University of St Andrews

MigrantLife
Working Paper 25 (2024)

MigrantLife

Working Life Expectancy Among the Descendants of Immigrants in the UK: A Multistate Life Course Approach

Hill Kulu, Andreas Höhn
and Júlia Mikolai

This paper is part of a project that has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 834103).

MigrantLife

Understanding Life Trajectories of Immigrants and Their Descendants in Europe and Projecting Future Trends.

Website | Twitter/X | Bluesky

Working Life Expectancy Among the Descendants of Immigrants in the UK: A Multistate Life Course Approach

Hill Kulu[1], Andreas Höhn[1,2], Júlia Mikolai[1]

[1] University of St Andrews, [2] CSO/MRC SPHSU, University of Glasgow

Abstract

Previous research has shown that the descendants of immigrants in European countries have lower labour market participation rates when compared to native populations. However, it is unclear how much time the descendants of immigrants spend in employment, or out of it, throughout their working ages. Applying an incidence-based multistate model to data from the UK Household Longitudinal Study, we calculate working life expectancies between ages 25 and 65 for the descendants of immigrants in the UK by country-of-origin background, gender, and education. Our results show first that, overall, men spent more time in the active state than women, as expected. Second, while there were no major differences among descendant groups for men, the number of active years varied significantly among women. Women of European, Caribbean, and African origin were mostly active during their working ages, whereas those of Pakistani and Bangladeshi descent were mostly inactive. Third, our analysis by education showed that high educated individuals spent more time in employment than medium and low educated people among all descendant groups, but the observed group differences persisted. We argue that conservative gender norms are likely to explain the group differences among women. Low labour market participation has a negative effect on an individual's long-term (financial) security and well-being; it may also promote conservative gender norms intergenerationally.

Keywords: *immigrants, second generation, employment, activity, multistate models, working life expectancy, UK*

Acknowledgements

This paper is part of the MigrantLife project that has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 834103). Andreas Höhn is further supported through the Spanish Ministry of Science and Innovation (PID2022-142762OA-I00), the Medical Research Council (MRC: MC_UU_00022/5), and the Chief Scientist Office (CSO: SPHSU20). We are grateful for the opportunity to use data from the UK Household Longitudinal Study, hosted and managed by the UK Data Service. We thank Parth Pandya for their valuable comments on an earlier version of this study.

Background

European countries have experienced increasing immigration streams and ethnic heterogeneity of their populations (Vertovec, 2007). Previous research has improved our understanding of the factors that have facilitated or hindered the integration of post-World War II labour migrants in European countries (Adsera, 2011; Andersson, 2004; Milewski, 2007; Wachter & de Valk, 2022). Post-war immigration occurred as a response to the Northern and Western European countries' labour market needs, which were driven by the demand for workers in the labour-intensive sectors of industry in the 1950s and 1960s (Seifert, 1997). Consequently, labour migrants had high employment levels, although most of them worked in semi-skilled and unskilled occupations (Fassmann, 1997; Peach, 1998; Seifert, 1997).

The descendants of post-war immigrants and recent immigrants have entered the labour market in a different economic context. Research shows that employment levels among the descendants of immigrants tend to remain below those of native populations in Europe and that their salaries are lower (Alba, 2005; Connor & Koenig, 2015; Dustmann & Fabbri, 2005; Longhi et al., 2013). Previous research has proposed three explanations for the observed gaps in employment and income. First, many of the descendants of post-war labour migrants have low educational levels, which appear to be related to their parental background (Clauss & Nauck, 2010; Dustmann & Fabbri, 2005). Second, traditional gender roles and high levels of religiosity may explain the low female labour market participation among some migrant groups (Khoudja & Fleischmann, 2015). Third, hidden discrimination in the labour market has been considered an important factor contributing to lower levels of employment among the descendants of immigrants (Modood & Khattab, 2016).

Although some studies show that differences in employment and income vanish after adjusting for the individual's education or socioeconomic background (Belzil & Poinas, 2010), research demonstrates that ethnic gaps persist, particularly among non-Western migrant and minority groups (Cheung, 2014; Khattab & Johnston, 2015; Rafferty, 2012; Rathelot, 2014). These penalties are the highest among Caribbean groups and Sub-Saharan Africans and those migrant and minority groups of Turkish, South Asian, and North African origin (Khattab & Johnston, 2015; Modood & Khattab, 2016). Previous research has also argued for an intersectional perspective as women from those groups may face both 'ethnic' and 'motherhood' penalties, particularly in countries with liberal and conservative welfare state provisions (Hartmann, 2016). State policies are thus expected to shape the labour market behaviour of immigrants and their descendants. Differences between different groups of immigrants' descendants are expected to be smaller in countries with inclusive integration policies and/or a wide range of policies that reduce differences between population subgroups (Esping-

Andersen, 1999; Seifert, 1997). However, several studies have challenged these assumptions, showing that 'ethnic' penalties exist in all European countries (Kelly & Hedman, 2016; Wiesbrock, 2011).

The aim of this study is to determine working life expectancies (WLE) for the descendants of immigrants. Many studies report employment rates among ethnic minorities; however, they are usually measured at certain stages (or ages) in their lives. We adopt a dynamic and longitudinal life course perspective and calculate the time individuals spend in and out of the labour market between ages 25 and 65. We also adjust the models for education and calculate WLE for high and medium/low educated groups. To the best of our knowledge, this is the first study to apply a multistate approach to examine WLE for migrant and ethnic minority populations. To calculate WLE, we use data from the UK Household Longitudinal Study (UKHLS - Understanding Society) – the largest, longest-running UK household panel study. The UK, with its diverse ethnic minority population, offers a good case to investigate employment among ethnic minorities as the country has a large population of men and women whose parents were immigrants from either European, Caribbean, or South Asian countries. Typically, research has investigated ethnic minority populations without distinguishing between immigrants and their descendants. We distinguish between the first and second generation by focusing on the descendants of immigrants and distinguishing their country-of-origin background, making for the second novelty of our study.

Immigrant and ethnic minority assimilation

Previous research has proposed two approaches to understand the integration of immigrants and their descendants. The classical assimilation theory predicts that immigrants and their descendants become increasingly similar to the native population. Here, the descendants of immigrants are more similar to the native population than immigrants; their descendants, in turn, are normally indistinguishable from the majority population (Alba, 2005; Alba & Nee, 1997). In contrast, the segmented assimilation theory assumes that assimilation is not a linear process with one common outcome; rather groups will have different trajectories and destinations. Some groups undergo socio-cultural integration into the middle class; others experience economic integration into the middle class, but may preserve their cultural characteristics; finally, some may undergo assimilation into the lower class: they experience cultural assimilation, but remain socio-economically disadvantaged (Collet-Sabé, 2020; Portes et al., 2009). Although the concept of immigrant and ethnic minority integration should be understood in holistic terms, including the economic, political, social, and cultural aspects of individuals' lives, it is critical to consider labour market outcomes of immigrants and their descendants as these are fundamental to their socio-economic and often also cultural integration and well-being.

There is a large literature on immigrant labour market participation in the UK. With the increase of the size of the descendant population, research has examined employment levels of ethnic minorities in relation to the white British population. Blackaby at al. (2005) investigated employment and earnings outcomes of the British-born ethnic minority men using data from the UK Labour Force Survey (Blackaby et al., 2005). The analysis showed substantial earnings and employment differences between the white majority and British-born ethnic minority populations as all minority groups had higher unemployment levels and lower earnings. Characteristics such as qualification, industry sector, and region of residence explained a significant part of these differences, although discrimination also played a role in employment differences. The authors argued that employment and earnings disadvantages remained particularly severe for specific UK-born ethnic groups such as Black and Pakistani populations.

Dale et al. (2006) examined the relationship between family formation and employment for women from ethnic minority groups (Dale et al., 2006). This analysis of Labour Force Survey data showed that for all women, economic activity rates were lower once they had young children. However, there were significant variations across ethnic groups: Caribbean women had a relatively high likelihood of being employed while having children, whereas Pakistani and Bangladeshi women had low employment rates. The authors concluded that employment patterns among Caribbean women are consistent with norms of motherhood that encompass roles of both breadwinner and parent. In contrast, Pakistani and Bangladeshi women's patterns of economic activity reflect a strongly gendered division of labour where motherhood is associated with full-time care for children. Several other studies have reported significant differences in employment patterns among ethnic minority women in the UK (Khattab & Johnston, 2015; Modood & Khattab, 2016).

While early research on ethnic minorities in the UK mostly used cross-sectional data, recent studies have benefitted from longitudinal data and followed patterns over a longer period in individuals' lives. Li and Heath (2020) used longitudinal data to analyse labour market dynamics among ethnic minorities (Li & Heath, 2020). The analysis showed that most ethnic minority groups had higher unemployment levels than the white British majority in all ages between 30 and 60. The exceptions were Chinese, White Other, and Irish groups who had employment levels similar to those of the majority groups. For men, unemployment levels were the highest among the Caribbean group, whereas for women they were the highest for Bangladeshi and Pakistani ethnic groups. These differences largely persisted once demographic and socio-economic factors (specifically education) were controlled for, suggesting that labour market discrimination very likely played a role.

Longhi (2020) used data from the UKHLS to understand why UK-born ethnic minorities have higher unemployment levels than the white majority population (Longhi, 2020). The analysis showed

no ethnic differences in the probability to move from employment into unemployment. Once unemployed, ethnic minorities had a longer duration of unemployment than the white British population. Thus, the main determinant of ethnic differences was the longer duration of unemployment spells for minorities. Education, marital status, and place of residence explained part of the differences, but they persisted. The authors concluded that discrimination may play an important role – ethnic minorities face challenges to get a job. However, once they are hired their actual productivity is revealed and their likelihood of a job loss becomes similar to that of the white British population (Longhi, 2020).

Finally, Arcarons (2020) investigated the role of (extended) family members, particularly the mother-in-law in female labour force participation among the descendants of immigrants (Arcarons, 2020). The study supported findings of previous research that, overall, women have lower activity rates than men. However, the study also found that Pakistani and Bangladeshi women had significantly lower labour force participation rates than other ethnic minority women, although the second-generation had higher activity rates than immigrants. Interestingly, the employment of Pakistani and Bangladeshi women was sensitive to the work status of their mothers-in-law: they had low activity rates when their mother-in-law was not working and much higher rates when they were working. The study showed that the intergenerational transmission of attitudes and social behaviour and family context may shape women's employment, and explain at least to some extent, the low labour force participation rates among some ethnic minority women.

In summary, previous research shows that, first, ethnic minorities in the UK have lower employment levels than the native population. Second, there are large gender differences: employment levels are particularly low among some ethnic minority women, especially those of Pakistani and Bangladeshi origin. Third, it becomes evident that education and cultural-normative factors explain part of these differences: ethnic minorities have lower educational levels, and some groups have conservative gender norms, which encourage women with children to stay at home. The rest is typically attributed to discrimination: ethnic minorities face ethnic penalties and minority women also motherhood penalties.

Although research has advanced our understanding of employment differences between minority and majority populations there are two major shortcomings: first, most research has investigated ethnic minority populations often without distinguishing between immigrants and their descendants. Distinguishing between the first and second generation is critical to understand migrant and minority employment experiences. Second, although longitudinal analyses have become more common in the last decade or so, no study has determined how much time the descendant women and men spend in employment and out of employment during their working lives.

This study calculates working life expectancies (WLE) among the descendants of immigrants in the UK separately for men and women. We also adjust the models for education and calculate WLE for high and low educated groups. In the light of past research, we expect the descendants of immigrants to spend more time out of employment during their working lives than the native population. Further to this we expect women, especially those of South Asian origin, to spend more time out of the employment than the native women population. Lastly, we expect education to explain some of these observed differences. But interesting questions are how much time each group spends in and out of employment, how much can education explain the group differences, and how much is left for other factors.

Data

We used data from 9 waves (2009–2019) of the UKHLS - Understanding Society survey, special license version (access granted under PN 187744). The UKHLS is a large, nationally representative, household panel study (University of Essex, 2020). In the UKHLS, around 51,000 adults in about 30,000 households are interviewed each year about their employment and other important life domains, such as family life, education, housing, and socioeconomic circumstances. This makes the UKHLS an exceptional opportunity to study the lives of immigrants and their descendants.

The UKHLS has seen two boost samples in which ethnic minorities were oversampled to increase sample size and sample diversity (S. McFall et al., 2019). The first boost sample, an ethnic minority boost sample (EMB), supplemented wave 1 and included over 4,000 households with the aim to include at least 1,000 adult interviews from each of the five main ethnic groups: Indian, Pakistani, Bangladeshi, Caribbean, and African. The second boost sample, an immigrant and ethnic minority boost sample (IEMB), occurred parallel to wave 6. Through the IEMB, around 2,900 households were added to refresh the EMB sample with the aim to provide a sample of immigrants from a wider range of origin-of-origin backgrounds (S. McFall et al., 2019). Through both boost samples, alongside information on ethnic minorities already captured in the main sample, the UKHLS allows for detailed analyses of various life domains for the UK's immigrants and their descendants. Here, the rich representation of immigrants and their descendants enabled comparisons across different country-of-origin backgrounds while considering the heterogeneity of life courses and socioeconomic conditions.

In addition to prospective information on the year and month of changes in employment status collected during the panel waves, the UKHLS also collected retrospective employment histories among individuals who have left full-time education. However, employment histories are only available for a subset of individuals. Employment histories were collected in wave 1 for those who

were interviewed in months 1-6 of the 24-month data collection period and in wave 5 for those who were interviewed in months 7-24. As a result, employment histories are not available for the IEMB sample (introduced in wave 6), for those who entered the study after wave 1, and for those who were not eligible to provide employment histories in wave 1 but left the survey before wave 5. For individuals who never left full-time education, we assumed that their employment history consists of being in full-time education since age 16. Overall, this meant that information on employment histories was available for 71% of individuals in the analytical sample. In addition to the retrospective employment histories, all panel waves provide prospective information on changes in employment status which occurred in between waves.

Study population and covariates

Our analytical sample consisted of women and men who were born between 1940 and 1988, who were original or permanent sample members, completed a full interview in wave 1 or were included in one of the boost samples, and who have provided retrospective information on their employment histories. From this initial pool, we removed all individuals for whom information on both the mother's and the father's country of origin was missing, who were not yet aged 16 at the time of their first interview, and who had missing information on their gender. In total, this resulted in an analytical sample of 11,958 women and 9,179 men.

