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A global perspective on household size and composition, 1970–2020

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Abstract

Households are core units of social organization and reproduction, yet, compared to other areas of demographic research, we have limited understanding of their basic characteristics across countries. Using data from 793 time points and 156 countries in the new CORESIDENCE database, this article provides a comprehensive analysis of global household size and composition trends. The findings reveal that despite significant international variations in household size, ranging from 1.8 in Denmark to 8.4 in Senegal, there is a widespread decline in household size. On average, households have decreased by approximately 0.5 persons per decade. Children contribute to over three-quarters of the observed variability and decline in household size in recent decades. In contrast, the number of other relatives in households has remained relatively stable or has only moderately decreased. While households are becoming more similar in size, their composition is not converging globally to the same extent. These dynamics have macro and micro-level implications for families, societies, and the economy. Further investigation is required to understand the underlying factors driving these transformations and their consequences.

Introduction

Households constitute the most basic unit of interaction among humans and have profound implications for the social and economic reproduction of their members (Becker, 1998; Esping-Andersen, 2016; Laslett, 1970; Le Play, 1871; Parsons, 1949). They are widely used as units of enumeration for data collection purposes and have significant implications for research on poverty, living conditions, family structure, or gender dynamics (Deaton, 1997; England & Farkas, 2017; Lanjouw & Ravallion, 1995). At the micro-level, studying households provides insight into the processes that shape societies, including decision-making, resource allocation, consumption, and socialization (Agarwal, 1997; Becker, 1998; Browning et al., 1994). At the macro-level, household change is often linked to broader social and economic processes such as urbanization, housing dynamics, aging, or family change (Buzar et al., 2005; Clark & Dieleman, 2017; Lesthaeghe, 2020; Mulder, 2006; Myers, 1990). Despite their importance, comparative research on households at a global level is relatively scarce. Most existing studies tend to focus on single countries/regions or age groups and rarely combine multiple data sources (Asis

et al., 1995; Bongaarts, 2001; Bongaarts & Zimmer, 2002; Burch, 1967; Dommaraju & Tan, 2014; Esteve et al., 2012a, 2012b; Salcedo et al., 2012; Thomson, 2014; van de Walle, 2016; Vos, 1990). While these studies provide valuable insights into the living arrangements existing in individual societies, they do not normally lead to a comprehensive understanding of variations in household size and composition on a more general scale. To address this knowledge gap, this study aims to answer the following question: How does the size and composition of households vary among countries and regions and how has it evolved in the relatively recent past?

We make use of diverse data sources derived primarily from population censuses and household surveys to comprehensively examine patterns of change for 156 countries and 792 data samples spanning from 1960 to 2021. These countries represent a broad range of demographic, social, and economic conditions and have undergone profound transformations in recent decades, including fertility decline, increases in life expectancy, educational expansion, and rises in per capita income. Modernization and demographic transition theories have relied on these transformations to predict a process of increasing individualization and rapid aging of societies which, according to these theories, will ultimately have an impact on the size and composition of households (Cherlin, 2012; Furstenberg, 2019; Goode, 1963; Lesthaeghe, 1989; Ruggles, 1994).

In this article, households are the units of analysis. We recognize that household-level analysis does not control for individual characteristics (e.g., age, sex, education, marital status). Nonetheless, households are important in demographic research because they provide insights into links between living arrangements and population structure. Household changes reflect demographic trends, such as declining fertility and the weakening of marriage, structural dynamics, such as urbanization, and socio-cultural dynamics as shown in the rich literature on households developed in the twentieth century (Goode, 1963; Laslett & Wall, 1972; Todd, 1985). We aim to add a global comparative perspective that provides an overview of past and present changes in household size and composition that is currently missing from the literature.

Background

Households have attracted the attention of several social science disciplines, including sociology, economics, anthropology, and demography. Sociological perspectives have primarily focused on gender roles, socialization, and family structure (Bales & Parsons, 2013; Forste & Fox, 2012; Goode, 1963), while economic views have examined household consumption and resource allocation (Becker, 1998; Browning et al., 2014; Mason, 1988). Anthropological perspectives have centered on kinship and different cultural dimensions (Goody, 1976; Murdock, 1967). Demographers have primarily investigated household size and composition and their determinants (Bongaarts, 2001; Ruggles & Brower, 2003). This current study, rooted in the demography of households, will have implications for an array of social science disciplines.

Examples of such implications extend into social, economic, and ecological dimensions and are often complex. Increases in one-person and two-person households, relative to larger ones, change demand patterns in the housing market and household characteristics (Mulder, 2006) and their impact on housing markets can have ecological consequences linked to the provision of resources and infrastructure (O'Neill & Chen,

2002; Zagheni, 2011). Gender roles, division of labor, and norms associated with living arrangements evolve as household characteristics change (Bianchi et al., 2000; de Laat & Sevilla-Sanz, 2011; Pessin, 2018; Sevilla-Sanz et al., 2010). Smaller households might have positive social effects as fewer members can reduce complexity, vulnerability to conflict, and domestic violence. However, one-person households, especially at older ages, and living arrangements of single parents might be linked to feelings of loneliness, social exclusion, and economic deprivation (Holt-Lunstad et al., 2015; Nieuwenhuis & Maldonado, 2018). Fewer children in the household might reduce care obligations and changes in intra-household roles, which can impact female labor market participation and gender relations. Yet, changes in the transition to adulthood observed across different country contexts might increase the time spent in intra-generational households (Billari et al., 2001; Esteve & Reher, 2021; Furstenberg, 2010). We are not directly examining the implications of household change in this article, but we are highlighting them, to emphasize the relevance of the household-level perspective.

Household size

Household size refers to the number of individuals living together in a household during the process of census or survey data collection. Defining what constitutes a household and who qualifies as a member, presents challenges when comparing across countries. The United Nations (UN) defines a household as "a small group of persons who share the same living accommodation, who pool some or all of their income and wealth, and who consume certain types of goods and services collectively, mainly housing and food" (United Nations, 1993), but specific practices can vary significantly across countries (Bongaarts, 2001). Household membership can be defined by *de jure* or *de facto* enumeration. The *de jure* criteria includes persons who normally live in the household, while the *de facto* criteria refer to those who spend the census night in the dwelling. In societies where there is a significant number of temporary displacements and absences, this distinction may have significant effects. Generally, however, existing evidence shows that differences between the two criteria with respect to their impact on average household size tend to be negligible at the aggregate level, even in Sub-Saharan Africa, which historically exhibits the most complex structure of household organization (Lesthaeghe, 1989; van de Walle, 2016).

