Longer and Healthier Lives: Health and Mortality Trajectories of International Immigrants and Native-Born Residents in Finland

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Abstract

While international immigrants often exhibit a mortality advantage over native-born populations, whether this extends to health outcomes, particularly past working ages, remains debated. Previous research has been limited by a reliance on cross-sectional health data. This study leverages Finnish register data to simultaneously examine the health and mortality trajectories of immigrants and native-born residents. We followed 31,577 foreign-born individuals and an age-matched sample of 92,281 native-born Finns, tracking mortality and the incidence of seven chronic conditions between ages 30 and 80. We find that immigrants in Finland live longer and in better health than their native-born counterparts. While their advantage tends to narrow with age, it seldom reverses before late adulthood. We observed a socioeconomic gradient in health and mortality for both populations; however, this gradient was flatter among immigrants. Consequently, the foreign-born advantage in longevity and health was most pronounced among manual workers and smallest among upper-level white-collar workers.

Introduction

International immigrants often enjoy a mortality advantage over native-born residents of destination countries (Guillot et al. 2018; Hendi and Ho 2021; Wallace et al. 2022). Whether a similar advantage exists for other health outcomes, particularly past late adulthood, remains debated (Boen and Hummer 2019; Zheng and Yu 2025). Particularly at older ages, immigrants retain a mortality advantage, but their health advantage diminishes. This morbidity-mortality paradox (Kouris-Blazos 2002), has been ascribed by some to weathering-like processes or accelerated ageing (Boen and Hummer 2019; Loi et al. 2025), but has been interpreted more positively by others as a process in which the better health endowments of immigrants allow them to both postpone the onset of selected health conditions and to better withstand their adverse consequences and thus delay mortality (Zheng and Yu 2025).

Data to test these competing explanations are rare. In particular, we are aware of a single study that looked at both health and mortality outcomes for the same population using a single data source — the National Health Interview Study (NHIS) — to investigate health and mortality trajectories of immigrants over their life course (Zheng and Yu 2025). A key limitation of this and other studies with a similar design is their reliance on cross-sectional evidence for health, which means that age is partially confounded by year of birth and year of arrival, with changing selection of immigrants over time, as well as shifts in their country-of-origin composition, potentially affecting the results.

In this study, we leverage Finnish register data to look simultaneously at the health and mortality trajectories of international immigrants and native-born residents of Finland. We follow individuals longitudinally and track diagnosis of selected health conditions as well as death and out-migration from Finland. We also link sociodemographic information to investigate socioeconomic differentials in health and mortality across the foreign-born and

native-born populations. Finland is an interesting context where to explore these questions for two main reasons. First, the availability of register data, with the possibility of following longitudinally all eligible individuals in the population, access to objective health measures based on hospital and medication data, and the possibility to examine different dimensions of socioeconomic status. Second, relative to other countries in which foreign-native health differentials have been examined, particularly the United States, health inequalities are smaller in Finland and generally in Nordic countries, particularly among males (Popham et al. 2013).

Data and Methods

Data

We use total population individual-level administrative register data on annual sociodemographic measures and date of death information maintained, pseudonymized, and approved for research (TK-53-1490-18) by Statistics Finland. The study population includes all foreign-born individuals not of Finnish background who arrive in Finland for the first time between 1990 and 2000 and an age-stratified sample of individuals born in Finland to match the age distribution of the foreign-born population. For each foreign-born individual we retrieve information on age, sex, and occupational status on December 31st of the third year since immigration (e.g. for someone who arrive in 1992, we would retrieve these variables on December 31st, 1995). This lag is intended to remove the initial period of adaptation of immigrants to the Finnish society. For native-born residents, we measure these same variables on December 31st, 1993. We remove from the sample individuals for whom occupational status is unknown, reported as student, or as self-employed. With this restriction, our sample comprises 31,577 foreign-born individuals and 92,281 native-born individuals, with 1,483 deaths among the foreign-born and 9,631 deaths among the native-born.

We used information on specialized healthcare use episodes (hospitalizations, outpatient care, emergency care visits) to determine whether and when an individual had been diagnosed with selected health conditions: diabetes (International Classification of Diseases, ICD-10 code E11), asthma (J45), hypertension (I10), arthritis (M15-M19), heart disease (I20-I25), malignant neoplasms (C00-C97), and mental disorders (F00-F99).

Study Design

We follow individuals from January 1st of the year after their sociodemographic characteristics were measured to December 31st, 2019. The longest follow-up duration will be 26 years for all native-born residents and for foreign-born residents who arrived in 1990, the shortest will be 16 years for immigrants who arrived in 2000. During the follow-up, we monitor deaths, diagnosis of selected chronic conditions, and out-migration events. Individuals who leave Finland are censored and removed from the sample, with no possibility of return allowed. When looking at survival without a health condition, individuals who die before being diagnosed are also censored. Because of the relatively sparse data at older and younger ages, we only model hazard rates between ages 30 and 80.

