

1 General Demographic Overview

1.1 Background

Demographic research lies at the nexus of social science research and shares much in common with other fields. The overlap between demography and other fields often puts it in a difficult place in terms of solidifying its place as a unique field. This may be especially true in the current era of large scale data production where research concerning “populations” is used by a larger number of research fields. These large N studies allow for more detailed divisions and subpopulations within a particular population to be studied, making the distinction between demography and other fields more blurred. While one could imagine a scenario where this could drain demography of its standing while other fields take over the space it once occupied this seems not to be the case. The expansion of data has come alongside an expansion in those that take a demographic mindset into their analysis and incorporate demographic methods into their respective fields of study. It may be because of this that we have seen a relative growth in the size of institutions in the United States that are associated with demographic research, while at the same time a collapsing down in the size and number of academic institutions that house a proper school of demography (Xie 2000). In order to best summarize how we arrived at the current state of demography research I will discuss and review a brief series of papers that cover the history of demographic research in the 20 and 21st century, with particular attention to the development of the field in the United States.

1.2 Formal Demography and Population Studies

It is likely impossible to find a credible account of the history of demography in the United States without acknowledging Hauser and Duncan 1959 piece *The Study of Population*. The work attempted to establish demography as a legitimate social science and the particular research domains for which the field holds a special claim to. Though the work spans nearly 900 pages the often most cited passage comes to us as the direct, albeit vague, statement of what constitutes the field of demography. Hauser and Duncan state *Demography is the study of the size, territorial distribution, and composition of population, changes therein, and the components of such change*. While not stated specifically here the elements that constitute population changes in a society can be traced back to the forms of the demographic balancing equation, namely the increase contributed by births and the decreases attributed to death. If we subdivide our population into specific geographic areas then we must also consider how populations move in space and how these spaces may differentially experience births and deaths and thus, the particular focus that is placed on *territorial distribution*. How the age distribution of deaths, and the age of and number of children, predominately, women have are “shaped”, ie their age distributions, and how that shape changes are at the heart of what is now considered formal demography. On the other hand we have population process and social demography. This set of demography is more interested in the social drivers that alter the distributions of mortality, fertility, and migration. The distinction between the two fields has seen development of theoretical opposition happen in one field even if it was at the disman of the other, a topic that I will touch on further in this report.

1.3 The Demographic Transition: Fertility and Mortality

1.3.1 Changes in Child Mortality

Whether the distinction between these two fields is helpful or not its separation has helped shape the current state of the demographic field. Perhaps one of the most influential aspects from the formal demographic group has been the development of age-specific profiles of mortality and fertility and their relationship to developmental change in what is known as the demographic transition. Briefly the demographic transition states that as a country develops in its technologies and economic infrastructures it experiences a decline in its child mortality and then in its total fertility rate which leads to a period in the disruption of the equilibrium of balancing forces, causing an uptick in population (Lee 2003). Child mortality declines are often associated with advances in care but can also be due to greater and more egalitarian access to care, an

increase in the social status of women, increased education of both men and women, as well as better overall access to reproductive health needs (Caldwell 1990).

While the original theory was coined in the United States by demographer Warren Thompson around 1930, a number of subsequent articles have been written that expand on the timing, the population effect, and the applicability of the transition on a number of countries. One of the more discussed papers on the topic has been Caldwell's 1986 paper "Routes to Low Mortality in Developing Countries" (Caldwell 1986). The paper uses the 1984 World Development Bank report in order to assess how both Infant Mortality Rate (IMR), the rate of death of persons under the age of 1, and Child Mortality Rate (CMR), the rate of death of persons under the age of 5, have varying country level differences and how those differences compare with over all period life expectancy at birth, level of income, as well as some qualitative assessments of investment by a country into the health systems infrastructure of the state, especially in Costa Rica, Cuba, and Vietnam. His primary focus on the analysis was on developing countries, termed third world countries in the original text, and how they ranked on their child health indicators.

In Caldwell's analysis he placed a strong focus on the idea of economic expectation of health outcomes. Whether by intention or not, his focus on the parallel's between economic success and health outcomes helped to cement the role of economic theory into the demographic transition. This is not to say that economics role was not present before this paper, much of the demographic transition research was originally formulated based on increasing economies within countries, however, the sheer influence of this paper has led to the continued use of expectation of health outcomes conditional on economic success even in contemporary work. A prime example of this is the use of the Socio-demographic index (SDI) measure used by researchers such as those from the work of the Institute for Health Metrics and Evaluation (IHME) in their work measuring IMR and expectations of IMR at a country level (Wang et al. 2012).

In his original work, Caldwell simply ranked countries based on their status for IMR/CMR and then by their GNP. He paid special attention to countries who "performed" higher or lower than expected based on their economic ranking using a criteria of having a health ranking either 25 places above or below their economic ranking respectively. Obviously, this measure was crude and ignored the quantitative differences in both IMR and GNP, however, the focus on strong achievers allowed Caldwell to build a set of hypothesis of the drivers of child mortality reduction that are not necessarily tied to the wealth of a country. Of particular note is Caldwell's focus on the autonomy of woman, education and political systems, as well as the cultural attitudes that may drive health outcomes.

