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## Demographic, health, and economic transitions and the future care burden

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## ABSTRACT

The COVID-19 pandemic has caused millions of infections and deaths worldwide, forced schools to suspend classes, workers to work from home, many to lose their livelihoods, and countless businesses to close. Throughout this crisis, families have had to protect, comfort and care for their children, their elderly and other members. While the pandemic has greatly intensified family care responsibilities for families, unpaid care work has been a primary activity of families even in normal times. This paper estimates the future global need for caregiving, and the burden of that need that typically falls on families, especially women. It takes into account projected demographic shifts, health transitions, and economic changes in order to obtain an aggregate picture of the care need *relative* to the potential supply of caregiving in low-, middle- and high-income countries. This extensive margin of the future care burden, however, does not capture the weight of that burden unless the quantity and quality of care time per caregiver are taken into account. Adjusting for care time given per caregiver, the paper incorporates data from time-use surveys, illustrating this intensive margin of the care burden in three countries that have very different family and economic contexts—Ghana, Mongolia, and South Korea. Time-use surveys typically do not provide time data for paid care services, so the estimates depend only on the time intensity of family care. With this caveat, the paper estimates that the care need in 2030 would require the equivalent of one-fifth to two-fifths of the paid labor force, assuming 40 weekly workhours. Using the projected 2030 mean wage for care and social service workers to estimate the hypothetical wage bill for these unpaid caregivers if they were paid, we obtain a value equivalent to 16 to 32 percent of GDP in the three countries.

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## 1. Introduction

In December 2020, the World Health Organization (WHO) reported more than 65 million confirmed cases of COVID-19 infections, including more than 1.5 million deaths. Besides illness and deaths, the pandemic has forced most schools worldwide to suspend classes, workers to work from home, many to lose their livelihoods, and countless businesses to close. Studies that have already assessed the impact of the pandemic and of the mobility restrictions aimed to control the spread of the virus conclude that families have borne the brunt of that impact and have magnified gender inequalities (Adams-Prassl, Boneva, Golin, & Rauh, 2020; Casale &

Posel, 2020; Craig & Churchill, 2020; Del Boca, Oggero, Profeta, & Rossi, 2020; Farré, Fawaz, González, & Graves, 2020; Dang & Viet Nguyen, 2020, among others). In cases where public and private services are diminished or stretched to their limits, as they have been due to COVID-19, the family has served as our sole option for care, comfort, and even survival. Indeed, the pandemic has expanded the domestic and care responsibilities of families and has put a spotlight on the importance of unpaid caregiving which has remained largely invisible in national production accounts and in national policy discourse.

Independent of COVID-19, long-run demographic and health transitions and economic forces have been changing the future need for care around the world. Understanding how these macro changes are affecting care needs is a first step in ensuring that national care systems are able to meet those needs. This paper aims to estimate the future global care need and burden, putting forth a simple model that takes into account shifts in population

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growth, labor force participation, and health status. The report *Care Work and Care Jobs* by the [International Labour Organization \(ILO\) \(2018a\)](#) defines the care sector more broadly than we do; it includes health, education, and social services workers, that is, teachers, professors, and physicians, as well as daycare workers and domestic workers, and estimates the care sector to include a global number of 215 million workers.<sup>1</sup> Our paper focuses instead on the unpaid care work within households and estimates the level of family caregiving alone to be in the range of one-fifth to two-fifths of the labor force, with most of them being women.

In [Section 2](#), we combine UN age-specific population projections by country with country data on morbidity rates to arrive at estimates of the extensive margin of the future global need for care. We do not incorporate assumptions specific to COVID-19 into our estimates, but we do take into account the impact of diseases considered by the Institute of Health Metrics and Evaluation global study (2018). The diverse patterns in fertility rates and aging and in the prevalence of types of diseases together imply different aggregate levels of need for caregiving in low-, middle- and high-income countries in the future. The extensive margin of care need relative to the potential supply of caregivers in the population is an estimate of the future care burden in a country, a burden that will be met by a mix of unpaid family caregiving and paid care services. In [Section 3](#), we apply data from national time-use surveys in three countries to the extensive margin estimates for those countries in order to illustrate the magnitude of the intensive margin of care need met by unpaid caregiving. Taking as given the care arrangements within households, the reported care time for direct (or relational) care and indirect (support) care provides a fuller picture of the care burden in different country settings. Our estimates also show how the care burden is shared between women and men. [Section 4](#) is a brief discussion of the policy implications of our results.

## 2. Projecting future care need and potential caregiving

The care burden is co-determined by the total care need in a population and the pool of potential caregivers. It can be thought of as the dependency of those requiring care on those who provide it. In this section, we estimate the extensive margin of the global care need and the implication of that need on the global care burden. To do this, we combine the UN age-specific population projections, the ILO projections of the labor force participation rates, and projections of morbidity to estimate a potential aggregate need for, and potential supply of, caregiving across countries. These care demand and supply projections yield an estimate of global care dependency.

### 2.1. Economic dependency: accounting for demographics and labor force participation

The UN's definition of a dependency ratio provides a starting point for estimating care dependency. That ratio represents eco-

<sup>1</sup> As defined by the [ILO \(2018a, p. 8\)](#), “[c]are workers include a wide range of workers who differ in terms of education, skills, sector and pay: from university professors, doctors and dentists at one end of the spectrum, to childcare workers and personal care workers at the other. Care workers in care occupations deliver health, social and education services, with the support of other workers, such as managers, accountants, technicians and office workers laboring in the same hospital or school. While not classified as care workers, their work is integral to the provision of care services. For this reason, the report considers them to be part of the care economy and all occupations in the “health and social work” and “education” sectors as forming part of the care workforce.”<sup>1</sup> In 2010–15, 46 percent of the world's population lived in countries with fertility level below 2.1 births per woman. This includes all of Europe and North America, 19 countries in Asia, 15 in Latin America and the Caribbean, three in Oceania, and two in Africa ([United Nations, 2017a](#)).

omic dependency; it is defined as the ratio of the sum of the total number of children aged 0–14 and the total number of adults aged 65 and older to the total number of adults aged 15–64 years ([United Nations, 2019b](#)). The implicit assumption behind this definition is that all children younger than 15 and all adults older than 64 are not economically productive and are therefore economically dependent on the income of adults aged 15–64. Changes in dependency ratios are thus driven solely by changes in the population structure, that is, by changes in fertility, mortality, and migration that shift the relative sizes of these population groups.

