

**170 years of US living arrangements reveal rise and stagnation in lifetime spent living with primary kin, an emergence in solo living, and a resurgence of extended family coresidence**

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**Acknowledgments.** The authors thankfully acknowledge the comments and advice received from Luca Maria Pesando and Enrique Acosta in preparing this manuscript. We thank Anna Turu for her help with the preparation of the data. We gratefully acknowledge feedback from the participants to the 2024 Population Association of America and European Population Conference meetings, as well as participants to the Population Health Research Group at the University of St Andrews, the ISSS seminar at the Centre for Demographic Studies, and the Q-Step seminar at the University of Edinburgh.

## **Abstract**

Over the past 170 years the United States (US) has undergone demographic, structural, and cultural changes that are reflected in—and a reflection of—changes in living arrangements. We provide the first account of life-years spent across different living arrangements for the entire US population between 1850–2021. We also describe changes across generations born in the 1860s, 1900s, and 1940s. We use harmonized census data from the Integrated Public Use Microdata Samples (IPUMS USA). We classify living arrangements broadly into living alone, only with primary kin (partners, parents, and children), and in extended households, and into more detailed sub-categories including, for example, single-parent primary-kin households and extended families. Our results reveal three distinct systems of living arrangements. A “large household” system prevails between 1850 and 1940, starting from similar shares of life years spent in extended and primary-kin households, with a steady growth of the latter in line with rising life expectancy. This is followed by an era of “primary kin household” dominance between 1940 and 1980, when gains in life years spent with primary kin outpace life expectancy increases, and living alone emerges. From 1980 onwards, a “diversified” system emerges, with declines in primary-kin households in favor of a more varied set of arrangements. Our results show how historical changes in population mortality and age structure combine with social change to affect household composition, and invite scholarship on families and households to consider the repercussions of social and demographic change for living arrangements across the population age distribution.

## Introduction

Throughout modern history, most people's lifespans have unfolded in homes shared with others, often partners and family members. With adequate data, it is possible to quantify the number of life years spent in each living arrangement at the population level over time, however such quantifications have not been previously attempted. Doing so is important because living arrangements are the result of—and have implications for—the social and economic characteristics of households and societies (1,2).

Between the 19th and the 20th centuries, the United States (US) experienced transitions from an agricultural to industrial and service-based economy, and the strong institutionalization of marriage and the gender division of reproductive and market labor. These changes are thought to have led to a shift from extended family living arrangements to the dominance of the so-called “nuclear household” (3,4), defined as parental units with any number of young children. Towards the end of the 20th century, changes associated with the deinstitutionalization of marriage, increased divorce rates, postponed childbearing, and overall declining fertility rates, combined with economic uncertainty, began to put the dominance of the so-called “nuclear”, two-parent household into question, giving new life to extended family arrangements and consolidating emerging ones, such as living alone (5–11).

The dominant view in the sociological literature is that living arrangements have historically responded to social, economic, and cultural change (1,3,12–16). Previous explanations for the evolution of living arrangements in Western Europe and the US include the Second Demographic Transition (SDT) theory, which predicts long-term fertility decline and the diversification of family forms subsequent to shifts in norms and attitudes towards greater individualism (15,16). The SDT and similar explanations mainly refer to changes in the behavior of young adults, as they concern the timing and prevalence of leaving the parental household, forming cohabiting partnerships, and having children (17). However, the co-existence of several generations at any given time implies that such changes will have consequences for the living arrangements of the population across its entire age structure. For instance, if a large share of young adults

leaves the parental household to form cohabiting partnerships, the likelihood of a large share of three-generation households will decrease in the short term. And, in the longer term, depending on sex-specific mortality and the prevalence of re-partnering, widowed parents may end up spending a significant proportion of life living alone. Thus, social and family change (mostly concentrated among younger people) will have different short- and long-term consequences across the population age distribution.

To summarize the experiences of people at different ages in relation to their living arrangements, we refer to the concept of life expectancy. Life expectancy at birth is a summary measure of mortality, indicating the number of years a fictitious cohort of people would live if, throughout their lives, they experienced the same age-specific mortality rates as those prevalent in the population in a given year. At the population level, at any time, total years of life expectancy are distributed across a variety of living arrangements. Changes in life years spent across these living arrangements over time will depend on population age structure and mortality, as well as on the changing prevalence of each living arrangement within age groups. While not representative of any real cohort of individuals, life expectancy by living arrangement is a useful summary measure for providing a perspective on the relative importance of living arrangements over time while accounting for changing mortality, especially if harmonized data on living arrangements is available for a long period.

At the time of writing, US census data on household structure is available for 170 years, from 1850 until 2021. Authors before us have used this wealth of data to document changes in living arrangements. Ruggles studies the share of older adults (65+) living with their children over this period, and argues that the large fall in this share (from nearly 70% in 1850 to around 15% in 2000) mainly resulted from the restructuring of the US economy, which led to increasing economic opportunities for young adults outside the family farm or business (18). Pilkauskas, Amorim and Dunifon examine instead the living arrangements of children aged 0–18 (19). They find a historical increase in the share of children living in multi-generation households between 1870 and 1950 (from 7.7 to 10.1%), followed by a rapid decline between 1950 and 1980 (5.0%), and a subsequent rebound until the end of the observation period (9.9% in 2018). They show increased

single parenthood and greater racial/ethnic diversity to be significant drivers of the recent rebound. Overall, however, most of the variation in children's living arrangements remains unexplained, and is possibly attributable to a combination of changing economic circumstances, preferences and ability to live independently, attitudes, and social policies (19). Schwartz, González-Velastín and Li recently adopt a life-years perspective to study changes in lifetime years spent married versus unmarried among US males (20). They show that changes in lifetime years spent married since 1880 at the population level depend on the relative contribution of longer life expectancy—which has historically prolonged time spent married—and changes in marriage and divorce—which have contributed to longer time spent married until 1960, and shorter time spent married afterwards, especially for lower-educated men.

