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From Lifespan Inequality to Lifespan Inequity

Introduction

In a recent opinion piece "Why science needs philosophy," Laplane et al. eloquently state, "Modern science without philosophy will run up against a wall: the deluge of data within each field will make interpretation more and more difficult, neglect of breadth and history will further splinter and separate scientific subdisciplines, and the emphasis on methods and empirical results will drive shallower and shallower training of students" (2019, p.3951). Demography, as an interdisciplinary field that builds on and integrates perspectives from other disciplines (Coleman, 2000; Dykstra and van Wissen, 1999; Stycos, 1987), is particularly vulnerable to negative consequences of the absence of philosophy. This is because, in demography, the connection to the theoretical embedding of concepts and measures in the original discipline is often lost, simplified, or their explanatory power to demographic phenomena stops being questioned (Caldwell, 1996; Sigle, 2016). Demography has long been criticized, often from within, for being rich in method but lacking in theory (Crimmins, 1993; Greenhalgh, 1996; Keyfitz, 1993; Preston, 1993; Vance, 1952). Arguing for "Demography needs philosophy," in this paper we focus on the concept familiar to demographers, *lifespan inequality*, and develop an analytical framework, informed by a philosophical theory, for *lifespan inequity*, i.e., *unfair* or *ethical problematic* lifespan inequality.

Demographic studies of lifespan inequality are *bivariate* or *univariate* (Wolfson and Rowe, 2001). Studies of the bivariate approach are concerned with differences in health and mortality of groups of the population, where the groups are formed according to some socially meaningful characteristics other than mortality. These demographic studies using the bivariate approach show a relationship between life expectancy (or another statistic of the lifespan distribution) and socioeconomic status, race, deprivation level, or country of residence (or other socially meaningful groups) in a manner of correlation between less desirable level of the lifespan statistic (e.g. shorter lifeexpectancy) and greater social disadvantage. Though rarely articulated, studies of the bivariate approach to lifespan inequality are often thought to imply normative judgments, and inequalities in the length of life across the socially meaningful groups are considered as inequitable. On the other hand, univariate studies, i.e., studies of differences in the length of life regardless of socioeconomically graded characteristics, are often considered as irrelevant to ethical analysis (e.g., Asada, 2007, Hausman, 2017). Aims of demographic studies of the univariate approach typically are to: examine the compression of deaths to older ages (e.g. Fries, 1980; Kannisto, 2000); answer questions about a limit to human lifespan (e.g. Cheung et al., 2005; Rothenberg et al., 1991); better understand the relationship between the location and spread of age-at-death distributions (Edwards and Tuljapurkar, 2005; Smits and Monden, 2009; van Raalte et al., 2018); and improve accuracy of population projections (Bohk-Ewald et al., 2017). Tremendous improvements in modelling and measurement of lifespan inequalities using the univariate approach have been made over the past few decades. Indices of inequality in length of life have been adopted and adapted for the life table (Hanada 1983; Myers and Manton 1984; Shkolnikov et al., 2003; Silber 1983; 1988; Wilmoth & Horiuchi, 1999), and new indices have been developed (Goldman & Lord, 1986; Vaupel, 1986). Nevertheless, because these demographic studies are not based on a theoretical framework informed by an ethical theory that would justify lifespan inequality as ethically objectionable, ethical judgments cannot be made from their results.

This paper aims to develop an analytical framework for the measurement of lifespan inequity based on the univariate approach by following the three-step procedure of definition, operationalization, and quantification proposed by Asada (2005a, 2007, 2019). This procedure was originally applied in health studies for developing measures of health inequities within a coherent measurement framework with theoretical underpinnings. As presented in the definition step (Section 2.1), in this study, we chose to apply a philosophical theory of the capability approach (Nussbaum and Sen, 1993; Nussbaum, 2000, 2011; Sen, 1992) to move from inequality (i.e., a difference) to inequity (i.e., an ethically problematic difference). Based on the capability approach, we define univariate lifespan inequity as the inequality resulting from lifespan deprivation due to *premature mortality*. We define premature deaths as deaths that occur below what we call the *Minimally Adequate Length of Life* (MALL), i.e., a threshold age that divides ages at death into those premature and of full length and propose to quantify the MALL with the adult modal age at death in a period life table (Section 2.2). Given similarities between the poverty and lifespan deprivation due to premature mortality and the importance of both poverty and lifespan in the capability approach, we propose to measure lifespan inequity applying the most commonly used statistics of poverty, the Foster-Greer-Thorbecke and Sen-Shorrocks-Thon indices (Section 2.3). We empirically demonstrate the proposed framework by examining how the United States has performed in terms of lifespan inequity over the period of 1933-2019 in comparison to other high-income countries (Section 3). We demonstrate that the proposed analytical framework can serve as a guide for interpreting findings in light of the philosophical theory upon which the framework is built. As argued by Imenda (2014), a systematically developed measurement framework represents the researcher's specific perspective for exploring, interpreting, or explaining the phenomena under study. Thus, in our case, the proposed measurement framework offers transparent and explicit philosophical assumptions for measuring lifespan inequity.