The size of a household is mainly determined by the number of children and the type of coresident family group (Glick, 1976). In societies with high fertility rates, households tend to be larger than in those with low fertility rates and declines in fertility rates invariably lead to declines in household size. The coresident group is mainly determined by two factors: the number of adult members in the household and the nature of their kin or non-kin relationships. Most commonly, these relationships involve a certain degree of kinship. Family-based households can be broadly categorized into two main types: nuclear and extended (Laslett & Wall, 1972). A nuclear family household comprises a couple and their children, or any combination of them, whereas an extended household involves kin such as grandparents, aunts, or uncles, and others. In societies where nuclear arrangements predominate, the average household size tends to be lower than in societies where extended households are more frequent (assuming similar levels of fertility and mortality). Among non-family households, we can distinguish two types.

The first type is single-person households. The second type is multi-person households whose members are not related by any degree of kinship (Ruggles, 1988).

As an indicator for household size, we take the number of persons living in any given household. It is important to note, however, that different distributions of small and large households can produce similar average household sizes. In this study, we will examine trends in both average household size and in the distribution of households by size. Average household size provides the link between the total population and the total number of households (Mulder, 2006; Myers, 1990). These dynamics have both macro and micro implications. At the macro level, variations in household size have direct implications for the housing market and the economy in general (Bloom et al., 2003; Espenshade et al., 1983; Malmberg, 2012). When people live in small households, family members tend to be spread over different units. This has consequences for the share of private transfers that take place within or between households (Hammer & Prskawetz, 2022; Lee & Mason, 2011; Vargha et al., 2017). At the micro level, household size shapes interfamily relationships and, thus, the process of socialization. The size of a household can shape power dynamics within households and their distribution along gender and intergenerational axes.

Household composition

Household composition refers to the internal structure of households. In this study, we explore two interconnected dimensions of household composition: age structure and the relationship to the household head or reference person. First, by analyzing age structure, we aim to understand how the presence of children and adults within households varies across societies and how it has evolved. As fertility decreases, life expectancy increases, and populations subsequently age, a decline in households with children and an increase in households with older adults would be expected to reflect these changes. Changes in the presence of children and/or elderly individuals in households have implications for intergenerational support, caregiving patterns, and expenditure dynamics, as households with children and older adults may have different consumption patterns and demand characteristics (Hammer & Prskawetz, 2022; McGarry & Schoeni, 2000; Vargha et al., 2017).

Second, we analyze the type of relationships existing between household members and the person of reference. Censuses and surveys most often define a reference person (also known as head of the household), to whom other members can be related. The relationship to the household head provides valuable insights into the family configurations of households (Bongaarts, 2001; Posel, 2001). The structure of intra-household relationships constitutes an indicator of the strength of family ties in any given society (Reher, 1998). To facilitate cross-national comparisons and maximize the number of countries included in the analysis, we consider four types of relationships to the person of reference: child, spouse/partner, other relative, and non-family. We take the presence of other relatives of the person of reference in the household as indicative of more complex or extended household structures that depart from the strictly nuclear household (Ruggles, 1994).

A central goal of this study is to assess the contribution of children and other relatives to variations in household size across societies and over time. This will allow us to

elucidate the extent to which the distinctive characteristics of household configurations across societies persist during times of on-going reductions in the number of children. Fertility declines will reduce the number of children in society and, therefore, their presence in households, but this may not necessarily modify the type of families commonly found in households. However, if the decline in fertility is embedded within a broader process of social and economic modernization, a progressive simplification and nuclearization of households could also be a part of this very process (Cherlin, 2012; Lesthaeghe, 2010). In other words, fertility decline can potentially be associated with increases in the importance of nuclear households and a decline in the presence of other relatives present in households.

Changes and convergence in household size and composition

Although the global scope of this study prevents a detailed examination of the underlying mechanisms of changes in household size and structure for individual countries, we can identify some of them. Firstly, demographic dynamics shape household size and composition. As fertility declines, families, and often households, become smaller because there are fewer children on average (Bongaarts, 2001; Bongaarts & Zimmer, 2002). In the long-term, fewer children can also imply fewer siblings and smaller family networks (Murphy, 2011; Tomassini & Wolf, 2000), which might reduce the number of vertically extended households. However, fewer children could reduce intra-household resource competition, thus contributing to a delayed transition to adulthood and higher levels of intergenerational coresidence in some contexts (Aparicio-Fenoll & Oppedisano, 2016; De Falco et al., 2023). Increases in longevity and population aging can increase the duration of overlap between generations but also contribute to increases in households with older adults (Jiang & O'Neill, 2007; Zeng et al., 2008). Other demographic determinants of households are changes in union formation dynamics, migration, and changes in health and mortality patterns.

Secondly, economic conditions and material constraints shape households. Wages, employment trajectories, and public transfers further impact household size and composition (Becker, 1998; Espenshade, et al., 1983; Furstenberg, 2019; Ruggles, 2015). Inequality, economic uncertainty, and welfare state dynamics further contribute to changes in households over time and across countries (Cherlin, 2012; Furstenberg, 2019).

Thirdly, socio-cultural factors such as norms and values associated with family, marriage, kinship, and gender are closely associated with household size and composition. Decline in patriarchal family organization and parental control have been far reaching in some world regions, contributing to different relationship types and changes in the timing of life course events, which impact household size and structure (Esteve et al., 2012a, 2012b; Ruggles, 2015; Therborn, 2004, 2006). Value systems and norms may evolve or persist over time, resulting in different household typologies across countries and regions (Therborn, 2004).

In the literature, it has been suggested that the above-described changes will contribute to a global convergence of household size and composition (Goode, 1963). Embedded in the larger framework of development theory, this idea of convergence has always been present in demography, initially linked primarily to the core aspects of mortality and fertility, and later extended to partnership dynamics (Cherlin, 2012; Furstenberg,

2019; Pesando & GFC team, 2019). However, theories of demographic change have paid little attention to convergence in household size and structure. To find theoretical references that contribute to this topic, we must turn to sociology, primarily drawing from the work of William Goode, who in the 1960s aimed to adapt the economic modernization theory to a systematic study of the family across different world regions (Goode, 1963). He predicted that societies undergoing the industrialization processes would witness an increase in conjugal families and a decline in extended households due to a reduction in the economic dependence on the family as a unit of social organization and reproduction. Goode's influential research on household and family change has emphasized the adaptive nature of families and households to the needs of society (Cherlin, 2012; Goode, 1963). Nonetheless, Goode failed to adequately predict further changes in society that would weaken conjugal life and present alternatives to the nuclear family model (Cherlin, 2012; Furstenberg, 2019), and his postulates could neither be empirically verified at a global scale nor countered by a theory of the same scope (Cherlin, 2012; Pesando, 2019).