Different patterns of fertility and life expectancy cause significant variation in dependency among country income groups and world regions. The global average fertility rate has been halved since the 1960s to below 2.5 children per woman today ([Fig. 1](#)). Despite this decline, the Total Fertility Rate (TFR) in the poorest countries remains very high, particularly in Africa, implying still-heavy pressure on households to care for young children. Even though some of those countries now have lower TFRs than in the past, the “youth bulge” from the past means that the absolute number of births remains high even as current couples are having fewer children. In other world regions, fertility levels have continued to fall to replacement rate (defined as 2.1 children per woman) or even lower in some countries.<sup>2</sup> Sustained over a long period, fertility rates below the replacement rate, in the absence of migration, means negative population growth and a rapidly aging population.<sup>3</sup> The trend of longer life expectancy increases potential care dependency. According to the *World Population Prospects*, by 2050, one in six people worldwide will be over age 65, up from one in 11 in 2019, and the number of persons aged 80 years or over will triple from 143 million in 2019 to 426 million ([United Nations, 2019c](#)).<sup>4</sup>

[Fig. 2](#) presents the population pyramids for country income groups, based on the medium variant of the UN population projections from the 2019 revision of the *UN World Population Prospects* ([United Nations, 2019a](#)).<sup>5</sup> According to the projections for 2030, the largest increases in population will be in low- and middle-income countries, while the populations in high-income countries will stay fairly constant. The age structures of the populations across these country income groups differed dramatically in 2015; those differences will intensify by 2030. High-income countries are already aging noticeably, as are upper-middle-income countries, but lower-middle-income countries are still in the process of attaining the middle-age bulge which presages their period of a demographic dividend. Low-income countries will continue to be much more youthful than other countries, but the relative size of their older groups will also rise. For example, about 46 million people aged 60 years and over live in sub-Saharan Africa today; this population is expected to more than triple to 165 million by 2050.

[Table 1](#) translates the changes in the age structure of the population pyramids into dependency ratios by country income group

<sup>2</sup> Between 1990 and 1995, 12 countries (all in Europe, except for Rwanda) experienced a negative rate of natural increase, i.e., deaths outnumbered births. By 2030–2035, 40 countries are projected to have a negative rate of natural increase, including nine countries outside Europe ([United Nations, 2017b](#)).

<sup>3</sup> In the United States, the percentage of the population above 65 is projected to rise from 12.4 percent to 20 percent by 2030 ([National Institute of Aging, National Institute of Health and the World Health Organization, 2016](#)). In the European Union, this share will rise from 16 percent today to 30 percent by 2050 ([Bolin, Lindgren, & Lundborg, 2008](#)).

<sup>4</sup> There are clear differences among the world regions – from the youthful populations of Africa to the increasingly aging populations of Europe. In 2030, the developing countries in other regions will be reaping the demographic dividend, their prime working age-groups increasing relative to children and the elderly.

<sup>5</sup> The predicted economic dependency ratios will also differ by geographic region ([Table A1](#)): The total ratio will decline significantly in Africa due to a lower child dependency ratio, and increase in Europe due to a rising elderly dependency ratio. In Asia, this ratio will fall only slightly, because the decline in its child dependency ratio will be almost offset by an increase in its elderly dependency ratio.

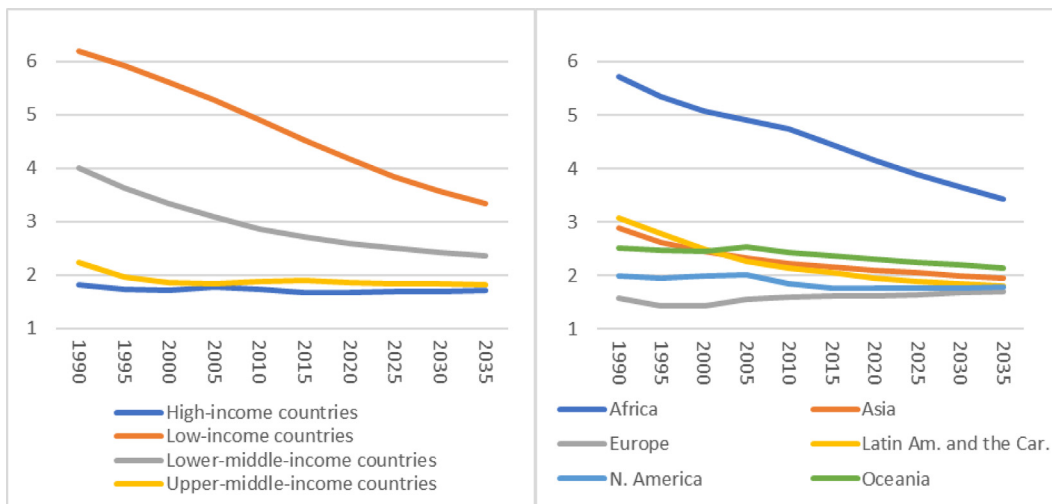


Fig. 1. Total fertility rate, by country income group and region, 1990–2035. Data source: UN World Population Prospects, 2019 revision (United Nations, 2019a).