While Caldwell's paper was without a doubt a huge step forward in the discussion of drivers of demographic change, it was met with many rebuttals and reflections from other demographers within the field. A particularly noteworthy revisitation to Caldwell's original piece was Randall Kuhn's 2010 article in *Population and Development Review* (Kuhn 2010). Kuhn made particular care to revisit the limitations of the original article that had been made by himself as well as other researchers since Caldwell's original publication. In particular he focused on the causal language that was used especially related to the impact that religion could play on child mortality outcomes. This was easily refuted in other work by making country comparisons for states that were not included in the original analysis. Nonetheless, the lasting influence of Caldwell's paper led Kuhn to run a similar analysis of countries this time using a perhaps more indicative measure of person level economic standing, the purchasing power parity (ppp). The results led to some similar findings, countries that had high ppp but were primarily oil based economies still lagged behind in health standings related to IMR. The new updated rankings however found the relative lagging of health outcomes by country tend to change over time. This was especially true for Latin American and predominately Arabic countries (Kuhn 2010).

Despite this more careful attention to details Kuhn's article still places an extreme importance on economic success in the way that we frame health outcomes. Countries in Latin America who have political systems that are more socialist than here in the United States such as Cuba and Costa Rica are seen as exceptions despite both of these countries, as detailed in the paper, spending more on health care infrastructure. In addition the framework presented places a strong importance on average health outcomes and largely neglects variation in health outcomes. This comes along with language that often reflects a causal nature, even though Kuhn himself was critical of Caldwell's causal remarks, and calls into question when exactly a primary focus

should be placed on shifting trends in means of population measures in relation to country level indicators, in economics and beyond (Greg J. Duncan 2008).

A more pointed claim of the importance of economics, especially in relation to public health efforts was founded in the so-called “McKeown Thesis” (McKeown, Brown, and Record 1972). McKeown placed a strong importance on the roles of economic growth, rising living standards, and improved nutrition as the primary sources of most historical improvements in the health of developed nations and population growth. The article is often seen as downplaying the importance of public health’s role in altering population change and has been hit with many criticisms across the years. A series of papers commissioned by the American Journal of Public Health sought to re-evaluate the original paper’s claims and rethink how public health and health systems effect health outcomes (Szreter 2002) (Colgrove 2002) (Link and Phelan 2002). In addition a growing number of articles, including those that were written as responses to Caldwell, show that changes in the vaccination schedule and distribution and access to clean water can have a measurable effect on the rate of child mortality, especially demonstrated in the declines in under five mortality in Latin American Countries (González-Pier et al. 2016) (Kuhn 2010) (Palloni and Rafalimanana 1999).

1.4 Developing Theory and Causal Modeling

Again this debate of the importance of changing country or state level indicators and best predicting changes in population structure, child mortality and fertility declines leading to population growth, brings up the question of what data we can use for making causal connections and adapting theory for drivers of population change. This discussion of theoretical drivers of change is much discussed (Lee 2003) (Preston 1993) (Xie 2000) and perhaps what most sets apart formal demography from social demography and population sciences. While there is no doubt value in descriptive statistics and compositional analysis of change, what fuels these changes in different context is especially important not only for our own academic understanding but also because demography is inherently tied to policy and its implementation (Greenhalgh 1996) (Tienda 2002). It is important then that we are critical of the methodology that we use to test our assumptions of causal drivers of population change, but also be critical of the climate that has historically created theories on population changes.

As stated prior, the ways in which we approach causal claims in demography need to be done carefully. Demography concerns itself with changes at the population level, however, the often cited gold standard for making causal claims comes from the set up of a randomized control trial (Moffitt 2005). While we may take studies from psychology, biology, public health, and experimental sociology to help develop our theories, the kind of scale and data that demography deals with does not well lend itself to these kinds of tests. To reference Hauser and Duncan again, one of the main interest of demographers is differences in population by geographic space. The ways which we hypothesize space, the physical area that an individual resides in, and place, the conceptualized area that an individual occupies and its characteristics, are likely things that we could never ethically test in a randomized control style setting. Ways around this limitation have been discussed and examples of such include natural experiments, such as the Moving to Opportunity study which tested how individuals living in poverty who were nearly randomly assigned a new location within a more developed neighborhood, twin studies, selecting individuals that match on all characteristics except some treatment effect, as well as other methodological approaches that allow for weighting of receiving treatment to be taken into account in the model such as in Marginal Structural Models (Sampson and Sharkey 2008).

In 2007 Bhrolchain and Dyson presented an article which attempted to highlight some of the ways in which causal claims have been made in demography in the past and how they were either lacking in adequate testing of causality or could only be evaluated by the existence of previously purported theories (Bhrolcháin and Dyson 2007). This is not to say that causal inference is beyond the realm of population studies, but rather, we need to be careful in how we make causal claims and the data that we use in order to do so. An overview of causality and how it may be assessed was well articulated by Moffitt in his 2005 article “Remarks on the analysis of causal relationships in population research” (Moffitt 2005). Moffitt highlights how intuition in traditional modeling approaches can lead to false claims of the importance of some variables on population process and again evokes the importance of theory, and in his own words intuition, must be used when considering causal relationships.