Since Goode's seminal work, only Göran Therborn's, 2004 book, "Between Sex and Power: Family in the World, 1900–2000," set out to offer a similarly comprehensive global analysis of shifts in family patterns (Therborn, 2004). Therborn, while endorsing the notion of worldwide transformations in family systems, diverged from Goode's convergence hypothesis (Cherlin, 2012). Instead, Therborn directed his attention to what he perceived as a growing complexity and heterogeneity within global family systems across three analytical dimensions: (1) shifts in the roles and authority of fathers and husbands; (2) changes in marriage, cohabitation, and non-marital relationships; and (3) population policies (Therborn, 2004). He proposed that, rather than converging, family systems on a global scale would continue to evolve and diverge. This implies that various regions across the world would witness the emergence of distinct family patterns, notwithstanding shared underlying social dynamics such as declining fertility rates or alterations in union formation and types (Cherlin, 2012; Pesando, 2019; Pesando & GFC team, 2019; Therborn, 2004, 2006).

The debates around convergence of household composition initially centered on the structural and cultural forces promoting or hindering the nuclearization progress (Goode, 1963; Therborn, 2004). Limited theoretical consideration was given to the role of demographic change (Ruggles, 1987). Demographic shifts, particularly in fertility (Burch, 1967; Dorius, 2008), shape households, reducing their size not only through fewer children but also indirectly by thinning kinship networks. However, questions arise regarding whether the presence of other relatives in households will change and how household composition will evolve over time.

Data

The data used in this study is taken from the CORESIDENCE database (Galeano et al., forthcoming manuscript), which provides household-level indicators at the national and subnational levels for 156 countries, comprising 793 data points over time. The CORESIDENCE database combines data from various sources, including population censuses obtained via the Integrated Public Use of Microdata Series-international (IPUMS-i) (Minnesota Population Center, 2020), Demographic Health Surveys (DHS),

Multiple Indicator Cluster Surveys (MICS), European Labor Force Surveys (EU-LFS), and other miscellaneous sources. All data used in this study are openly available in the CORESIDENCE database (https://zenodo.org/record/8142652). The CORESIDENCE database offers several advantages to the UN Database on Household Size and Composition (United Nations, 2022). The former includes a more detailed number of indicators, has a higher temporal coverage, and draws from data sources beyond MICS. Additionally, data in the CORESIDENCE database are available on the sub-national level. The CORESIDENCE database is an open-source project, and the code for the harmonization processes are available for open access, which increases transparency and allows for reproducibility of all results.

The available indicators in the database are grouped into four main categories: size, age composition, kinship structure, and household headship. Each category includes multiple indicators. In this study we focus on the average household size, the proportion of single-person households, the proportion of households with 5 people or more, the proportion of households with children aged 0 to 4, the proportion of household with people aged 65 or more, the average number of children (offspring) of the reference person, and the average number of other relatives present in the household, irrespective of age, and the average number of members by age. We use country-level data to produce a global comparison that emphasizes trends and changes over time and across countries. Adding a sub-national perspective would expand the paper beyond its scope in terms of necessary explanations and data presentation.

The data available for each country often come from different sources and in the process of building the indicators from the microdata, the individual weights were provided by the data sources. It is important to highlight that while data and indicators can be harmonized, definitions cannot be harmonized across samples. Thus, harmonization primarily refers to the construction of indicators, such as household size typology indicators and relationships to the head. Underlying definitions for headship across some samples may differ. Additionally, the harmonization process entails harmonizing data on the subnational level, as geographical regions may have changed over time. While there is a high level of consistency among the sources within the same country, we treat each source independently for graphical representations. Therefore, when plotting trends over time, lines will only connect data points taken from the same source.

All analyses and graphical representations in this study are based on the 156 countries and 793 samples described here, with the sole exception of the map in Fig. 1, which shows the average household size of 19 countries and territories for which there are no data available after year 2000 in the CORESIDENCE database. Data for these cases come from the United Nations Database on Household Size and Composition 2022. These are Norway, Japan, Greenland, Iceland, New Zealand, Taiwan, Israel, French Guiana, Sri Lanka, Lebanon, United Arab Emirates, Equatorial Guinea, Central African Republic, Svalbard, Saudi Arabia, Libya, Kuwait, Djibouti, Eritrea, Iraq, and Oman. Data presentation by geographical region serves visualization purposes and is not based on theoretical or analytical claims with respect to these groups. Such clustering would require indicators beyond the household-level ones used for this research. Instead, we emphasize our focus on the country-level analysis and have grouped countries to make the visualization on the global scale possible. However, we note the important work on clustering of
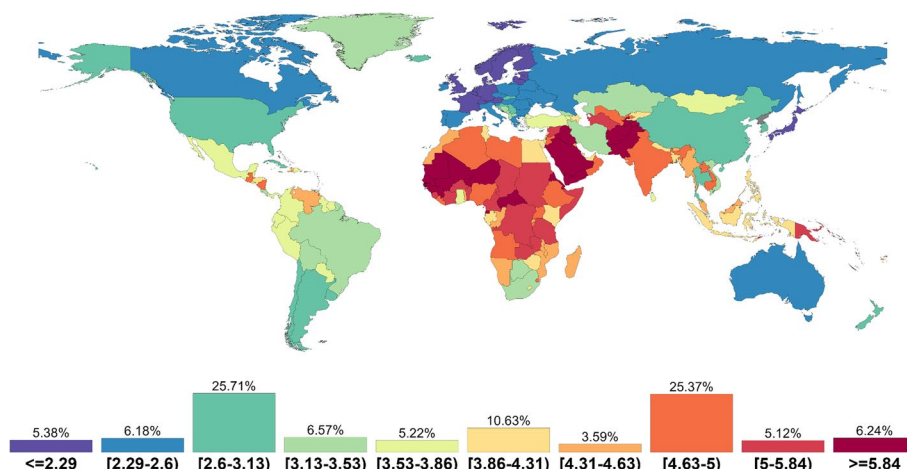
Fig. 1 Average household size by country, most recent year available since 2000. Histogram legend shows the percentage of the world's population in each category. Each category represents 10 percent of the 156 countries represented in the map. Sources: CORESIDENCE database and UN Household database

family systems in the literature (e.g., Castro et al., 2022). For the data analysis and visualization, we treat countries and samples as single points in time. No weighing takes place beyond the weighing of the source data, as the objective is not to analyze living arrangements on the micro-level but to outline differences on the macro-level for countries and continental regions, as is common in cross-national descriptive analysis.

Results

Changes in size

Figure 1 displays a global map illustrating average household size per country, based on the most recent data available since the year 2000. The 163 countries for which data are available are divided into 10 deciles of the distribution of household size. These categories are arranged from the smallest decile (depicted in the blue shade) to the largest decile of household sizes (represented by the red shade) worldwide. The legend incorporates an embedded histogram, providing a visual representation of the proportion of the world's population represented by each category. The average household size ranges from 1.83 individuals per household in Denmark 2021 to 8.42 individuals per household in Senegal 2019. The countries with the smallest households in the world (under 2.3) are located in West and North Europe as well as Japan. Together, these countries account for slightly over 5 percent of the global population. Denmark and Finland, with average household sizes below 2 individuals, have the smallest average household size worldwide.