Statistical Analysis

We use negative-binomial generalized additive hazard models to estimate age-specific hazard rates of native-born and foreign-born residents by sex and occupational status. In models for mortality, we censor individuals who leave Finland during the follow-up. In models for health conditions, we further censor individuals who die during the follow-up period. We use a flexible specification in which the hazard of dying or being diagnosed with one of the health conditions over the follow-up is modeled as a smooth, group-specific function of age via penalized splines. We first test migration- and sex-specific functions, to examine overall mortality and health differentials by migration status. Then we move to occupation-, migration-

, and sex-specific functions, to further estimate longevity and health differentials by occupational status. From the estimated hazard rates for single years of age $h(x)$, we obtain cumulative survival curves through the expression $S(x) = e^{-\sum_{k=0}^{x} h(k)}$. We employ standard techniques and assume constant hazard of death in one-year age intervals to construct truncated life tables for ages 30 to 80. From these life tables, we draw truncated life expectancies between ages 30 and 80, which we refer to as adult life expectancies for the remainder of the paper. When referring to health conditions, we use the term incidence to refer to the hazard of being diagnosed with a condition at age x. Rather than looking at survival rates, for health conditions we examine prevalence rates, defined as $1 - S(x)$ and representing the proportion of the population which is alive and has been diagnosed with the condition at age x. Finally, when constructing life tables starting from the incidence rates ($h(x)$), we compute the number of disease-free years lived between ages 30 and 80, considering each condition in isolation.

Results

Mortality and Longevity by Sex and Migration Status

Immigrants enjoy a mortality advantage over the native-born population at almost all ages except above age 75 (Figure 1A). The advantage is more sizeable among males but shows a clearer narrowing over age relative to women, with convergence above age 70. The female foreign-born advantage is smaller but does not show signs of convergence until around age 70, turning into a disadvantage thereafter. For both females and males, the mortality advantage translates into a longevity advantage which, due to the cumulative nature of survival, persists even beyond age 70 (Figure 1B). Overall, female adult life expectancy is 0.5 years higher among the foreign-born (47.7 years) than the native-born (47.2 years) population. The male foreign-born advantage is more than twice as large (1.2 years), with an adult life expectancy of 45.9 years among the foreign-born and 44.7 years among the native-born population (Table 1).

Incidence and Prevalence of Selected Health Conditions by Sex and Migration Status

Among both females and males, foreign-born residents have lower incidence rates for most health conditions at most ages (Figure 2A). There are, however, substantial differences by sex and between health conditions. Among females, the incidence advantage is rather large for arthritis, asthma, diabetes, and hypertension, but smaller for heart disease, neoplasms, and mental disorders. A crossover in incidence rates is observed for diabetes above age 70 and for hypertension above age 55. The foreign-born advantage for asthma and heart disease also narrows at the older ages but does not turn into a disadvantage. At the same time, the foreign-born advantage for arthritis, neoplasms, and mental disorders widens at older ages. Patterns are similar for men but the advantage for diabetes, heart disease, hypertension, and neoplasms is narrower than among women. The advantage for mental disorders is, however, more pronounced. Overall, the foreign-born advantage for males shows less variation with age, with the notable exception of arthritis and asthma — initial disadvantages turning into growing advantages (Figure 2A). Due to the cumulative nature of prevalence rates, the foreign-born population shows consistently lower prevalence for most health conditions at all ages (Figure 2B). The only deviation from this pattern are heart disease and neoplasms among men, for which prevalence rates are very similar for the foreign-born and native-born population. Looking at disease-free years of adult life expectancy (Table 2), foreign-born women have the largest advantage for arthritis (2.1 years) and the smallest for diabetes and hypertension (0.2 years). For men, we observe a sizeable foreign-born advantage for arthritis and mental disorders (1.4 years), a small advantage for hypertension (0.2 years), and no advantage for diabetes (0.1 years), heart disease (-0.1 years), and neoplasms (0.0 years).

Mortality and Longevity Socioeconomic Differentials

We observe a socioeconomic gradient in mortality and longevity for all groups except foreign-born women (Figure 3). Mortality is lowest among upper-level white collars and highest among manual workers, with lower-level white collars falling in the middle. For all groups except foreign-born women, the mortality gradient narrows at the older ages. Even though a gradient is present for foreign-born men, the size of the gradient is larger among native-born than foreign-born adults. Looking at adult life expectancy, female lower-level white collars have 0.6 fewer years of adult life expectancy relative to their upper-level white collar counterparts among the native-born but just 0.2 fewer years among the foreign-born (Table 1). Similarly, the adult life expectancy disadvantage for manual workers relative to upper-level white collars is 1.5 years among the native-born but only 0.1 years among the foreign-born. This pattern is also observed for males. Lower-level white collar men have a 0.9-year adult life expectancy disadvantage among the native-born population but only a 0.6-year one among the foreign-born population. Similarly, the disadvantage for manual workers is 3.3 years for the native-born but is half as large (1.8 years) among the foreign-born (Table 1).

The flatter socioeconomic gradient for the foreign-born than the native-born population means that the foreign-born adult life expectancy advantage is much larger among manual workers – – females: 1.2 years, males: 2.2 years — than among upper-level white collars — females: -0.2 years, males: 0.7 years, with lower-level white collars falling in between — females: 0.2 years, males 1.0 years (Table 1). Except among upper- and lower-level white collar women, the foreign-born mortality and survival advantage narrows over age, and we observe a mortality crossover among both upper- and lower-level white collar males, with native-born men enjoying lower mortality at the oldest ages (Figure 3 and Figure S1). However, only among white-collar women does a larger proportion of the native-born survive to age 79 than among their foreign-born counterparts.

