

Sustainable human wellbeing: What can demography contribute?

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Abstract

This note considers the role that demography as a discipline can play in addressing some of the key questions in the context of human wellbeing and sustainable development. Starting with the wellbeing function of sustainability science that tries to explain an indicator of human wellbeing as being determined by a set of capitals and explanatory factors, it gives an example of how the constituents of such a wellbeing indicator can be combined based on a demographic approach. It also highlights how a broadened view of demographic methodology that goes beyond the conventional focus on age and sex alone can help to make demography more relevant for studying the key challenges of humanity.

Keywords: sustainability science; multi-dimensional demography; years of good life; wellbeing indicator

1 Introduction

The improvement of human wellbeing has been an essential human aspiration for as long as written records of humanity exist. Aside from some ancient philosophers, the focus of most scholars until the time of the Enlightenment was on the collective wellbeing of a kingdom or a certain community. Since then, the idea of human rights as individual rights has given rise to a more individualistic understanding of wellbeing in modern Western cultures (Russell 1945). Today, from an international perspective, more collectivistic and more individualistic understandings of wellbeing tend to co-exist. Demography, as a discipline that focuses on population-level

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changes as well as their micro-level foundations in terms of individual characteristics, is well-positioned to bridge these two understandings.

Demography is also well-equipped to cover the temporal dimension of changes in wellbeing over time. The naïve expectation that wellbeing has been increasing and will continue to increase more or less automatically for all segments of the global human population for the foreseeable future has become untenable, particularly considering what humanity has done to the environment and our natural life support systems. The very successes societies can claim in improving human living conditions through the extensive use of fossil energy, material consumption and land-use changes with associated losses of biodiversity have resulted in planetary-scale environmental changes that threaten our life support systems, and, thus, the wellbeing of future generations. In response to these insights, the focus of attention in demography has recently been shifting away from assessing only past and current conditions, and toward the notion of sustainable human wellbeing, which takes future challenges into account (Lutz et al. 2021b).

Today, the adjective “sustainable” is used excessively, and has many different connotations. But above all, it explicitly introduces a temporal dimension, and thus frames the phenomenon it defines as something that has the potential to go on into the future, for as long as we can imagine. In the context of human wellbeing, the term shifts the focus away from assessments of past improvements and current levels of wellbeing, and toward likely future changes, with the goal of maintaining or further improving the level of wellbeing, even when potential threats – including threats related to political, economic, pandemic or environmental problems – are also factored in. Since future trends cannot yet be observed, researchers must rely on scientific models and scenarios to assess the likelihood that alternative future trends will occur. Since demography has more quantitative models for analyzing the longer-term future to offer than most other scientific disciplines, it is highly relevant to the study of sustainable human wellbeing. In particular, models of multi-dimensional demographic dynamics have been producing alternative scenarios of future population trends that go beyond the conventional demographic focus on changing age structures by also considering changing structures in other relevant demographic characteristics, such as educational attainment, labor force participation and health status (Lutz and KC 2011). The Shared Socioeconomic Pathways (SSP) scenarios, which are already widely used in the global environmental research community (Riahi et al. 2017), can be translated into demographic scenarios, and applied to project alternative multidimensional demographic trajectories.

The combination of the words “sustainable” and “development” in the currently ubiquitous notion of sustainable development has evolved into an effort to combine the more traditional focus on socioeconomic development with more recent concerns about environmental degradation and climate change. The classic definition by the Brundtland Commission in 1987 ([World Commission on Environment and Development 1987](#)) refers to a pattern of development that meets the needs of present generations, but without compromising the rights of future generations to fulfil their needs. Three decades later, in a preface to the *Global Sustainable*

Development Report 2019, which was written by a group of 15 independent scientists (including the author) who were charged by the UN Secretary General to assess the progress made toward meeting the Sustainable Development Goals (SDGs), Gro Harlem Brundtland revisited this definition, and highlighted some key aspects from today's perspective. The first of these aspects listed as priorities for sustainable development is "Strengthening human wellbeing and capabilities" (Brundtland 2019).