At the opposite extreme, 37 countries spread across Africa, Asia, and Oceania have average household sizes above 5 individuals. These countries collectively represent over 11 percent of the world's population. The regions with the largest households include West Africa, Central Africa, East Africa, West Asia, South and Central Asia, and Melanesia. The range of household size in these regions is quite broad, spanning from 5 persons per household in Tanzania to 8.42 persons per household in Senegal. Of the top 10 countries with the largest household sizes in the world, 5 are in Africa (Senegal,

The Gambia, Guinea, Guinea-Bissau, and Mauritania) and 5 in Asia (Afghanistan, Oman, Pakistan, Yemen, and Iraq).

80 percent of the countries in the world have households with a size ranging from 2.3 to 5 persons per household. These countries represent 83 percent of the world's population. At the lower end of this range (2.3 to 2.6), we find the majority of European countries along with Canada and Australia. In the next tier (2.6 to 3.13), we have countries such as China, the United States, and countries from the southern part of Latin America (Argentina, Chile, and Uruguay). These countries represent 25 percent of the world's population. With values between 3.13 and 4.63 persons per household, we find a mix of countries spread across all continents. Between 4.63 and 5 persons per household, we find India, the world's most populous country, along with countries in Southeast Asia (e.g., Laos), North Africa (e.g., Algeria), and two countries in Central America (e.g., Nicaragua). Lastly, 6.24 percent of the world's population lives in countries with an average household size above 5.84.

Figure 2 shows time trends of average household size for 156 countries around the world. Labels have been used to denote those countries with longer data series and those exhibiting values deviating significantly from the central trends. Specific data
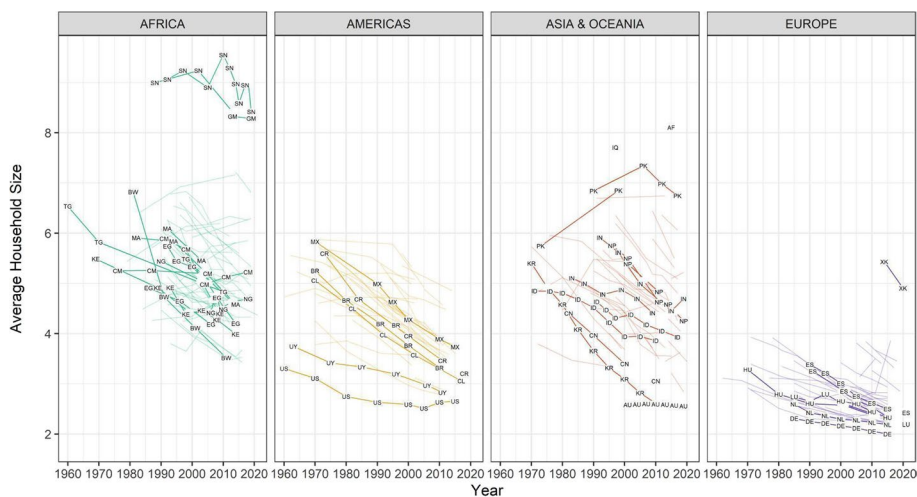

Fig. 2 Country-level trends in average household size. Source: CORESIDENCE database. Two-letter country codes and country names in alphabetical order: AL Albania, AM Armenia, AR Argentina, AT Austria, AU Australia, BA Bosnia and Herzegovina, BD Bangladesh, BE Belgium, BF Burkina Faso, BG Bulgaria, BI Burundi, BJ Benin, BO Bolivia, BR Brazil, BW Botswana, BY Belarus, CD Congo Democratic Republic, CF Central African Republic, CG Congo, CH Switzerland, CI Cote d'Ivoire, CL Chile, CM Cameroon, CN China, CO Colombia, CR Costa Rica, CU Cuba, CYCyprus, CZ Czech Republic, DE Germany, DO Dominican Republic, DZ Algeria, EC Ecuador, EE Estonia, EG Egypt, ES Spain, ET Ethiopia, FJFiji, FR France, GA Gabon, GH Ghana, GM The Gambia, GN Guinea, GR Greece, GT Guatemala, GW Guinea-Bissau, HN Honduras, HR Croatia, HT Haiti, HU Hungary, ID Indonesia, IE Ireland, IL Israel, IN India, IR Iran, IT Italy, JM Jamaica, JO Jordan, KE Kenya, KH Cambodia, KM Comoros, KR South Korea, KY Kyrgyz Republic, KZ Kazakhstan, LA Laos, LC Saint Lucia, LR Liberia, LS Lesotho, LT Lithuania, LU Luxembourg, LV Latvia, MA Morocco, MD Moldova, ME Montenegro, MG Madagascar, MK Macedonia, ML Mali, MM Myanmar, MN Mongolia, MR Mauritania, MU Mauritius, MV Maldives, MW Malawi, MX Mexico, MY Malaysia, MZ Mozambique, NA Namibia, NE Niger, NG Nigeria, NI Nicaragua, NL Netherlands, NP Nepal, PA Panama, PE Peru, PG Papua New Guinea, PH Philippines, PK Pakistan, PL Poland, PR Puerto Rico, PS Palestine, PT Portugal, PY Paraguay, RO Romania, RS Serbia, RU Russia, RW Rwanda, SI Slovenia, SK Slovakia, SL Sierra Leone, SN Senegal, SV El Salvador, TD Chad, TG Togo, TH Thailand, TJ Tajikistan, TL Timor-Leste, TM Turkmenistan, TR Turkey, TT Trinidad and Tobago, TZ Tanzania, UA Ukraine, UG Uganda, UK United Kingdom, US United States, UY Uruguay, UZ Uzbekistan, VE Venezuela, VN Vietnam, XK Kosovo, YE Yemen, ZA South Africa, ZM Zambia, ZW Zimbabwe

points represent different observations, totaling 792 entries derived from surveys and censuses. Trend lines connect observations from the same country, as well as from the same source. Household size shows a generalized decline over time in most countries. In absolute terms, this decline is most pronounced in countries with the largest households. In most countries, household size diminishes monotonically over time. African countries exhibit the greatest disparities in this regard. The diversity of data sources used for African countries in this study may explain a part of this pattern. When census data alone are available, as in the case of Latin America, trends over time are more consistent. As countries approach an average of two individuals per household, the rate of decline slows.

Figure 3 provides a summary of the observed trends. It shows the variation over time in the average household size by country, considering the time elapsed between the most recent observation since the year 2000 and the earliest available observation, always comparing observations from the same source. Countries are identified by their labels. We have added trend lines for major regions to facilitate the analysis. The color indicates the continent of origin. Out of the 128 represented countries, the average household size has decreased in 113 of them. Generally, the longer the observation period, the greater the decline.