The history of demographic theories of change, however, should be considered within the context of its development.

References

- Bhrolcháin, Máire Ní, and Tim Dyson. 2007. "On Causation in Demography: Issues and Illustrations." *Population and Development Review* 33 (1). John Wiley & Sons, Ltd (10.1111): 1–36. doi:10.1111/j.1728-4457.2007.00157.x.
- Caldwell, John C. 1986. "Routes to Low Mortality in Poor Countries." *Population and Development Review* 12 (2): 171. doi:10.2307/1973108.
- . 1990. "Cultural and Social Factors Influencing Mortality Levels in Developing Countries." *The ANNALS of the American Academy of Political and Social Science* 510 (1). SAGE PUBLICATIONS: 44–59. doi:10.1177/0002716290510001004.
- Colgrove, James. 2002. "The McKeown thesis: a historical controversy and its enduring influence." *American Journal of Public Health* 92 (5). American Public Health Association: 725–9. <http://www.ncbi.nlm.nih.gov/pubmed/11988435> <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC1447153>.
- González-Pier, Eduardo, Mariana Barraza-Lloréns, Naomi Beyeler, Dean Jamison, Felicia Knaul, Rafael Lozano, Gavin Yamey, and Jaime Sepúlveda. 2016. "Mexico's path towards the Sustainable Development Goal for health: an assessment of the feasibility of reducing premature mortality by 40% by 2030." *The Lancet. Global Health* 4 (10). Elsevier: e714–25. doi:10.1016/S2214-109X(16)30181-4.
- Greenhalgh, Susan. 1996. "The Social Construction of Population Science: An Intellectual, Institutional, and Political History of Twentieth-Century Demography on JSTOR." *Comparative Studies in Society and History* 38 (1): 26–66. https://www.jstor.org/stable/179337?seq=1{\#}metadata{_}info{_}tab{_}contents.
- Greg J. Duncan, Greg j. 2008. "When to Promote, and When to Avoid, a Population Perspective." *Demography* 45 (4). Springer-Verlag: 763–84. doi:10.1353/dem.0.0031.
- Kuhn, Randall. 2010. "Routes to low mortality in poor countries revisited." *Population and Development Review* 36 (4): 655–92. <http://www.ncbi.nlm.nih.gov/pubmed/21174865>.
- Lee, Ronald. 2003. "The Demographic Transition: Three Centuries of Fundamental Change." *Journal of Economic Perspectives* 17 (4): 167–90. doi:10.1257/089533003772034943.
- Link, Bruce G, and Jo C Phelan. 2002. "McKeown and the idea that social conditions are fundamental causes of disease." *American Journal of Public Health* 92 (5). American Public Health Association: 730–2. <http://www.ncbi.nlm.nih.gov/pubmed/11988436> <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC1447154>.
- McKeown, Thomas, R. G. Brown, and R. G. Record. 1972. "An Interpretation of the Modern Rise of Population in Europe." *Population Studies* 26 (3): 345. doi:10.2307/2173815.
- Moffitt, Robert. 2005. "Remarks on the analysis of causal relationships in population research." *Demography* 42 (1): 91–108. <http://www.ncbi.nlm.nih.gov/pubmed/15782897>.
- Palloni, Alberto, and Hantamala Rafalimanana. 1999. "The Effects of Infant Mortality on Fertility Revisited: New Evidence from Latin America." *Demography* 36 (1). Springer-Verlag: 41. doi:10.2307/2648133.
- Preston, Samuel H. 1993. "The Contours of Demography: Estimates and Projections." *Demography* 30 (4): 593. doi:10.2307/2061808.
- Sampson, Robert J, and Patrick Sharkey. 2008. "Neighborhood selection and the social reproduction of concentrated racial inequality." *Demography* 45 (1). Springer: 1–29. <http://www.ncbi.nlm.nih.gov/pubmed/18390289> <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC2831380>.
- Szreter, Simon. 2002. "Rethinking McKeown: the relationship between public health and social change." *American Journal of Public Health* 92 (5). American Public Health Association: 722–5. <http://www.ncbi.nlm.nih.gov/pubmed/11988434> <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC1447152>.
- Tienda, Marta. 2002. "Demography and the Social Contract." *Demography* 39 (4). Springer-Verlag: 587–616.

doi:10.1353/dem.2002.0041.

Wang, Haidong, Laura Dwyer-Lindgren, Katherine T Lofgren, Julie Knoll Rajaratnam, Jacob R Marcus, Alison Levin-Rector, Carly E Levitz, Alan D Lopez, and Christopher JL Murray. 2012. "Age-specific and sex-specific mortality in 187 countries, 1970–2010: a systematic analysis for the Global Burden of Disease Study 2010." *The Lancet* 380 (9859). Elsevier: 2071–94. doi:10.1016/S0140-6736(12)61719-X.

Xie, Yu. 2000. "Demography: Past, Present, and Future." *Journal of the American Statistical Association* 95 (450): 670. doi:10.2307/2669415.