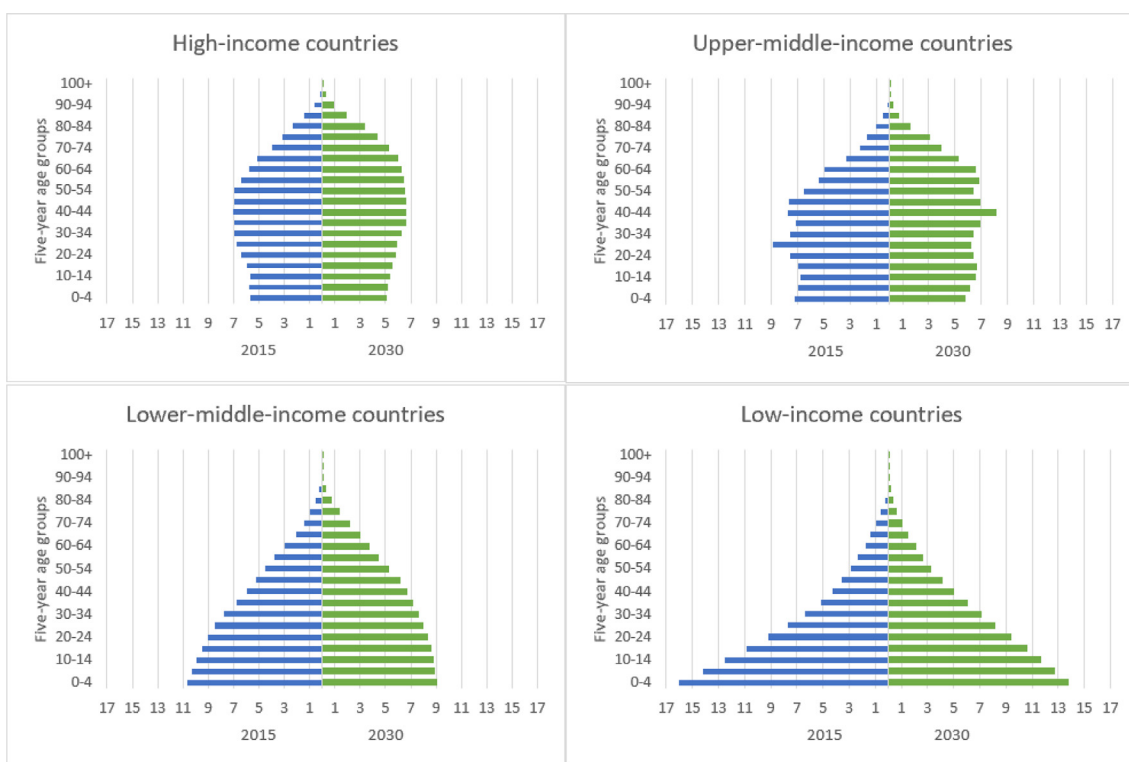


Fig. 2. Age-gender population pyramids, 2015 and 2030, by country income group. Data source: UN World Population Prospects, 2019 revision (United Nations, 2019a).

for 2015 and 2030. Following the UN definition, these dependency ratios are defined as:

$$\frac{n_c + n_e}{n_a} \tag{1}$$

where  $n_c$  is the number of children,  $n_e$  is the number of elderly persons, and  $n_a$  is the number of non-elderly adults. These ratios can be decomposed into a child dependency ratio and an elderly dependency ratio. In low- and lower-middle-income countries, child dependency ratios fall despite their still-high fertility rates. In middle-income countries, reduced mortality rates and longer lives increase the elderly dependency ratios, but overall, there is a shift of the population to the working ages 15–64. In high-income coun-

tries which have had low fertility rates for some time, a rapidly aging population increases the elderly dependency ratio as well as the total economic dependency ratio.<sup>6</sup>

These conventional dependency ratios do not accurately capture economic dependency. Not all adults 15–64 are employed,

<sup>6</sup> Children below 15 are in the labor market despite national laws that prevent them from doing so. Child labor force participation is prevalent, with a large proportion of them working in the informal and unregulated sector. Country data on this phenomenon are spotty, but available data illustrate our point: Afghanistan (50 percent in 2011), Bangladesh (58 percent, 2013), Guatemala (40 percent, 2015), Senegal (45 percent in 2015), and Sudan (25 percent, 2014). Data on average work hours indicate that children who are employed work full-time hours in several countries (World Bank Group, 2020).

**Table 1**  
Economic dependency ratios by country income group.

Country income group	Type of dependency ratio	2015	2030
Low-income	Child	78.9	65.4
	Elderly	6.0	6.4
	Total	85.0	71.7
Lower-middle-income	Child	48.3	40.6
	Elderly	8.2	11.6
	Total	56.5	52.1
Upper-middle-income	Child	29.7	27.5
	Elderly	12.6	22.2
	Total	42.3	49.6
High-income	Child	25.8	24.9
	Elderly	25.3	35.3
	Total	51.0	60.2

Data source: UN World Population Prospects, 2019 revision (United Nations, 2019a).

and neither are all those under 15 nor those over 65 out of the labor force. The average labor force participation rate of adults over 65 in low-income countries has dropped from over 50 percent in 1990, but it was still over 45 percent in 2015 and is projected to be 45 percent in 2030 (Fig. 3). This rate is declining also in middle-income countries, but in high-income countries, the labor force participation rates of seniors are increasing, projected to reach 15 percent in 2030 as older populations live longer, healthier lives.

Acknowledging that the conventional assumptions about the labor force participation of adults are far from reality, we adjust the formula for the dependency ratio by the age-specific labor force participation rates in countries, but only for adults ages 15 and above, maintaining therefore the UN assumption that children younger than 15 do not work.<sup>7</sup> For the sake of simplicity, we assume that the labor force participation rate suffices to measure employment, recognizing that this is only a potential measure of workers rather than an actual one, since not all who are in the labor force are actually employed.<sup>8</sup> With these considerations, we rewrite Eq. (1) thus,

$$\frac{n_c + (1 - p_j)n_j}{p_j n_j} \quad (2)$$

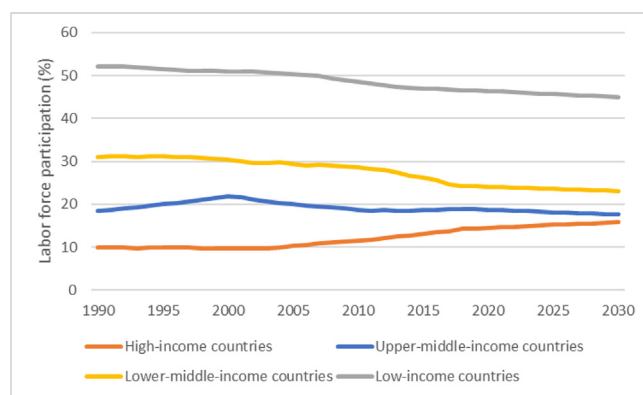
where  $p$ , which takes on a value between 0 and 1, inclusive, is the labor force participation rate of adults ages 15 and over, and  $j$  represents all adults 15 and older. In this formulation, a 0.5 value of  $p$ , for example, means that either all adults in the population spend one-half of their time in the labor force or that one-half of all adults spend all of their time in the labor force while the other half are not in the labor force. How much time “all of their time” means could be 40 or 50 hours per week, depending on both custom and regulatory

<sup>7</sup> Labor force participation rates are not necessarily equal to employment rates. Even in a full-employment economy, there will be adults who are not actually employed but are seeking work, but are still part of the labor force participation numbers. The labor force participation rate is likely to be more stable than the employment rate which depends on the business cycle. Our definition of economic dependency ignores other sources of income that people have, such as rent from property owned, which do not depend on people's time.