To boost sample size and statistical power, we combined migrant generations in our study. Our definition of immigrants' descendants reflects both the second generation (i.e., those who were born in the UK but at least one of their parents was born outside the UK), as well as those who migrated to the UK as children (i.e., before age 15, or 1.5 generation). Our decision was further justified as previous research has shown that the employment patterns of the second and 1.5 generation are very similar (Mikolai and Kulu 2022). Further to this, preliminary analyses revealed that transition-specific models were very similar with respect to direction and magnitude when comparing, for example, the combined definition against the second generation only sample. We defined UK natives as all individuals who were born in the UK to two UK-born parents. (An overview of included birth cohorts, distinguishing UK natives and all studied immigrant's descendants' groups is provided in Supplementary Figure 1.) We distinguished between the descendants of immigrants from European and other Western countries (e.g., Australia, New Zealand, Canada, the United States), India, Pakistan, Bangladesh, Caribbean countries (e.g., primarily Jamaica), African countries, and a heterogeneous group of all other countries (e.g., China and Sri Lanka).

In our analysis, we included education as a time-varying variable, reflecting the highest achieved level of education at a particular age. We captured three mutually exclusive categories,

reflecting “high” (i.e. university degree or other higher degrees, including diploma in higher education, teaching/nursing degree), "medium” (A level degree or equivalent), or “low” (less than completed A level degree of equivalent) levels of education. We then combined the categories “medium” and “low” into one category (i.e. “low/medium”) to allow for a meaningful number of observations across all immigrants’ descendants groups.

Methods

Incidence-based multistate approach

We use a multistate approach to calculate the time spent in the labour market. Multistate life tables have a long history. Rogers (1966) calculated the time people spend in different regions during their lives using prevalence-based multistate life tables (Rogers, 1973). Schoen (1975) applied the method to calculate the amount of time people live in different marital statuses (single, married, and divorced) (Schoen, 1975). Using an incidence-based Markov approach, Hoem (1977) calculated WLE for people until the age of 75 (Hoem, 1977).

Incidence-based approaches offer a number of advantages over traditional prevalence-based approaches. For example, incidence-based approaches are better suited to capture situations in which labour market dynamics change rapidly and allow for a quantification of covariate effects directly from individual-level data (Dudel et al., 2018; Hoem, 1977). Further, recent innovations have enabled for decomposition approaches to be used in incidence-based settings (Shen et al., 2023). Within the past years, incidence-based Markov models have been used to estimate WLE for a variety of national contexts and time periods. Within the field of labour demography, previous applications examined the impact of changes in working life expectancy due to policy changes or economic recession – or explored inequalities in the length of WLE across different population subgroups (Dudel et al., 2018; Dudel & Myrskylä, 2017; Lorenti et al., 2019).

Within the health sciences, incidence-based multistate Markov models tables have become an increasingly popular tool to estimate health expectancies among population subgroups directly from individual-level data (Martikainen et al., 2014). Here, specifically parametric approaches have become popular. Key advantages of parametric approaches include the rapid processing of large amounts of data – often with time-varying covariates – while offering a continuous time setting (Höhn et al., 2022; Jackson, 2016).

For our analysis, we defined the following states and transitions. Individuals can be active and inactive, and they can move between the two states (see Figure 1). We follow them between ages 25 and 65. Most people have left education by age 25; age 65, in turn, is a common age of retirement. The active state included individuals who are in paid work, full- or part-time employed, self-employed,

or are on maternity leave. The inactive state included individuals who were unemployed or looking for work, who were looking after family or home, in full-time education, students, long-term sick or disabled, on a government training scheme, and individuals whose employment status was classified as 'something else'. Our definition of active and inactive is narrower compared to the definition used by the Office for National Statistics (Office for National Statistics, 2020). For example, the ONS considers unemployed individuals to be active due to the potential to seek a job and find employment. We purposely deviated from the ONS' definition as their broader and more inclusive definition is likely to mask differences between groups which might occur due to time spent in unemployment.

We observed only a small number of transitions into retirement. This is likely explained by the UK's current state pension age of 66 years. Given our study design, distinguishing retirement as a separate state would have led to an insufficient number of observations given the covariates specified. We therefore did not distinguish retirement as a separate state. Instead, we included retirement as part of the inactive state. This means that individuals retiring throughout the studied age range were therefore classed as inactive.

As mortality rates are generally low among the working ages and as deaths are likely not well enough measured in surveys, we did not define death as an additional absorbing state. Instead, we censored individuals in case they died. Hence, the two state expectancies for each population subgroup always add up to 40 years. Overall, the longitudinal data included a total of 21,287 transitions between the two defined states. In detail, we observed 11,458 (Men: 4,031; Women: 7,427) transitions from the active into the inactive state and 9,829 (Men: 2,995; Women: 6,824) transitions from an inactive to an active state. (Due to the design of the survey, we observed more transition in more recent years, as indicated in Supplementary Figure 2.)

Parametric survival models

We used parametric survival models to estimate transition rates between the two states. Depending on the set of covariates utilised, we estimated three distinct sets of models; with every set containing two survival models – one for each transition. The first set of models allowed us to produce estimates for UK natives in comparison with one descendants of immigrants group. In the second set of models, we distinguished the country-of-origin background for the descendants of immigrants group. In the third set of models, we analysed the country-of-origin background for the descendants of immigrants group (as previously in the second set) while adjusting for the level of education. While this three-set approach reflected our stepwise model building process, it was also a methodological requirement as state expectancies can only ever be obtained reliably based on the covariates specified.

Estimating separate models for each of the two transitions (within each set) allowed us to examine the impact of the chosen distribution and functional form in full detail. For each modelled transition, we chose the distribution which minimised the respective Akaike information criterion (AIC). In addition, we aimed for the functional form to be conceptually appropriate, given frequencies among covariates observed among the analytical sample. This means, for example, that we avoided 3-way interactions in case the impact on state expectancies was negligible when compared to 2-way interactions. As shown at a later point, the impact of this decision has been examined thoroughly through a range of sensitivity analyses. (The process of model building and model selection is documented in more detail within Supplementary Tables 1 to 3, demonstrating the exploration of different distributions and functional forms.)

With respect to the underlying distribution of the hazard, we estimated all models for a Gompertz, Weibull, and Exponential distribution. Here, we found that a Gompertz model performed consistently best for each transition of each set. Working with a Gompertz model allowed for an intuitive interpretation of all covariate effects as proportional hazards (HR), with respective 95% Confidence Intervals (95% CIs)

We aimed to follow a coherent functional form within all selected models. For this purpose, we included gender as a categorical covariate (men/women), and included an interaction effect between gender and migrant origin to account for the fact that the effect of gender can vary across population subgroups across all three sets of models. Further to this, all models captured the birth cohort of individuals, which we centred for the birth year 1970. In contrast to the first and the second set of models, we included education only in the third set of models.

Estimation of working life expectancy

Based on previously estimated survival models and their covariates, we then derived WLE estimates for all studied population subgroups. Our WLE estimates can be understood as the average number of years an individual is expected to spend in the active and inactive states between the ages of 25 and 65, given that the observed transition rates remain unchanged. Through a previous process of weighting, all derived WLEs are independent of the start state. This means that our final WLE estimates account for the fact that individuals may start in different states when reaching the start of the process at age 25.

To derive WLEs, our process followed the standard methodology of estimating start-state-independent state expectancies. In line with this methodology, we first derived start-state-specific state expectancies from the age trajectory of predicted start-state-specific probabilities of state occupancy and applied a weighting which accounted for the distribution of states reflecting the start

of the studied age range (van den Hout et al., 2019). This means that, in a first step, we predicted start-state-specific probabilities of state occupancy for men and women of all studied population subgroups (exemplarily shown in Supplementary Figures 3 and 4). By summing up these start-state-specific probabilities of state occupancy across the studied age range, we derived start-state-specific state expectancies. We then weighted all start-state-specific state expectancy estimates with the distribution of states at the start of the studied age range. This distribution, often referred to as weights, reflected in our case the relative frequency of men and women aged 25-29 across the two studied states (described later, shown in Supplementary Table 4). Through this weighting, we then obtained our final WLE point estimates for all studied population subgroups.

We produced 95% CIs to quantify the uncertainty around obtained WLE point estimates. For this purpose, we followed the bootstrap approach as outlined by Hoehn et al. 2022. All analyses were carried out using the statistical software *R* (Moustafa et al., 2020). Parametric models and start-state-specific probabilities of state occupancy were estimated using the R-package *flexsurv.*

Results

Overview of the study population and start states

In our study, we included a total of 21,137 individuals: 11,958 women and 9,179 men (Table 1). Out of all studied individuals, 17,715 individuals were UK natives (84%), while 3,422 individuals (16%) were descendants of immigrants. Overall, most of them were descendants of immigrants from either Europe or other Western countries (N = 1,401), followed by those of Caribbean (N=502), African (N=402), and Indian origin (N=389).

More individuals were in the active state than in the inactive state between the ages of 25 and 29. As expected, we found clear patterns with respect to gender, education, and country-of-origin background. The highest share of people in the active state was observed among UK native men (85-87%), the lowest share among low and medium educated women of Pakistani and Bangladeshi origin (around 30%) (see Supplementary Table 4 for further details). Given the age range of 25-29, these patterns could be impacted by factors related to participation in full-time further education or parenthood.

Transition-specific models

To allow for an intuitive interpretation of all transition-specific models, we focus on the presentation of hazard ratios (HRs) rather than absolute rates. Further to this, we present the combined effect of gender and country-of-origin backgrounds, referring to UK native women as a reference category throughout.

Table 2 presents HRs and 95% CIs for all parameter estimates of interest. For transitions from the active to the inactive state (T1), we found no significant differences between UK native women and women who are descendants of migrants (HR: 1.01 (0.95-1.08). However, the difference was significant for transitions from the inactive to the active state (T2) (HR: 0.88 (0.83-0.94), indicating a lower transition intensity among the descendants of migrants when compared to UK native women.

For men, we found both groups to have a lower HR with respect to transitions from the active to the inactive state when compared to UK native women, at levels of 0.56 (0.54-0.58) among UK native men and 0.59 (0.54-0.65) among men who are descendants of immigrants. However, patterns deviated with respect to transitions from the inactive to the active state. Here, we found a significantly higher intensity among UK native men (1.24 (1.19-1.31), but no significant difference among men who are descendants of immigrants (1.06 (0.97-1.16) when compared with UK native women. (A comprehensive overview of the models is presented in Supplementary Tables 5-7.)

In a next step, we distinguished the country-of-origin background for the descendants of immigrants. As shown in Table 3 (Model Set 2), our results provided strong evidence of significant heterogeneity by country-of-origin background. For example, we found women who are descendants of migrants from Europe and other Western countries to have a lower transition rate to inactivity when compared to their UK native counterparts (0.90 (0.82-0.99)), while having a higher propensity of moving from inactivity to an active state (1.11 (1.01-1.22)). In contrast, women who are descendants of immigrants from Pakistan had higher intensity of moving to inactivity (1.98 (1.52-2.57)), while having lower propensity of moving back into activity (0.28 (0.21-0.38).

Overall, we again found men to have a lower transition intensity out of the active state when compared to women, while generally showing a higher transition rate out of the inactive state. However, exact patterns differed by country-of-origin background. For example, for transitions from activity to inactivity, estimated propensities among men of Caribbean and Bangladeshi origin, 0.82 (0.66-1.03) and 0.75 (0.49-1.15) respectively, were lower but did not differ significantly from patterns observed among UK native women. While transitions from inactivity occurred more frequently among UK native men when compared with UK native women, we found no significant differences when comparing men of European, Pakistani, and Bangladeshi descent with UK native women. Only men of Caribbean origin showed somewhat lower intensity of moving from inactivity to activity.

In summary, these results of this second set of models highlight very clearly that the effect of gender varied across different country-of-origin backgrounds, providing a substantial adjustment to the country-of-origin main effects. (This interaction effect is even further evident in Supplementary Table 6 which provides a comprehensive overview of the second model set.)

Table 3 (Model Set 3) provides further detail by controlling for the effect of education. As expected, individuals with low/medium education had a slightly higher transition rate into inactivity than those with high education (1.10 (1.06-1.15)), and a lower propensity of moving from inactivity to an active state (0.44 (0.43-0.46)). Although we found some smaller changes in relative transition rates between the groups, overall, the differences between the studied country-of-origin groups persisted. (An overview of the third set of models is presented in Supplementary Table 7.)

Working life expectancy

Our WLE estimates quantify the average time an individual is expected to spend in the two distinguished states between the ages of 25 and 65 – given observed transition rates and covariates specified within each set of models. As such, our WLE estimates can be understood intuitively as population-level summary metrics which facilitate a like-for-like comparison across the men and women of all studied population subgroups. Figure 2 shows that, on average, men spend more years in the active state than women. Based on the first set of models, we found that UK native men are 33.0 years (95% CI: 32.6-33.4) active and 7 years inactive (95% CI: 6.6-7.4) between the ages of 25 and 65. For UK native women the corresponding figures are 27.2 (95% CI: 26.7-27.7) and 12.8 (95% CI: 12.3-13.3). As a group, the descendants of immigrants are not that different from natives: men are 31.4 years (95% CI: 30.7-32.1) active and women are 25.9 (95% CI: 25.2-26.6). However, we found significant differences across the different country-of-origin groups.

Figure 3 shows a substantial amount of heterogeneity when distinguishing the UK's major descendant groups. Among men, we found that the time spent in activity is higher among men with European (32.0), Indian (35.6), and African descent (32.1) than those of Caribbean (27.2), Pakistani (29.5), and Bangladeshi (26.8) origins. However, while the differences are relatively small among men, they are large among women. While women of Indian (28.8), Caribbean (26.4), and African (25.6) origin are mostly active during their working lives, and they do not differ that much from the UK native women (27.4), women of Pakistani and Bangladeshi origin spend most time in inactivity between ages 25 and 65, 28.6 and 25.9 accordingly.

Finally, we present WLE estimates by country-of-origin while adjusting for education. We have calculated WLE separately for high- and for low- and medium-educated groups. Here, we found that, while differences between country-of-origin groups were reduced, they did not vanish entirely. Specifically, we found that both highly educated men and women are mostly active during their working lives (Figure 4). The only exceptions are women of Pakistani and Bangladeshi origin who either spend slightly more (Bangladeshi) or slightly less (Pakistani) than a half of their working lives in the active state. In contrast, medium-and low-educated men and especially women spend much fewer

years in an active state than their high-educated counterparts. The differences are especially striking for women: most of them spend a significant period of their working lives in the inactive state; among Pakistani and Bangladeshi women this counts for most of their working life years.