Health Socioeconomic Differentials

With few exceptions, we also observe a socioeconomic gradient in the incidence (Figure 4) and prevalence (Figure 5) of most health conditions for both the foreign-born and native-born populations and both sexes. Neoplasms are a notable exception. Among women, the gradient is reversed — higher prevalence among upper-white collars — and among males it is absent. As for mortality and longevity, the gradient is generally wider for the native-born than the foreign-born population. For example, the diabetes-free adult life expectancy advantage for upper-level white collars relative to manual workers is 1.0 year among the native-born but only 0.3 years among the foreign-born (Table 2). As a consequence, the foreign-born prevalence advantage is generally wider among manual workers than among upper-level white collars (Figure 5). While for most conditions we observe a narrowing foreign-born advantage over age, the narrowing, which sometimes leads to a crossover, is more pronounced among upper- and lower-level white collars than among manual workers (Figure S2). For example, by age 79, native-born women have similar or lower prevalence of diabetes, heart disease, and hypertension, than their foreign-born counterparts among upper- and lower-level white collars but higher prevalence among manual workers (Figure S2).

Discussion

Leveraging Finnish full population data, our study follows and compares the health and mortality trajectories of international immigrants and native-born Finnish residents from early (age 30) to late adulthood (age 80). We find that immigrants enjoy both a health and a mortality advantage over native-born residents, living longer and spending more years free from a broad range of health conditions. Although both the health and the mortality advantages tend to narrow with age, this only leads to a crossover in few instances and only in late adulthood. At the same time, the foreign-born advantage in incidence and prevalence rates become larger at

older ages for arthritis, mental disorders, and neoplasms (among females). When looking at the intersection of migration status and occupational status, we observe a socioeconomic gradient for most health conditions and for mortality among both foreign-born and native-born residents. Upper-white collar residents generally live longer and spend more years free from adverse health conditions than lower-level white collars and manual workers. However, this gradient is less pronounced among foreign-born than native-born residents. Therefore, the foreign-born health and mortality advantage is wider among manual workers than it is among white collars. Furthermore, although the foreign-born health and mortality advantage narrows over age across all occupational groups, only among upper- and lower-level white collars it frequently turns into a disadvantage, with foreign-born manual workers enjoying an adult health and mortality advantage relative to their native-born peers even when their white-collar counterparts do not.

In contrast to previous work finding a morbidity-mortality paradox (Boen and Hummer 2019; Wallace and Darlington-Pollock 2022; Zheng and Yu 2022, 2025) — a foreign-born mortality advantage despite a health disadvantage —, our findings indicate that the immigrant population lives longer and healthier lives than the native-born population in Finland. Similar findings of a migrant health advantage has been reported in other context (Antecol and Bedard 2006; Brown 2018; Gorman et al. 2010; Moullan and Jusot 2014), and it is important to consider that the composition of international immigrants by country of origin, education, pre-migration health, and other relevant characteristics can vary widely across destination countries and over time, thus influencing the observed health and mortality differentials.

While we do find that migrants have better health and lower mortality than native-born residents, the mortality advantage and the health advantage for some major conditions including diabetes, hypertension, and heart disease, narrows over adulthood and becomes

significantly smaller or reverses by age 80. These findings are generally consistent with previous research showing narrowing foreign-born health advantages or emerging disadvantages at older ages (Loi et al. 2025; Loi and Hale 2019; Zheng and Yu 2025). Regarding the narrowing mortality advantage, our results are in line with cross-sectional studies finding that the foreign-born advantage is generally largest in early and middle adulthood and declines thereafter (Guillot et al. 2018; Hendi and Ho 2021), but are inconsistent with other longitudinal studies, chiefly from the US, documenting a widening migrant mortality advantage at the older ages (Zheng and Yu 2022, 2025).

Our finding of a flatter socioeconomic gradient among the foreign-born than the native-born population replicates previous studies in the United States (Goldman et al. 2006; Kimbro et al. 2008) and Germany (Loi et al. 2025). Similarly, the more pronounced foreign-born health and mortality advantage among those with lower than higher SES has been noted before in the literature (Goldman et al. 2006; Kimbro et al. 2008; Loi et al. 2025). However, in contrast with previous studies, we do not find faster health declines among immigrant with lower SES, rather, we observe convergence in the health and mortality trajectories of different SES groups over age, indicating that those with lower SES experience slower health deterioration. Consequently, we also find that foreign-born manual workers retain a mortality advantage and lower prevalence of almost all health conditions even if their white-collar counterparts do not. These findings suggest that even though increasing one's socioeconomic status is not as beneficial for immigrants as it is for native-born residents, the health and mortality penalty association with having low SES is smaller among immigrants and narrows with age.

Conclusion and Next Steps

Overall, our study suggests that international immigrants in Finland live longer and healthier lives than native-born residents. While this favorable position deteriorates with age, the

probability of reaching late adulthood, and doing so free from adverse health conditions, is higher among foreign-born than native-born residents.

Moving forward, we plan to extend the analysis by integrating information on reimbursement rights for long-term medication for certain chronic diseases for each of the health conditions except mental disorders. Combining these data with medical records should allow us to capture a larger share of diagnoses for most of the health conditions we are examining. A second next step will be to integrate additional measures of socioeconomic status, including employment status and household income. A final extension will be to allow for changes in socioeconomic status over adulthood rather than examining differentials by socioeconomic status at the start of the follow-up period.