In the Americas, we observe an average decrease of approximately one person per household every two decades. As an exception, Haiti maintains a relatively stable average household size around 4.7, while the United States experienced a decline of around half a person over four decades between 1960 and 2015. Across Europe, a widespread decline in household size is evident, occurring at an average rate of one person per household every five decades. Ireland stands out as an exception, exhibiting relative stability around 2.8 persons per household over a period of 45 years.
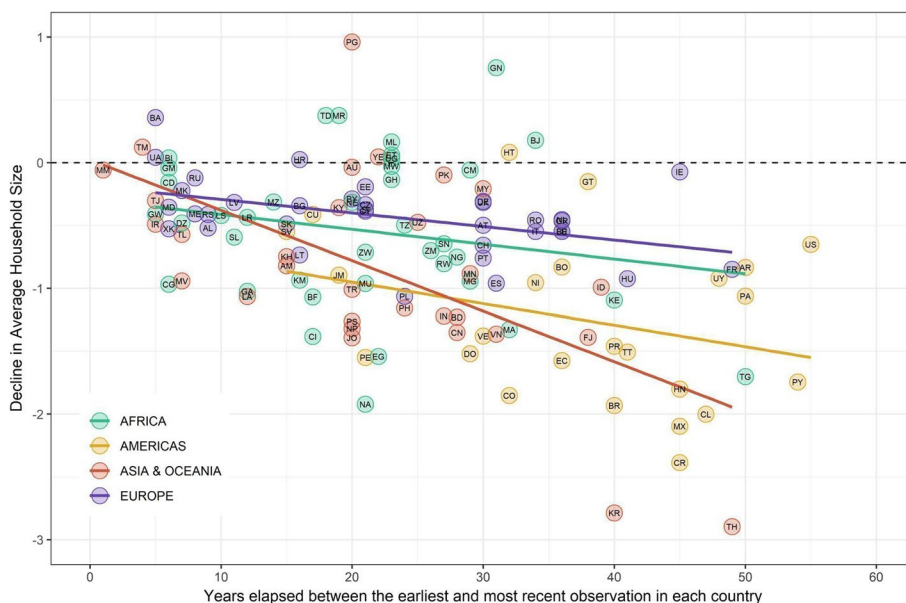

Fig. 3 Variation in average household size by country over time. Time measured in years elapsed between the most recent observation since the year 2000 and the earliest observation, always within the same data source. Color indicates continental region. Source: CORESIDENCE database

In Asia and Oceania, household size decline is widespread, with exceptions visible in Pakistan, Papua Guinea, Yemen, and Australia. Notably, South Korean households have experienced a substantial decline of 2.7 persons per household over four decades. Thailand's households have experienced a similar decrease (2.9) over five decades. Africa exhibits the greatest heterogeneity, with several countries experiencing virtually no change in average household size. Countries such as Ethiopia, Guinea, Benin, and Cameroon have maintained a consistent household size for about three decades. Conversely, Botswana has seen a decrease of 3.3 persons per household over three decades. Kenya's average household size has declined by 1.1 persons over 40 years.

The decline in the average household size implies a redistribution of the households by size. In general terms, a decrease in household size should lead to a decline in the importance of the largest households, together with an increase in the importance of smaller households. Changes in the timing of life course events, such as a delayed transition to parenthood and marriage, contribute to a higher number of young individuals living alone. At the same time, population aging contributes to a higher proportion of older adults in the population that might live alone. Figure 4 serves to illustrate this point. It represents the share of unipersonal households headed by a person below age 50 (upper panel) and by a person aged 50 or older (lower panel). Combining the values for each country represents the country-level proportion of unipersonal households. In recent decades, in some European countries, but also in South Korea, Australia, and Botswana, single-person households headed by a person below age 50 have increased. This increase is particularly pronounced in Botswana and South Korea. In both, the proportion of single-person households headed by younger adults increased by more than 10 percent between 1980 and 2010. In most countries of Asia and Oceania, and the Americas, the proportion of unipersonal households with relatively younger heads has remained somewhat stable, below 5 percent in the former and below 10 percent in the latter country groups. In Africa and
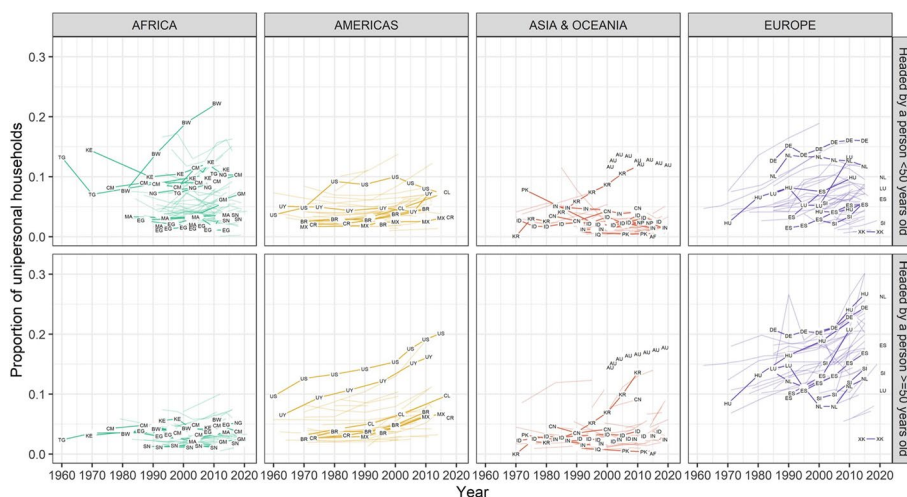

Fig. 4 Country-level trends of the proportion of unipersonal households by age of the household head. Source: CORESIDENCE database

Europe, there is high variability in the proportion of unipersonal households headed by an adult below age 50 across countries, ranging from close to 0 to over 20 percent.

Headship of unipersonal households by adults above or equal to age 50 is increasing in most countries in the Americas and Europe, reaching 20 percent of households in the United States. At the extremes, we find countries like Hungary, Germany, and the Netherlands, where around 25 percent of households are one-person households headed by an adult of at least age 50, with pronounced increases in recent decades. In Africa the proportion of unipersonal households with a relatively older head remains below 10 percent in all countries. In most countries in Asia and Oceania, with exceptions such as South Korea, Australia, and China, the share of unipersonal households headed by an adult of at least age 50 remains below 10 percent as well, however, recent trends suggest slight increases. Thus, single-person households are extremely rare in Africa and most Asian countries, quite widespread in Europe, and are growing rapidly across Latin America. This points to a considerable heterogeneity in household structures and underscores the need to analyze household composition to understand how and under what conditions declines in household size occur.

Changes in household composition

Figure 5 illustrates cross-national variations in the average number of household members by age. This indicator is calculated by dividing the number of people of each age across all households by the total number of households. The panel on the left provides an overview of the members' contribution by age groups for the most recent sample after 2000. The panel on the right illustrates changes and variability in the contribution of each age group between the earliest and the latest available sample, adjusted for a decade of change. This approach involves dividing the observed change between the earliest and most recent observations by the number of years between the two observations and multiplying it by 10. For visualization purposes, the panels are presented in continental clusters.