In this paper we examine 170 years of transformations in US living arrangements, using life expectancy in different living arrangements as a summary measure to capture—in aggregate form—the experience of a fictitious cohort of people representing the population living in private households in each given year. This perspective has various advantages over accounts based on the raw percentages of households or individuals in each household type (21). Over a household-level perspective, it allows to incorporate the population age structure into the estimation of the likelihood of any particular arrangement occurring. For example, in the 1960s, comparing the proportion of households with multi-generational kin between pre-industrial and modern societies led to the conclusion that their prevalence had remained unchanged over time (22), but failed to account for the much lower availability of older adults in pre-industrial societies (18). Studies adopting an individual-level perspective address this issue, but cannot summarize the simultaneous experiences of different age groups, and focus therefore on specific groups such as older adults (18) or children (19). A life expectancy approach allows us to summarize changes in living arrangements across the entire population age structure into a single set of indicators for life-years spent alone, with primary kin, and in extended households. In other words, we show how total life-years lived in the population at any given time are distributed across living arrangements. A life expectancy approach also enables us to understand the contributions to each change of different age groups, which

may be in opposite directions. We distinguish three broad living arrangement types: alone; with primary kin only (partners, parents and children); and extended households. For those living with primary kin only, we distinguish among couple-only households, two-parent households with children (either as a parent, or as a child) and single-parent households with children (either as the parent, or as a child). For those living in extended households, we distinguish among extended kin only (i.e., everyone in the household is kin-related), mixed arrangements (i.e., some individuals are kin-related, others are not), and non-kin only (i.e., nobody in the household is kin-related). First, we describe overall change in life expectancy spent in each living arrangement over time; then, we analyze where the most substantial changes have been produced in terms of age groups and periods. Finally, we provide an overview of changes across three cohorts of people born in the 1860s, 1900s, and 1940s.

## Results

***Changes in broad living arrangements over time.*** Figure 1 shows the total change in life expectancy at birth between 1850 and 2021, with different fill colors corresponding to the three broad categories of living alone, with primary kin only, and in extended households. Supplementary tables S1 and S2 complement the figure by decomposing the total change in life expectancy at birth by broad living arrangement into the contribution of different age groups, for females and males respectively. The age decomposition allows to understand the ages at which changes in life expectancy by living arrangement are concentrated, and shows the extent to which they are proportionate to changes in total life expectancy, or disproportionately higher or lower, thus likely resulting from structural changes in the system of living arrangements.

Life expectancy at birth doubles in the US between 1850 and 2021, going from around 40 to around 80 years for both sexes. Of these life years, the greatest share is spent living only with primary kin, followed by extended households, and finally alone. This order is maintained in every census year, although the relative importance of each broad category changes substantially over time. In 1850, the number of life years spent living with

primary kin only (20.0) and in extended households (19.1) are almost identical. From then onwards, living with primary kin increases until 1970 as this state absorbs the majority of the extra life years added due to decreased mortality. The most rapid increment (45.8 to 52.9 years) is observed between 1910 and 1970, followed by a stabilization around that level until the end of the observation period (50.5 in 2021). It is interesting to note that the average absolute number of years spent in extended households at the population level is similar between 2021 (18.6) and 1850 (19.1). Living alone remains relatively rare until 1940, when it accounts for up to 2 years of female life expectancy, and 1.6 years for males. After 1940, living alone rises fast, incorporating an additional 8 years of life expectancy for females and 7 years for males until 2021. Of the 9.5 years of life expectancy at birth gained between 1850 and 1900, 7 are added to living with primary kin, and 2 are added to living in extended households, and 0.5 to living alone. The majority of life years are gained between ages 0–9 as a consequence of declining infant and child mortality, and changes are substantially more modest among other age groups.

Between 1900 and 1940, the majority of life expectancy gains (from 49 to 66 years for females, and from 46 to 61 for males) are added to living with primary kin only. For example, of the 7.3 years of female life expectancy gained between 1900 and 1920, 6.85 are added to years living with primary kin. The number of years spent in extended households remains constant throughout this period, making for an increasingly lower share of the total. Again, most of the gains in life years spent in any living arrangement are concentrated among infants and children, with the exception of living alone.

Without a doubt, the years between 1940 and 1960 see the most radical transformations in living arrangements observed for the entire period. For the first time, the increase in life years spent in a particular living arrangement outpaces the increase in total life expectancy: for females, 11.2 years of life expectancy with primary kin are added, compared to a total increase in life expectancy by 7.8 years. This is counteracted by a decrease in life expectancy in extended households for females by -6.7 years between 1940 and 1960. This transformation is also reflected in a rapid increase in years spent living alone, from 1.1 to 3.2 during this period. It is interesting to point out that the

majority of these changes result from ages between 10 and 50, which are generally characterized by low mortality. As such, the decades between 1940 and 1960 are characterized by a pronounced shift towards living with primary kin.