This focus on human capabilities and intergenerational aspects of human wellbeing again places demography on center stage as the discipline that, through its analytical focus on cohort changes over time, is very well-positioned to conduct such intergenerational analyses using a quantitative approach. As a key driver of sustainable development, human capabilities (Bengtsson et al. 2018) can be quantitatively captured, and the changes in these capabilities over time can be modelled through the multi-dimensional demographic approach of modelling human capital trends, while explicitly considering education, health and labor force participation, in addition to age and sex. These characteristics cover all of the essential aspects of human capabilities – with labor force participation as a proxy for not being in absolute poverty – following the approach of Sen (1997). A demography that goes beyond the rather narrow conventional focus on population size and age structure, and that explicitly includes education, skills and health status as the key aspects of capabilities, can assume a key role in this field of studies (Lutz and KC 2011; Lutz 2017; Lutz et al. 2021a). Finally, as has been shown at this conference, demographic methods, data and knowledge can contribute a lot to the definition and the measurement of human wellbeing indicators.

Given that demography has so much to contribute to all of these key dimensions of sustainable development and the study of sustainable human wellbeing, it is rather surprising how few demographers have taken the opportunity to enrich this field through their expertise.

In the following, I will give an example of how demographers can make a contribution to the very core of sustainability science by also applying core demographic methods, such as the life table and associated tools. This example illustrates that to become more relevant for the rest of the world, demography does not have to evolve into some form of hyphenated demography, such as social-demography or bio-demography. Instead, by broadening its unique methodological core to encompass multi-dimensional analysis, demography can be applied to some of the most pressing questions of humanity, which will, in turn, boost the relevance of the discipline.

2 Demography and sustainability science

In the remainder of this brief commentary, I will highlight one possible entry point of demography into what has come to be called "sustainability science," and I will introduce the approach on which I currently work with a team at the Wittgenstein

Centre as part of an ERC Project entitled “The demography of sustainable human wellbeing.” At the same time, in this short text, I will try to provide a theoretical framing for the newly developed Years of Good Life (YoGL) indicator, which has been used and applied in three of the papers in this volume.

Broadly defined, sustainability science focuses on the interactions between natural and social systems in the most comprehensive way possible. Nonetheless, in the words of one of its founders, it still suffers from the “plurality of purpose in characterizing and measuring sustainable development, and the confusion of terminology, data, methods and measurement” (Parris and Kates 2003). Because of this extremely broad and often diffuse focus, it is also sometimes called an “inter-discipline” (Stycos 1989). An explicit aim of sustainability science is to cross all disciplinary boundaries if doing so helps to address one overriding and all-important question: What are the conditions that assure long-term human thriving and wellbeing in harmony with nature? In this context, the distinction between strong and weak sustainability is sometimes made, depending on the views on the substitutability of natural capital. According to the most extreme view of strong sustainability, nature needs to be protected for its own sake, preferably without any disturbance by humans. If such a position is taken, then a world completely without human beings would, ultimately, be seen as most desirable. In this view, demography would have little to offer (except for providing demographic scenarios of a one-time mortality rate of 1.0, or a somewhat softer alternative scenario of zero fertility over the next half century).

When advocating for the – in my view – more meaningful concept of weak sustainability, which is more anthropocentric in the sense that it argues that nature needs to be preserved in order to serve as a human life support system, then sustainable human wellbeing becomes the ultimate sustainability criterion. In this context, the specification of an analytical function has been broadly agreed upon in which human wellbeing W is being generated through a combination of human, manufactured and natural capital, as well as institutions and knowledge (Clark 2012).

$$W = f(C_i, I, K)$$

W is “human well-being” (intra- and intergenerational); and C_i are “capital assets” (from which services flow).