For each country and year, the relative contribution of each age group correlates perfectly with the relative weight of that group in the total population. The figure is thus reflective of what we would observe in a traditional population pyramid. Depending on the number of households over which the population is distributed, the absolute level will be different. Two countries with similar population structures but different household size will show different values. In most countries in Africa, Asia, and the Americas, the absolute (and relative) share of each age decreases as we observe higher ages. In these countries, children are the group most present in households, followed by teenagers. At the opposite end, the elderly are the least numerous. European countries are the exception to this pattern as the most frequent age groups in households correspond to the ages 40–49 or 50–59. Cross-national differences within Europe are comparatively smaller than in countries on other continents.

The right panel shows the contribution of each age group to the variation in the average household size. For each country, the sum of the total contributions by age equals the observed change in the average household size. Changes are adjusted to a decade of change during the observed period. The range of the boxplots highlights the difference between countries. The median values reveal the magnitude of the change. Negative
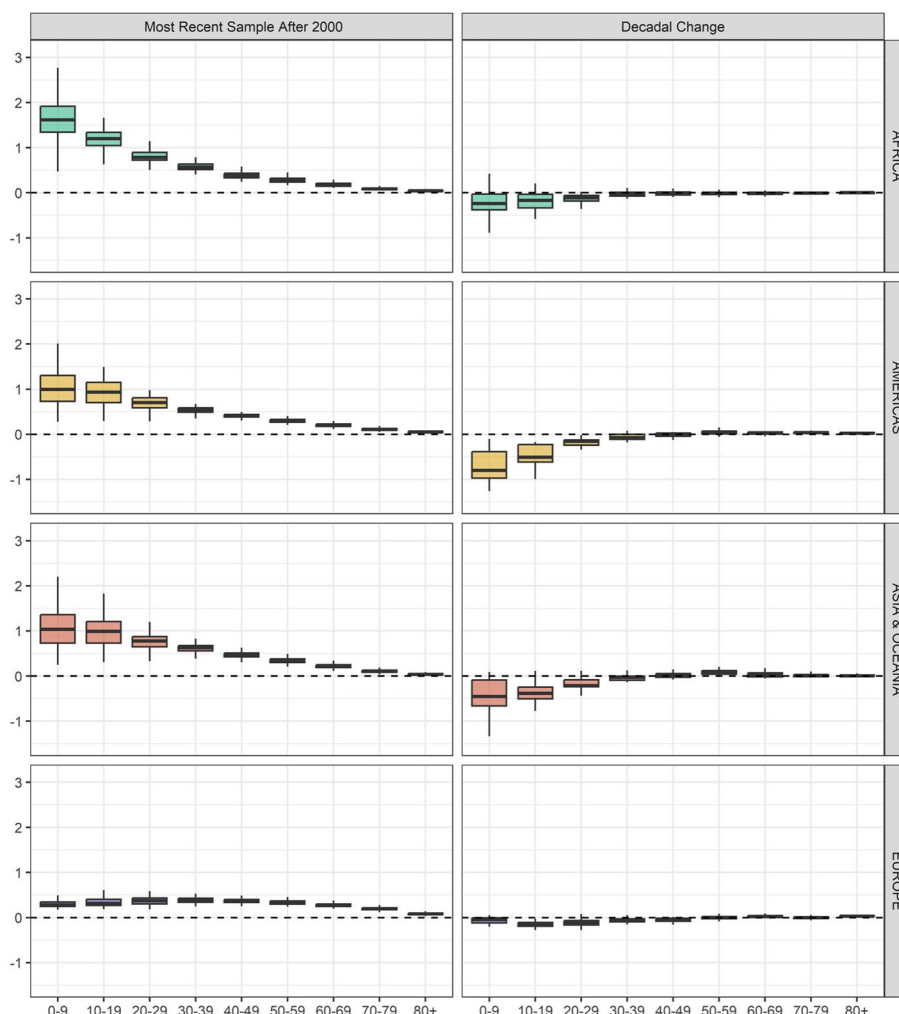
Fig. 5 Cross-national differences in the age-specific contribution to the average household size and change over time. Left panel shows the data for the most recent sample and the right panel the change in the age-specific contribution between the earliest and latest samples, standardized for a decade. Source: CORESIDENCE database

values contribute to the decline in household size and positive values to the increase. Compared to the rest of the world, European countries are fairly homogeneous and experience few variations in the age structure of their households. The contribution of ages between 0 and 49 has decreased, while that of older ages has also increased, albeit modestly. In the rest of the countries, the decline in the contribution of ages between 0 and 29 is more pronounced and not offset by the small increase in older age groups.

The differences across countries and over time outlined here are the reflection of two main factors. Firstly, the share of each group in the total population. Secondly, the degree of concentration or dispersion of individuals across households, summarized by the average household size. A decomposition on a global scale of the different dynamics is not straightforward but we can highlight the need for a further analysis of changes in household size and composition by age to better understand to what extent demographic dynamics and the distribution of the population across households drive the observed

differences over time. In Morocco, Nigeria, and Ethiopia, average household size is similar, with 4.6, 4.7, and 4.8 people, respectively. However, in Ethiopia and Nigeria, children, and teenagers (ages 0–19) account for around 55 percent of household members, compared to 37 percent in Morocco. In the United States and Denmark, young individuals account for a somewhat similar share of the household with 25 percent and 21.3 percent, respectively, despite a difference in average household size of nearly one person. Germany, with an average household size of 2 is placed between the U.S. and Denmark, but young people account for only 18 percent of the household members. The share of older adults in the household (ages 70+) is similar in Denmark (14.8 percent) and Germany (16 percent) but different in the U.S. (9.7 percent). Thus, differences and similarities in the average household size mainly reflect underlying demographic dynamics, such as fertility patterns and the population age structure, yet variation may also arise due to a distinctive social organization of people across households.