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Additional Online Material

Table 1A. Minimum Adequate Length of Life (MALL), Lifespan Inequity Statistics in the United States, and Selected High-Income Countries (Other), and Proportional Differences (Other vs. US) in 2019.

							Proportional difference			
Country	**MALL**	**SST**	**I**	**Depp**	**Depp* MALL**	**G**	**SST**	**I**	**Depp**	**G**
Men										
ESP	88.4	0.155	0.679	0.136	12.1	0.671	0.383	0.029	0.371	-0.017
ITA	88.0	0.156	0.660	0.141	12.4	0.668	0.376	0.057	0.334	-0.015
JPN	87.2	0.158	0.698	0.136	11.9	0.666	0.359	0.001	0.372	-0.014
CHE	88.0	0.159	0.666	0.144	12.6	0.660	0.357	0.048	0.320	-0.011
PRT	88.0	0.159	0.708	0.134	11.8	0.667	0.357	-0.013	0.385	-0.015
SWE	88.3	0.163	0.689	0.142	12.6	0.659	0.333	0.014	0.329	-0.010
NOR	87.8	0.166	0.665	0.150	13.2	0.657	0.315	0.050	0.274	-0.009
AUT	87.1	0.173	0.717	0.147	12.8	0.642	0.272	-0.025	0.297	0.000
FIN	88.8	0.173	0.674	0.154	13.6	0.671	0.271	0.037	0.251	-0.017
AUS	87.4	0.177	0.705	0.152	13.3	0.647	0.249	-0.009	0.260	-0.003
DNK	87.1	0.177	0.697	0.153	13.3	0.666	0.247	0.003	0.257	-0.014
West DE	87.0	0.178	0.683	0.159	13.8	0.640	0.242	0.022	0.217	0.002
France	87.5	0.179	0.700	0.155	13.6	0.646	0.239	-0.001	0.242	-0.002
NLD	86.4	0.181	0.687	0.160	13.8	0.656	0.224	0.018	0.214	-0.008
BEL	88.5	0.186	0.697	0.161	14.2	0.660	0.198	0.003	0.206	-0.011
GBR	87.8	0.187	0.707	0.161	14.1	0.639	0.195	-0.012	0.204	0.002
CAN	89.0	0.195	0.701	0.170	15.1	0.639	0.151	-0.003	0.151	0.002
USA	86.7	0.227	0.699	0.198	17.1	0.643	-	-	-	-
Women										
ESP	91.1	0.125	0.663	0.110	10.0	0.705	0.396	0.026	0.398	-0.028
ITA	90.5	0.127	0.651	0.115	10.4	0.694	0.377	0.045	0.353	-0.021
JPN	92.8	0.129	0.637	0.120	11.1	0.698	0.361	0.067	0.317	-0.023
CHE	91.0	0.130	0.687	0.112	10.2	0.688	0.355	-0.009	0.381	-0.018
PRT	89.9	0.133	0.623	0.125	11.3	0.700	0.333	0.088	0.269	-0.025
SWE	90.3	0.135	0.671	0.120	10.8	0.680	0.317	0.014	0.315	-0.013
NOR	90.6	0.137	0.671	0.122	11.1	0.669	0.302	0.014	0.294	-0.006
AUT	90.0	0.138	0.689	0.119	10.7	0.686	0.294	-0.012	0.323	-0.016
FIN	90.5	0.140	0.671	0.123	11.2	0.685	0.285	0.014	0.286	-0.016
AUS	91.3	0.141	0.679	0.123	11.2	0.685	0.277	0.003	0.290	-0.016
DNK	89.3	0.143	0.673	0.127	11.4	0.672	0.259	0.012	0.256	-0.008
West DE	89.6	0.144	0.664	0.129	11.6	0.680	0.253	0.025	0.240	-0.013
France	91.8	0.144	0.649	0.131	12.0	0.695	0.252	0.049	0.225	-0.021
NLD	89.8	0.145	0.661	0.131	11.8	0.674	0.244	0.029	0.224	-0.009
BEL	90.3	0.147	0.682	0.128	11.6	0.679	0.233	-0.001	0.246	-0.012
GBR	89.7	0.152	0.661	0.138	12.3	0.677	0.196	0.029	0.177	-0.011
CAN	91.3	0.156	0.689	0.136	12.4	0.673	0.170	-0.011	0.190	-0.009
USA	90.0	0.185	0.681	0.164	14.8	0.659	-	-	-	-

