** (0.059)	-0.01215*** (0.001)	0.70256*** (0.009)
Education (Post-secondary)	-0.0599*** (0.017)	0.00015*** (0.000)	-0.00860*** (0.003)
Widowed and Separated, and Divorced	-0.1615*** (0.027)	0.00042*** (0.000)	-0.02241*** (0.004)
Unemployed	-0.0588*** (0.021)	0.00015*** (0.000)	-0.00840*** (0.003)
Race (White)	0.0606** (0.025)	-0.00015** (0.000)	0.00854** (0.003)
Household (Living with Family)	0.4470*** (0.023)	-0.00123*** (0.000)	0.06012*** (0.003)
Born in Canada	0.0641*** (0.024)	-0.00016** (0.000)	0.00905*** (0.003)
Male	-0.2186*** (0.016)	0.00055*** (0.000)	-0.03103*** (0.002)
18 – 19 Years Old	-0.2120*** (0.059)	0.00058*** (0.000)	-0.02838*** (0.007)
20 – 24 Years Old	-0.2660*** (0.050)	0.00074*** (0.000)	-0.03519*** (0.006)
25 – 29 Years Old	-0.1717** (0.050)	0.00046*** (0.000)	-0.02337*** (0.007)
30 – 34 Years Old	-0.1065** (0.050)	0.00028*** (0.000)	-0.01477*** (0.007)
35 – 39 Years Old	-0.2475*** (0.050)	0.00068*** (0.000)	-0.03298*** (0.006)
40 – 44 Years Old	-0.2433*** (0.050)	0.00067*** (0.000)	-0.03244*** (0.006)
45 – 49 Years Old	-0.2415*** (0.052)	0.00067*** (0.000)	-0.03216*** (0.006)
50 – 54 Years Old	-0.1299** (0.048)	0.00034** (0.000)	-0.01793*** (0.006)
55 – 59 Years Old	-0.0425 (0.046)	0.00011 (0.000)	-0.00602 (0.006)
60 – 64 Years Old	0.1063** (0.045)	-0.00025** (0.000)	0.01564** (0.007)
65 – 69 Years Old	0.3147*** (0.046)	-0.00069*** (0.000)	0.04879*** (0.008)
70 – 74 Years Old	0.4029*** (0.048)	-0.00085*** (0.000)	0.06423*** (0.009)
75 – 79 Years Old	0.5349*** (0.053)	-0.00106*** (0.000)	0.08873*** (0.010)
80 Years Old or More	0.6667*** (0.052)	-0.00126*** (0.000)	0.11383*** (0.010)
Urban2 (25%-50%)	0.2508*** (0.049)	-0.00057*** (0.000)	0.03808*** (0.009)
Urban3 (50%-75%)	0.2084*** (0.046)	-0.00050*** (0.000)	0.03029*** (0.008)
Urban4 (75%-100%)	0.0606 (0.046)	-0.00015** (0.000)	0.00868** (0.008)
Pseudo R ²	0.0532		
Observations	53,818		

Notes: *** p < 0.01, ** p < 0.05, * p < 0.10 (Standard errors in parentheses). This table shows the ordered logit estimates of life satisfaction regression model and the marginal effects at the means of each variable when Cantril Ladder Score = 0 and 10.

The HDI Dimensions:

- Health is the most important determinant in explaining life satisfaction.
 - This is consistent with the literature. Health is the most important factor in all areas, and it has greater importance in Western Europe (Margolis & Myrskylä, 2013; Yang, 2018).
- Income merely has a small impact on life satisfaction relative to health.
 - Deaton (2008) concludes that "many studies comparing people within countries have found only a small effect of income on life satisfaction relative to other life circumstances" (p. 54).
- The direct effects of post-secondary education on life satisfaction are negative but small in magnitude. This surprising finding is also found in a few other papers. (The education variable may capture discouraged workers spending their time in education. The variable does not capture the causal effects of education on other variables such as income.)
 - Education has a large impact on life satisfaction in poor countries and a small impact in rich countries. There is even a negative but small relationship between life satisfaction and education in rich countries (Veenhoven, 1996).

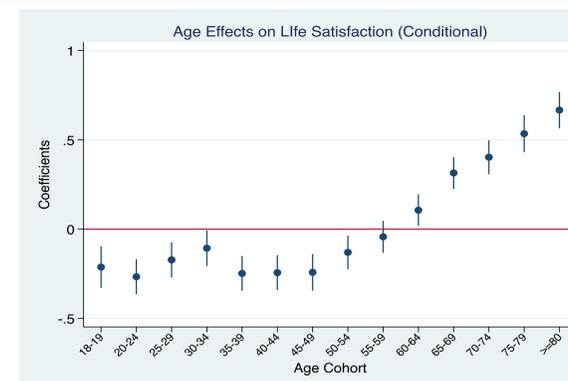
Socio-demographic controls:

- People who are separated, widowed, and divorced are less satisfied.
- People who are unemployed are less satisfied.
- Whites are more satisfied with their lives than visible minorities.
- The Canadian-born population is more satisfied than immigrants.
- People living with family members are more satisfied than people living alone.
- Males are less satisfied than females.
- Individuals living in health regions with higher degrees of urbanization (25%-50%, 50%-75%, and 75%-100%) are happier than individuals living in the least urbanized health regions (less than 25%).
- People living in mid-urbanized health regions are more likely to be happier than others.