In the following two decades (1960–1980) we observe only for females an increase in years spent living alone that outpaces the increase in total life expectancy. It is the older age groups (70+) that contribute mostly to this change, and for which the rise in living alone outpaces declining mortality. This is the result of the ageing of those generations of females that lived mainly in primary-kin households, whose children moved out to form separate households. For men, we do not observe the increase in life expectancy spent living alone due to the lower survival of males to older ages: in other words, the increase in female life expectancy alone after age 70 is driven largely by the departure of children from dual-parent primary kin households, followed by the death of the partner in couple-only households.

Changes in living arrangements after 1980 see a moderate increase in total life expectancy, with a slight fall for males between 2000 and 2021 partly attributable to COVID-19. During these years, the stabilization and subsequent fall of primary-kin living arrangements is observed at all ages between 0 and 60. The increase in living alone also stabilizes during this period, with a slight decline in life-years spent alone in the older female population, compensated by an increase among people in their 40s and 50s. Between 2000 and 2021, the largest increase in living alone is detected for people aged 20–29, among whom a slight increase in mortality is observed. The number of years spent alone rises among older males, and declines for older females. From the 1980s, for both sexes, the greatest expansion in any living arrangement, outpacing total life expectancy, is observed for extended households. Of the 4 years of male life expectancy gained between 1980 and 2000, 3.6 are added to extended households. This rise is observed across all age groups, but especially concentrated among children and young adults (0–9 and 20–29), in line with Pilkauskas and colleagues' findings (19).

***Internal diversity in living arrangements.*** Figure 2 decomposes the change in life expectancy at birth for each broad category of living arrangement into its sub-categories,



with the exception of living alone, which has no sub-categories. The top two panels of Figure 2 clearly show the rapid increase in female life expectancy spent living alone between 1940 and 1980. For males, living alone increases more gradually between 1940 and the early 2000s, and appears to stabilize around 2006 at slightly lower levels than for females (7.5 years in 2021). As commented above, life years spent living only with primary kin take up the majority of life expectancy gains until 1940, outpace life expectancy gains between 1940–1960, and finally stabilize and decline slightly after 1980. The internal composition of this broad category changes considerably over time. The rise in primary kin households until 1910 is predominantly attributable to life years spent in two-parent households with children, which increase with infant and child mortality decline. Between 1910 and 1960, the rapid rise in primary kin is attributable to continued rapid growth in two-parent living arrangements, but also to an increase in years spent living only with partners (and no children). After 1960, couple-only living arrangements continue to rise, only experiencing a slight decline in the last observed decade. By contrast, life expectancy spent in two-parent households peaks in 1960 and declines between 1970 and 2021. Relative to total life expectancy, years spent in two-parent households go from representing 48% of the total years in 1960 to 36% in 2021. Life expectancy in single-parent households remains at low levels throughout most of the period, but increases from 3.8 to 7 years for females between 1960 and 2021, and from 1.3 to 3.3 among males. This tendency likely reflects increases in union dissolution during this period (20).

As noted above, years spent in extended households are similar in 1850 and 2021, with some oscillations between these two time points. A consistent trend between 1850 and 1960 is the steady decline in mixed (kin and non-kin) living arrangements, which is likely to reflect the decline in the presence of live-in servitude, boarders, and lodgers, characteristic of the pre-industrial US (23). Life expectancy in non-kin households also declines between 1850 and 1960, to slightly increase again after 1970. Female life expectancy in extended kin-only households increases together with total life expectancy

between 1850 and 1950 (from 9.2 to 15.7) then declines to 10.5 between 1950 and 1980, to rise back to 13.5 by 2021. We find very similar trends for males.

***Changes across cohorts.*** The changes described so far reflect period trends, condensing the experience of different cohorts into a single indicator for each year. To complement our results, we present an aggregate generational perspective, which follows distinct cohorts of people born around the same time throughout their lives. Figure 3 shows the proportion of non-institutionalized individuals by age (from 0 to 80) in each type of living arrangement for females and males born in three decades: 1860–1869, 1900–1909, and 1940–1949. For this figure, we distinguish the two sub-categories of two-parent and single-parent households into whether the individual is a parent or a child of other household members.

The 1860s cohort has a high share of people (40–50%) living in extended households at every age, with peaks just before age 20 for females, and just after for males, and increases at older ages for both sexes, especially for the extended kin-only arrangement. The prevalence of extended households is much lower in the 1900s cohort, which experiences the “dying out” of mixed extended households and the decline in extended kin co-residence at older ages. The 1940s cohort shows the lowest prevalence of extended households, mainly concentrated at younger ages in sharp contrast to the trends observed for the 1860s cohort. Still, the peak in extended living arrangements around age 20 (when both parents and children are likely to be alive) is consistent across all three cohorts. The 1860s cohort is characterized by low levels of solo living, mainly concentrated at advanced ages, and similar for females and males. In the 1900s cohort, we observe a large shift from living in extended households to living alone at older ages, but only among females. As noted above, this is due to the combination of two factors: first, the residential emancipation of children, shown by the sharp decline in the “couple with children” category for females and males in their 40s and 50s in this cohort; second, the earlier death of male partners, as shown by the gradual shift from living as a couple to living alone from age 50 onwards for females only. The levels of widowhood for the 1900s female cohort are very high, in line with the historical circumstances this

generation lived through, especially World War II. The 1940s cohort is comparable to the 1900s cohort, but levels of living alone among females are lower in favor of living as a couple, in line with greater male survival in this generation. In the 1940s generation, for both males and females, living as a couple emerges as a predominant form of living arrangement, first before children are born (early to mid-20s) and then after they move out (from age 45 onwards). Based on our period life expectancy results, it is likely that the trends will look very different in subsequent cohorts (e.g., born in the 1980s), due to delayed union formation and fertility. However, of course, we cannot provide a complete life-course picture for the younger cohorts in our data.