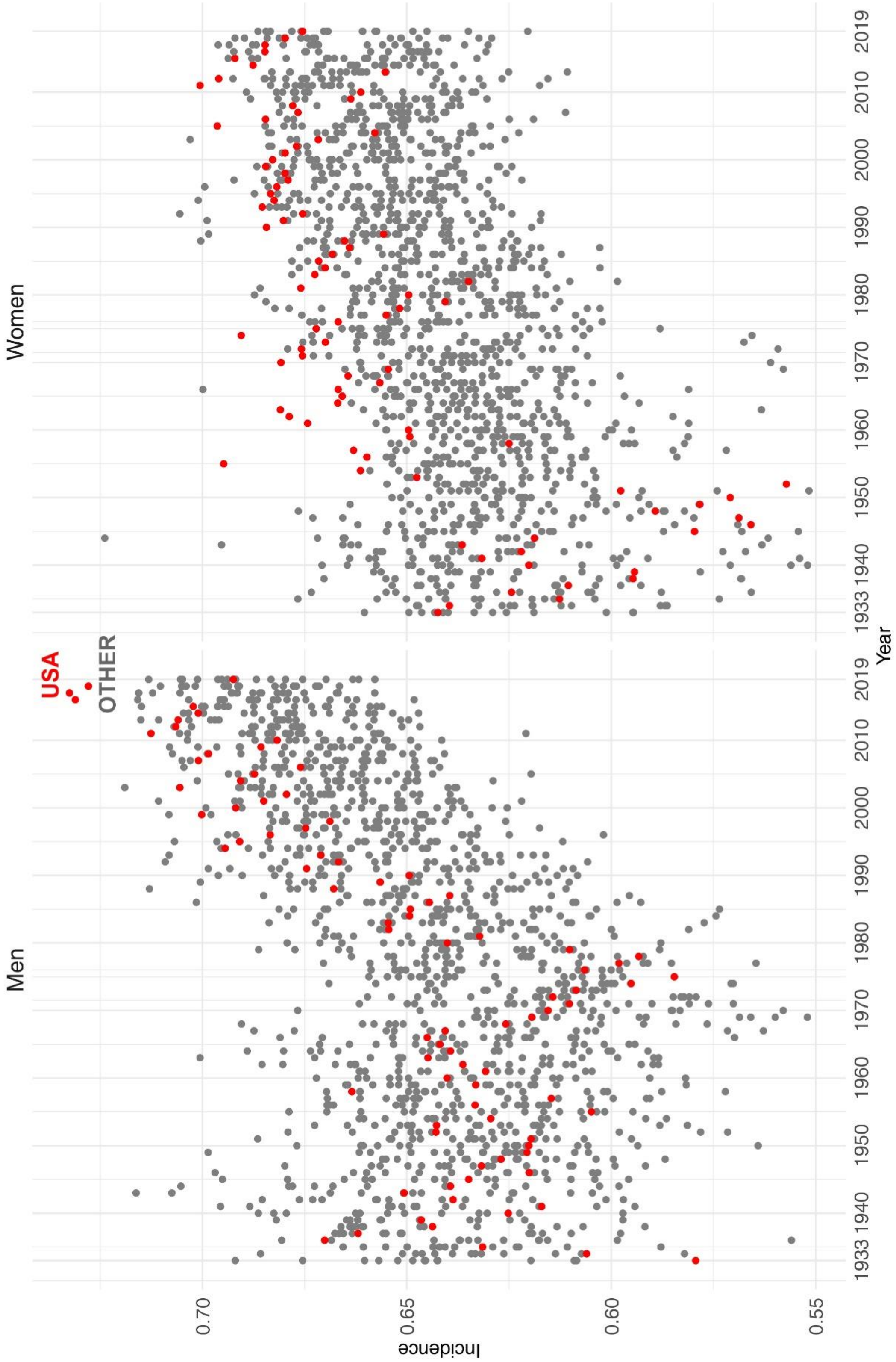
Notes: Countries order by the value of SST by sex.