HDI Attainment Variables

- y_i^{income} : The total household income is coded as five categories in a range from \$0 to more than \$80,000. The midpoint of each category is assigned to represent the dollar amount of individuals' income, and the amount of the last category is \$90,000. Equalized income equals total household income divided by the square root of household size.
- y_i^{health} : The McMaster Health Utilities Index Mark III (HUI3) aggregates the individual's positive health attainment over eight health attributes: "vision, hearing, speech, ambulation, dexterity, cognition, emotion, pain and discomfort" (Santana et al., 2010, p. 2). Each attribute is assessed according to the severity of diseases. The methodology for aggregating the attributes involves determining the "time trade-off" of disease burdens to provide utility aggregation weights ("Health Utilities Index", 2019, Scoring section, para. 1; Santana et al., 2010, pp. 2-3).
 - This is individual data, unlike the HDI which uses average life expectancy.
- $y_i^{education}$: Education is treated as a dummy variable for people who have some post-secondary education or above like certificates and degrees.

The Effects of Age on Life Satisfaction



- After smoothing the data, the age effects on life satisfaction are roughly U-shaped.
- This shape is relative to the reference cohort which is 15-17 years old.
- Happiness is the lowest at about 50 years old.
- These findings are consistent with the existing literature. Blanchflower and Oswald (2008) have found that life satisfaction is U-shaped over the life cycle in many countries such as Sweden and Canada.
 - Blanchflower and Oswald (2017) also illustrate that there is a middle-age slump in life satisfaction and happiness based on seven databases for different countries.

Conclusion

- Health, an HDI dimension, plays the most important role in explaining individuals' life satisfaction.
- Income only explains little variation in life satisfaction relative to health.
- All chosen socio-demographic controls are significant in explaining life satisfaction, especially age and family circumstances.

Future Research

- I would like to control for the endogeneity between income, health, and education.
- If the panel data is available to use, I will focus on causality.

References

- Anand, P. (2016). *Happiness, well-being and human development: The case for subjective measures*. Retrieved from United Nations Development Programme (UNDP) Website: http://hdr.undp.org/sites/default/files/anand_template_rev.pdf
- Blanchflower, D. G., & Oswald, A. J. (2008). Is well-being U-shaped over the life cycle? *Social Science & Medicine*, 66(8), 1733-1749. <https://doi.org/10.1016/j.socscimed.2008.01.030>
- Blanchflower, D. G., & Oswald, A. J. (2017). *Do Humans Suffer a Psychological Low in Midlife? Two Approaches (With and Without Controls) in Seven Data Sets*. (NBER Working Paper 23724). <http://www.nber.org/papers/w23724>
- Deaton, A. (2008). Income, health, and well-being around the world: Evidence from the Gallup world poll. *The Journal of Economic Perspectives*, 22(2), 53-72. <https://doi.org/10.1257/jep.22.2.53>
- Health Utilities Index. (2019, August 2). In *Wikipedia*. Retrieved April 24, 2020, from https://en.wikipedia.org/wiki/Health_Uilities_Index
- Margolis, R., & Myrskylä, M. (2013). Family, money, and health: Regional differences in the determinants of life satisfaction over the life course. *Advances in Life Course Research*, 18(2), 115-126. <https://doi.org/10.1016/j.alcr.2013.01.001>
- Organisation for Economic Co-operation and Development. (2013). *OECD Guidelines on Measuring Subjective Well-being*. <https://doi.org/10.1787/9789264191655-en>
- Santana, M., Feeny, D., Ghosh, S., Nador, R. G., Weinkauff, J., Jackson, K., ... Lien, D. (2010). The construct validity of the health utilities index mark 3 in assessing health status in lung transplantation. *Health and Quality of Life Outcomes*, 8(1), 110-110. <https://doi.org/10.1186/1477-7525-8-110>
- Statistics Canada. (2014a). *Canadian Community Health Survey - Annual component - 2014 Questionnaire*. Retrieved from Statistics Canada Website: https://www23.statcan.gc.ca/imdb/p3inst.pl?Function=getInstrumentList&Item_Id=214314&UL=1V&
- Statistics Canada. (2014b). *Canadian Community Health Survey - Annual component (CCHS)*. Retrieved from Statistics Canada Website: <https://www23.statcan.gc.ca/imdb/h2SV.pl?Function=getSurvey&Id=164081#1>
- United Nations Development Programme. (2019). *Human Development Report 2019: Beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century*. Technical notes. http://hdr.undp.org/sites/default/files/hdr2019_technical_notes.pdf
- van den Bergh, Jeroen C. J. M., & Botzen, W. J. W. (2018). Global impact of a climate treaty if the human development index replaces GDP as a welfare proxy. *Climate Policy*, 18(1), 76-85. <https://doi.org/10.1080/14693062.2016.1227954>
- Veenhoven, R. (1996). Developments in Satisfaction-Research. *Social Indicators Research*, 37(1), 1-46. <https://doi.org/10.1007/BF00300268>
- Yang, L. (2018). Measuring well-being: A multidimensional Index Integrating Subjective Well-being and Preferences. *Journal of Human Development and Capabilities*, 19(4), 456-476. <https://doi.org/10.1080/19452829.2018.1474859>

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