This can be further decomposed into:

- C_m is “manufactured capital” (factories, homes, roads);
- C_h is “human capital” (population, health, education);
- C_n is “natural capital” (ecosystem and their services);

I is “institutions” (laws, rules, norms, expectations); and K is “knowledge” (scientific, practical, innovation).

While this specification offers a promising way forward, there are still huge challenges in empirically assessing the different elements of this function and their interactions. Most fundamentally, one has to decide whether to focus the

measurement on the left- or the right-hand side of this function; or, in other words, on the constituents or the determinants of human wellbeing. Much of the recent literature in this field has used economic approaches to quantify the determinants on the right-hand side. Here, the notion of inclusive wealth has become prominent as a broadening of conventional concepts of economic wealth and material capital to include other capitals, particularly the value of natural capital (Dasgupta 2001). While there is a rich body of economic theory and a well-equipped economic toolbox for such approaches, a fundamental problem that arises in their application is that it is hard to estimate the relative sizes of the effects of these different determinants on the right-hand side if there is no quantification of W on the left-hand side.

My ERC project focuses on the left-hand side of this function. The aim of the project is to come up with a tailor-made indicator of human wellbeing that is fit for use in estimations of this analytical function. We have specified important criteria that any such indicator should meet; and, as we will see, demography plays an important role in almost all of these criteria.

3 An indicator for sustainable human wellbeing

In recent years, there has been a mushrooming of wellbeing and quality of life indicators, with 31 of them described in the appendix of Lutz et al. (2021b). A common feature of most of these indicators is that they are designed to go beyond the outdated focus on GDP per person as an indicator of general wellbeing and social progress. Many of them are composite indicators that try to combine different aspects that are assumed to be important for wellbeing. Here, the question of how those aspects should be combined and weighted is difficult to answer. The solutions offered range from applying fixed equal weights, as is done in the well-known UNDP Human Development Index (HDI); to leaving the weights entirely up to the user, as is done for the 11 aspects covered by the OECD Better Life Index, in which users can freely choose which aspects they value more. Thus, in both approaches, the weighting is more or less arbitrary. In the new tailor-made indicator, this problem should be avoided.

There are other important criteria that such a new tailor-made indicator for W should meet. Most importantly, it should be based on **characteristics of people** that can be flexibly aggregated to apply to **subpopulations**. This is a deeply demographic approach, because any such indicator that refers to the wellbeing of people should be built from the bottom up based on individual characteristics that are observable and measurable for individual people. The use of such an approach also makes it possible to calculate the indicator for groups of people other than just national populations. A focus on subpopulations is essential for answering many of the important questions that are asked in sustainability science, and that also tend to be important for ethical and political considerations: e.g., how does wellbeing differ by gender; how does it differ among various ethnic or socioeconomic groups in a population; and, how does it differ between residents of urban and rural populations

or different administrative districts or other geographic units? The criteria used to assess the wellbeing of subpopulations cannot include any indicators that only exist at the national level.

In addition, such a tailor-made indicator needs to have a meaning in its absolute value that makes the indicator **comparable over time and across subpopulations**. For the indicator to be useful for comparing the wellbeing of certain populations at two different points in time, and for determining whether the wellbeing of these populations has improved or deteriorated, it must have a meaning in its absolute value. Thus, the indicator cannot simply be defined on a relative scale that depends on other time-varying indicators. As an example, the life expectancy component of the HDI is defined as a fraction of the maximum national life expectancy observed in any given year. Hence, when this mortality index (given in the form of a fraction) is compared for a given population between, say, 1990 and 2015, it is impossible to determine whether survival conditions in this population actually improved over time, and, if so, by how much. Thus, in its relative form, the mortality index can only show whether the given population improved its standing relative to that of the country with the highest life expectancy.