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Table 1: Life Expectancy between Ages 30 and 80 by Nativity, Sex, and Occupational Status.

Occupational Status	Female			Male		
	Foreign	Native	Foreign-Born Advantage	Foreign	Native	Foreign-Born Advantage
Total	47.7	47.2	0.5	45.9	44.7	1.2
Upper-level white collar	47.8	48.0	-0.2	47.0	46.3	0.7
Lower-level white collar	47.6	47.4	0.2	46.4	45.4	1.0
Manual	47.7	46.5	1.2	45.2	43.0	2.2

Table 2: Disease-Free Life Expectancy between Ages 30 and 80 by Health Condition, Nativity, Sex, and Occupational Status.

Occupational Status	Female			Male		
	Foreign	Native	Foreign-Born Advantage	Foreign	Native	Foreign-Born Advantage
Arthritis						
Total	46.1	44.0	2.1	46.5	45.0	1.4
Upper-level white collar	47.0	45.1	1.9	47.0	46.0	1.0
Lower-level white collar	45.9	44.1	1.8	46.1	45.0	1.1
Manual	45.8	43.0	2.7	46.3	44.5	1.9
Asthma						
Total	48.1	47.1	0.9	48.2	48.2	0.0
Upper-level white collar	48.3	47.6	0.7	48.3	48.8	-0.6
Lower-level white collar	48.1	47.1	1.0	48.3	48.2	0.1
Manual	47.9	46.8	1.0	48.1	47.9	0.2
Diabetes						
Total	49.2	49.0	0.2	48.3	48.2	0.1
Upper-level white collar	49.4	49.3	0.1	48.6	48.8	-0.2
Lower-level white collar	49.2	49.1	0.1	48.0	48.3	-0.4
Manual	49.1	48.6	0.5	48.3	47.8	0.5
Heart Disease						
Total	48.2	47.8	0.3	45.4	45.5	-0.1
Upper-level white collar	48.2	48.6	-0.4	46.5	46.4	0.0
Lower-level white collar	48.3	48.0	0.3	45.2	45.5	-0.3
Manual	48.1	47.3	0.8	45.0	44.9	0.1
Hypertension						
Total	47.7	47.5	0.2	47.8	47.6	0.2
Upper-level white collar	48.0	48.1	-0.1	48.1	48.1	0.1
Lower-level white collar	47.5	47.4	0.1	47.6	47.5	0.1
Manual	47.6	47.3	0.4	47.7	47.5	0.2
Neoplasms						
Total	44.9	44.1	0.8	44.9	44.8	0.0
Upper-level white collar	44.9	43.8	1.1	44.5	44.8	-0.2
Lower-level white collar	44.6	44.0	0.6	44.7	45.1	-0.4
Manual	45.2	44.5	0.7	45.0	44.8	0.2
Mental Disorders						
Total	42.0	41.6	0.4	43.0	41.6	1.4
Upper-level white collar	42.8	43.1	-0.3	43.9	44.0	-0.2
Lower-level white collar	41.8	42.5	-0.6	42.9	42.1	0.8
Manual	41.6	39.6	2.0	42.6	39.7	2.9

Figure 1: Hazard Rates and Cumulative Survival by Sex and Nativity, Ages 30 to 80.