Overall, our results suggest that the level of education has a larger impact on the number of life years spent in the active state than the country of origin per se, especially among men. At the same time, we still observed significant differences by country-of-origin background. Here, the results are striking among women who are descendants of immigrants from Bangladesh and Pakistan, as well as among individuals with low/medium levels of education.

Results of Sensitivity Analyses

We carried out two major sensitivity analyses to evaluate the robustness of our WLE main results. These are described in full detail as part of a separate resource (Supplementary Material: Results of Sensitivity Analyses). In brief, these analyses explored two particular features of our study design. Firstly, we explored the sensitivity of our presented WLE main results with respect to the underlying functional form. For this purpose, we explored different functional forms as it could be possible that resulting levels and group differences with respect to the time spent in the two states are affected by the choice of functional form when modelling the two transitions. Secondly, we explored the sensitivity of our results with respect to the captured age range. In all presented main findings, we captured the ages 25 to 65. Here, it is possible that observed group differences are impacted by time spent in education and retirement. To explore the impact of the chosen age range, we re-estimated all transition-specific models and working life expectancies for a reduced age range of 30 to 50 years. In summary, the results of these additional analyses confirmed the robustness of the presented main findings as neither the choice of the functional form, nor the choice to focus on the age range 25 to 65, changed the observed direction or magnitude of group differences considerably.

Summary and Discussion

This is the first study to investigate differences in the working life expectancy (WLE) among the descendants of immigrants. We used longitudinal data from the UK and applied multistate models to calculate WLE for all major descendant groups in the country. We fitted models with and without adjusting for individuals' educational level. Our analysis showed, first, that overall men spent more time in the active state than women between ages 25 and 65, as expected. Second, while there were no major differences among various migrant descendant groups for men, the number of active years varied significantly among women. Women of European, Caribbean, and African origin were mostly active between ages 25 and 65, whereas those of Pakistani and Bangladeshi descent were mostly

inactive during their working ages. Third, our stratified analysis by education showed that high educated individuals were more likely to be active than medium and low educated people among all descendant groups, although women of Pakistani and Bangladeshi descent had high inactivity levels independent of their education.

Previous research has emphasised three factors in explaining the differences in employment among the descendants of immigrants: education, discrimination and gender roles (Clauss & Nauck, 2010; Dustmann & Fabbri, 2005; Longhi, 2020; Modood & Khattab, 2016). Our analysis showed that educational differences play little role (if any) in the group differences. Although individuals with higher education were more likely to be active during their working lives than those with lower education, our stratified analysis showed that the group differences persisted when adjusting the models to education. Similarly, we argue that discrimination is unlikely to explain the employment gap between the groups (although our analysis did not capture any indicators of racism or discrimination explicitly). Previous research in the UK has emphasised the importance of ethnic penalties for the Caribbean groups and for some South Asian populations (Khattab & Johnston, 2015; Modood & Khattab, 2016). At first glance, discrimination may explain some differences among men, e.g. slightly lower activity among Caribbean, Pakistani, and Bangladeshi men relative to people of European and Indian descent. However, the argument of discrimination is challenged by relatively high activity levels among African men who are also likely to suffer from ethnic penalties. Most importantly, discrimination cannot explain the level of diversity observed among the female population, especially the finding that Pakistani and Bangladeshi women are mostly inactive during their working lives, whereas those of Caribbean descent have activity levels similar to those of individuals of European descent and the UK native population.

Clearly, the findings among women suggest that cultural-normative factors or gender norms may play a key role (although it is possible that discrimination promotes conservative gender roles). The prevalence of conservative gender norms among women of Pakistani and Bangladeshi origin is likely to explain their low employment levels. For those populations it is expected that if women marry and have children then they withdraw from the labour market (Arcarons, 2020). While this pattern is largely expected for first-generation migrants, it is surprising for their descendants – given that these are all women who were born and grew up in the UK. However, intergenerational transmission of values and norms may be of critical importance: most of the descendants of immigrants are children of family migrants, i.e. their mothers arrived in the UK as dependants and for cultural, but also legal reasons (i.e. no right to work) many stayed at home for all of their lives (J. Mikolai & Kulu, 2022). Briefly, immigrant women came from countries with conservative family and gender norms; the nature of their migration (i.e., often following male partners as dependent family members) and migration

policies only supported conservative gender norms among these populations and their transmission to the next generation within family.

It is possible that all three factors intersect – minority women may face serious challenges when entering the labour market due to their poor education and discrimination; these factors may reinforce conservative gender norms and lead them to the decision to stay at home (Delaporte & Kulu, 2024). However, if the role of education and discrimination was critical, we would have observed similar patterns among other groups (e.g. women of Caribbean descent) and men. However, our results did not provide evidence for this assumption. While our results do not undermine the role of labour market discrimination, they demonstrate that there are other factors, such as norms around gender and employment, which could be more important to explain the observed group differences, especially among women.

Our study focuses on economic activity and inactivity, the latter which also captures unemployment. We do not study the type of employment or occupation, let alone other important aspects of employment such as income. Clearly, factors other than gender norms may have an important role there (Li & Heath, 2020; Longhi et al., 2013). Further to this, causal mechanisms and/or the causal chain around these factors remained unexplored. Nevertheless, we can argue that our study of differences in activity levels over the life course is of critical importance. Needless to say that employment provides income and security for old age via pension schemes; also it is an important source of self-esteem and social relations. Here, WLE estimates are an important indicator of migrant and minority social integration - or the lack of it. It is possible that women of Pakistani and Bangladeshi descent in the UK are involved in informal work outside of the home, which we are unable to measure, such as work in a family business. While informal work (beyond homemaking) has certain benefits, i.e. as a source of income and social contact, it also poses challenges in modern high-income highly commodified countries in which (some) formal income is needed to secure social participation, quality housing, quality health insurance, and old-age pension.

Future research may therefore investigate other dimensions of work such as employment or occupation type to better measure social mobility among the descendants of immigrants. Recent research shows that, while the descendants of immigrants in the UK are well educated, on average, their higher education does not always translate directly into a successful labour market career, leading to a disconnect of expected and realised social position. A follow-up study exploring the time spent in various employment types would thus be an important topic to study social mobility. Future research might also consider capturing additional life domains, particularly those which closely interact with employment such as family and care. Previous research has shown that women who are descendants of immigrants may have similar labour market activity rates to UK native women when

they have no children, but some women who are descendants of immigrants are much less likely to return to the labour market after childbearing. Hence, the inclusion of parity in the analysis along with employment states would be an important extension to the current study.

This is a first study to calculate the time spent in activity over the life course for the descendants of immigrants. We showed large differences in the time spent in employment between various descendant groups, especially women. While women of Indian, Caribbean and African origin are 25 years active and 15 years inactive, women of Pakistani and Bangladeshi origin are mostly inactive between ages 25 and 65. Our findings are of particular importance in light of our aging societies as low labour market participation has a negative effect on an individual's long-term (financial) security and well-being, affecting not just the working ages but also the remaining life course.

References

Adsera, A. (2011). Where Are the Babies? Labor Market Conditions and Fertility in Europe. *European Journal of Population / Revue Européenne de Démographie*, *27*(1). https://doi.org/10.1007/s10680-010-9222-x

Alba, R. (2005). Bright vs. blurred boundaries: Second-generation assimilation and exclusion in France, Germany, and the United States. *Ethnic and Racial Studies*, *28*(1). https://doi.org/10.1080/0141987042000280003

Alba, R., & Nee, V. (1997). Rethinking assimilation theory for a new era of immigration. *International Migration Review*, *31*(4). https://doi.org/10.2307/2547416

Andersson, G. (2004). Childbearing after migration: Fertility patterns of foreign-born women in Sweden. *International Migration Review*, *38*(2). https://doi.org/10.1111/j.1747-7379.2004.tb00216.x

Arcarons, A. F. (2020). The working mother-in-law effect on the labour force participation of first and second-generation immigrant women in the UK. *Journal of Ethnic and Migration Studies*, *46*(5), 893–912. https://doi.org/10.1080/1369183X.2018.1539268

Belzil, C., & Poinas, F. (2010). Education and early career outcomes of second-generation immigrants in France. *Labour Economics*, *17*(1). https://doi.org/10.1016/j.labeco.2009.07.008

Blackaby, D. H., Leslie, D. G., Murphy, P. D., & O'Leary, N. C. (2005). Born in Britain: How are native ethnic minorities faring in the British labour market? *Economics Letters*, *88*(3), 370–375. https://doi.org/10.1016/j.econlet.2005.03.008

Cheung, S. Y. (2014). Ethno-religious minorities and labour market integration: Generational advancement or decline? *Ethnic and Racial Studies*, *37*(1). https://doi.org/10.1080/01419870.2013.808757

Clauss, S., & Nauck, B. (2010). Immigrant and Native Children in Germany. *Child Indicators Research*, *3*(4). https://doi.org/10.1007/s12187-010-9067-1

Collet-Sabé, J. (2020). Religious discrimination in young Muslim assimilation in Spain: Contributions to Portes and Rumbaut's segmented assimilation theory. *Social Compass*, *67*(4). https://doi.org/10.1177/0037768620948476

Connor, P., & Koenig, M. (2015). Explaining the Muslim employment gap in Western Europe: Individual-level effects and ethno-religious penalties. *Social Science Research*, *49*. https://doi.org/10.1016/j.ssresearch.2014.08.001

Dale, A., Lindley, J., & Dex, S. (2006). A life-course perspective on ethnic differences in women's economic activity in Britain. In *European Sociological Review* (Vol. 22, Issue 4, pp. 459–476). Oxford University Press. https://doi.org/10.1093/esr/jcl009

Delaporte, I., & Kulu, H. (2024). Family Formation and Employment Changes Among Descendants of Immigrants in France: A Multiprocess Analysis. *European Journal of Population*, *40*(1). https://doi.org/10.1007/s10680-024-09709-3

Dudel, C., López Gómez, M. A., Benavides, F. G., & Myrskylä, M. (2018). The Length of Working Life in Spain: Levels, Recent Trends, and the Impact of the Financial Crisis. *European Journal of Population*, *34*(5). https://doi.org/10.1007/s10680-017-9458-9

Dudel, C., & Myrskylä, M. (2017). Working Life Expectancy at Age 50 in the United States and the Impact of the Great Recession. *Demography*, *54*(6). https://doi.org/10.1007/s13524-017-0619-6

Dustmann, C., & Fabbri, F. (2005). Immigrants in the British labour market. *Fiscal Studies*, *26*(4). https://doi.org/10.1111/j.1475-5890.2005.00019.x

Esping-Andersen, G. (1999). Social Foundations of Postindustrial Economies. In *Social Foundations of Postindustrial Economies*. https://doi.org/10.1093/0198742002.001.0001

Fassmann, H. (1997). Is the Austrian Labour Market Ethnically Segmented? *European Journal of Population*, *13*(1). https://doi.org/10.1023/A:1005738004073

Hartmann, J. (2016). Do second-generation Turkish migrants in Germany assimilate into the middle class? *Ethnicities*, *16*(3). https://doi.org/10.1177/1468796814548234

Hoem, J. M. (1977). A markov chain model of working life tables. *Scandinavian Actuarial Journal*, *1977*(1), 1–20. https://doi.org/10.1080/03461238.1977.10405621

Höhn, A., McGurnaghan, S. J., Caparrotta, T. M., Jeyam, A., O'Reilly, J. E., Blackbourn, L. A. K., Hatam, S., Dudel, C., Seaman, R. J., Mellor, J., Sattar, N., McCrimmon, R. J., Kennon, B., Petrie, J. R., Wild, S., McKeigue, P. M., Colhoun, H. M., Chalmers, J., Fischbacher, C., … Pearson, E. (2022). Large socioeconomic gap in period life expectancy and life years spent with complications of diabetes in the Scottish population with type 1 diabetes, 2013–2018. *PLoS ONE*, *17*(8 August). https://doi.org/10.1371/journal.pone.0271110

Jackson, C. H. (2016). Flexsurv: A platform for parametric survival modeling in R. *Journal of Statistical Software*, *70*. https://doi.org/10.18637/jss.v070.i08

Kelly, M., & Hedman, L. (2016). Between Opportunity and Constraint: Understanding the Onward Migration of Highly Educated Iranian Refugees from Sweden. *Journal of International Migration and Integration*, *17*(3). https://doi.org/10.1007/s12134-015-0422-4

Khattab, N., & Johnston, R. (2015). Ethno-religious identities and persisting penalties in the UK labor market. *Social Science Journal*, *52*(4). https://doi.org/10.1016/j.soscij.2014.10.007

Khoudja, Y., & Fleischmann, F. (2015). Ethnic differences in female labour force participation in the netherlands: Adding gender role attitudes and religiosity to the explanation. *European Sociological Review*, *31*(1). https://doi.org/10.1093/esr/jcu084

Li, Y., & Heath, A. (2020). Persisting disadvantages: a study of labour market dynamics of ethnic unemployment and earnings in the UK (2009–2015). *Journal of Ethnic and Migration Studies*, *46*(5), 857–878. https://doi.org/10.1080/1369183X.2018.1539241

Longhi, S. (2020). A longitudinal analysis of ethnic unemployment differentials in the UK. *Journal of Ethnic and Migration Studies*, *46*(5), 879–892. https://doi.org/10.1080/1369183X.2018.1539254

Longhi, S., Nicolettiy, C., & Plattz, L. (2013). Explained and unexplained wage gaps across the main ethno-religious groups in Great Britain. *Oxford Economic Papers*, *65*(2). https://doi.org/10.1093/oep/gps025

Lorenti, A., Dudel, C., & Myrskylä, M. (2019). The Legacy of the Great Recession in Italy: A Wider Geographical, Gender, and Generational Gap in Working Life Expectancy. *Social Indicators Research*, *142*(1). https://doi.org/10.1007/s11205-018-1910-7

Martikainen, P., Moustgaard, H., Einiö, E., & Murphy, M. (2014). Life expectancy in long-Term institutional care by marital status: Multistate life table estimates for older finnish men and women. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, *69*(2). https://doi.org/10.1093/geronb/gbt131

McFall, S., Nandi, A., & Platt, L. (2019). *Understanding Society: UK Household Longitudinal Study: User Guide to ethnicity and immigration research.* .