Source: Authors ‘estimations based on HMD (2023)

Figure 1A. Incidence of Premature Mortality in the United States and Selected High-Income Countries (Other) by Sex, 1933-2019

Notes: Other countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and former West Germany;
Source: Authors 'estimations based on HMD (2023)

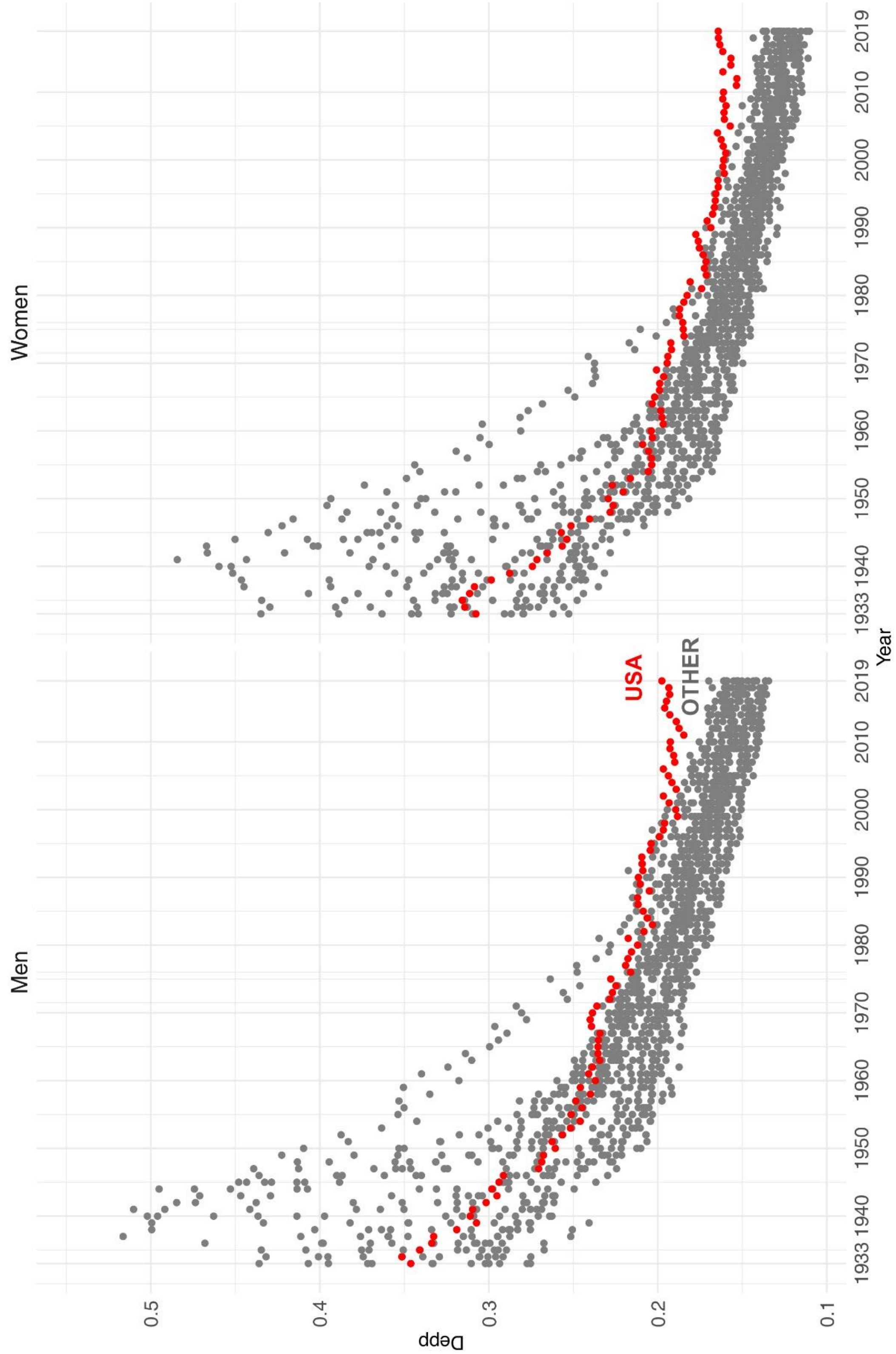
Figure 2A. Incidence of Premature Mortality for Adult Ages (10 Years and Older) in the United States and Selected High-Income Countries (Other) by Sex, 1933-2019