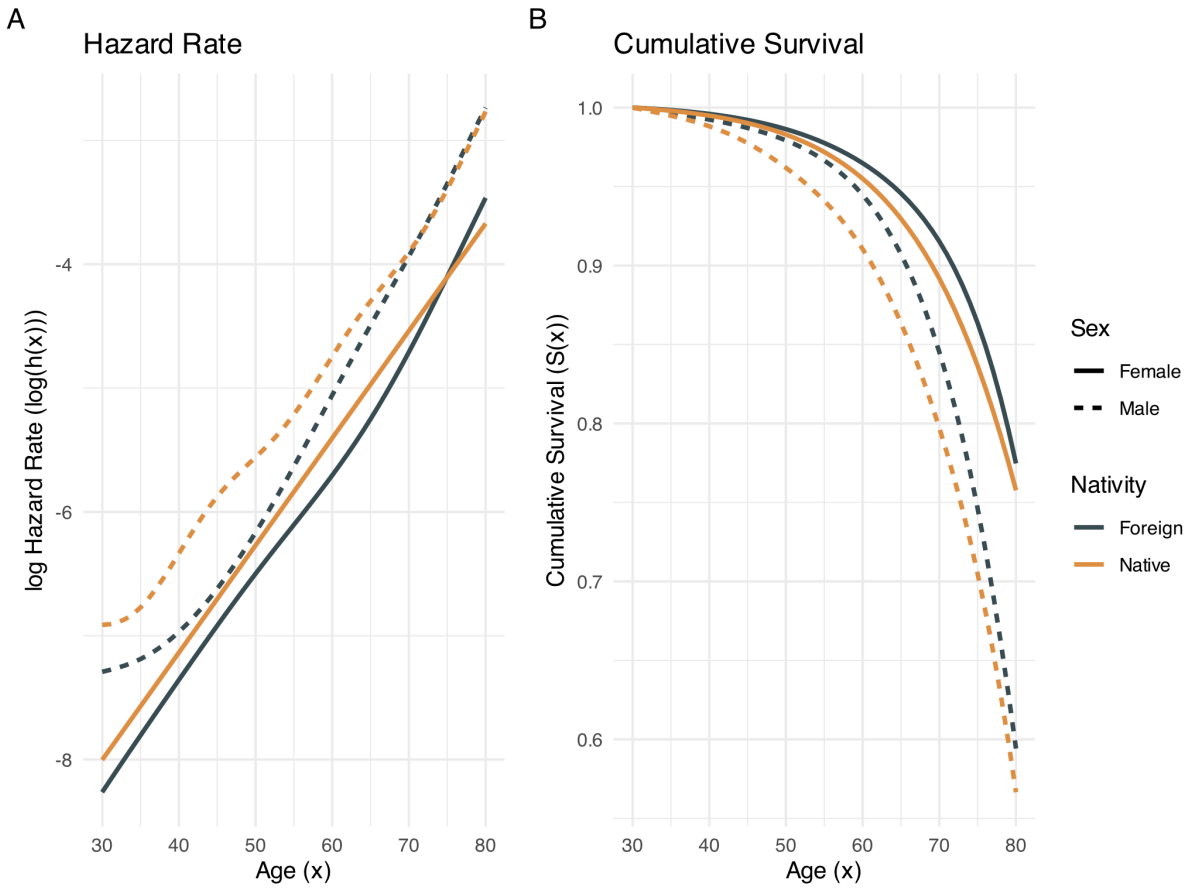

Figure 2: Incidence and Prevalence Rates by Health Condition, Sex and Nativity, Ages 30 to 80.

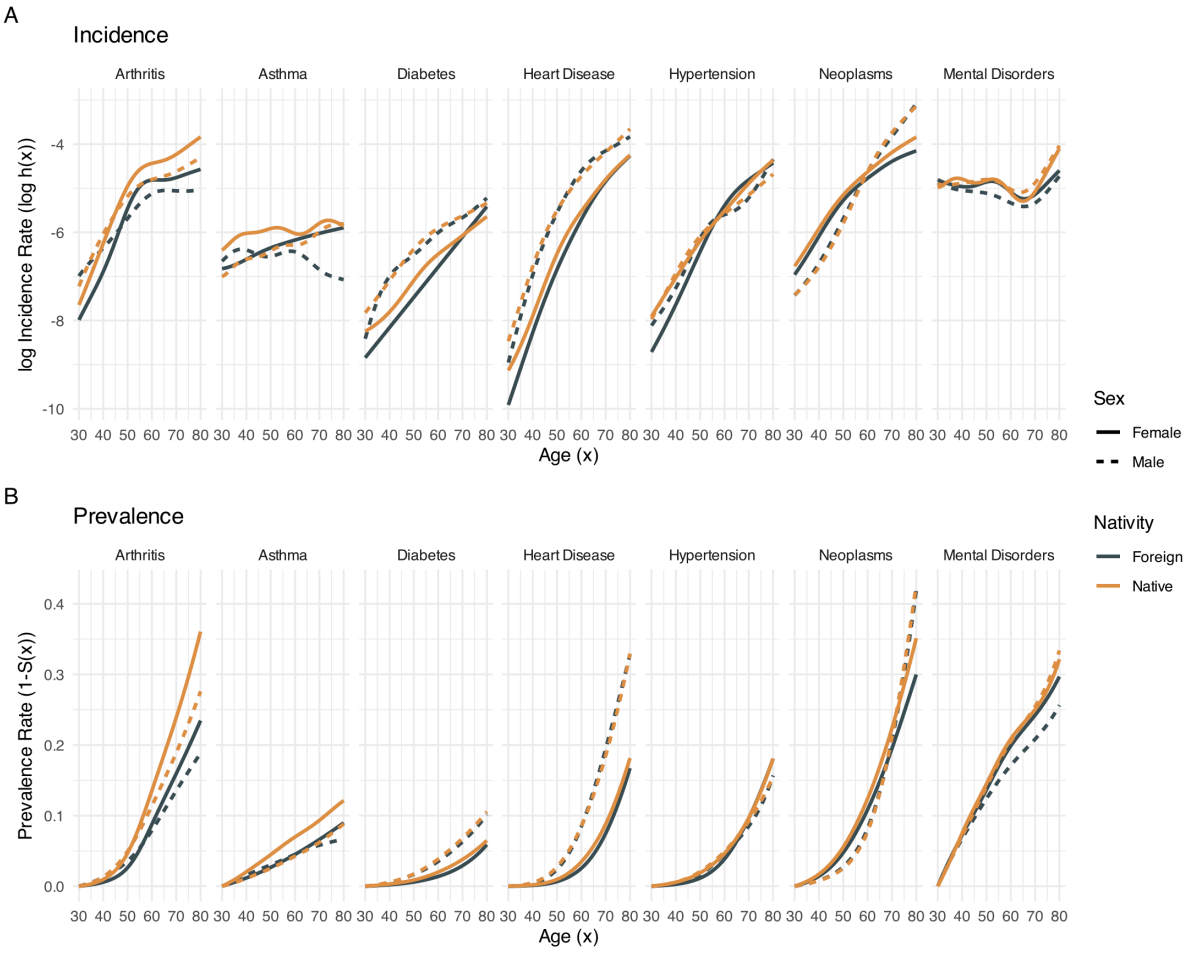

Figure 3: Hazard Rates and Cumulative Survival by Sex, Nativity, and Occupational Status, Ages 30 to 80.