Mikolai, J., & Kulu, H. (2022). *Partnership, fertility, and employment trajectories of immigrants in the UK: A three-channel sequence analysis*.

Milewski, N. (2007). First child of immigrant workers and their descendants in West Germany: Interrelation of events, disruption, or adaptation? *Demographic Research*, *17*. https://doi.org/10.4054/DemRes.2007.17.29

Modood, T., & Khattab, N. (2016). Explaining Ethnic Differences: Can Ethnic Minority Strategies Reduce the Effects of Ethnic Penalties? *Sociology*, *50*(2). https://doi.org/10.1177/0038038515575858

Moustafa, M. A. M., Mohamed, W. M. A., Lau, A. C. C., Chatanga, E., Qiu, Y., Hayashi, N., Naguib, D., Sato, K., Takano, A., Matsuno, K., Nonaka, N., Taylor, D. M., Kawabata, H., & Nakao, R. (2020). R A language and environment for statistical computing, R Foundation for Statistical. *Computing*, *20*.

Office for National Statistics. (2020). *A guide to labour market statistics Explanation of the major concepts that exist within the labour market and their relationship to each other*.

Peach, C. (1998). South Asian and Caribbean ethnic minority housing choice in Britain. *Urban Studies*, *35*(10). https://doi.org/10.1080/0042098984097

Portes, A., Fernández-Kelly, P., & Haller, W. (2009). The adaptation of the immigrant second generation in America: A theoretical overview and recent evidence. *Journal of Ethnic and Migration Studies*, *35*(7). https://doi.org/10.1080/13691830903006127

Rafferty, A. (2012). Ethnic penalties in graduate level over-education, unemployment and wages: Evidence from Britain. *Work, Employment and Society*, *26*(6). https://doi.org/10.1177/0950017012458021

Rathelot, R. (2014). Ethnic differentials on the labor market in the presence of asymmetric spatial sorting: Set identification and estimation. *Regional Science and Urban Economics*, *48*. https://doi.org/10.1016/j.regsciurbeco.2014.06.007

Rogers, A. (1973). The multiregional life table. *The Journal of Mathematical Sociology*, *3*(1). https://doi.org/10.1080/0022250X.1973.9989827

Schoen, R. (1975). Constructing increment-decrement life tables. *Demography*, *12*(2). https://doi.org/10.2307/2060768

Seifert, W. (1997). Admission policy, patterns of migration and integration: The German and French case compared. *Journal of Ethnic and Migration Studies*, *23*(4). https://doi.org/10.1080/1369183X.1997.9976605

Shen, T., Riffe, T., Payne, C. F., & Canudas-Romo, V. (2023). Decomposition of Differentials in Health Expectancies From Multistate Life Tables: A Research Note. *Demography*, *60*(6). https://doi.org/10.1215/00703370-11058373

University of Essex. (2020). *Understanding Society: Waves 1-10, 2009-2019 and Harmonised BHPS: Waves 1-18, 1991-2009: Special Licence Access*.

van den Hout, A., Sum Chan, M., & Matthews, F. (2019). Estimation of life expectancies using continuous-time multi-state models. *Computer Methods and Programs in Biomedicine*, *178*. https://doi.org/10.1016/j.cmpb.2019.06.004

Vertovec, S. (2007). Ethnic and Racial Studies Super-diversity and its implications. *Ethnic and Racial Studies*, *30*(6).

Wachter, G. G., & de Valk, H. A. G. (2022). Cohort Succession in the Timing of Marriage Among the Children of Turkish and Moroccan Immigrants. *European Journal of Population*, *38*(3). https://doi.org/10.1007/s10680-022-09616-5

Wiesbrock, A. (2011). The Integration of Immigrants in Sweden: A Model for the European Union? *International Migration*, *49*(4). https://doi.org/10.1111/j.1468-2435.2010.00662.x

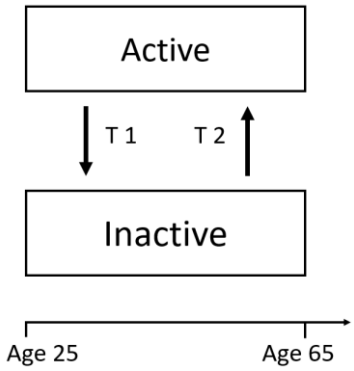


Figure 1: The study design: Activity states between the ages of 25 and 65.

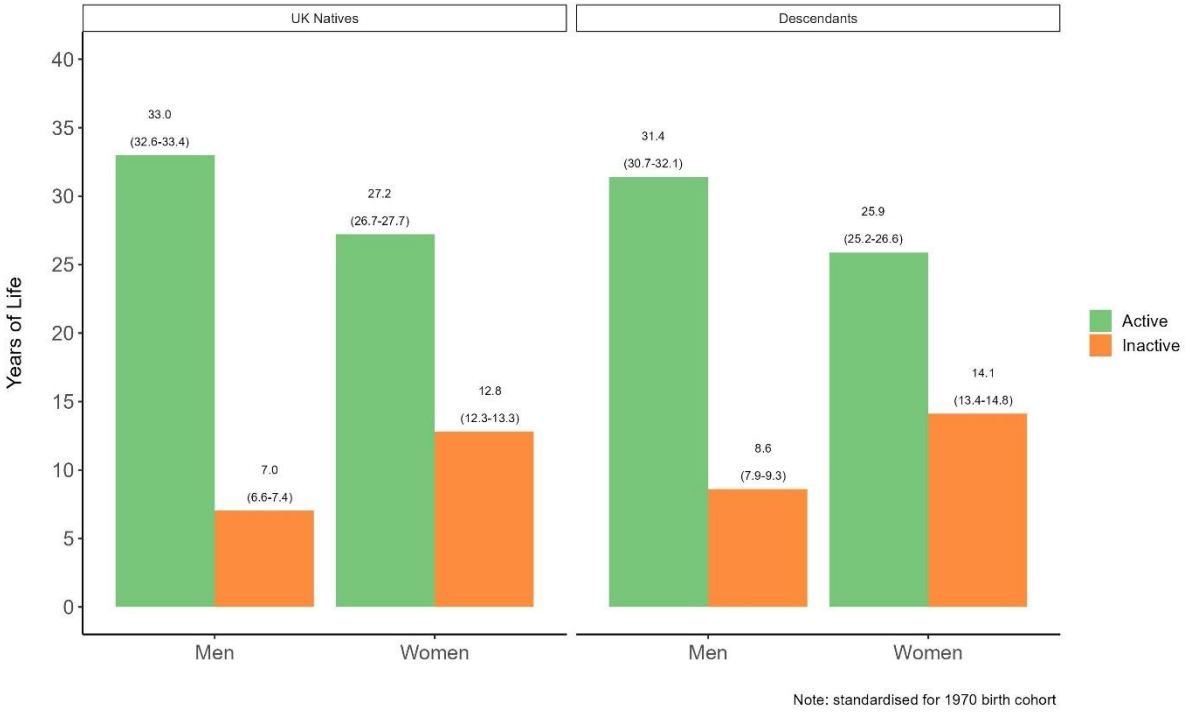


Figure 2: Working life expectancy estimates for the descendants of immigrants.

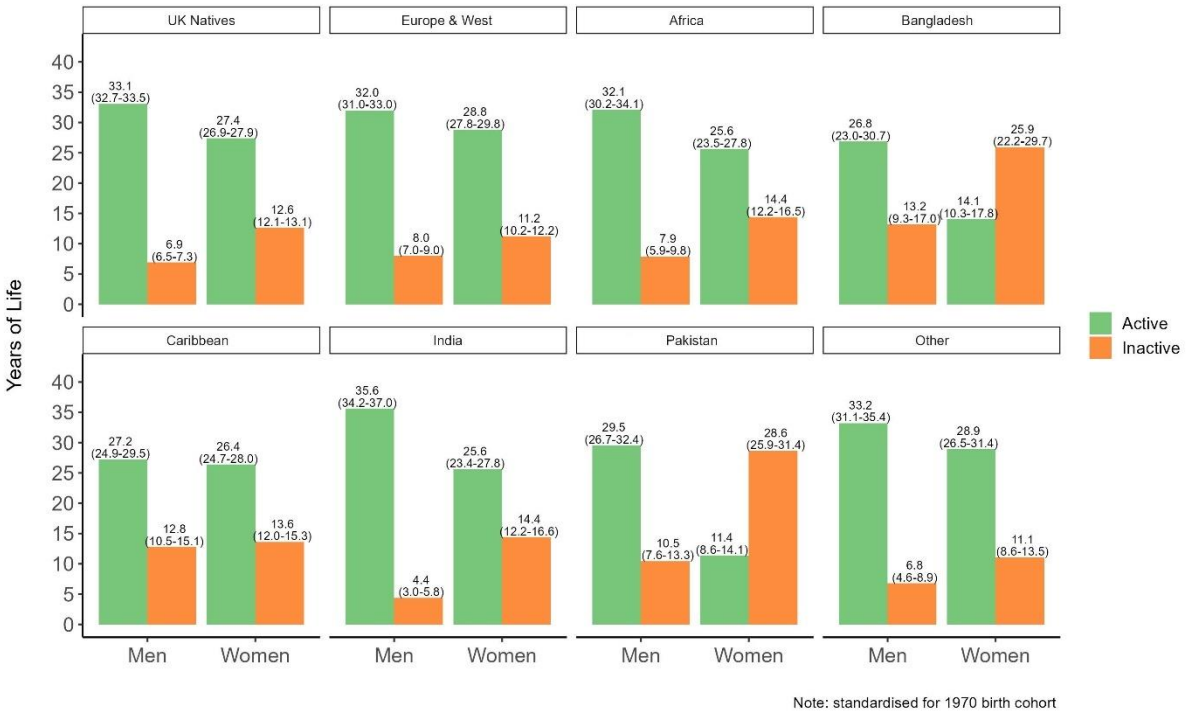


Figure 3: Working life expectancy estimates by detailed country-of-origin background.

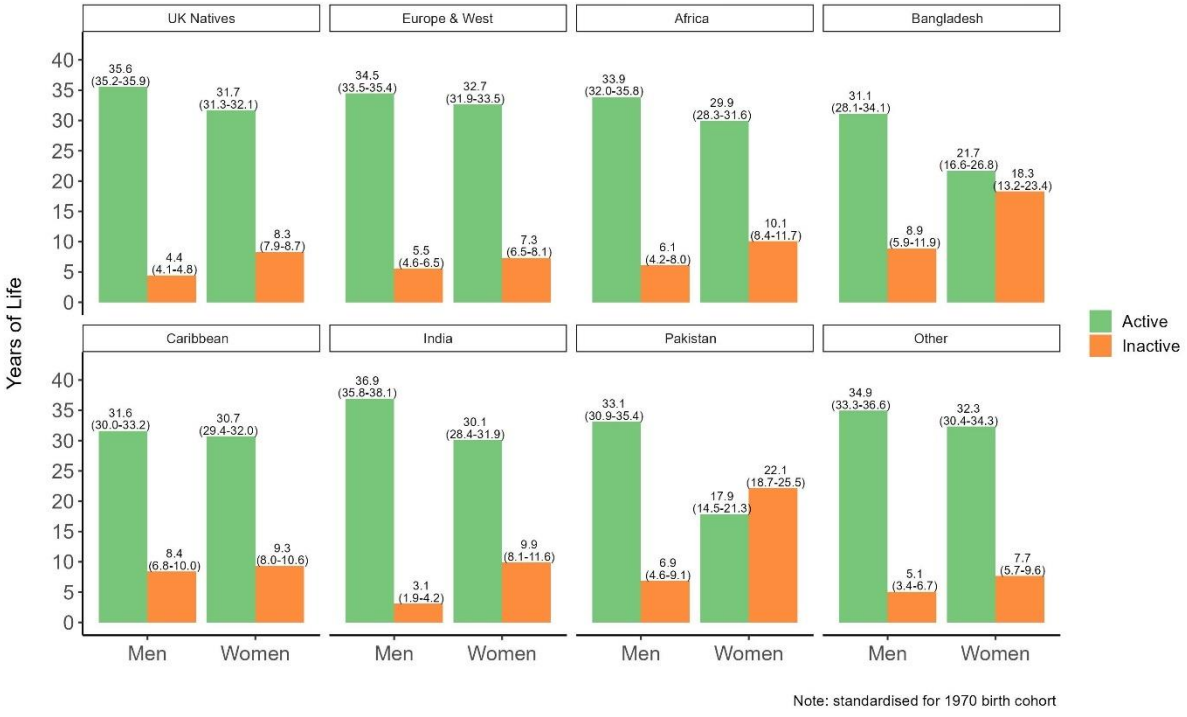


Figure 4: Working life expectancy estimates by country-of-origin background for individuals with high education.

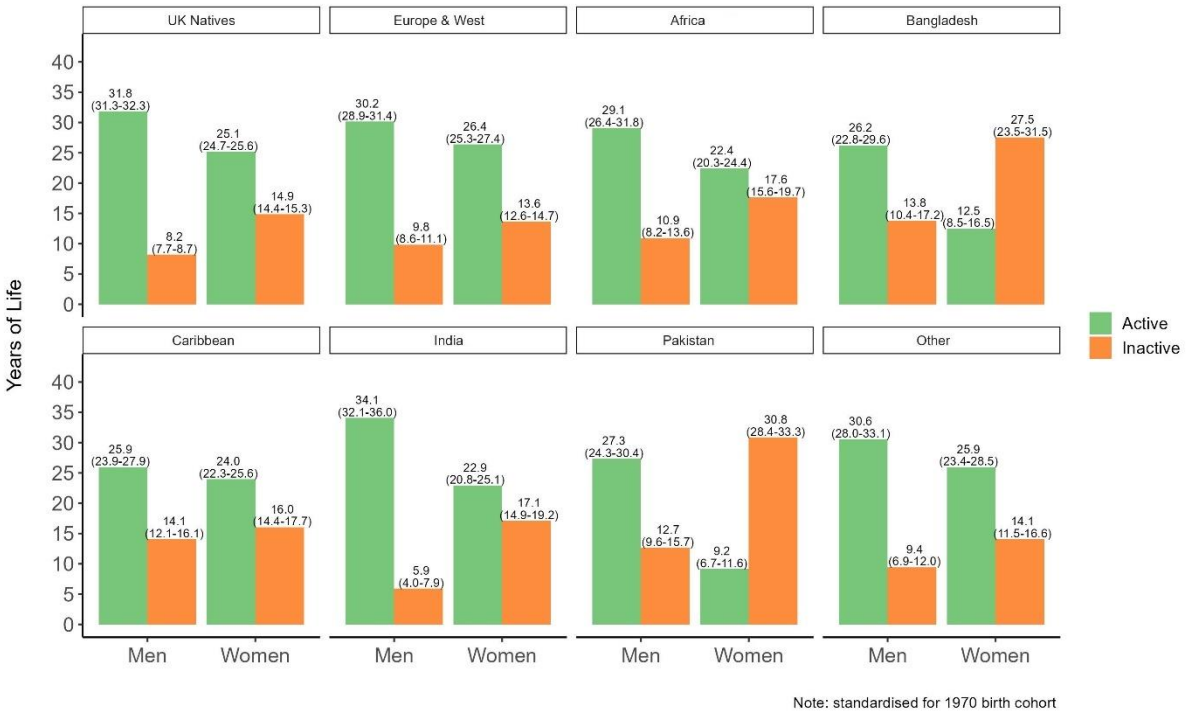


Figure 5: Working life expectancy estimates by country-of-origin background for individuals with low/medium education.