Furthermore, such an indicator needs to describe some highly desirable state as an ultimate end goal that has the potential to **be universally shared across all cultures** (Lutz et al. 2021b). The use of any wellbeing indicator only makes sense if there is near consensus that it describes a highly desirable target. The aspiration is to capture the single most important ultimate end goal that people with very different orientations, values and cultural backgrounds already to subscribe to. It should describe some aim that a Wall Street broker, a Buddhist monk and a member of a traditional nomadic tribe would all, at least in principle, find most desirable. While the actual acceptance of the indicator as an ultimate end goal will be empirically tested in different settings later in this project, at this point, we can only *ex ante* exclude some candidates for such an indicator that would clearly be rejected by certain groups. Avoiding the premature death of oneself or a person one cares for seems to be a good candidate for such a universally accepted goal. Here, demography can again contribute a lot to the measurement of this end goal, including the use of subpopulation-specific mortality rates and life table-based methods, such as the Sullivan method, to link the person-years lived at any age to other relevant characteristics.

Finally, ideally, it should be possible to interpret such an indicator through some **real-life analogy**, rather than simply as an abstract index (Lutz et al. 2021b). Thus, the hope is that the indicator will provide not only abstract index values, but outcomes that have a real-life analogy, just as life expectancy gives the number of years that a person can expect to still be alive. For an indicator of wellbeing, it is more attractive and intuitive to say, for instance, that in population *x*, the average person has 66 years of good life, while in population *y*, s/he only has 54 years of good life; rather than to say that a wellbeing index has values of 0.753 and 0.683, which are numbers that people cannot relate to. Here again we can draw on the

strength of demographic life table methods, which can be used to calculate the number of years a person is expected to live in good health.

The application of these criteria to the definition of the tailor-made indicator Years of Good Life (YoGL) and its specific quantification will not be discussed here, but will be shown in three of the following papers ([Reiter and Spitzer 2021](#); [Striessnig et al. 2021](#); [Buathong et al. 2021](#)). A comprehensive description of this concept has been published recently in PNAS ([Lutz et al. 2021b](#)). Here, it is sufficient to say that in order to meet these criteria, a clear hierarchy of the dimensions that will be covered in the YoGL indicator has been established on theoretical grounds. First and foremost, the indicator assumes that survival is the most essential prerequisite for enjoying any quality of life. Indeed, it seems odd that most existing wellbeing indicators do not explicitly include the length of human life. If avoidance of premature death is not explicitly factored into the criterion, then the average value of any indicator can always be improved by eliminating (killing) the members of the population who have lower values for this indicator, as doing so would increase the average value for the survivors. For this reason, it seems imperative to explicitly include longevity in the indicator.

However, since mere survival is not considered good enough to ensure wellbeing by many people, in a next step, the YoGL indicator goes on to define good years of life as the years in which people live above a minimum level in terms of both objectively observable conditions and subjectively assessed life satisfaction. At a third level, the objective conditions that are used to define capable longevity are further broken down into three dimensions: being out of poverty, not being cognitively disabled, and not being physically disabled. All of these aspects are integrated and brought together using a uniquely demographic method called the Sullivan method, in which the person-years in a life table are multiplied by the proportions of men and women at each age and for each subpopulation who have values that are above these specified minimum thresholds. The indicator can then give the average number of years a person can expect to be alive and above minimum levels in terms of subjective life satisfaction, and to be out of poverty and in good cognitive and physical health. We call these years the Years of Good Life (YoGL), and their calculation is based on a genuinely and uniquely demographic approach.

In the conclusion of their PNAS paper, [Lutz et al. \(2021b\)](#) also speculated about the possibility that YoGL could be used in the future as a kind of demography-based currency for assessing costs and benefits. They wrote: “An indicator like YoGL also has the potential to become a broadly used currency in which the costs and benefits of certain developments and actions can be expressed, complementing assessments based on purely monetary units. For example, the social costs of carbon could potentially be assessed in terms of years of good life lost among future generations, rather than only in some dollar terms” ([Lutz et al. 2021b](#)). Thus, demographic units of measurement could even be used to replace units of money in assessments of sustainable development and human wellbeing.