<sup>8</sup> Working hours vary greatly among countries. Assuming a 50-week working year, average weekly hours range from 27.1 in Germany to 49.1 in Cambodia (Feenstra, Inklaar, & Timmer, 2015).

<sup>9</sup> In the U.S., the proportion of adults over 65 who work full time has been increasing over time. In 2005, 65.7 percent of men and 49.5 percent of women aged 66–69 worked full time; the corresponding shares for men and women aged 70 and over were 51.7 and 39.2 percent, respectively (Gendell, 2006).

<sup>10</sup> Secondary and tertiary education enrollment rates expanded greatly over the past 30 years, taking an increasingly significant number of young adults out of the labor force and into colleges and universities (World Bank Group, 2020). In 2017, the gross enrollment rate in tertiary education was 9 percent in low-income countries, but it was 24 percent in lower-middle-income countries, 52 percent in upper-middle-income countries, and 77 percent in high-income countries.



**Fig. 3.** Labor force participation rate of populations aged 65 and over, 1990–2030. Data source: ILOSTAT modelled estimates of the labor force participation by age and sex, 2019 revision (ILO, 2019).

limits on work hours.<sup>9</sup> Unlike the UN definition, the numerator of Eq. (2) includes adults aged 65 and older who are not in the labor force and the denominator includes the share of that population that is in the labor force.<sup>10</sup> This modification yields lower economic dependency ratios for the elderly, but increases the dependency ratios for children and adds a representation of economic dependency for adults aged 15–64.

By recognizing explicitly that some adults above 65 do work for pay, the projected elderly dependency ratio in low-income countries in 2030 drops from 6.4 percent in Table 1 to 4.7 percent, but rises in high-income countries from 35.2 percent to 37.5 percent (Table 2). Accounting also for the fact that not all adults aged 15–64 are in the labor force, the estimated economic dependency ratio for this age group ranges from a low of 38.6 percent in low-income countries to a high of 69.2 percent in lower-middle-income countries. These ratios are large because youths aged 15–22 who are considered part of the adult population are increasingly attending secondary or tertiary education and are not employed;<sup>11</sup> in lower-middle-income countries, this age group is a larger share of the population than in the other income groups. Adjusting for data on labor force participation rates raises the implied total economic dependency ratio across all country income groups using the conventional economic dependency ratio – by 83 percent in low-income countries, almost triple in lower-middle-income countries, about double in upper-middle-income countries, and 70 percent in high-income countries.

## 2.2. Care dependency: the effects of labor market participation and morbidity patterns

The previous section adjusted conventional dependency ratios to better capture economic dependency. This section turns to estimating care dependency, still using the UN's definition of dependency ratio as a starting point. We introduce the concept of a

<sup>11</sup> The ILO also estimates care dependency ratios, adjusted by healthy life expectancy at 60 using two datasets: total population, disaggregated by age groups, and healthy life expectancy at age 60 (years) (International Labour Organization (ILO), 2018a, p. 23). The numerator refers to the people in need of care, defined as children under the age of 15 and older persons at or above the healthy life expectancy age of 60 years old, while the denominator refers to potential care providers, defined as adults between 15 years and the healthy life expectancy minus six years of age (International Labour Organization (ILO) (2018a, p. 357). Budlender (2010) defined the care dependency ratio as the sum of the population in the age groups 0–6, 7–12, 75–84, and 85+, with the relative weights of 1, 0.5, 0.5, and 1, respectively, divided by the number in the age group 15–74. The relative weights are not derived from data from time-use surveys. The numerator is defined as the number of all people needing care and the denominator is the number of potential caregivers.

**Table 2**  
Economic dependency ratios, adjusted for labor force participation rates, by country income group.

Country income groups	Type of dependency ratio	2015	2030
Low-income	Child	105.6	88.1
	Adult	37.6	38.6
	Elderly	4.3	4.7
	Total	147.5	131.4
Lower-middle-income	Child	79.6	66.9
	Adult	68.2	69.2
	Elderly	9.9	14.6
	Total	157.8	150.8
Upper-middle-income	Child	40.4	37.8
	Adult	39.2	42.8
	Elderly	14.0	25.1
	Total	93.6	105.7
High-income	Child	34.0	31.5
	Adult	36.4	33.3
	Elderly	29.0	37.5
	Total	99.4	102.3

Notes: See Eq. (2). Data sources: Authors' calculations using data from UN World Population Prospects, 2019 revision (United Nations, 2019a); ILOSTAT modelled estimates of the labor force participation by age and sex (ILO, 2019).

*care dependency ratio* to measure future care needs relative to the potential future supply of caregiving in a country.<sup>12</sup> We incorporate morbidity rates into the conventional dependency ratio in order to account for the effect of health status on future care need, and we change the adjustment for the labor force participation in the previous section to better estimate those who are potential caregivers.<sup>13</sup> We assume that all young children (aged under 15) need full direct care from parents and other caregivers in the best of times but that the probability of morbidity adds to that care need. Elderly persons who are physically and mentally healthy do not need direct care and may be caregivers themselves. However, illness and disability among the young and the old intensify the need for care. A number of conceptual and measurement issues complicate efforts to estimate future care needs; we return to those issues later in this section.

Population trends affect not only economic dependency but also care dependency. As fertility rates fall, particularly in those countries with below-replacement TFR, it becomes easier for parents to care for and invest more resources per child, and the lower pressure to expand public services such as schools frees up resources for improving the quality of those services. Over the long run, however, persistently low fertility levels mean having fewer future workers to finance expanding pension and social security systems for elders (United Nations, 2017a; Guo, 2012; Stephen, 2012).