## **Discussion**

In this paper we have provided a broad overview of living arrangements in the US for the longest period of time for which population data is currently available, from 1850 until 2021. To historical investigations of living arrangements at the household level, our analysis adds an individual perspective that allows to incorporate age-specific mortality rates, thus better accounting for population mortality and age structure. To historical demographic accounts of individual living arrangements for specific population groups, this study adds a novel outlook across the entire age distribution, by period and cohort. We can summarize our results into three distinct systems of living arrangements. What we call a “large household” system prevails between 1850 and 1940. It is characterized by relative stability in the number of life-years spent in extended households in the population, and a slow and steady increase in living with primary kin only, which incorporates the majority of the substantial gains in life expectancy. We reiterate that gains are largely the result of reduced infant and child mortality, and the living arrangements of adults remain relatively stable, with much of adult life spent living with children, parents, partners, and others. Among the non-primary co-residents, the “large household” era sees the progressive decline of mixed kin- and non-kin households, with an increase in extended families. Among the primary co-residents, this period sees the

emergence of couple-only households, which are relatively rare in 1850 and quite common in 1940, as well as the steady rise of two-parent households.

An intensified rise in two-parent households ushers in a second era of “primary kin household” dominance, between 1940 and 1980, when all age groups experience an increase in life-years spent living only with parents, partners, and children. This is the era during which much of the US benefits system, including pensions, is established. This carries an implicit assumption of a two-parent, male-breadwinner family model, which is the predominant but by no means the only arrangement during this period. In fact, extended households decline but living alone emerges, mainly as a consequence of the ageing of women formerly living in primary-kin households. Couple-only households also rise significantly as a result of the more common residential emancipation of adult children.

These transformations bring about a third, “diversified” phase (1980–onwards), which for the first time sees the decline in two-parent households in favor of a more diverse range of arrangements, including living alone among young adults, and living in extended kin-only households among young adults and children. These changes reflect societal and compositional trends in the US population including increased union dissolution, the changing racial/ethnic composition, and the rising importance of inter-generational ties for economic and non-economic support (5; 19).

An account of the role of macro-economic, compositional, social, and cultural changes over the period considered is beyond the scope of this study. However, we hope to encourage further work in examining, for example, the extent to which the above trends correspond to migration flows or changes in the racial and ethnic composition of the population; and the role of educational expansion, union dissolution, and female labor force participation. Our results also invite for sociological theories around living arrangements to consider the role of population age structure and mortality, and highlight the importance of taking into account the entire population simultaneously.

## **Materials and Methods**

The data for the analyses come from harmonized microdata samples of the US census between 1850 and 2021, with the exception of the 1890 census, which was lost to fire. The harmonized data are freely available to registered users from the Integrated Public Use Microdata Series (IPUMS) USA (<https://usa.ipums.org/usa/>). To the basic census information, IPUMS have added variables about individuals' identification within the household, that are key for classifying individual living arrangements. These variables are the unique identifier for the mother, father, partner and children of the reference person, so long as they live in the same household unit. With this information, we are able to identify whether or not each individual lives with their own mother, father, partner, and children. People in the household who share the same mother and/or father are classified as siblings: as a limitation, only siblings with a co-resident mother and/or father can be identified as such. By elimination, it is then possible to identify whether the individual lives with anyone else. Among other co-residents, it is possible to distinguish between non-primary relatives of at least one member of the household, and those who have no kin relationship to any member of the household. We only focus on the samples of individuals living in private households, excluding those living in institutions. In line with census definitions, we group the population by age and sex (female or male). From the microdata we obtain the proportions of people living in each of the categories and sub-categories of living arrangements detailed above, by age and sex.

Life expectancy at birth ( $e_0^t$ ) is a summary measure of age-specific mortality rates in year  $t$  for a given population. At the population level, total years of life are distributed across the three broad categories (and seven sub-categories) of living arrangements ( $i = 1, 2, \dots, 7$ ). Life expectancy at birth in a given living arrangement  $i$  in year  $t$  ( $e_{0i}^t$ ) is defined as the number of years a fictitious cohort of people would expect to spend in living arrangement  $i$ , if they experienced the same age-specific mortality rates and the same age-specific probabilities of being in  $i$  as those prevailing in the population in year  $t$ . While not representative of any real cohort of people, this is a useful summary measure for understanding simultaneous change in mortality and prevalence of living arrangements over time. To calculate our indicator  $e_{0i}^t$ , we require life tables, which contain age-specific mortality rates for the entire population by sex. We use the life

tables for each US census year between 1940 and 2021 provided by the Human Mortality Database (<https://www.mortality.org/>). For the census years between 1910 and 1930, we use the life tables produced by the Centers for Disease Control and Prevention (CDC) (24) and for 1850 to 1900 we use Haines' estimated historical life tables (25).

We apply the Sullivan method (26) to calculate life-years spent in each living arrangement by year in the population, and the corresponding life expectancy indicator  $e_{0i}^t$ . We multiply the age- and sex-specific proportions in each living arrangement by the life years lived in that age and sex group in the same year. For example, if the female life table for year  $t$  indicates that there were 100,000 person-years lived among females between age 30 and (just below) age 35, and the IPUMS data indicates that 4% of females in that age group lived alone during that year, we estimate 4,000 person-years spent living alone in that age group.  $e_{0i}^t$  is then the cumulative sum of all life years in that living arrangement across age groups, divided by the total population alive at the start of the life table for year  $t$ . To understand the relative contribution of different age groups to changes in  $e_{0i}^t$  over time, we use an age decomposition described in the Supporting Information document.