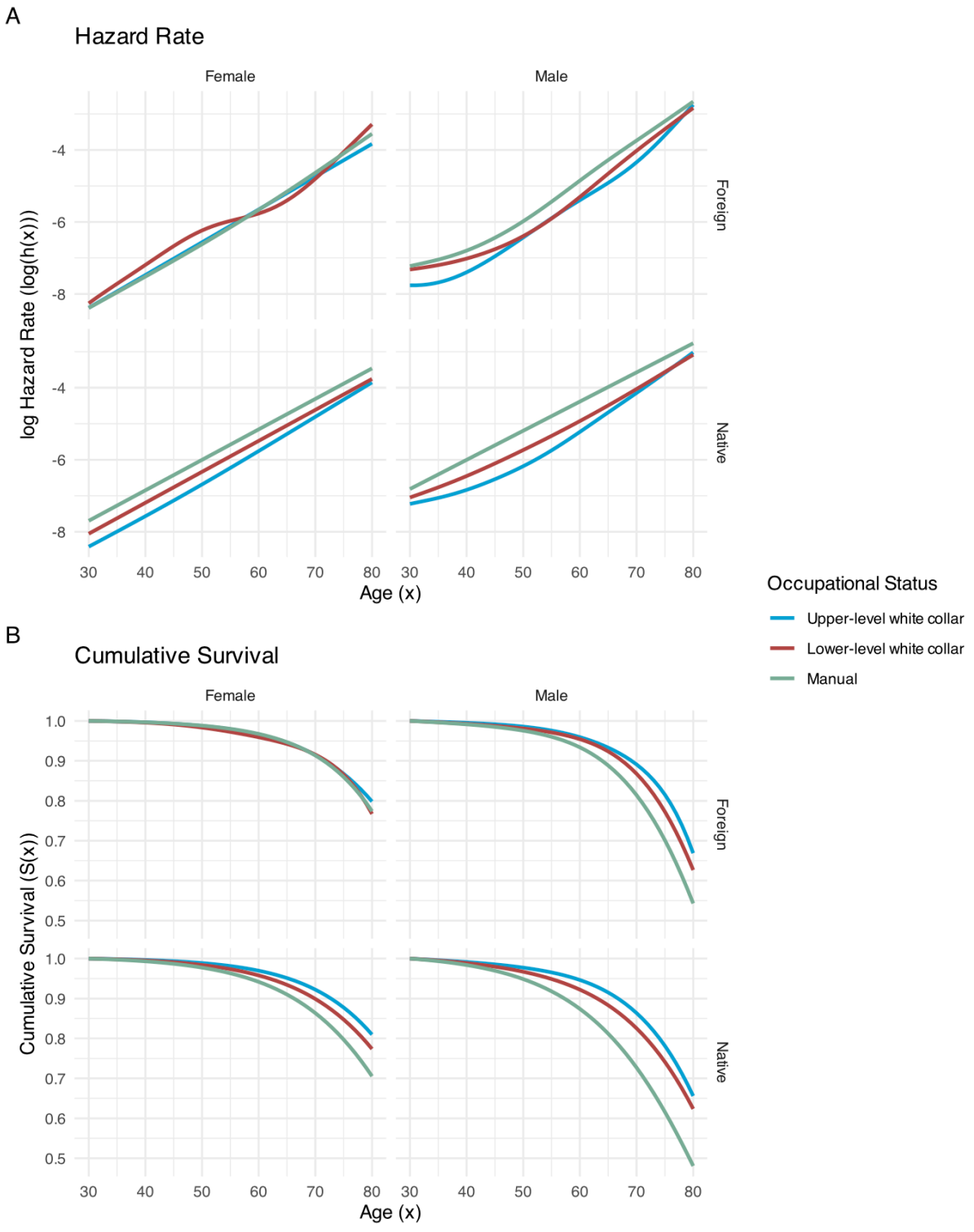

Figure 4: Incidence Rates by Health Condition, Sex, Nativity, and Occupational Status, Ages 30 to 80.