Like population trends, labor force participation rates are closely related to the availability of caregiving, but market work does not necessarily limit one's availability for unpaid care work. Adults who are in the labor force also spend time for direct and indirect care activities; adults who are not employed or who work few hours, particularly women, are the most likely providers of care. We define potential caregivers as those adults aged 15 and older

<sup>12</sup> Mortality is already embedded in population projections for any given country or region.

<sup>13</sup> Dodson (2013) finds support for this conflict between family care responsibilities and work using interviews and interpretive focus groups of low-income/working class mothers and employers of entry-level workers in the US. Likewise, two systematic reviews of a number of empirical studies on the US, UK, and Canada (Lilly et al., 2007; Meng, 2013) conclude that caregiving is generally associated with lower female labor force participation. Caregiving produces a moderate reduction in the number of labor market hours, but the magnitude of that effect varies from almost negligible to six fewer hours of labor market work per week for each additional hour of caregiving (Meng, 2013). In the UK, caregiving men are not likely to leave the labor force or reduce their hours at the beginning of their caregiving commitment; however, those men who have been at this work for a number of years are much less likely to be employed (Meng, 2013).

who are not employed, represented as  $(1 - p_i)n_j$ . As noted in the previous section, it is possible to specify  $p$  flexibly enough such that adults who are not employed full-time can still be caregivers. We continue to impose the assumption that children below the age of 15 are not potential caregivers, in part because data on their unpaid caregiving are generally unavailable.

The burden of caregiving within the household has historically fallen mainly on women and girls (ILO, 2018a), so the rising trend in female labor participation intensifies the conflict between market work and family responsibilities and also between unpaid and paid care.<sup>14</sup> Female labor force participation (FLFP) rates have increased from a worldwide average of about 30 percent in 1960 to above 50 percent in 2017 (Fig. 4) (ILO, 2019). These rates are highest in low-income countries where families cannot afford to have women not work, but they are also high in high-income countries in North America and Europe. Studies find that individuals are able to balance their employment and caregiving when their care responsibilities are not heavy, but much less so when care work involves more than ten hours per week, particularly for women (Do, 2008; Liu, Dong, & Zheng, 2010).

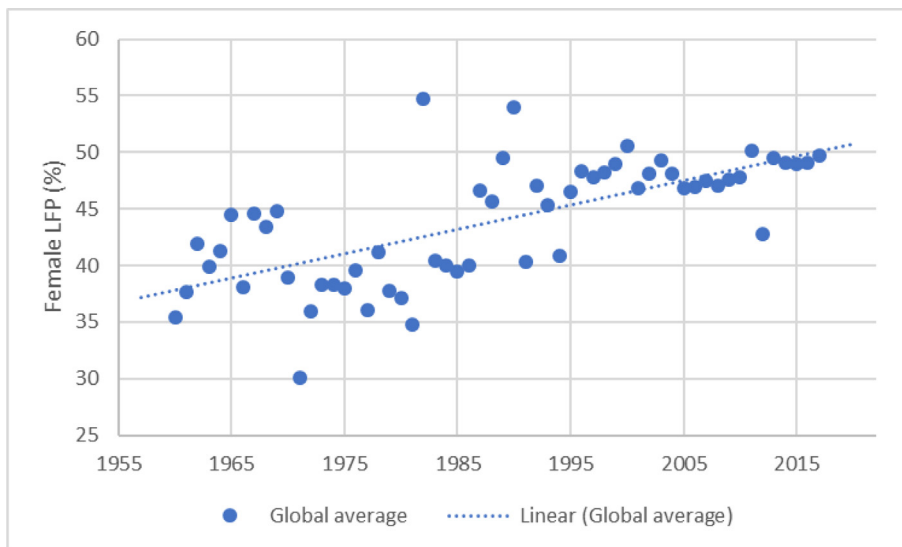
Children and elderly household members assist with care provision. Across many societies, grandparents and older children, especially daughters, share caregiving responsibilities with adults. Studies have found that grandparental childcare significantly increases women's labor force participation (Posadas & Vidal-Fernandez, 2013; Compton & Pollak, 2014; Maurer-Fazio, Connelly, Chen, & Tang, 2011; Zamorro, 2011), suggesting that raising retirement ages might increase seniors' labor supply but at the expense of young women's labor supply. Other studies have also found that older children spend a significant amount of time on housekeeping and care of young children (Larson & Verma, 1999; Yi et al., 2012; Yanagisawa, Poudel, & Jimba, 2010; Hunt, Levine, & Naiditch, 2005; Dodson & Dickert, 2004; East, 2010).

Health status and the nature of illness and disability also determine the need and provision of care. Medical advancements, investments in public health infrastructure (e.g., better water and sanitation services, safer roads, more health clinics), and higher incomes have together increased average life expectancy at birth worldwide—from 48 years in 1950 to 72 years in 2016 (Roser, 2018) (Fig. 5).<sup>15</sup> The largest increase in life expectancy has been in Africa, rising by 6.6 years between the periods 2000–2005 and 2010–15 and is projected to rise by another 11 years by 2050 (United Nations, 2017b). However, not only longer lives but also shifts in the nature of illness and disability will alter the levels and types of care needed.

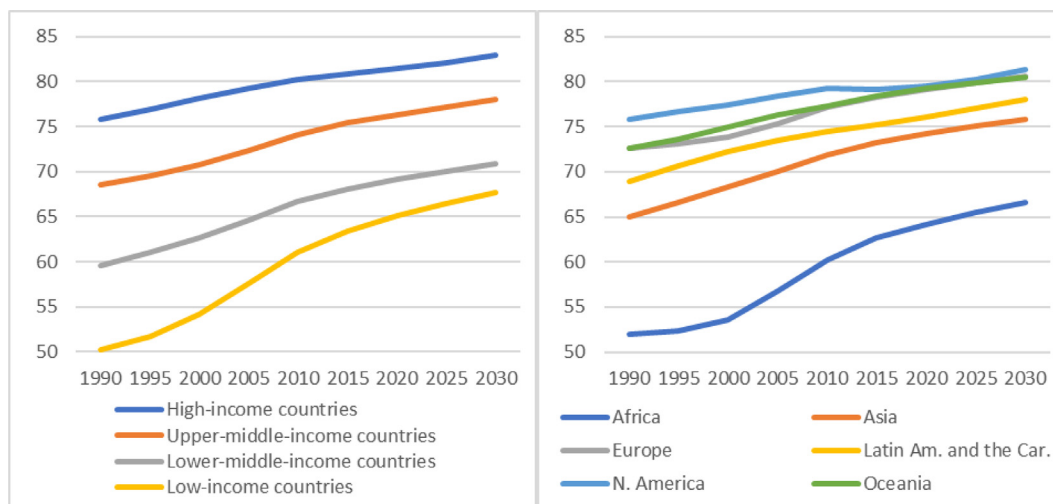
An epidemiological transition is happening in all country income groups (Global Burden of Disease Study, 2016). The prevalence rates of communicable (infectious and parasitic) diseases are still highest in low-income countries, but these rates have been decreasing toward the level in high-income countries (Fig. 6). Communicable diseases disproportionately affect young children. The decline in their prevalence has markedly reduced child mortality and morbidity rates, but older people also account for a growing share of the infectious disease burden in low-income countries.