Table 1: The study population at point of study entry by country-of-origin background.

Origin	N Men	N Women
UK Natives	7,731	9,984
Europe & West	619	782
India	173	216
Pakistan	135	177
Bangladesh	82	96
Caribbean	168	334
Africa	171	232
Other	100	137
Total	**9,179**	**11,958**

Table 2: Hazard ratios from transition-specific survival models by migrant status.

Trans.	Parameter	Model Set 1		
		HR	L95%	H95%
1	Women - UK Natives (Ref)	1.00		
1	Women - Descendants	1.01	0.95	1.08
1	Men - UK Natives	0.56	0.54	0.58
1	Men - Descendants	0.59	0.54	0.65
1	Cohort (Ref: 1970)	1.02	1.01	1.02
2	Women - UK Natives (Ref)	1.00		
2	Women - Descendants	0.88	0.83	0.94
2	Men - UK Natives	1.24	1.19	1.31
2	Men - Descendants	1.06	0.97	1.16
2	Cohort (Ref: 1970)	1.02	1.02	1.02

Table 3: Hazard ratios from transition-specific survival models by country-of-origin background without (Model Set 2) and with education (Model Set 3).

Trans.	Parameter	Model Set 2			Model Set 3		
		HR	L95%	H95%	HR	L95%	H95%
1	Women - UK Natives (Ref)	1.00			1.00		
1	Women - Europe & West	0.90	0.82	0.99	0.91	0.83	1.00
1	Women - India	1.08	0.90	1.30	1.09	0.91	1.31
1	Women - Pakistan	1.98	1.52	2.57	1.98	1.52	2.57
1	Women - Bangladesh	1.14	0.72	1.82	1.15	0.72	1.82
1	Women - Caribbean	0.97	0.84	1.13	0.98	0.84	1.14
1	Women - Africa	1.36	1.15	1.62	1.40	1.18	1.65
1	Women - Other	0.94	0.74	1.19	0.96	0.75	1.22
1	Men - UK Natives	0.56	0.54	0.58	0.56	0.54	0.58
1	Men - Europe & West	0.56	0.49	0.63	0.56	0.49	0.63
1	Men - India	0.43	0.32	0.57	0.43	0.33	0.57
1	Men - Pakistan	0.56	0.40	0.80	0.56	0.40	0.80
1	Men - Bangladesh	0.75	0.49	1.15	0.74	0.48	1.13
1	Men - Caribbean	0.82	0.66	1.03	0.82	0.66	1.02
1	Men - Africa	0.67	0.52	0.87	0.69	0.53	0.89
1	Men - Other	0.64	0.47	0.87	0.65	0.48	0.88
1	Cohort (Ref: 1970)	1.02	1.01	1.02	1.02	1.01	1.02
1	Education - low medium (Ref: high)	-	-	-	1.10	1.06	1.15
2	Women - UK Natives (Ref)	1.00			1.00		
2	Women - Europe & West	1.11	1.01	1.22	1.08	0.99	1.19
2	Women - India	0.88	0.74	1.06	0.86	0.72	1.03
2	Women - Pakistan	0.28	0.21	0.38	0.30	0.23	0.40
2	Women - Bangladesh	0.25	0.16	0.38	0.30	0.19	0.46
2	Women - Caribbean	0.87	0.75	1.01	0.86	0.74	0.99
2	Women - Africa	1.16	0.99	1.36	1.10	0.94	1.29
2	Women - Other	1.15	0.91	1.45	1.06	0.84	1.34
2	Men - UK Natives	1.24	1.18	1.30	1.24	1.19	1.3
2	Men - Europe & West	1.05	0.92	1.20	0.97	0.85	1.11
2	Men - India	1.92	1.48	2.47	1.65	1.28	2.13
2	Men - Pakistan	0.79	0.59	1.05	0.77	0.58	1.03

2	Men - Bangladesh	0.68	0.47	1.00	0.76	0.52	1.12
2	Men - Caribbean	0.79	0.63	0.99	0.85	0.68	1.07
2	Men - Africa	1.36	1.08	1.72	1.07	0.85	1.35
2	Men - Other	1.61	1.2	2.18	1.30	0.96	1.75
2	Cohort (Ref: 1970)	1.02	1.02	1.02	1.02	1.02	1.02
2	Education - low medium (Ref: high)	-	-	-	0.44	0.43	0.46

Supplementary Material

Results of Sensitivity Analyses

We carried out two major sensitivity analyses to evaluate the robustness of our working life expectancy (WLE) main results. In detail, the following analyses were carried out:

(1) **Sensitivity of presented main results with respect to the underlying functional form:** for all explored functional forms, we consistently found a Gompertz distribution to result in the lowest AIC among both transitions (see: **Supplementary Tables S1 to S3**). Here, it could be possible that resulting levels and group differences with respect to the time spent in the two states are affected by the choice of functional form when modelling the two transitions. To examine the sensitivity of our main results with respect to the choice of the functional form, we re-estimated all working life expectancy estimates based on a functional form with three-way interaction effects (i.e. AIC minimising form), using a Gompertz distribution.

(2) **Sensitivity of the presented main results with respect to the captured age range:** our analysis reflects the ages 25 to 65. With this design we intended to capture the core working years of the life course, while reducing effects emerging from life years spend in education or early retirement. However, it is still possible that observed group differences are impacted by both: time spent in education and retirement. To examine the sensitivity of our main results with respect to the chosen age range, we re-estimated all transition-specific models and working life expectancies for a reduced age range of 30 to 50 years. While not completely removing the effects of both, this reduced age range is likely to substantially reduce the impact of capturing life years spent in education and retirement on our WLE estimates.

Results - Sensitivity of presented main results with respect to the underlying functional form: we explored the sensitivity of our main results with respect to the choice of functional form. For this purpose, we estimated all results using a three-way interaction effect, which minimised the respective AIC of each transition within each of the three model sets. As shown in **Supplementary Figures 5 to 8**, there was generally only little change as results remained robust with respect to magnitude and group differences. However, women with high education who are descendants of immigrants from Pakistan presented an exception as their state expectancies were closer to UK natives after a three-way interaction was included. Although sampling and selectivity might have

contributed to this narrowing, this finding further underlines our main hypothesis that education is the central factor for the labour market integration of the descendants of immigrants.

Results - Sensitivity of the presented main results with respect to the captured age range: we explored the sensitivity of our main results with respect to the chosen age range as life years spend in education and retirement might have had an impact on observed group differences. For this purpose, we re-estimated all transition-specific models and obtained WLE estimates for a reduced age range of 30 to 50 years, while keeping all other parameters constant (i.e. functional form and Gompertz distribution). As illustrated in **Supplementary Figures 9 to 12,** group differences by country-of-origin background remained generally robust when reducing the age range. Here, effects of gender and education also remained robust, further underlining the importance of both factors for explaining WLE differentials. Nevertheless, a previously observed ethnic gap in WLE persisted to some extent – particularly among women.

Supplementary Tables

Supplementary Table 1: Overview of the model selection process for the first set of models, capturing all descendants of immigrants in one overarching category.

Trans.	Functional Form	Distribution	DF	AIC	Best	Chosen
1	men + origin(binary) + cohort	Gompertz	5	100658.0		
1	men * origin(binary) + cohort	Gompertz	6	100659.6		X
1	men * origin(binary) * cohort	Gompertz	9	100640.5	X	
1	men + origin(binary) + cohort	Weibull	5	101077.6		
1	men * origin(binary) + cohort	Weibull	6	101079.0		
1	men * origin(binary) * cohort	Weibull	9	101064.3		
1	men + origin(binary) + cohort	Exponential	4	101087.0		
1	men * origin(binary) + cohort	Exponential	5	101088.4		
1	men * origin(binary) * cohort	Exponential	8	101072.7		
2	men + origin(binary) + cohort	Gompertz	5	61979.9		
2	men * origin(binary) + cohort	Gompertz	6	61981.6		X
2	men * origin(binary) * cohort	Gompertz	9	61958.7	X	
2	men + origin(binary) + cohort	Weibull	5	62119.6		
2	men * origin(binary) + cohort	Weibull	6	62121.5		
2	men * origin(binary) * cohort	Weibull	9	62089.9		
2	men + origin(binary) + cohort	Exponential	4	62283.4		
2	men * origin(binary) + cohort	Exponential	5	62285.4		
2	men * origin(binary) * cohort	Exponential	8	62242.4		

Supplementary Table 2: Overview of the model selection process for the second of models, capturing descendants of immigrants through a detailed country-of-origin indicator.

Trans.	Functional Form	Distribution	DF	AIC	Best	Chosen
1	men + origin(detailed) + cohort	Gompertz	12	100618.7		
1	men * origin(detailed) + cohort	Gompertz	19	100606.8		X
1	men * origin(detailed) * cohort	Gompertz	34	100590.3	X	
1	men + origin(detailed) + cohort	Weibull	12	101044.5		
1	men * origin(detailed) + cohort	Weibull	19	101033.8		
1	men * origin(detailed) * cohort	Weibull	34	101017.4		
1	men + origin(detailed) + cohort	Exponential	11	101053.0		
1	men * origin(detailed) + cohort	Exponential	18	101042.1		
1	men * origin(detailed) * cohort	Exponential	33	101025.6		
2	men + origin(detailed) + cohort	Gompertz	12	60437.0		
2	men * origin(detailed) + cohort	Gompertz	19	60403.6		X
2	men * origin(detailed) * cohort	Gompertz	34	60342.7	X	
2	men + origin(detailed) + cohort	Weibull	12	60546.7		
2	men * origin(detailed) + cohort	Weibull	19	60512.6		
2	men * origin(detailed) * cohort	Weibull	34	60453.0		
2	men + origin(detailed) + cohort	Exponential	11	60685.8		
2	men * origin(detailed) + cohort	Exponential	18	60649.1		
2	men * origin(detailed) * cohort	Exponential	33	60580.1		

Supplementary Table 3: Overview of the model selection process for the third set of models, capturing descendants of immigrants through a detailed country-of-origin indicator and the level of education.

Trans.	Functional Form	Distribution	DF	AIC	Best	Chosen
1	men + origin(detailed) + edu + cohort	Gompertz	11	100640		
1	men * origin(detailed) + edu + cohort	Gompertz	18	100628		X
1	men * origin(detailed) * edu + cohort	Gompertz	33	100621	X	
1	men + origin(detailed) + edu + cohort	Weibull	11	101060		
1	men * origin(detailed) + edu + cohort	Weibull	18	101049		
1	men * origin(detailed) * edu + cohort	Weibull	33	101047		
1	men + origin(detailed) + edu + cohort	Exponential	10	101070		
1	men * origin(detailed) + edu + cohort	Exponential	17	101058		
1	men * origin(detailed) * edu + cohort	Exponential	32	101054		
2	men + origin(detailed) + edu + cohort	Gompertz	11	61814		
2	men * origin(detailed) + edu + cohort	Gompertz	18	61776		X
2	men * origin(detailed) * edu + cohort	Gompertz	33	61732	X	
2	men + origin(detailed) + edu + cohort	Weibull	11	61952		
2	men * origin(detailed) + edu + cohort	Weibull	18	61912		
2	men * origin(detailed) * edu + cohort	Weibull	33	61862		
2	men + origin(detailed) + edu + cohort	Exponential	10	62114		
2	men * origin(detailed) + edu + cohort	Exponential	17	62071		
2	men * origin(detailed) * edu + cohort	Exponential	32	62007		

Supplementary Table 4: Overview of the study population and distribution of start states in the study population at ages 25-29 ("weights").

Gender	Origin	Education	% Active	% Inactive
Men	UK Natives	High	84.5%	15.5%
Men	UK Natives	Low/Medium	86.6%	13.4%
Men	Descendants: Europe & West	High	78.4%	21.6%
Men	Descendants: Europe & West	Low/Medium	80.3%	19.7%
Men	Descendants: India	High	75.6%	24.4%
Men	Descendants: India	Low/Medium	81.1%	19.0%
Men	Descendants: Pakistan	High	71.9%	28.1%
Men	Descendants: Pakistan	Low/Medium	62.8%	37.2%
Men	Descendants: Bangladesh	High	57.1%	42.9%
Men	Descendants: Bangladesh	Low/Medium	72.1%	27.9%
Men	Descendants: Caribbean	High	69.2%	30.8%
Men	Descendants: Caribbean	Low/Medium	70.5%	29.5%
Men	Descendants: Other	High	77.1%	22.9%
Men	Descendants: Other	Low/Medium	76.9%	23.1%
Women	UK Natives	High	80.7%	19.3%
Women	UK Natives	Low/Medium	65.9%	34.1%
Women	Descendants: Europe & West	High	79.8%	20.2%
Women	Descendants: Europe & West	Low/Medium	64.8%	35.2%
Women	Descendants: India	High	75.6%	24.4%
Women	Descendants: India	Low/Medium	59.7%	40.3%
Women	Descendants: Pakistan	High	75.0%	25.0%
Women	Descendants: Pakistan	Low/Medium	30.4%	69.6%
Women	Descendants: Bangladesh	High	62.5%	37.5%
Women	Descendants: Bangladesh	Low/Medium	30.6%	69.4%
Women	Descendants: Caribbean	High	71.9%	28.1%
Women	Descendants: Caribbean	Low/Medium	61.8%	38.2%
Women	Descendants: Other	High	82.4%	17.6%
Women	Descendants: Other	Low/Medium	66.7%	33.3%

Supplementary Table 5: Overview of transition-specific Gompertz survival models and parameter estimates for the first set of models, capturing all descendants of immigrants in one overarching category.