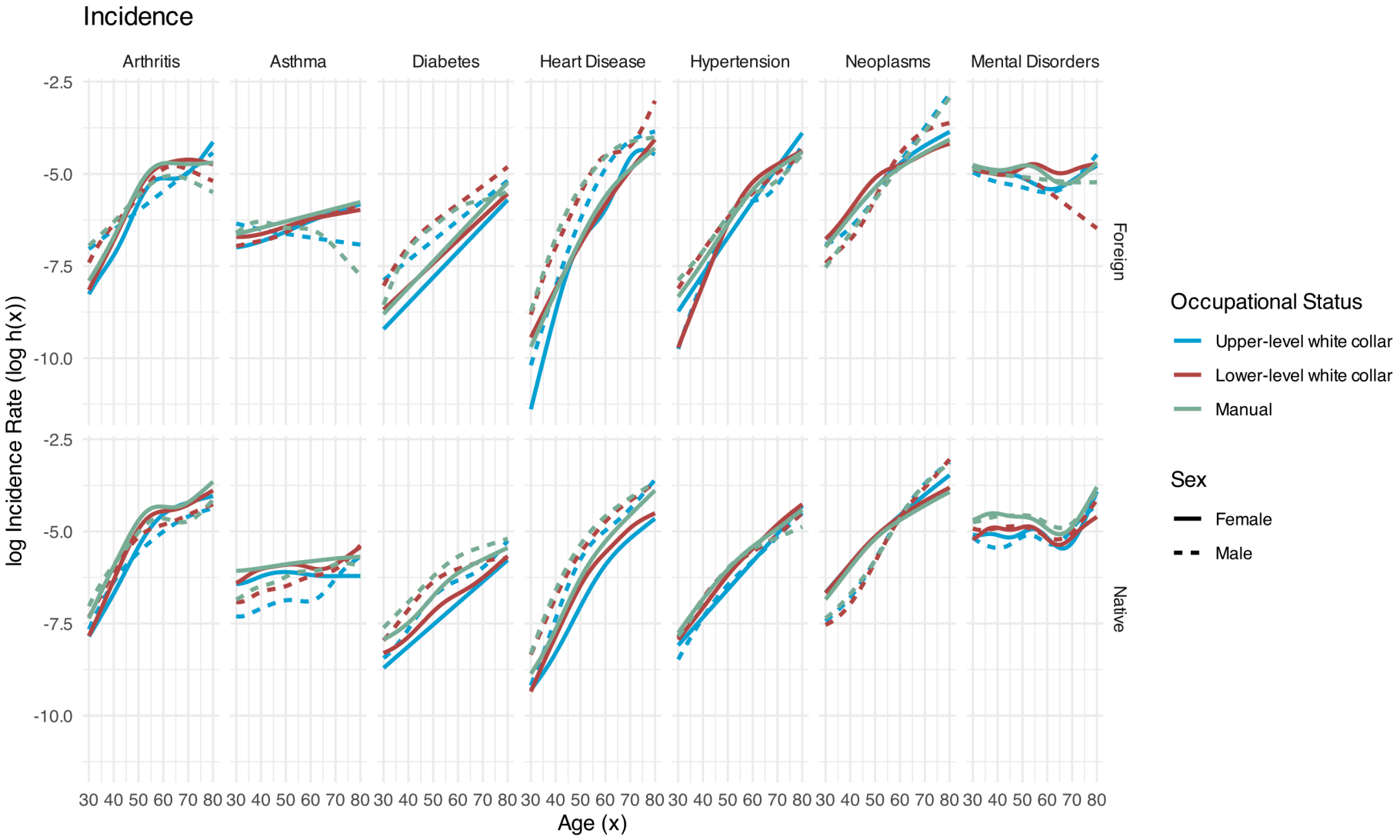

Figure 5: Prevalence Rates by Health Condition, Sex, Nativity, and Occupational Status, Ages 30 to 80.