Notes: Other countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and former West Germany;

Source: Authors 'estimations based on HMD (2023)

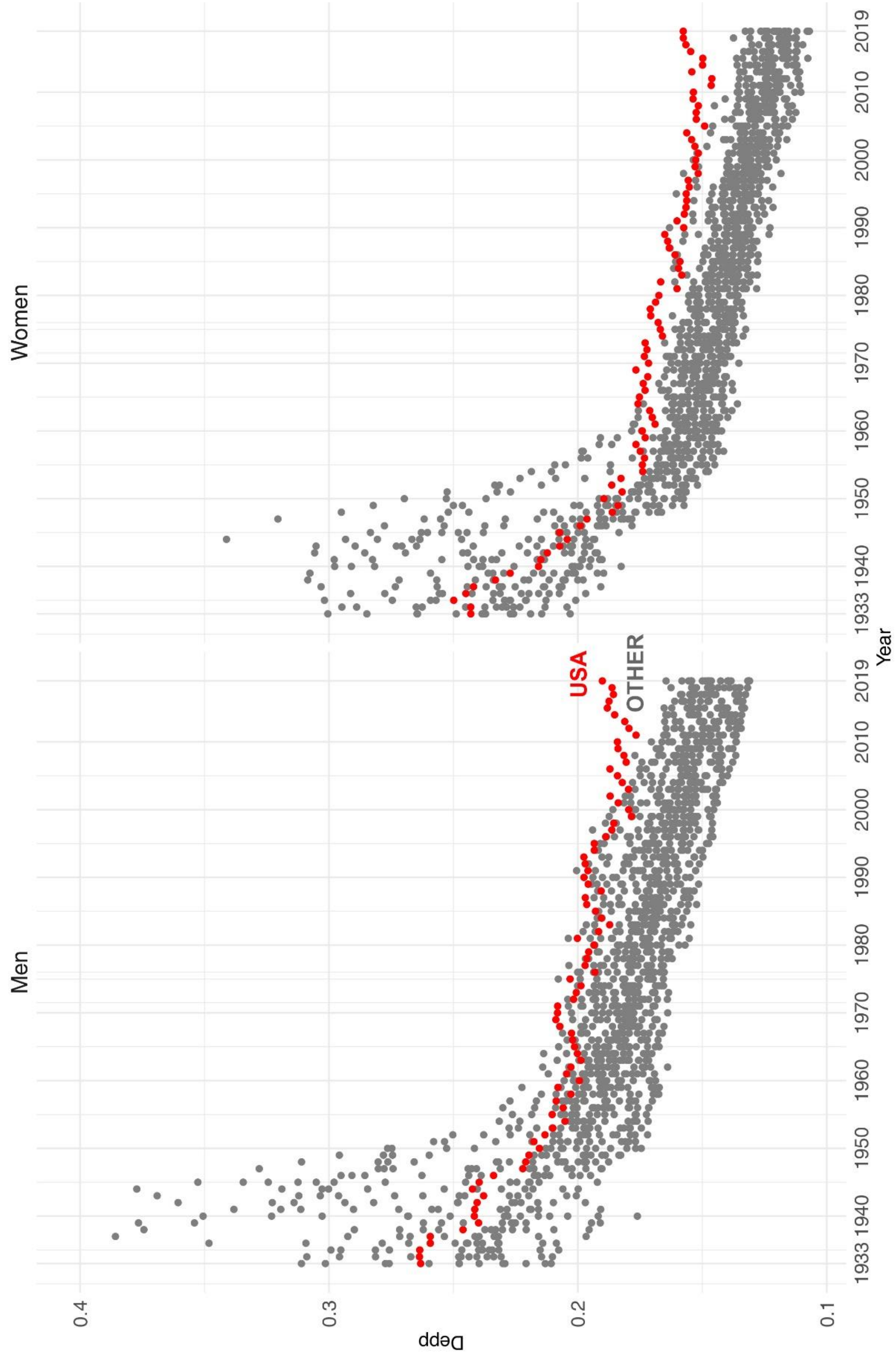
Figure 3A. Depth of Premature Mortality in the United States and Selected High-Income Countries (Other) by Sex, 1933-2019