Trans.	Parameter	Est	Est L95%	Est H95%	HR	L95%	H95%
1	Shape	0.02	0.02	0.03			
1	Rate	0.04	0.03	0.04			
1	Men (Ref: Women)	-0.58	-0.62	-0.54	0.56	0.54	0.58
1	Descendants (Ref: UK Natives)	0.01	-0.05	0.08	1.01	0.95	1.08
1	Cohort (Ref: 1970)	0.02	0.01	0.02	1.02	1.01	1.02
1	Men X Descendants	0.04	-0.07	0.15	1.04	0.93	1.17
2	Shape	-0.02	-0.03	-0.02	0.98	0.97	0.98
2	Rate	0.17	0.17	0.18	1.19	1.18	1.20
2	Men (Ref: Women)	0.22	0.17	0.27	1.24	1.19	1.31
2	Descendants (Ref: UK Natives)	-0.13	-0.19	-0.06	0.88	0.83	0.94
2	Cohort (Ref: 1970)	0.02	0.02	0.02	1.02	1.02	1.02
2	Men X Descendants	-0.03	-0.15	0.08	0.97	0.86	1.08

Supplementary Table 6: Overview of transition-specific Gompertz survival models and parameter estimates for the second set of models, capturing descendants of immigrants by country-of-origin background.

Trans.	Parameter	Est	Est L95%	Est H95%	HR	L95%	H95%
1	Shape	0.02	0.02	0.03			
1	Rate	0.04	0.03	0.04			
1	Men (Ref: Women)	-0.58	-0.62	-0.54	0.56	0.54	0.58
1	Europe & West (Ref: UK Natives)	-0.10	-0.19	-0.01	0.90	0.82	0.99
1	India	0.08	-0.10	0.27	1.09	0.90	1.31
1	Pakistan	0.68	0.42	0.94	1.98	1.52	2.57
1	Bangladesh	0.13	-0.33	0.60	1.14	0.72	1.82
1	Caribbean	-0.03	-0.18	0.12	0.97	0.84	1.13
1	Africa	0.31	0.14	0.48	1.36	1.15	1.62
1	Other	-0.06	-0.31	0.18	0.94	0.74	1.19
1	Cohort (Ref: 1970)	0.02	0.01	0.02	1.02	1.01	1.02
1	Men X Europe & West	0.10	-0.06	0.25	1.10	0.94	1.29
1	Men X India	-0.34	-0.68	-0.01	0.71	0.51	0.99
1	Men X Pakistan	-0.67	-1.11	-0.24	0.51	0.33	0.79
1	Men X Bangladesh	0.16	-0.47	0.79	1.18	0.63	2.21
1	Men X Caribbean	0.42	0.15	0.68	1.52	1.16	1.98
1	Men X Africa	-0.13	-0.43	0.18	0.88	0.65	1.20
1	Men X Other	0.20	-0.18	0.59	1.23	0.83	1.81
2	Shape	-0.02	-0.03	-0.02			
2	Rate	0.18	0.17	0.18			
2	Men (Ref: Women)	0.22	0.17	0.26	1.24	1.18	1.30
2	Europe & West (Ref: UK Natives)	0.11	0.01	0.20	1.11	1.01	1.22
2	India	-0.12	-0.30	0.06	0.88	0.74	1.06
2	Pakistan	-1.27	-1.55	-0.98	0.28	0.21	0.38
2	Bangladesh	-1.39	-1.82	-0.96	0.25	0.16	0.38
2	Caribbean	-0.14	-0.28	0.01	0.87	0.75	1.01
2	Africa	0.15	-0.01	0.31	1.16	0.99	1.36
2	Other	0.14	-0.10	0.37	1.15	0.91	1.45
2	Cohort (Ref: 1970)	0.02	0.02	0.02	1.02	1.02	1.02
2	Men X Europe & West	-0.27	-0.44	-0.11	0.76	0.64	0.90
2	Men X India	0.56	0.24	0.87	1.74	1.28	2.39

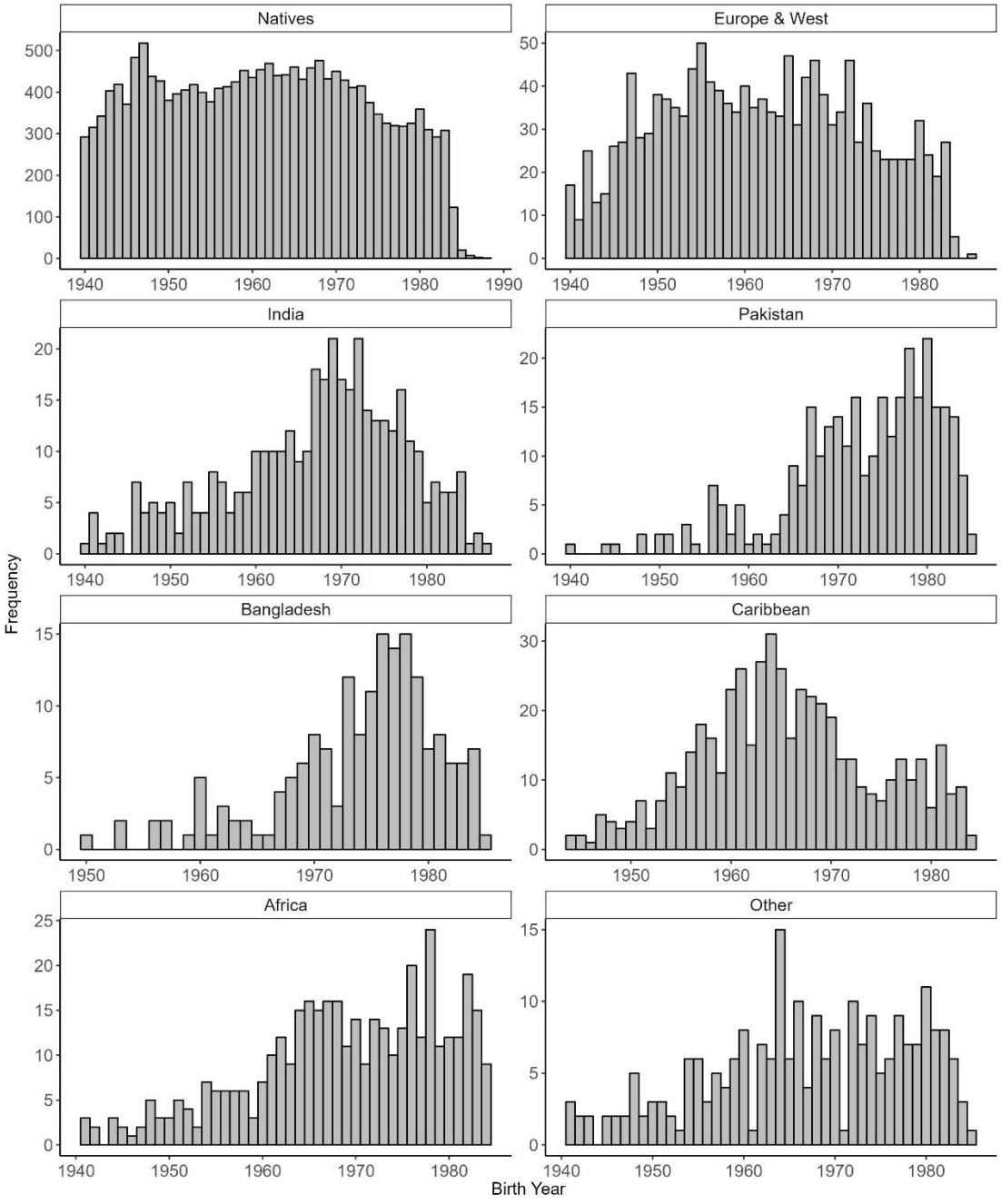
2	Men X Pakistan	0.81	0.40	1.21	2.24	1.49	3.37
2	Men X Bangladesh	0.79	0.22	1.36	2.21	1.25	3.91
2	Men X Caribbean	-0.32	-0.60	-0.05	0.72	0.55	0.95
2	Men X Africa	-0.06	-0.34	0.23	0.94	0.71	1.25
2	Men X Other	0.12	-0.26	0.50	1.13	0.77	1.66

Supplementary Table 7: Overview of selected transition-specific models and their parameter estimates for the third set of models, capturing descendants of immigrants by country-of-origin background and education.

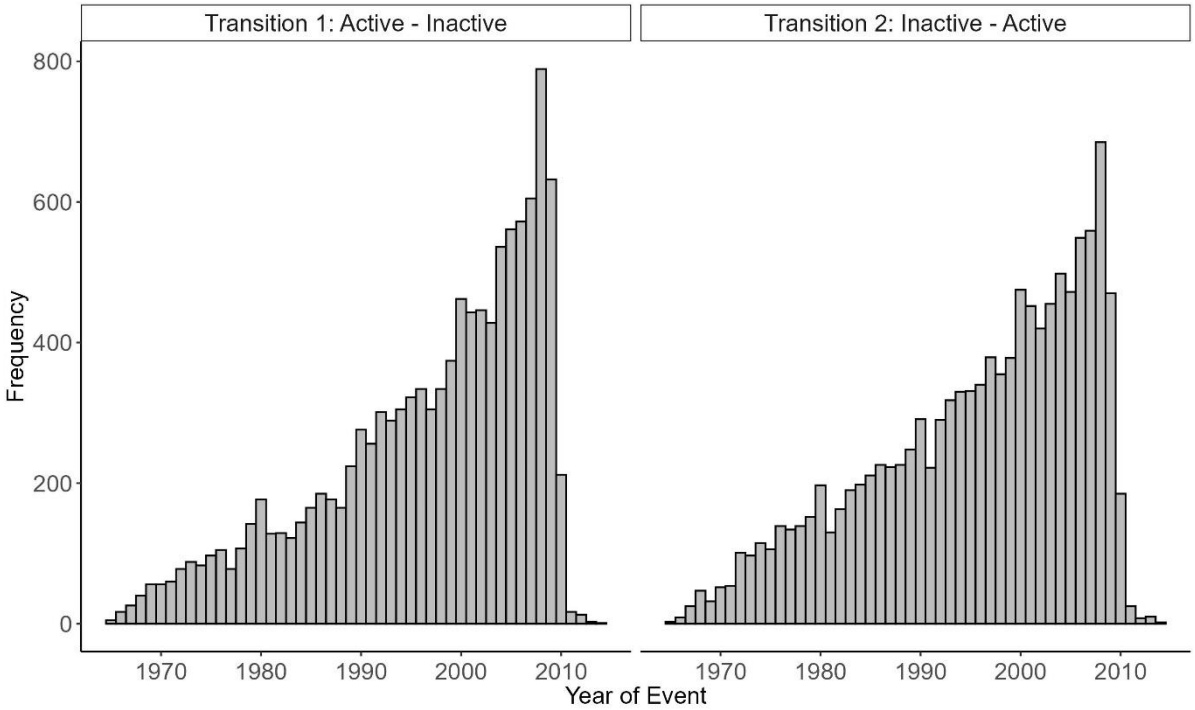
Trans.	Parameter	Est	Est L95%	Est H95%	HR	L95%	H95%
1	Shape	0.02	0.02	0.03			
1	Rate	0.03	0.03	0.03			
1	Men (Ref: Women)	-0.58	-0.62	-0.54	0.56	0.54	0.58
1	Europe & West (Ref: UK Natives)	-0.09	-0.19	0.00	0.91	0.83	1.00
1	India	0.09	-0.10	0.27	1.09	0.91	1.31
1	Pakistan	0.68	0.42	0.95	1.98	1.53	2.58
1	Bangladesh	0.14	-0.32	0.60	1.15	0.72	1.83
1	Caribbean	-0.02	-0.17	0.13	0.98	0.84	1.14
1	Africa	0.33	0.16	0.50	1.40	1.18	1.65
1	Other	-0.04	-0.28	0.20	0.96	0.75	1.22
1	Cohort (Ref: 1970)	0.02	0.01	0.02	1.02	1.01	1.02
1	Low/Medium Education (Ref: High)	0.10	0.06	0.14	1.10	1.06	1.15
1	Men X Europe & West	0.09	-0.06	0.25	1.1	0.94	1.29
1	Men X India	-0.34	-0.68	-0.01	0.71	0.51	0.99
1	Men X Pakistan	-0.67	-1.11	-0.24	0.51	0.33	0.79
1	Men X Bangladesh	0.14	-0.49	0.77	1.15	0.61	2.15
1	Men X Caribbean	0.41	0.14	0.67	1.50	1.15	1.96
1	Men X Africa	-0.13	-0.43	0.18	0.88	0.65	1.20
1	Men X Other	0.19	-0.19	0.58	1.21	0.82	1.79
2	Shape	-0.02	-0.02	-0.02			
2	Rate	0.30	0.29	0.32			
2	Men (Ref: Women)	0.22	0.17	0.27	1.24	1.19	1.30
2	Europe & West (Ref: UK Natives)	0.08	-0.01	0.18	1.08	0.99	1.19
2	India	-0.15	-0.33	0.03	0.86	0.72	1.03
2	Pakistan	-1.20	-1.49	-0.91	0.30	0.23	0.40
2	Bangladesh	-1.22	-1.65	-0.79	0.30	0.19	0.46
2	Caribbean	-0.15	-0.30	-0.01	0.86	0.74	0.99
2	Africa	0.10	-0.06	0.26	1.10	0.94	1.29
2	Other	0.06	-0.17	0.29	1.06	0.84	1.34
2	Cohort (Ref: 1970)	0.02	0.02	0.02	1.02	1.02	1.02
2	Low/Medium Education (Ref: High)	-0.81	-0.85	-0.77	0.44	0.43	0.46

2	Men X Europe & West	-0.33	-0.49	-0.16	0.72	0.61	0.85
2	Men X India	0.44	0.12	0.75	1.55	1.13	2.12
2	Men X Pakistan	0.72	0.31	1.13	2.05	1.37	3.08
2	Men X Bangladesh	0.73	0.16	1.30	2.07	1.17	3.68
2	Men X Caribbean	-0.22	-0.50	0.05	0.80	0.61	1.05
2	Men X Africa	-0.24	-0.52	0.04	0.79	0.59	1.04
2	Men X Other	-0.02	-0.40	0.36	0.98	0.67	1.44