Figure 6 provides an alternative perspective on this trend. This figure illustrates trends in the average number of children of the person of reference (all ages) per household
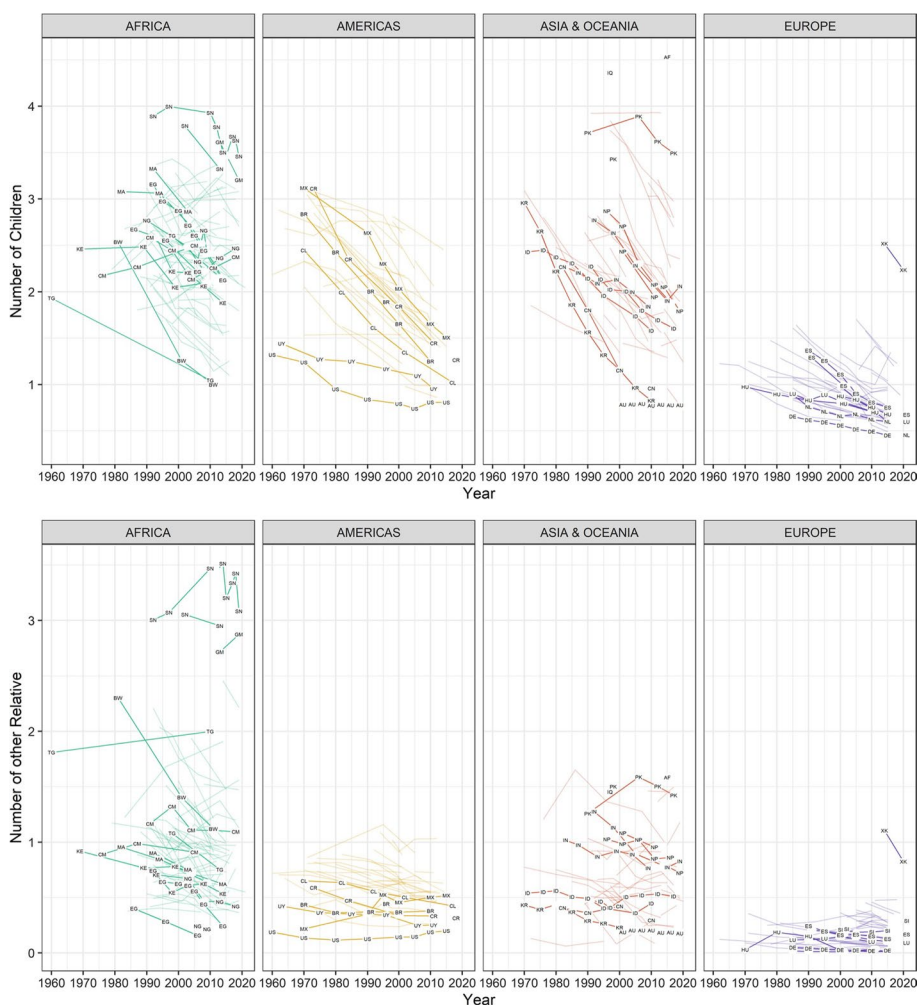

Fig. 6 Country-level trends of the average number of children and other relatives within the household. Source: CORESIDENCE database

(upper panel) and the average number of other non-primary kin (all ages) per household (bottom panel). Both groups are a large part of the total number of coresident kin and constitute important components in changing household size. This figure shows convincingly that the average number of children of the reference person in the household is declining in all countries worldwide, including Africa. The variations in levels are significant and reflect dynamic fertility conditions, mortality rates, and children's patterns of transitions to adulthood. In most European countries, the average number of children per household is less than 1. In Africa, the average number of individuals who are reported as children of the reference person is at least two. It should be noted that the number of children of the head does not have to be perfectly aligned with the total fertility rate of a country due to multigenerational, fragmented, or polygynous households, in which there may be children present that are not of the household head and therefore not included, such as grandchildren. This is particularly relevant across African countries, where child fostering, polygyny, and intergenerational coresidence are relatively more common, compared to other countries.

The bottom panel provides information on the time trends of the average number of other relatives in the household. Generally, other kin are less frequent in households than children. There are, however, large variations across countries both within and across continental regions. The countries with the highest number of other relatives are found in Africa and Asia. Most African and Asian countries have values above 0.5 regarding other relatives per household. In Europe, the United States, Australia, and South Korea, the number of other relatives is comparatively lower than in the rest of the world. There are no significant declines in the numbers of other relatives in the household over time. Thus, as households are shrinking in size, the stability over time in the number of other relatives in the household implies a relative increase in their weight within households.

Figure 7 summarizes the data displayed in Fig. 6 and contributes additional information. We use box plots to summarize the variability in household size using the most recent data since 2000 (left panel) and to illustrate the variability of change in household size between the earliest and latest observation, adjusted to a decade of change (right panel). In both cases, we examine the variability in space and time, considering only the
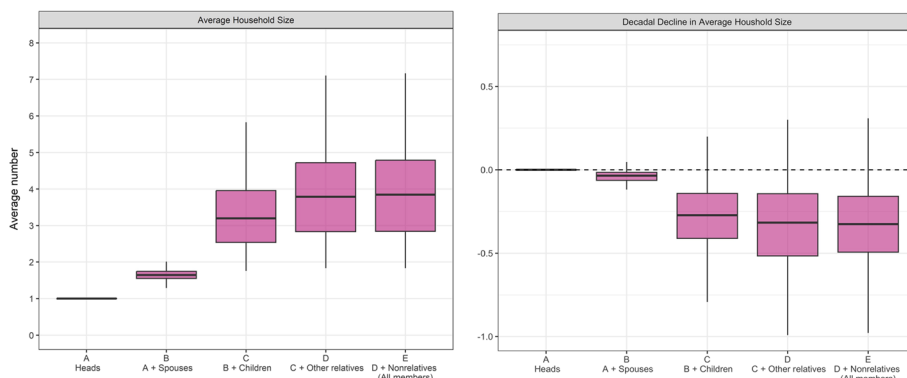

Fig. 7 Cross-national differences in the member-specific contribution to the average household size and change over time. Cross-national variations in average household size based on the most recent data since 2000 (left panel) and decadal change in average household size (right panel), considering different types of members. Source: CORESIDENCE database

household head (A). Furthermore, we explore the variability in size by considering different sets of household members. Each time, we add one type of household member to analyze the impact on the overall variation. We start with the household head (A), and then systematically add members in an incremental manner: first spouses (B), then children (C), followed by other relatives (D), and finally non-relatives (E). This exercise provides insights into the contribution of each type of member to the observed variability.

Initially, in all households, regardless of the country, there is only one reference person. If we add spouses (B), the median increases slightly, however the interquartile range (IQR) would hardly vary. The most significant impact on increasing the median and the variation of the IQR is observed when children are added to the household (C). In this scenario, the median value increases to 3.2 and the IQR increases to 1.5. If we add other relatives (D), the median increases to 3.8, a nearly 20 percent increase compared to the prior scenario. Lastly, adding non-relatives has a negligible effect on the IQR and the median. In summary, children and other relatives account for more than 90 percent of the variation between countries in the average household size, though the importance of children is much greater. The presence of spouses/partners of the reference person has little effect on variation between countries.

The right panel replicates the same structure of the left panel, but it summarizes cross-national variations in change over time in terms of the average household size. This graph addresses the question which type of member has contributed the most to the decline in household size in recent decades. Change over time has been standardized to account for a decade of change. This approach involves the same steps as those for the standardization used in Fig. 5. By applying this method, we ensure that the observed changes in household size across different decades are comparable, reducing the likelihood of biases due to varying observation periods.