<sup>14</sup> Other factors besides health explain the changes in mortality and morbidity trends: Rapid urbanization has changed the profile of diseases worldwide, worsening some health problems while improving others (Eckert & Kohler, 2014). Insufficient housing and informal settlements are associated with poor sanitary conditions and congestion, even as landscape changes may reduce malaria transmission (Tatem, Gething, Smith, Hay, 2013). Worse air quality may lead to more respiratory infections (Bygbjerg, 2012). Traffic-related accidents may increase disability, and violence and crime may cause not only more physical harm but also mental illness (Srivastava, 2009).

<sup>15</sup> Dietary changes, in part due to higher incomes and changes in family life, may result in less hunger but also in a higher risk of diabetes and obesity (Eckert & Kohler, 2014).



**Fig. 4.** Average global women's labor force participation, 1960–2017. Data source: ILOSTAT modelled estimates of labor force participation by age and sex, 2019 revision (ILO, 2019).



**Fig. 5.** Average life expectancy at birth in years, by country income group and region, 1990–2030. Data source: UN World Population Prospects, 2019 revision (United Nations, 2019a).

The opposite pattern holds for noncommunicable (chronic and degenerative) diseases (NCDs), such as cardiovascular diseases and cancer (Global Burden of Disease Study, 2016): the number of years lost due to illness or disability (YLD) due to NCDs is increasing as fast as, or faster than, population growth in each country income group. Relative to population size, their impact is largest in high-income countries where the burden will fall disproportionately more on elderly people and on women since they live longer than men, on average. In middle-income countries, the burden will be distributed more equally among the elderly and middle-aged adults, including those who are still productively employed. In low-income countries, because of shorter life spans, the burden of NCDs is lower. By 2030, however, NCDs are projected to account for more than three-fourths of the disease burden in middle-income countries and more than half in low-income coun-

tries. The rising prevalence of NCDs means that many more elderly people are unable to perform essential tasks of daily life without the assistance of others, but older adults now need care at a later age than was previously the case. With longer lives, the demand for caregiving within families will become more multigenerational, with young adults caring for their children as well as their parents and grandparents, simultaneously.

There are differences across countries, however. Disability due to disease occurs at a younger age in low-income countries than in developed countries (World Health Organization (WHO), 2015). In sub-Saharan Africa, the care needs of adults over 60 are far higher than those of adults similar ages in more developed settings due to differences in the patterns of morbidity and in the supply of health services. For example, in Ghana, more than 50 percent of those between 65 and 75 years require some assistance with

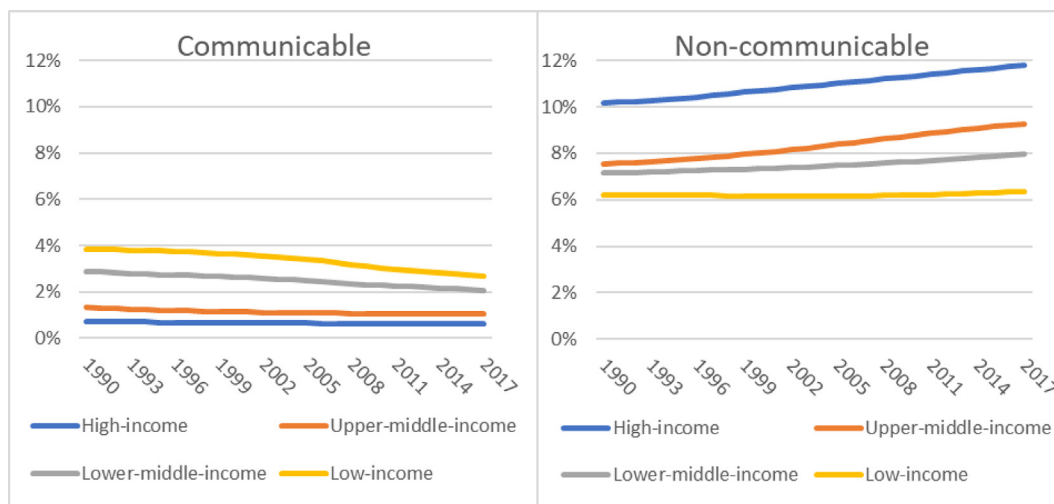


Fig. 6. Years lost due to communicable and noncommunicable diseases (rate of YLDs as a proportion of population). Notes: YLD is the number of years that a person lives with disability. Data source: Authors' calculations using data from IHME Global Burden of Disease Study, 2017 revision (Global Burden of Disease Collaborative Network, 2018).

daily activities, and greater than 65 percent among those 75 years and older (Aboderin & Beard, 2015). In contrast, in Switzerland, the corresponding percentages are less than 5 percent and 20 percent.<sup>16</sup>