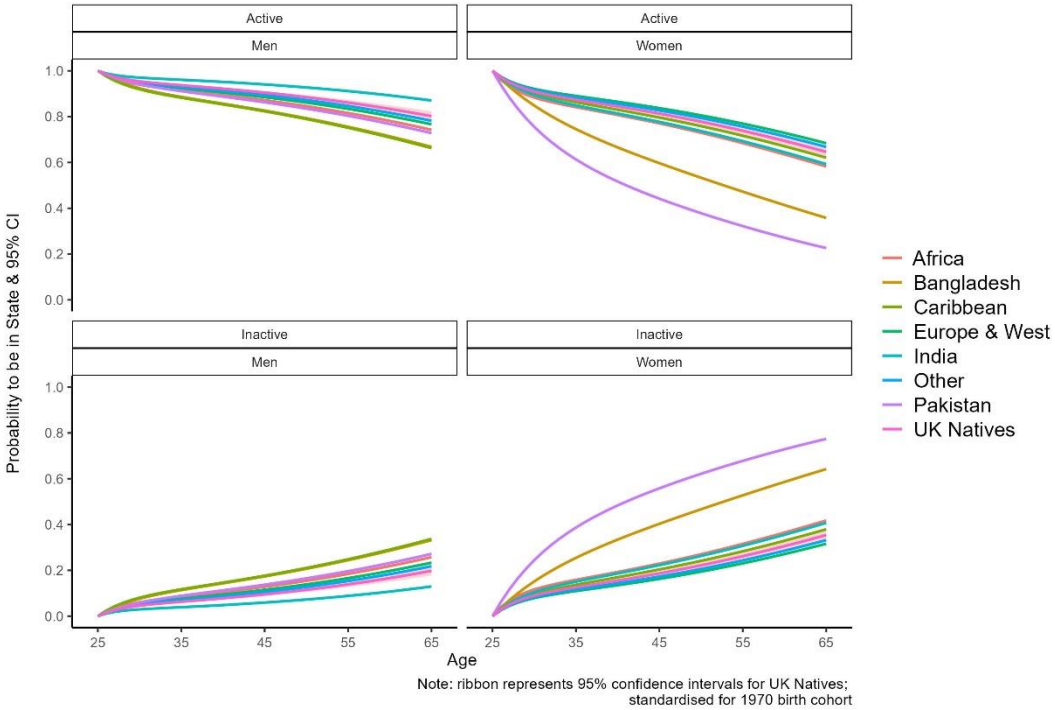
Supplementary Figures



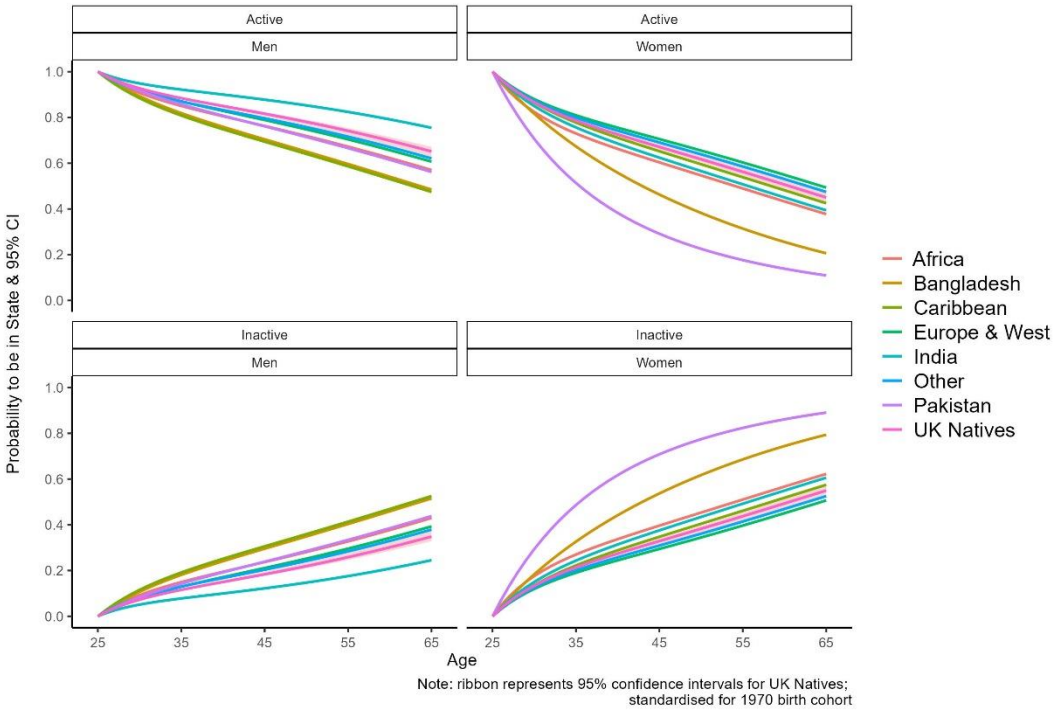
Supplementary Figure 1: Descriptive overview on included birth cohorts, distinguishing the descendants of immigrants group into detailed country-of-origin specific groups.



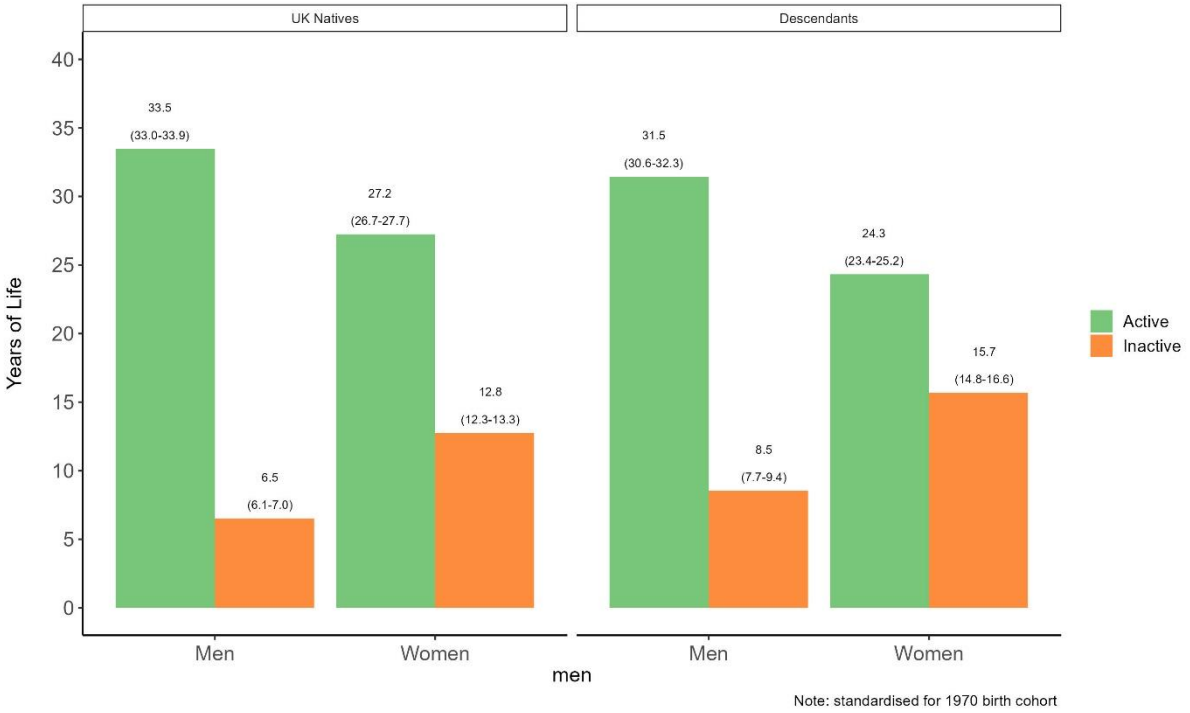
Supplementary Figure 2: Descriptive overview on included birth cohorts, distinguishing the descendants of immigrants group into detailed country-of-origin specific groups.



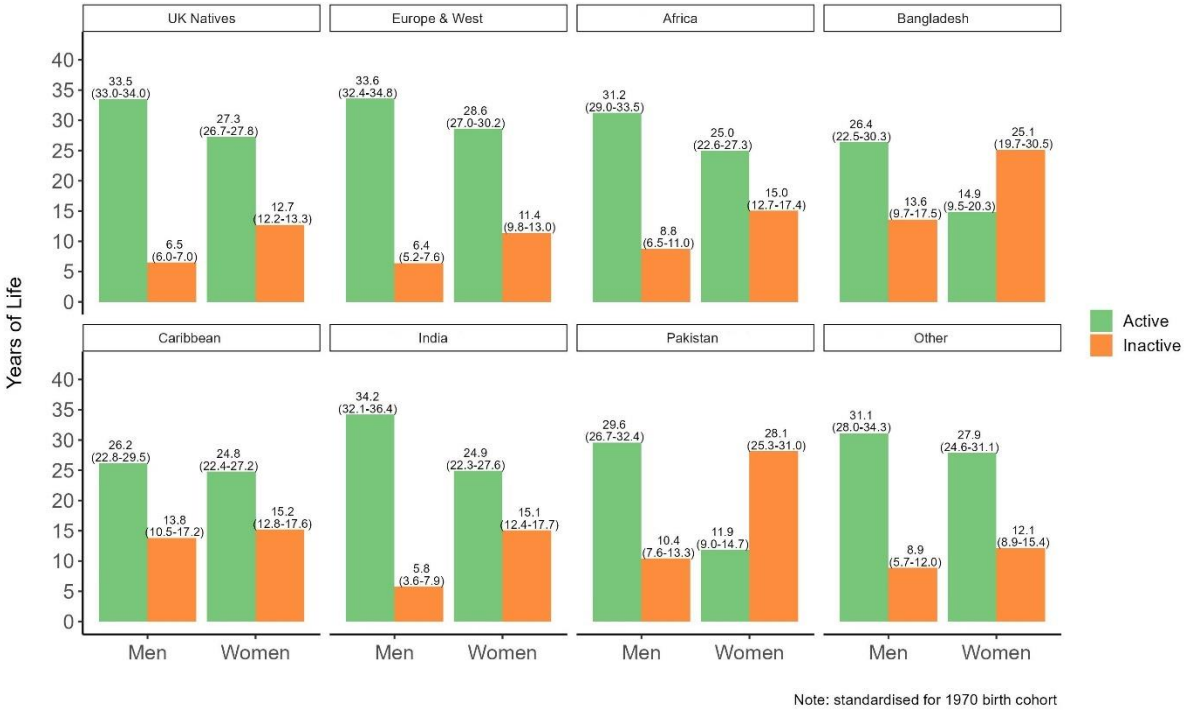
Supplementary Figure 3: Start-state-specific probabilities of state occupancy derived from the third set of models, presenting predicted for the group of individuals with high education.



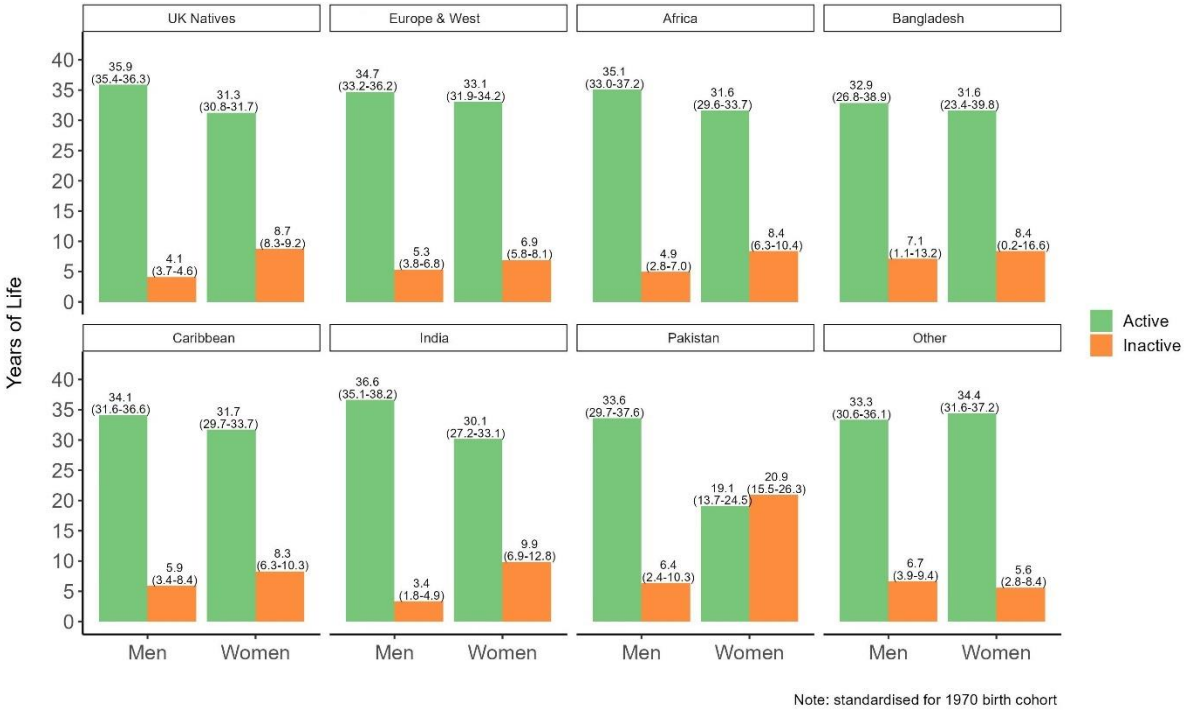
Supplementary Figure 4: Start-state-specific probabilities of state occupancy derived from the third set of models, presenting predicted for the group of individuals with low/medium education.