In most countries, the size of households has decreased. Spouses/partners make the least significant contribution to the decrease in household size (B). In 75 percent of cases, the rate of decline falls between 0.16 (Q3) and 0.53 (Q1). Children make the most significant contribution to the decrease in household size (C). In this case, the median value drops to -0.27, and the IQR increases compared to the prior scenario (B). When we include other relatives in the household (D), the median value of change decreases to -0.33 and the IQR increases slightly. In the last scenario, we add individuals who are not related to the reference person within the household. The median value stands at 0.34 individuals less per household in a decade of change and the IQR at 0.37 when all members are considered (E).

Conclusions

Households play a crucial role in people's lives. The structure of households and the way they change over time are the focal points of broad transformations in society, including demographic dynamics, changes in values, and economic changes that have implications in areas such as poverty, the division of labor, or gender dynamics. Despite this, there are no studies that document the global transformation of households in two of their most basic dimensions: size and composition. This study has filled this gap by analyzing household level data from 792 censuses and surveys conducted in 156 countries. While we have not delved into the underlying factors driving

household formation, our study analyzes the diversity of household configurations and examines change over time. The idea of convergence has historically been of great relevance for family demographers and sociologists, yet to date it has remained unanswered due to data limitations (Furstenberg, 2019; Pesando & GFC team, 2019). Our analysis yields clear findings on the basic components of household change around the world over the past few decades.

Firstly, the world population is clustered in increasingly smaller households and large households are becoming far less common. On average across countries, households have declined by about 0.5 persons per decade. The reduction in household size is more significant in countries that initially had larger household sizes, contributing to a gradual convergence on a global scale. The decrease in household size is primarily related to the decline in the number of children in the household. Children account for more than two thirds of the decline observed in recent decades. By contrast, the number of other relatives in the household has remained relatively stable or has declined only moderately. Households are shrinking in size, but their composition might not be converging globally to the same extent as their size. Variations across countries are likely driven by differences in the timing of life course events and life course trajectories, cultural and religious norms, as well as contextual and individual-level factors. Future comparative research aiming to explore these differences could explore changes in living arrangements throughout the life course across time and countries, and possible implications for household size and composition.

As households become smaller, their age structure also undergoes changes. Across the world, we observe an increase in households with elderly individuals and a decrease in households with young children. The visualization of household structure by age groups highlights steep declines in the contribution of younger household members to the average household size. However, older adults do not contribute to increases in household size, not even among European countries with large shares of older adults in the population. This suggests that as populations are aging, the number of households increases, resulting in increasing proportions of one- and two-person households. This trend has direct policy implications with respect to housing needs but also more indirect repercussions, such as changing energy needs in the case of a higher number of separate households relative to a lower number of larger households (Bardazzi & Pazienza, 2023; Ermisch, 1991; Zagheni, 2011; Zeng et al., 2021). If households become smaller, intra- and inter-household transfer patterns might change (Abio et al., 2021; Furstenberg, et al., 2015; Hammer & Prskawetz, 2022; Lee & Mason, 2011) but also gender relations and the division of labor in the household (Bales & Parsons, 2013; Bianchi et al., 2000; de Laat & Sevilla-Sanz, 2011; Forste & Fox, 2012.

As the number of children in the household decreases, the need for care work in the household declines, possibly allowing for more opportunities of work outside the household. Women are the primary family caretakers across many societies; hence such household changes can have profound implications for their negotiation power and economic opportunities (Agarwal, 2011; Cherlin, 2012). Yet, an increasing number of older adults in the population suggests that care needs will prevail, and care work might have to be directed towards older generations rather than younger ones.

If these older generations increasingly reside in separate households, care work might become more resource intensive, especially if fewer members of the younger generation are available to take on these responsibilities.

Secondly, despite common trends, there is great diversity of sizes and types of households across countries. Two countries in this study, Denmark, and Finland, have an average household size below 2, while two others, Senegal, and The Gambia, have average values above 8. All other countries lie between these extremes. When observed on a map, the regional patterns formed by countries based on their average household size provide insight into the geographical distribution of family systems. European countries stand out distinctly from the rest of the world due to their notable characteristics such as smaller household sizes, a higher prevalence of single-person households, and of households with older adults. These features are consistent with a lower presence of children and of other relatives in European households compared to the rest of the world. Despite the differences that may exist within most of the developed world, households are distinct in size and structure compared to those in the rest of the world.

The roots of the uniqueness of these family patterns are still debated among academics. Some authors attribute them to advanced stages of economic and demographic processes, while others attribute them to cultural legacies (Lesthaeghe, 2020; Reher, 1998; Therborn, 2004, 2006). Countries in Africa, Latin America, and Asia exhibit greater internal diversity while also showing systematic differences with respect to Europe and other developed countries. Generally, households in these regions tend to be larger, with a higher proportion of children and other relatives. Yet on-going declines in household size are considerably faster here than in the more developed world. At least on the surface, our results point to a possible global convergence in household size that to date seems far from complete. Our results further align with research suggesting that households and family systems may converge in some respects but diverge in others, possibly supporting the "convergence to divergence" hypothesis (Pesando & GFC Team, 2019; Therborn, 2004, 2014). It is important, however, to point out that this study did not focus on underlying drivers of convergence such as kinship structures and specific relationship types among household members. Future research will be needed to address these aspects on a global scale as well.

Based on the results observed here, both in terms of spatial and temporal variations, we can draw some considerations for the future. If fertility rates and the number of births continue to decline, household size will be reduced even further. Thus, global convergence in household size is closely linked to global convergence in fertility (Dorius, 2008; Pesando & GFC Team, 2019). Over the medium and long term, the decline in fertility will also impact the availability of living relatives (such as siblings, cousins, brothers-in-law, and uncles) within households (Furstenberg et al., 2015; Murphy, 2011). With fewer children and kin, the ability to maintain complex and large households based on traditional models will be significantly reduced. Conversely, increased life expectancy will lead to a longer overlap of generations between parents and their children, potentially favoring intergenerational co-residence (Esteve & Reher, 2021). A comprehensive study of coresidence patterns offers a major challenge for researchers in this field.

Households and family systems evolve due to demographic, social, and economic dynamics. It is crucial to recognize the procedural and contextual nature of these

changes. The complexity of global analysis of households stems from the understanding that dynamics and contextual factors influencing the shrinking of household size today, such as lower fertility rates, may not hold the same relevance in the past or future across all countries. Regions with a prolonged history of fertility below replacement rates may experience diminishing significance of low fertility in shaping future household size and composition. As has been argued by Cherlin (2012: 601), with respect to the continuity of change in family systems, "[…] there is no more reason to think that we have reached an endpoint today than there was in 1963". As long as households and families remain deeply intertwined, the question of future global convergence in household size and composition depends on the uncertainty and complexity of involved dynamics.

Availability on data and materials
The CORESIDENCE database can be accessed via the following link: https://zenodo.org/record/8142652; The R code for building the database is hosted in the following Github: https://github.com/JuanGaleano/CORESIDENCE.

Declarations

Competing interests
The authors declare that they have no competing interests.

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