Notes: Other countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and former West Germany;

Source: Authors 'estimations based on HMD (2023)

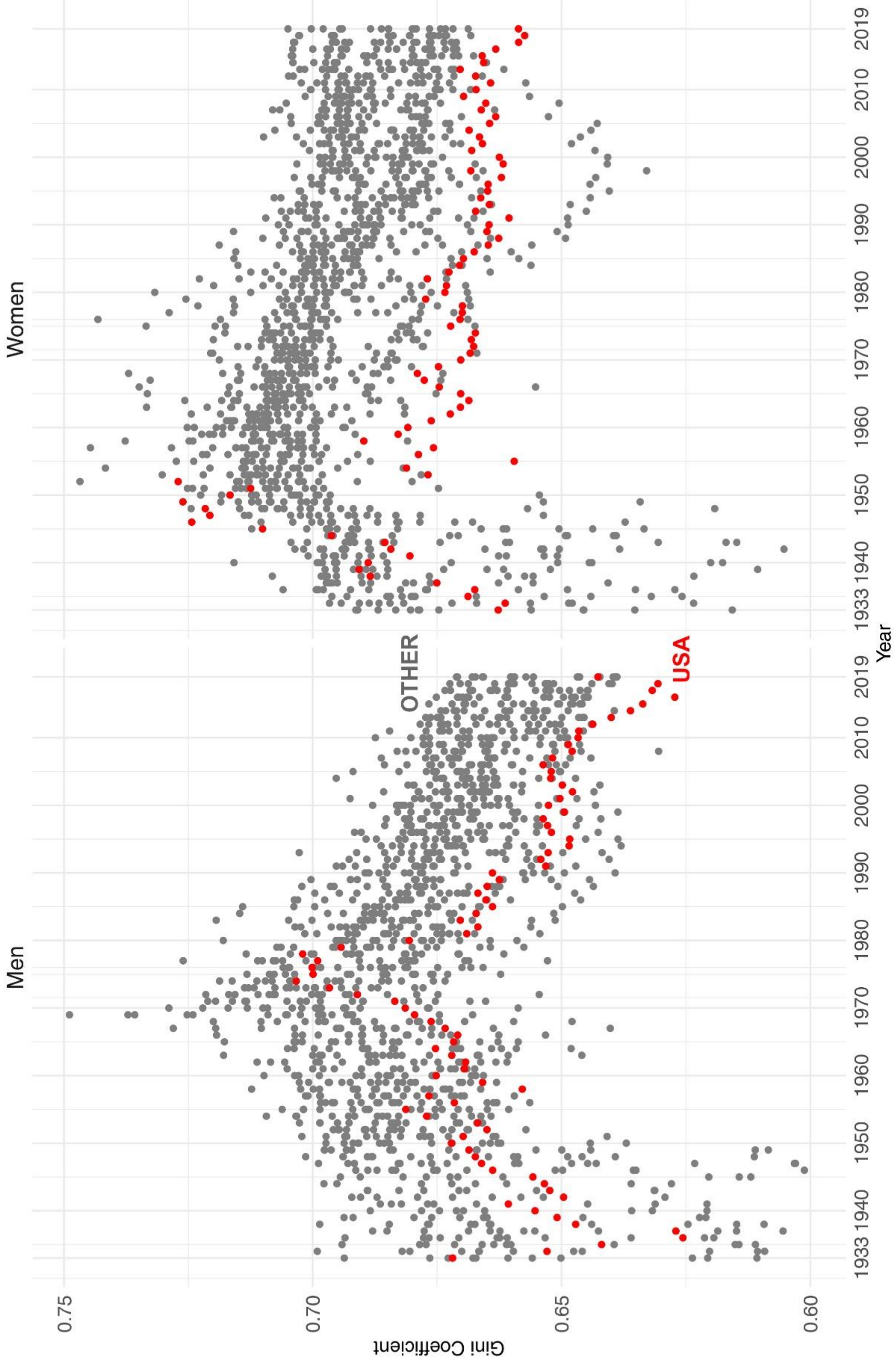
Figure 4A. Depth of Premature Mortality for Adult Ages (10 Years and Older) in the United States and Selected High-Income Countries (Other) by Sex, 1933-2019



Notes: Other countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and former West Germany;

Source: Authors 'estimations based on HMD (2023)