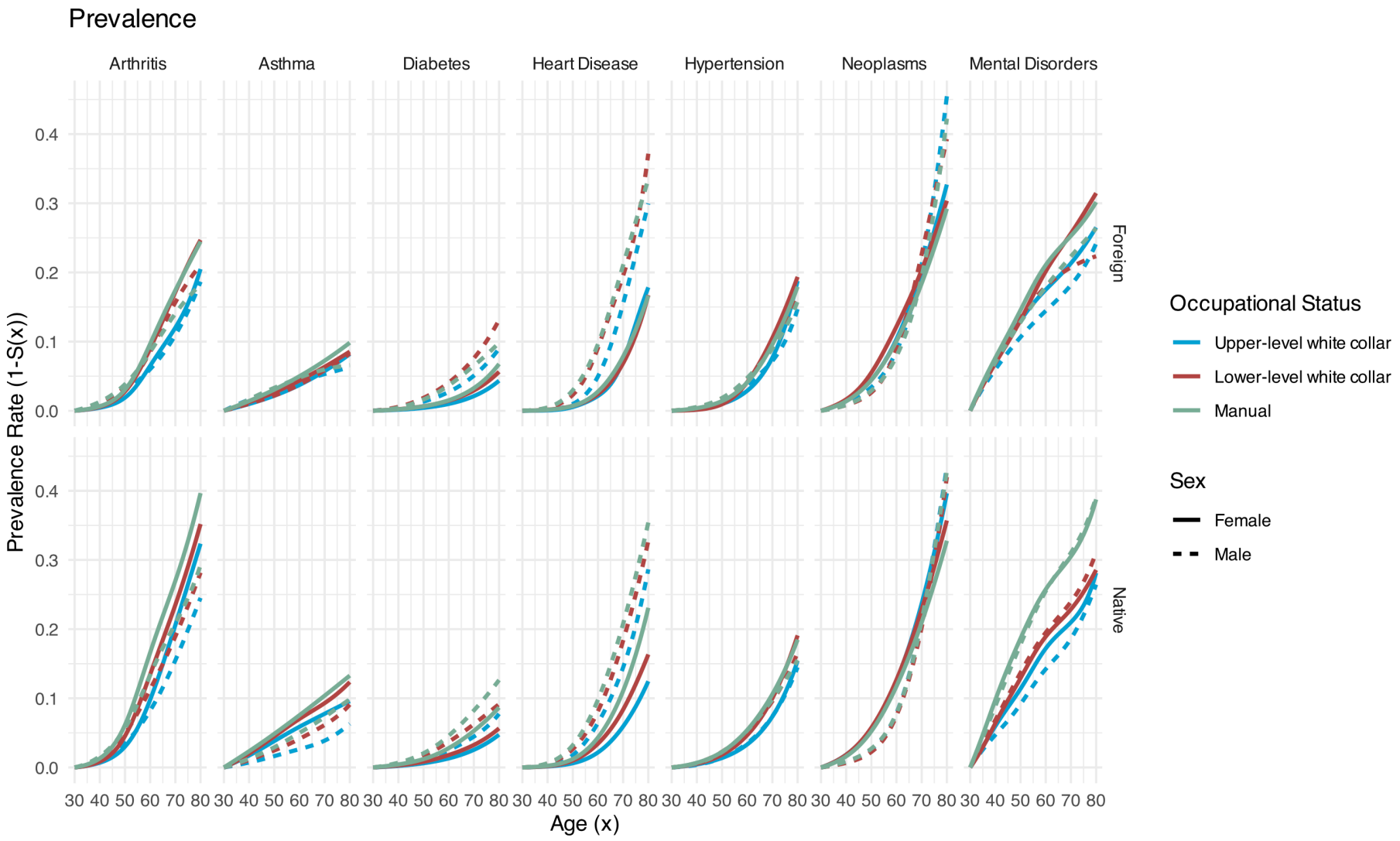

Figure S1: Hazard Rates and Cumulative Survival by Sex, Nativity, and Occupational Status, Ages 30 to 80.

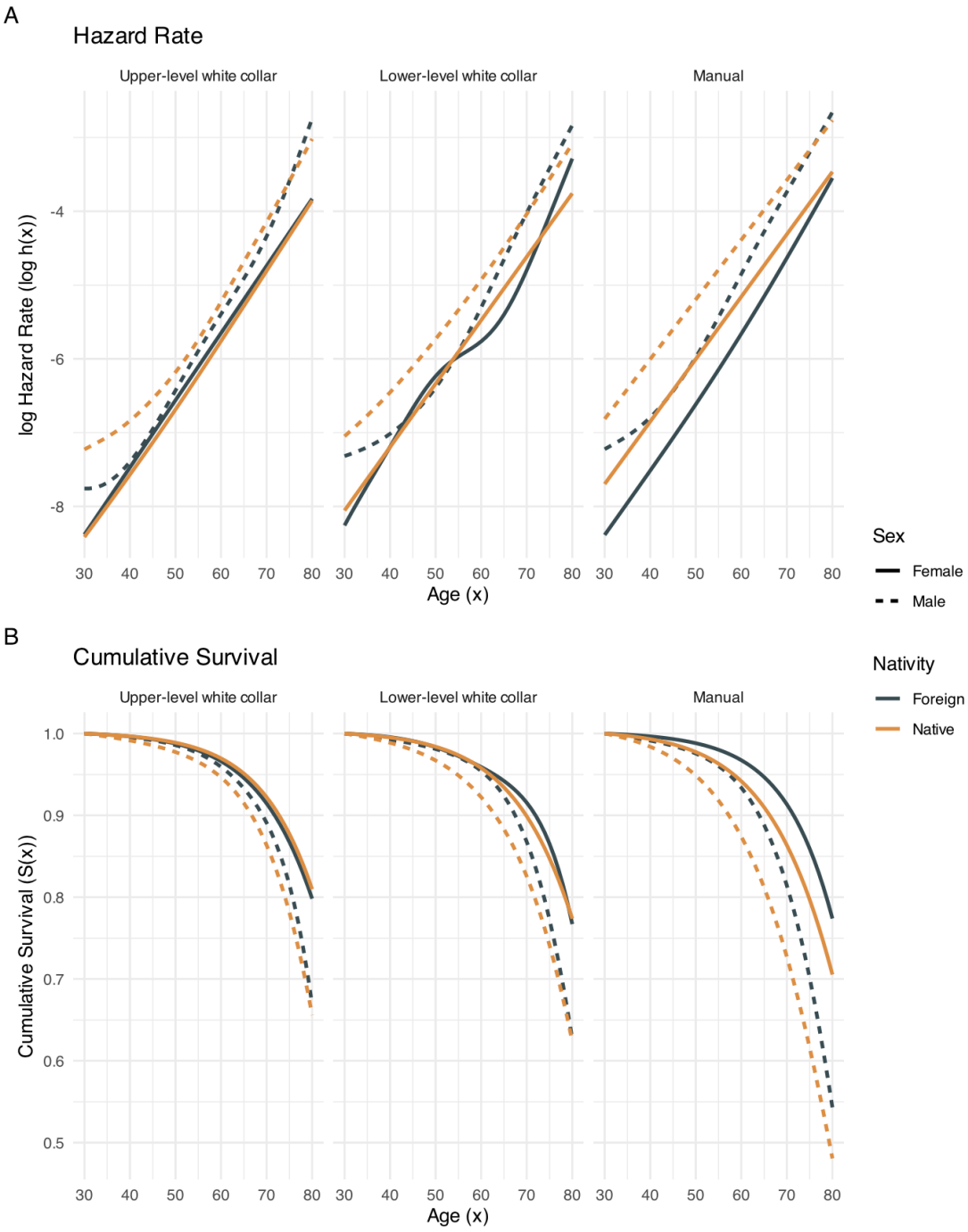

Figure S2: Prevalence Rates by Health Condition, Sex, Nativity, and Occupational Status, Ages 30 to 80.