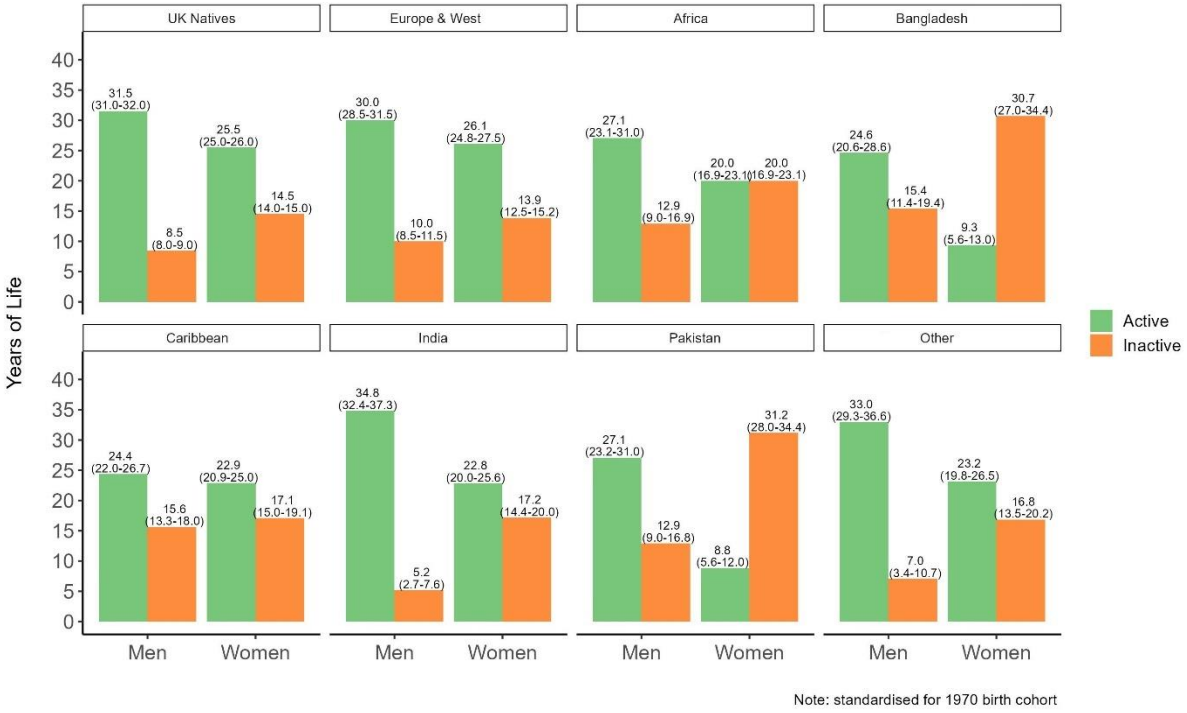
Supplementary Figure 5: Working life expectancy estimates for a dichotomous approach to the descendants of immigrants group, specifying a three-way interaction between origin, gender and cohort.



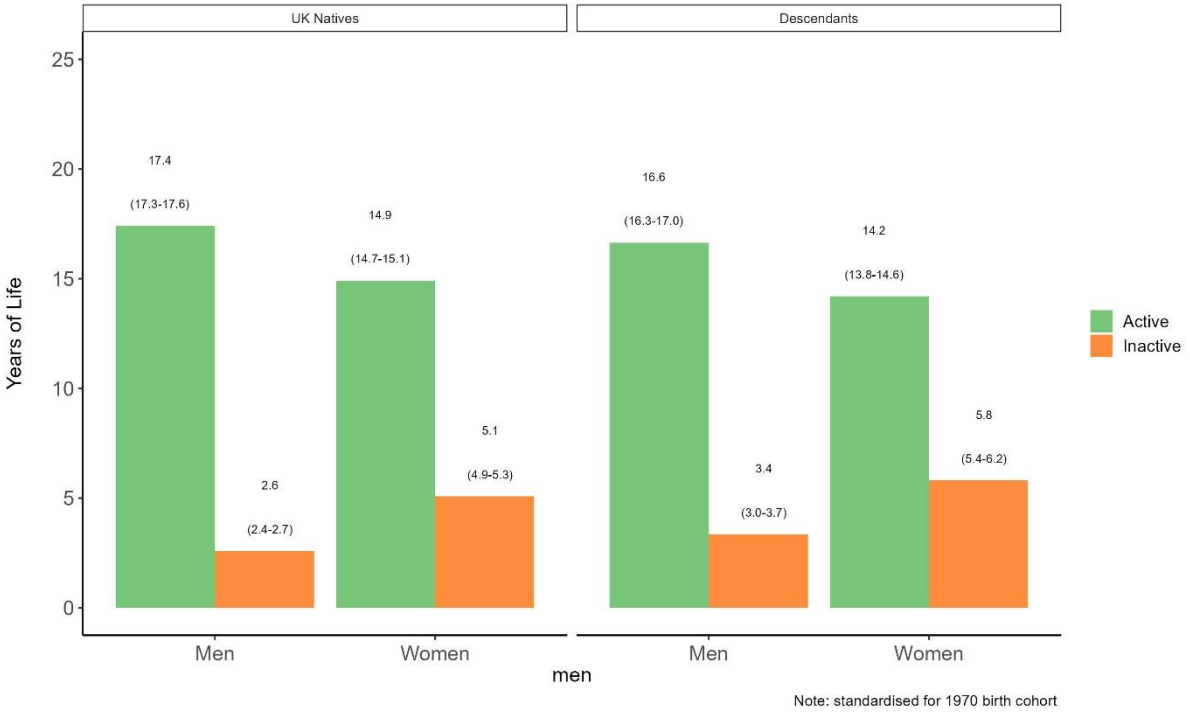
Supplementary Figure 6: Working life expectancy estimates by detailed country-of-origin background, specifying a three-way interaction between origin, gender and cohort.



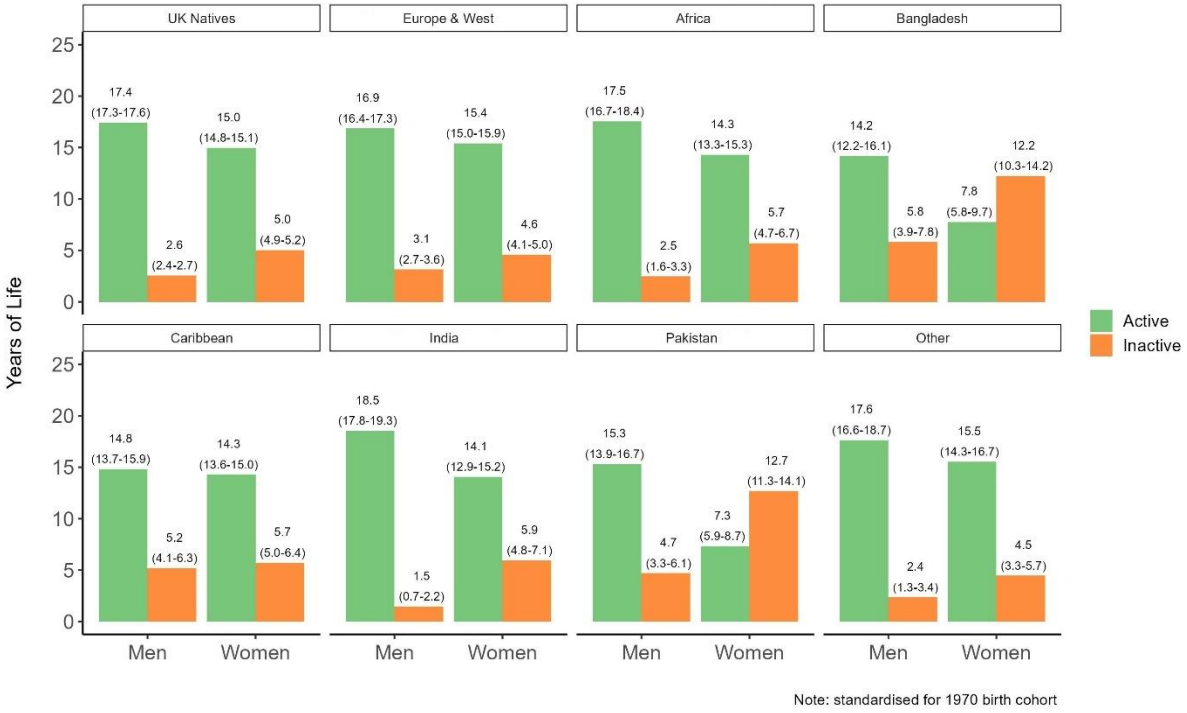
Supplementary Figure 7: Working life expectancy estimates by detailed country-of-origin background and level of education, specifying a three-way interaction between origin, gender, and education. The presented estimates are for individuals with high education.



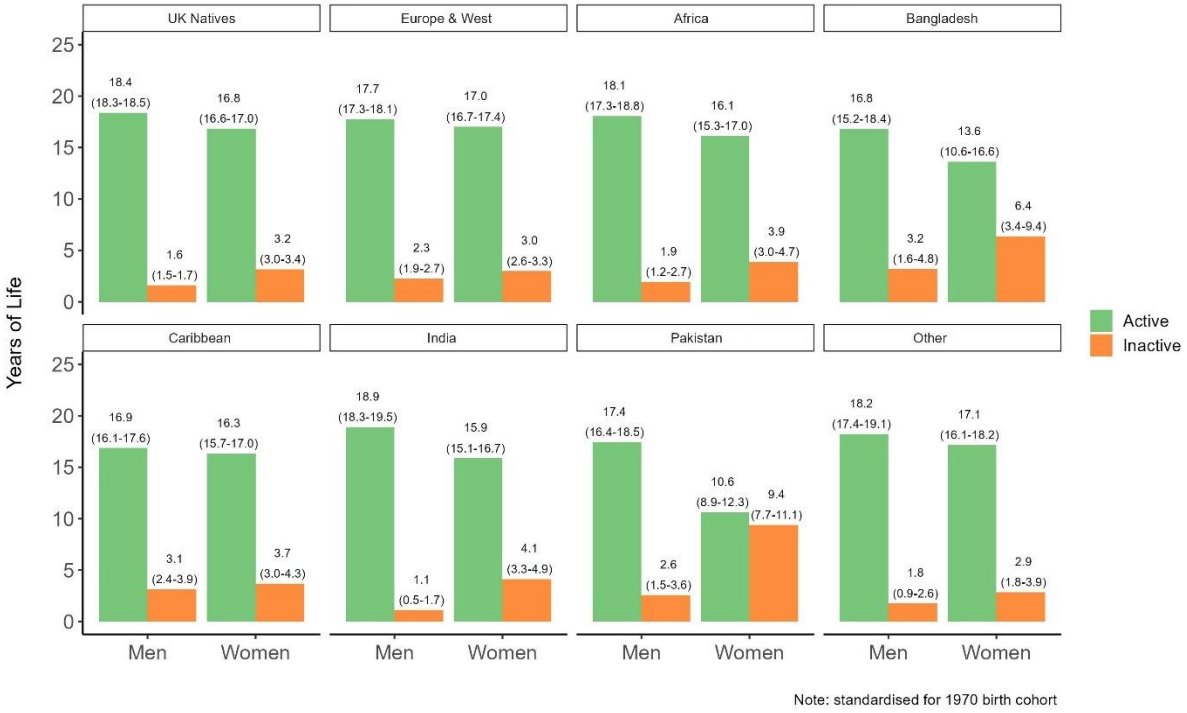
Supplementary Figure 8: Working life expectancy estimates by detailed country-of-origin background and level of education, specifying a three-way interaction between origin, gender, and education. The presented estimates are for individuals with low/medium education.



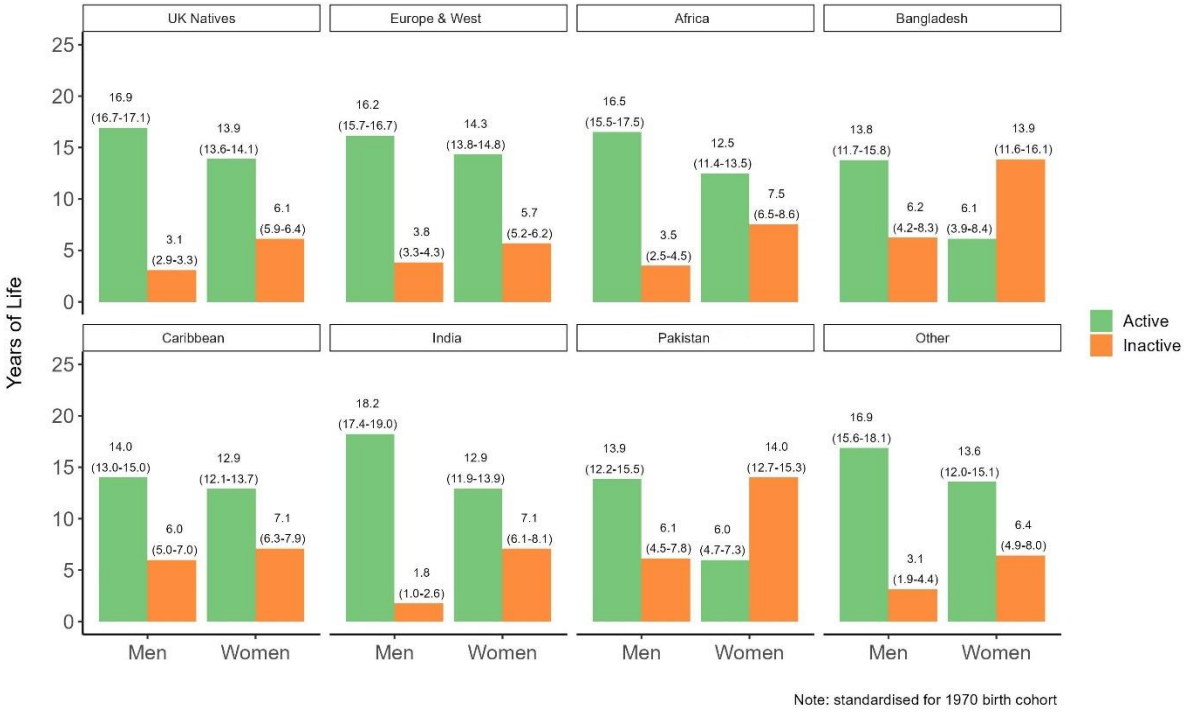
Supplementary Figure 9: Working life expectancy estimates for a dichotomous approach to the descendants of immigrants group, applying a reduced age range (30-50 years).



Supplementary Figure 10: Working life expectancy estimates by detailed country-of-origin background, applying a reduced age range (30-50 years).



Supplementary Figure 11: Working life expectancy estimates by detailed country-of-origin background and level of education, applying a reduced age range (30-50 years). The presented estimates are for individuals with high education.



Supplementary Figure 12: Working life expectancy estimates by detailed country-of-origin background and level of education, applying a reduced age range (30-50 years). The presented estimates are for individuals with high education.