We combine the population projections by country with the estimates of YLDs from the 2017 revision of the *Global Burden of Disease Study* (Institute for Health Metrics and Evaluation (IHME), 2018) by the source of illness and disability, that is, whether communicable or non-communicable disease.<sup>17</sup> Combining the adjustments for labor force participation and morbidity rates, we specify the *care dependency ratio* as:

$$\frac{(1 + r_c)n_c + r_j n_j}{(1 - r_j)(1 - p_j)n_j} \quad (3)$$

where  $r_c$  is the YLD rate for children below 15, and  $r_j$  is the YLD rate for adults  $j$  aged 15 and above, including elderly persons. Eq. (3) assumes that illness (or disability) among young children effectively expands the care needs of the existing number of children by  $r_c$ . It also assumes that illness or disability is not necessarily a full-time condition, and so  $r$  pertains to the proportion of time lived in disease or disability. The morbidity rates as defined by the IHME project reflects the gravity of the illness or disability and not just the proportion of time sick. Finally, we assume that those who are expected to contribute economically to their households by virtue of their age may not be able to do so because of disease and disability, and, for the sake simplicity, that children below age 15 are not caregivers, contrary to the experience of many households; the latter assumption can be relaxed if children's time-use data are available. Thus, the *care dependency ratio* assumes that the care of young

<sup>16</sup> The number of disabled older persons is expected to increase worldwide in the coming decades (Gobbens & van Assen, 2014). The prevalence figures are expected to range from 30 percent for persons aged 75 and over to 40 percent for persons aged 85 and older. "Disability is commonly defined as experiencing difficulty in carrying out activities that are essential to independent living—difficulties in performing activities of daily living (ADL) and/or instrumental activities of daily living (IADL)."

<sup>17</sup> The projected YLD rates per 100,000 population are obtained from a straight-line fit to yearly IHME data on each country group in 2010–2016. To translate these rates into population numbers for each country income group, we multiply them by the UN population projections for corresponding age and gender groups in each year. Data, methods, and cause categories are described in a technical paper available on the IHME website (Global Burden of Disease Study, 2016; Disease and Injury Incidence and Prevalence Collaborators, 2017). A disability weight is a weight factor that reflects the severity of the disease on a scale from zero (perfect health) to one (equivalent to death).

children, elderly persons, and non-healthy adults is borne by those adults who are not ill and not disabled,  $(1 - r_j)$  of them, and not working for pay,  $(1 - p_j)$  of them. Once again, both  $r_j$  and  $p_j$  are specified flexibly so that ill or disabled adults and those who work part-time can still provide care.<sup>18</sup>

Adjusting for morbidity, care dependency is significantly higher (Table 3) than economic dependency (Table 2). In 2015, the total care dependency ratio in low-income countries is 2.4 times the total economic dependency ratio; in 2030, this falls to 2.2. In high-income countries where morbidity rates are lower, the total care dependency ratio is only 1.1 times the total economic dependency ratio; in 2030, there is hardly any difference between the two ratios. The care dependency ratio in 2030 is lower than in 2015, but the decline is unequal among the country groups. For example, this decline will be largest in the upper-middle-income countries (18.3 percent) and smallest in the high-income countries (6.0 percent). Aging will increase the elderly care dependency in the higher income groups. Diseases such as COVID-19 will likely increase future care dependency ratios beyond what we have been able to project, and the size of their effects will depend not only on the prevalence and duration of the pandemic but also on the severity of its impact on survivors. Those who survived the Ebola virus disease, for example, present ongoing muscular and joint pain, tiredness, decreased appetite, or vision and hearing problems (Center for Disease Control, 2018), thus needing continuing care. Studies of the medical and psychological conditions of COVID-19 survivors are seeing the need for rehabilitation and care services to improve the functional return of survivors (Halpin et al., 2020; Mazza et al., 2020).

A number of conceptual and measurement issues are worth noting when estimating future care needs. As previously mentioned, labor force participation rates and the assumption that children younger than 15 are not care providers tend to underestimate

<sup>18</sup> We know that even adults who are ill or working in the labor market contribute to caregiving, though perhaps less than do adults who are not employed, so omitting them from the denominator overestimates the care burden. For this reason, conceptually  $r$  and  $p$  should not be defined as (0,1) variables. Note that the morbidity rate  $r$  is already calibrated for the gravity of the illness or disability as well as for the proportion of time spent ill or disabled, such that even those adults who are ill or disabled (i.e., who are not able to walk or are hearing impaired) can be caregivers. One statistical caution is that illness and disability are reasons why some adults are not in the labor force, so observed labor force participation rates compound the effects of illness and work-seeking behavior, perhaps exaggerating the adjustments made if the rates cannot be disentangled.

**Table 3**  
Care dependency ratios, by country income group.

Country income group	Type of care dependency ratio	2015	2030
Low-income	Child	307.6	245.7
	Adult	40.7	38.9
	Elderly	5.8	5.6
	Total	354.1	290.3
Lower-middle-income	Child	123.4	97.0
	Adult	25.6	24.2
	Elderly	5.3	6.9
	Total	154.3	128.0
Upper-middle-income	Child	91.8	68.8
	Adult	31.4	25.9
	Elderly	9.4	13.6
	Total	132.6	108.3
High-income	Child	65.7	57.2
	Adult	29.7	27.6
	Elderly	15.7	19.6
	Total	111.1	104.4

Data sources: Authors' calculations using data from UN World Population Prospects, 2019 revision (United Nations, 2019a); ILOSTAT modelled estimates of labor force participation by age and sex (2019); and IHME Years Lost to Disability (YLDs), 2017 revision (Global Burden of Disease Collaborative Network, 2018).

potential care supply. The labor force participation rates do not distinguish between full-time and part-time work and the definition of this work intensity differs, both by custom and regulation, across countries. Furthermore, the informality and proximity of place of work and the availability of care services influence whether employed individuals are able to combine market work with unpaid caregiving (Lilly, Laporte, & Coyte, 2007; Compton & Pollak, 2014; Nguyen & Connelly, 2014). For those who are employed, the mobility restrictions taken under COVID-19 have blurred the boundaries between paid work and family caregiving. Finally, our model does not adjust for those who are employed as paid care providers. Further exploration of data is needed to take into account paid care workers in the estimates of the extensive and intensive care burden.<sup>19</sup> For all these reasons, the projections in Table 3 should be interpreted as upper-bound estimates of the extensive margin of the family care burden.