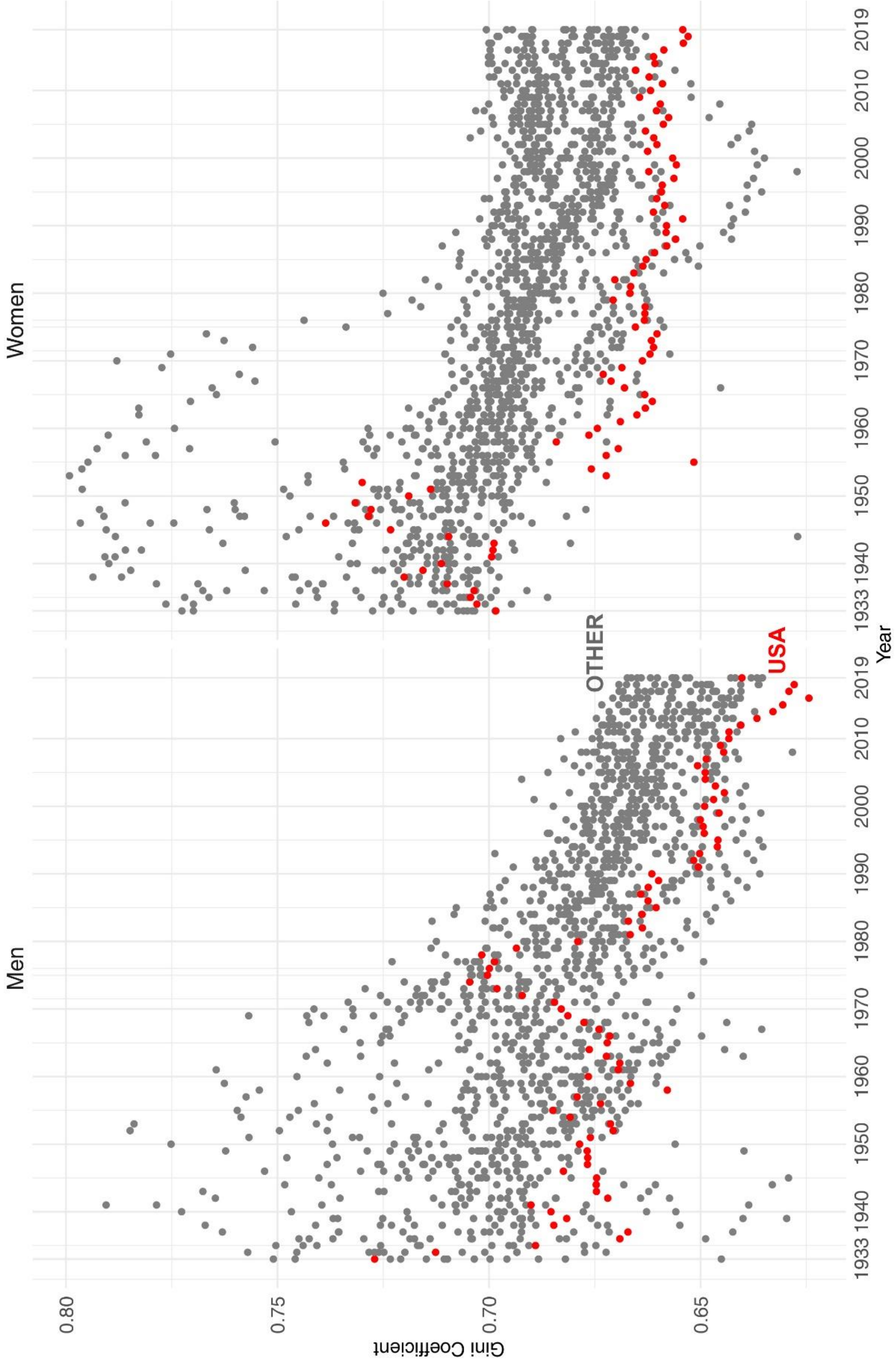
Figure 3A. Distribution of Premature Mortality measured by Gini Coefficient in the United States and Selected High-Income Countries (Other) by Sex, 1933-2019



Notes: Other countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and former West Germany;

Source: Authors ‘estimations based on HMD (2023)

Figure 4A. Distribution of Premature Mortality for Adult Ages (10 Years and Older), measured by Gini Coefficient, in the United States and Selected High-Income Countries (Other) by Sex, 1933-2019



Notes: Other countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and former West Germany;
Source: Authors 'estimations based on HMD (2023)