References

- Bengtsson, S. E. L., B. Barakat, R. Muttarak, E. B. Kebede and W. Lutz 2018. *The role of education in enabling the sustainable development agenda*. Abingdon, UK and New York, USA: Routledge. <https://doi.org/10.4324/9781315142708>
- Brundtland, G. H. 2019. Prologue. In *Global sustainable development report 2019: The future is now - science for achieving sustainable development*, ed. Independent Group of Scientists appointed by the Secretary-General, xv–xvii. New York: United Nations.
- Buathong, T., A. Dimitrova, P. M. M. Vicerra and M. Chimmamee 2021. Years of good life: An illustration of a new well-being indicator using data for Thailand. *Vienna Yearbook of Population Research* 19. <https://doi.org/10.1553/populationyearbook2021.dat.1>
- Clark, W. C. 2012. Sustainability science: Its origins, evolution and challenges. Paper presented at IIASA 40th Anniversary Conference: Worlds Within Reach: From Science to Policy, 24–26 October 2012. <http://conference2012.iiasa.ac.at/person.html?code=clark&scode=s2s7>
- Dasgupta, P. 2001. *Human well-being and the natural environment*. Oxford, New York: OUP Oxford.
- Lutz, W. 2017. Global sustainable development priorities 500 y after Luther: Sola schola et sanitate. *Proceedings of the National Academy of Sciences* 114(27): 6904–6913. <https://doi.org/10.1073/pnas.1702609114>
- Lutz, W. and S. KC 2011. Global human capital: Integrating education and population. *Science* 333(6042): 587–592. <https://doi.org/10.1126/science.1206964>
- Lutz, W., C. Reiter, C. Özdemir, D. Yildiz, R. Guimaraes and A. Goujon 2021a. Skills-adjusted human capital shows rising global gap. *Proceedings of the National Academy of Sciences* 118(7): e2015826118. <https://doi.org/10.1073/pnas.2015826118>
- Lutz, W., E. Striessnig, A. Dimitrov, S. Ghisland, A. Lijad, C. Reiter, S. Spitzer and D. Yildiz 2021b. Years of good life is a wellbeing indicator designed to serve research on sustainability. *Proceedings of the National Academy of Sciences* 118(12): e1907351118. <https://doi.org/10.1073/pnas.1907351118>
- Parris, T. M. and R. W. Kates 2003. Characterizing and measuring sustainable development. *Annual Review of Environment and Resources* 28(1): 559–586. <https://doi.org/10.1146/annurev.energy.28.050302.105551>
- Reiter, C. and S. Spitzer 2021. Well-being in Europe: Decompositions by country and gender for the population aged 50+. *Vienna Yearbook of Population Research* 19. <https://doi.org/10.1553/populationyearbook2021.res4.1>
- Riahi, K., D. P. van Vuuren, E. Kriegler, J. Edmonds, B. C. O’Neill, S. Fujimori, N. Bauer, K. Calvin, R. Dellink, O. Fricko, W. Lutz, ... and M. Tavoni 2017. The shared socioeconomic pathways and their energy, land use, and greenhouse gas emissions implications: An overview. *Global Environmental Change* 42: 153–168. <https://doi.org/10.1016/j.gloenvcha.2016.05.009>
- Russell, B. 1945. *History of Western Philosophy*. New York: Simon & Schuster.
- Sen, A. 1997. Editorial: Human Capital and Human Capability. *World Development* 25(12): 1959–1961.

- Striessnig, E., C. Reiter and A. Dimitrova 2021. Global improvements in years of good life since 1950. *Vienna Yearbook of Population Research* 19. <https://doi.org/10.1553/populationyearbook2021.res1.2>
- Stycos, J. M. (ed) 1989. *Demography as an interdiscipline*. New Brunswick, NJ: Transaction Publishers.
- World Commission on Environment and Development 1987. *Our common future*. Oxford: Oxford University Press

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