Our analysis refers to the non-institutionalized population as a whole. It is in principle possible to disaggregate the results by racial and ethnic group, or by educational attainment, among other factors. Unfortunately, in doing so we would lose the long temporal dimension, as disaggregated mortality data are unavailable or highly imprecise for earlier census years. Similarly, life tables for migrants are unavailable, so the oversimplifying assumption here is that migrants to the US have historically had the same mortality profile as natives. Anyhow, since the aim of the article is to provide an overall account of life years lived in different arrangements for the US population over time, such disaggregations are beyond the scope of our study.

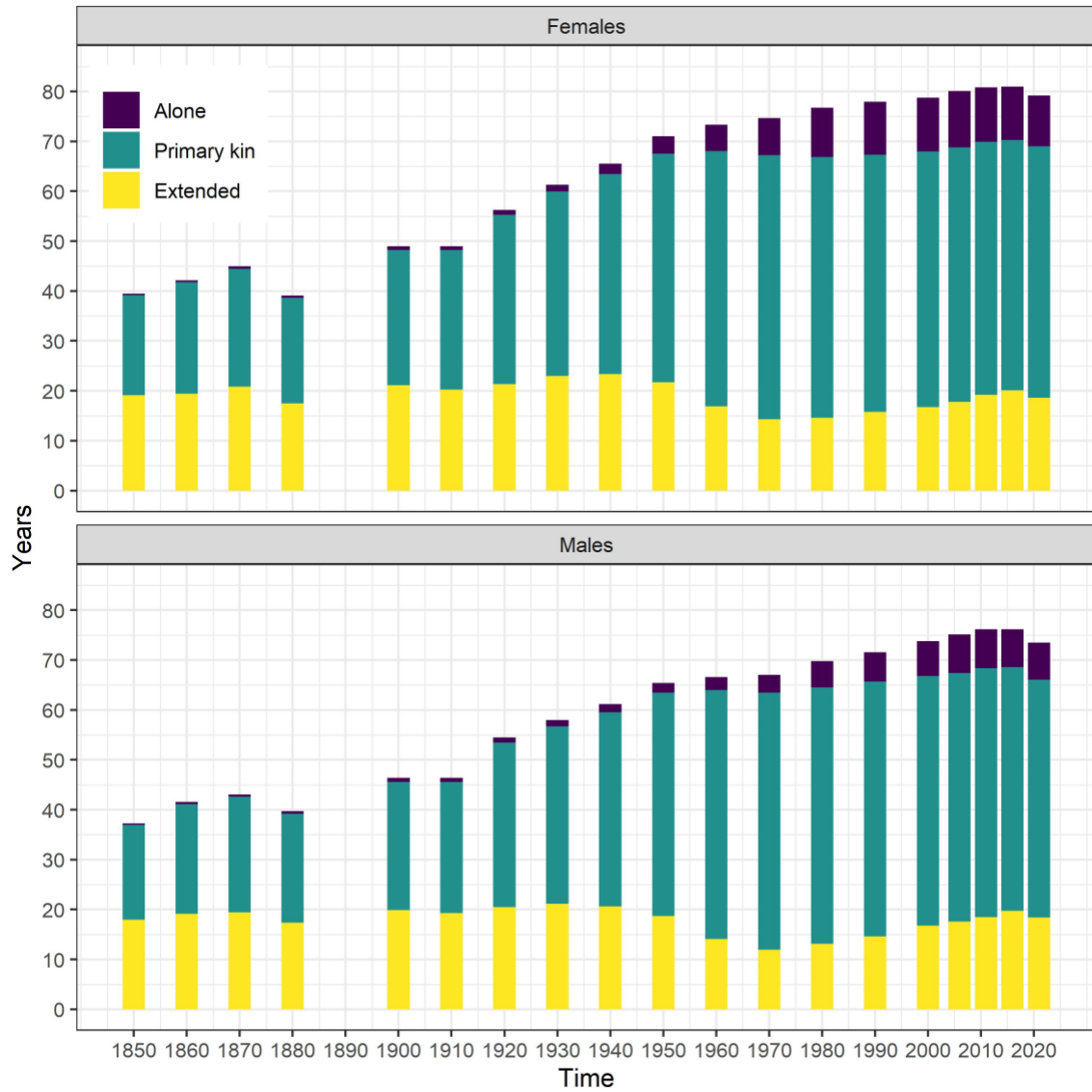
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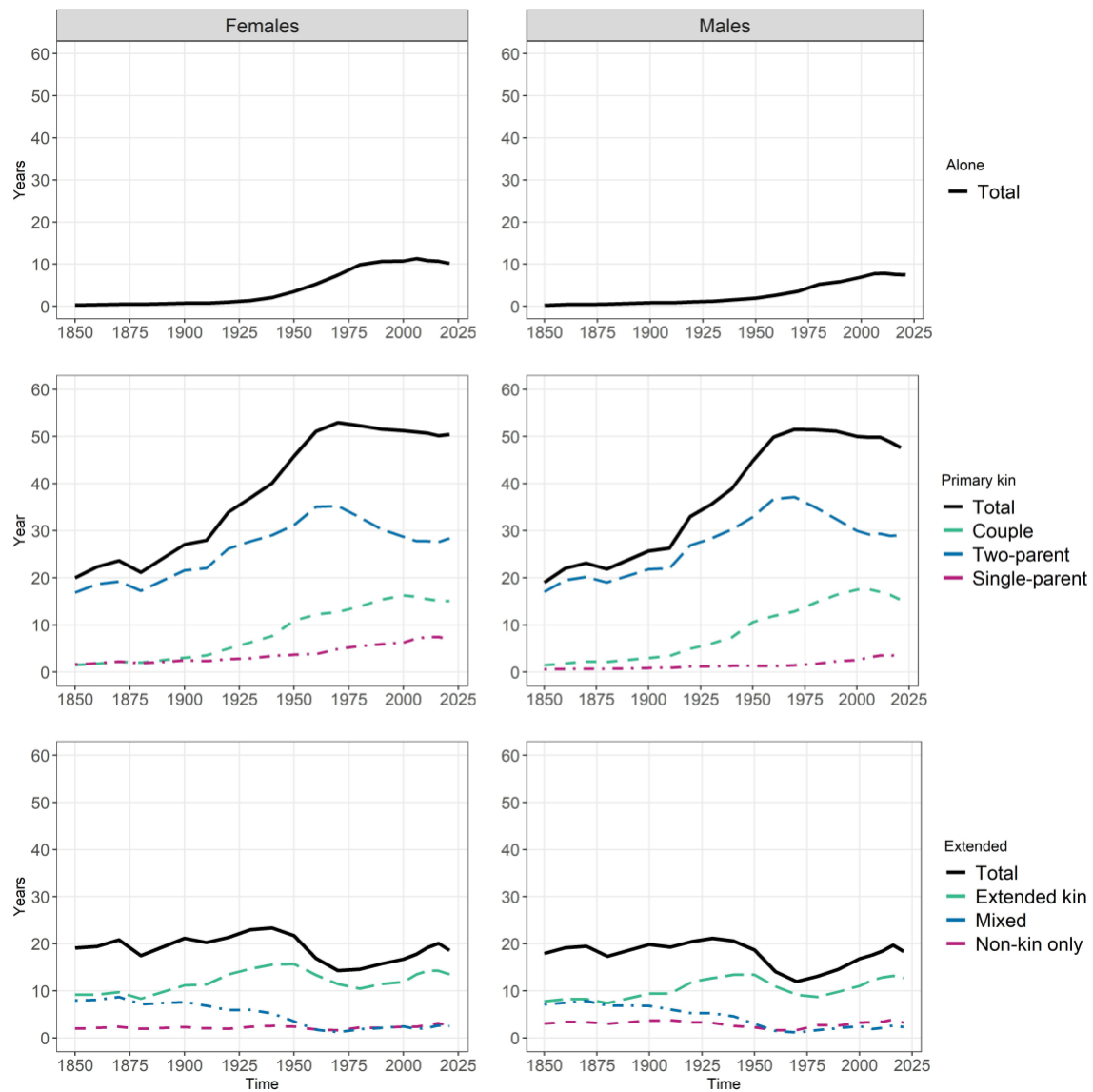
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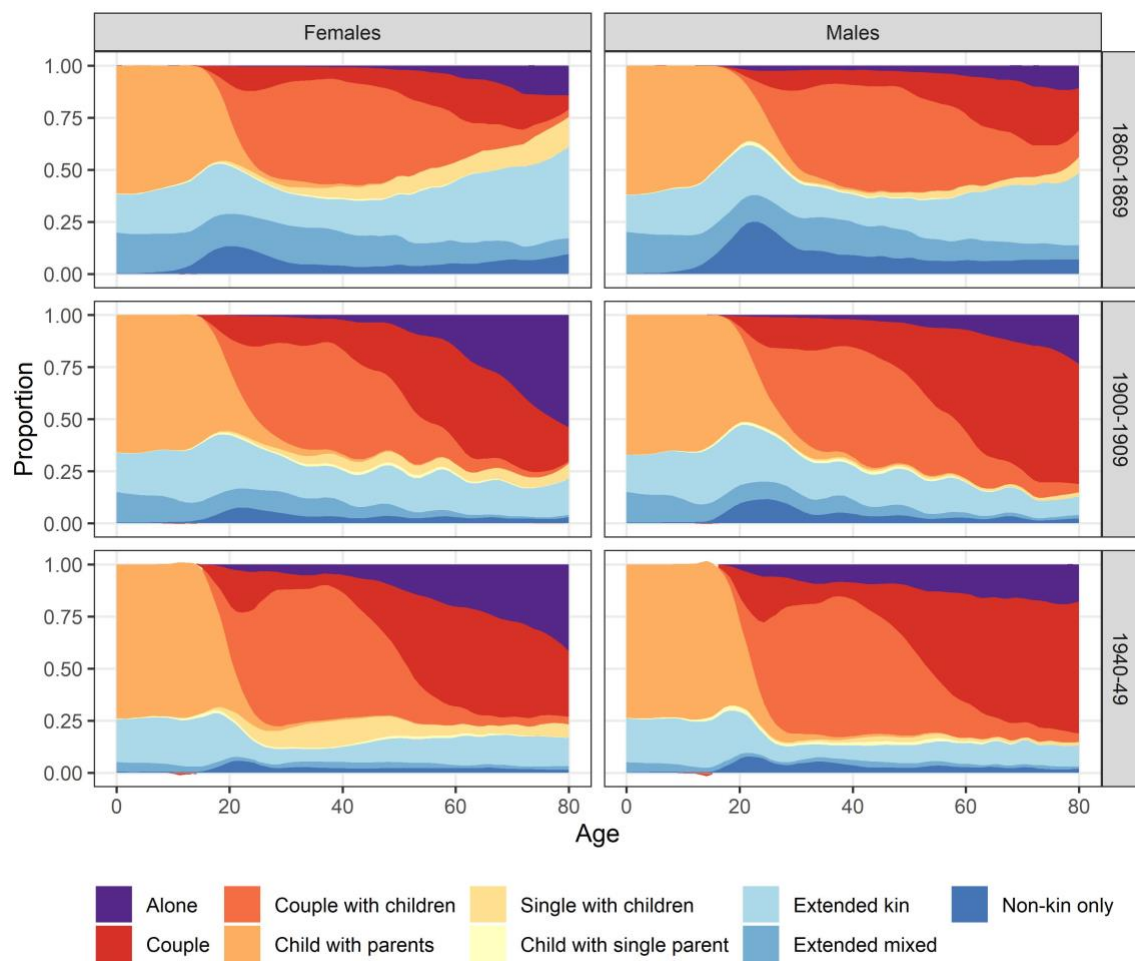
## Figures and Tables



**Figure 1.** Female and male life expectancy at birth by broad living arrangement, 1850–2021.



**Figure 2.** Female and male life expectancy at birth living alone (top), with primary kin only (middle), and in extended households (bottom), with detailed sub-categories, 1850–2021.



**Figure 3.** Percentage of female and male individuals in each living arrangement by age for three birth cohorts: 1860s, 1900s, and 1940.

## Supporting Information

**Age decomposition approach.** Life expectancy at birth (age 0) in year  $t$  is defined as  $e_0^t$ . To understand the relative contribution of different age groups to changes in life expectancy at birth in a given living arrangement  $i$  ( $e_{0i}^t$ ) over time, we use a simple age decomposition based on Arriaga's method (1). We divide the entire period (1850–2021) into eight 20-year intervals, from 1860–1880 to 2000–2021. We also split the population into eight 10-year age groups, from 0–9 to 70+. For each 20-year interval, we calculate the change in total life expectancy as  $e_0^{t=2} - e_0^{t=1}$ , and do the same for the change in life expectancy in each living arrangement  $e_{0i}$ . We then decompose such changes into the contribution of each 10-year age group. The Arriaga decomposition formulates the differences in life expectancy by living arrangement between two periods as the sum of direct and indirect effects of changes in mortality and living arrangements in each age group. The direct effect is due to changes in life-years spent in living arrangement  $i$  within a particular age interval as both mortality and the proportion of people in  $i$  change; the indirect effect is due to changes in the number of survivors in living arrangement  $i$  at the end of the age interval (1).

**Table S1.** Age decomposition for the contribution of each age group to changes in female life expectancy at birth, total and by broad living arrangement.

	Female population							
	1860- 1880	1880- 1900	1900- 1920	1920- 1940	1940- 1960	1960- 1980	1980- 2000	2000- 2021
<b>Total</b>	<b>-3.04</b>	<b>9.84</b>	<b>7.31</b>	<b>9.28</b>	<b>7.75</b>	<b>3.45</b>	<b>2.01</b>	<b>0.43</b>
0-9	-2.53	7.75	5.51	3.72	2.32	1.07	0.50	0.14
10-19	-0.14	0.48	0.32	0.86	0.42	0.03	0.06	0.02
20-29	-0.17	0.58	0.29	1.57	0.70	0.07	0.08	-0.14
30-39	-0.12	0.45	0.29	1.23	0.71	0.20	0.05	-0.25
40-49	-0.07	0.30	0.34	0.63	0.72	0.29	0.16	-0.23
50-59	-0.03	0.19	0.30	0.48	0.85	0.36	0.31	-0.21
60-69	0.00	0.07	0.17	0.42	0.90	0.59	0.28	0.04
70+	0.02	0.03	0.08	0.37	1.13	0.84	0.56	1.06
<b>Alone</b>	<b>0.10</b>	<b>0.26</b>	<b>0.26</b>	<b>1.08</b>	<b>3.22</b>	<b>4.47</b>	<b>0.84</b>	<b>-0.71</b>
0-9	-0.03	0.12	0.10	0.12	0.17	0.14	0.07	0.02
10-19	0.00	0.01	0.01	0.04	0.05	0.03	0.00	-0.01
20-29	0.01	0.02	0.01	0.11	0.15	0.55	0.01	0.14
30-39	0.02	0.02	0.02	0.13	0.12	0.37	0.12	0.08
40-49	0.02	0.01	0.04	0.11	0.27	0.15	0.40	-0.15
50-59	0.01	0.02	0.04	0.14	0.61	0.28	0.41	-0.21
60-69	0.03	0.02	0.04	0.19	0.85	0.79	-0.13	-0.13
70+	0.04	0.04	0.00	0.25	1.01	2.15	-0.04	-0.44
<b>Primary kin</b>	<b>-1.14</b>	<b>5.9</b>	<b>6.85</b>	<b>6.21</b>	<b>11.19</b>	<b>1.11</b>	<b>-1.04</b>	<b>-0.62</b>
0-9	-1.28	4.39	3.72	2.34	2.46	0.33	-0.23	-0.15
10-19	0.02	0.44	0.74	0.64	1.25	-0.30	-0.32	-0.30
20-29	0.00	0.32	0.72	1.21	1.88	-1.07	-0.47	-0.58
30-39	0.03	0.23	0.58	0.89	1.74	-0.12	-0.33	-0.44
40-49	-0.03	0.18	0.37	0.53	1.36	0.42	-0.49	0.03
50-59	0.03	0.18	0.24	0.36	0.97	0.88	-0.41	-0.15
60-69	0.03	0.09	0.28	0.09	0.90	0.74	0.25	-0.06
70+	0.06	0.08	0.20	0.14	0.62	0.24	0.97	1.03
<b>Extended</b>	<b>-2.00</b>	<b>3.68</b>	<b>0.20</b>	<b>1.99</b>	<b>-6.66</b>	<b>-2.13</b>	<b>2.20</b>	<b>1.76</b>
0-9	-1.22	3.23	1.69	1.26	-0.31	0.60	0.66	0.27
10-19	-0.17	0.03	-0.42	0.18	-0.88	0.30	0.39	0.32
20-29	-0.18	0.24	-0.44	0.26	-1.33	0.59	0.55	0.30
30-39	-0.16	0.20	-0.31	0.20	-1.15	-0.06	0.26	0.11
40-49	-0.05	0.11	-0.07	-0.01	-0.91	-0.28	0.25	-0.11
50-59	-0.07	0.00	0.02	-0.03	-0.73	-0.80	0.31	0.14
60-69	-0.06	-0.05	-0.15	0.14	-0.84	-0.94	0.16	0.24
70+	-0.09	-0.08	-0.11	-0.02	-0.50	-1.55	-0.37	0.47

**Table S2.** Age decomposition for the contribution of each age group to changes in male life expectancy at birth, total and by broad living arrangement.

	Male population							
	1860- 1880	1880- 1900	1900- 1920	1920- 1940	1940- 1960	1960- 1980	1980- 2000	2000- 2021
<b>Total</b>	<b>-1.83</b>	<b>6.69</b>	<b>8.10</b>	<b>6.62</b>	<b>5.49</b>	<b>3.16</b>	<b>4.03</b>	<b>-0.28</b>
0-9	-1.28	5.01	5.90	3.92	2.58	1.30	0.62	0.18
10-19	-0.10	0.33	0.19	0.76	0.30	0.02	0.18	0.03
20-29	-0.13	0.44	0.52	0.96	0.45	-0.10	0.32	-0.29
30-39	-0.11	0.37	0.45	0.81	0.57	0.09	0.17	-0.51
40-49	-0.09	0.29	0.42	0.25	0.53	0.35	0.26	-0.31
50-59	-0.07	0.17	0.32	-0.08	0.42	0.57	0.74	-0.32
60-69	-0.04	0.07	0.21	-0.07	0.22	0.61	0.92	-0.04
70+	-0.02	0.01	0.09	0.06	0.41	0.32	0.82	0.97
<b>Alone</b>	<b>0.12</b>	<b>0.32</b>	<b>0.19</b>	<b>0.51</b>	<b>1.06</b>	<b>2.59</b>	<b>1.75</b>	<b>0.48</b>
0-9	-0.02	0.09	0.12	0.10	0.10	0.10	0.06	0.02
10-19	0.01	0.00	0.00	0.02	0.02	0.04	0.00	0.00
20-29	0.03	0.01	-0.05	0.05	0.15	0.80	-0.12	0.07
30-39	0.02	0.03	-0.01	0.04	0.16	0.60	0.26	-0.14
40-49	0.03	0.05	0.01	0.03	0.15	0.37	0.48	-0.19
50-59	0.03	0.04	0.04	0.05	0.14	0.24	0.50	0.09
60-69	0.02	0.05	0.05	0.06	0.14	0.18	0.35	0.36
70+	0.01	0.05	0.03	0.15	0.20	0.27	0.23	0.28
<b>Primary kin</b>	<b>-0.16</b>	<b>3.81</b>	<b>7.35</b>	<b>5.93</b>	<b>11.11</b>	<b>1.37</b>	<b>-1.34</b>	<b>-2.42</b>
0-9	-0.56	2.87	3.97	2.54	2.82	0.56	-0.27	-0.02
10-19	0.04	0.34	0.70	0.63	1.10	-0.30	-0.36	-0.24
20-29	0.12	0.26	0.89	1.22	1.60	-1.42	-0.64	-0.29
30-39	0.07	0.14	0.61	1.05	1.60	-0.49	-0.54	-0.67
40-49	0.05	0.07	0.49	0.39	1.30	0.35	-0.49	-0.24
50-59	-0.01	0.09	0.26	0.13	1.01	0.90	0.03	-0.67
60-69	0.06	0.03	0.25	-0.03	0.88	0.98	0.37	-0.65
70+	0.08	0.01	0.19	-0.01	0.80	0.79	0.57	0.36
<b>Extended</b>	<b>-1.80</b>	<b>2.55</b>	<b>0.56</b>	<b>0.18</b>	<b>-6.69</b>	<b>-0.81</b>	<b>3.62</b>	<b>1.65</b>
0-9	-0.70	2.04	1.81	1.27	-0.34	0.64	0.83	0.18
10-19	-0.15	-0.02	-0.51	0.11	-0.82	0.29	0.53	0.27
20-29	-0.28	0.17	-0.32	-0.32	-1.30	0.52	1.08	-0.07
30-39	-0.20	0.20	-0.15	-0.27	-1.19	-0.03	0.45	0.30
40-49	-0.16	0.17	-0.09	-0.17	-0.92	-0.37	0.28	0.12
50-59	-0.09	0.05	0.03	-0.26	-0.73	-0.56	0.21	0.26
60-69	-0.13	-0.02	-0.09	-0.10	-0.80	-0.55	0.20	0.25
70+	-0.10	-0.04	-0.13	-0.07	-0.59	-0.75	0.03	0.33

## SI References

1. E.E. Arriaga, Measuring and explaining the change in life expectancies 1984.  
*Demography* 21, 83–96 (1984).