### 3. Estimating the intensive margin of care need

Eq. (3) defines the extensive margin of care need relative to the potential supply of care. In this section, we analyze time-use data from Ghana, Mongolia, and South Korea to illustrate a methodology for estimating the intensive margin for unpaid care provided within the household.<sup>20</sup> These three countries have very different family structures and average household sizes, so they allow us to examine how care patterns differ and how they are similar in different country settings. We note here that factoring time spent into Eq. (3) is only a partial elaboration of care needed and given, and recog-

<sup>19</sup> Home care rather than paid center-based care is relatively more common in lower-income countries than in high-income countries. According to an International Labour Organization (ILO) (2018a), paid domestic workers accounted for 3.6 percent of all paid employees worldwide in 2018. In Africa, these workers accounted for 4.9 percent; in Latin America and the Caribbean, 11.9 percent; in Asia, excluding China, 4.7 percent; and in advanced countries, 0.9 percent.

<sup>20</sup> Time-use data have been collected in about 90 countries using generally harmonized surveys (Buvinic & King, 2018; Charmes, 2019). Most surveys capture direct care but not time on supervisory or "on-call" responsibilities for children and frail elderly persons which can be far greater than active direct care (Ironmonger, 2004). Moreover, both active and supervisory direct care are often conducted in conjunction with indirect activities, resulting in underestimates of time spent on total unpaid care work (Folbre & Yoon, 2007; Floro & Miles, 2003). "Indirect" care (or "support" care) is often unreported by unpaid caregivers, leading to underestimates of the total time spent on unpaid care work.

nizes both the promise and the limitations of time-use data in capturing the real amount of unpaid care work.

#### 3.1. A. From care dependency to the intensity of the care burden

Previous work by Durán Heras (2012) and others estimate the global care burden in households by creating unpaid care scales derived from "expert opinion" about the care needs of people of different age groups and the required time of care for them.<sup>21</sup> These scales do not depict the level of unpaid care per group but instead indicate the relative time spent on different household members. Our proposed estimation of the intensive margin of care need allows us to compare the time spent caring for a young child relative to an elderly person as well as to measure the contributions of different household members to that care.

Time-use survey data are typically available by type of care activity (e.g., care of a young child aged 0–4, care of elderly persons, housekeeping) reported by the survey respondent, but not by a specific care receiver.<sup>22</sup> Using the total time spent on a direct care activity by caregiver  $k$  and the number of each type of care receiver, we can compute the average direct care time per recipient given by individuals in group  $k$  as  $w_{c,k}$  and  $w_{j,k}$ , where the subscripts  $c$  and  $j$  pertain, respectively, to the care of young children and of adults who need care, be they elderly or not. Similarly, we can calculate the per-recipient average indirect care time by using data on tasks that are not directed towards a particular family member, such as cooking, cleaning, and other housework. We make the simplifying assumption that every individual benefits equally from such care work at a per-capita level  $h$  provided by caregiver  $k$ . This implicitly assumes that there are no economies of scale in indirect care, as we do for direct care, and that those individuals who provide indirect care also benefit from such care work. Such a per-receiver direct or indirect care time or "care weight" is defined as,

$$w_{m,k} = \frac{\sum t_{m,k}}{n_m} \tag{4}$$

where  $t$  is the time for (direct or indirect) care reported by caregiver group  $k$ ;  $n_m$  refers to the number of individuals in the recipient group  $m$  (children or elderly for direct care, and all household members for indirect care).

Applying these care weights to the numerator in Eq. (3) yields a measure of the time intensity of care dependency in the population, or the *care intensity dependency ratio* in the population. Differentiating between direct ( $d$ ) and indirect ( $h$ ) care, the direct care weights are  $d_{c,k}$  and  $d_{j,k}$  for caregiver  $k$ , and the indirect care weights are  $h_k$ . Aggregating across the population segments  $c, j$  and  $k$ , Eq. (5) represents the intensive margin of the care intensity dependency ratio in the population,

$$\frac{d_{c,k}n_c + d_{j,k}n_j}{(1 - r_{j,k})(1 - p_{j,k})n_{j,k}} + \frac{h_k(n_c + n_j)}{(1 - r_{j,k})(1 - p_{j,k})n_{j,k}} = \frac{(d_{c,k} + h_k)n_c + (d_{j,k} + h_k)n_j}{(1 - r_{j,k})(1 - p_{j,k})n_{j,k}} \tag{5}$$

<sup>21</sup> Some scales take into consideration the composition and health of the dependent age group, while others don't. For example, the Freetown scale developed by Rogero-Garcia (2012, as cited by Durán Heras (2012)), applies a weight based on the percentage of life with poor health and the availability or absence of public services. In the case of the Santiago de Chile scale, Durán Heras used a subjective assessment of the demand for care by twenty-one ECLAC experts in social affairs and statistics (2012). See Endnote 12 for Budlender (2010) scale.

<sup>22</sup> Data collection design and methodology of time-use surveys differ across countries. Statistical agencies make various decisions regarding the activities performed (granularity of activities and simultaneity), when to ask (seasonality consideration), whom to talk to, and how to treat those activities (richness of coding of responses). A summary of which activities are included in the direct and indirect care variables for each country can be found in Table A3.



where  $d_{c,k} = w_{c,k}(1 + r_c)$  and  $d_{j,k} = w_{j,k}r_j$ .

The care weights  $d$  and  $h$  which represent direct and indirect care do not distinguish between paid and unpaid caregiving. Each of these care weights may have a paid care component, but household-based time-use surveys from which we derive care weights collect data only on the unpaid care of household members. This data limitation implies that these care weights, as well as the intensive margin of total care needs, are underestimated to the extent that households supplement unpaid caregiving with paid care services (e.g., using paid non-household members to clean house or prepare meals, or to mind a young child). This underestimation will be larger in the countries where households are more likely to use paid care services and where the market for paid care services is more developed.<sup>23</sup>

The weights derived from time-use data for Ghana, Mongolia, and South Korea are presented in Table 4. The first two rows for each country refer to the average direct care time received by a child and by an elderly person in the households that report the respective activity. These time data are sums of time reported for all household members.<sup>24</sup> As noted above, this direct care time could be an underestimate of the total direct care time received by a child or an elderly person if paid care is used to supplement unpaid care time. The third row is the average indirect care time spent in activities such as cooking, cleaning, laundry, computed as the total unpaid indirect care time divided by household size. This too would be an underestimate if the household supplements unpaid indirect care time with paid services from, say, domestic workers. Overall, the total (direct and indirect) unpaid care time per type of recipient per day is just a little over an hour in Ghana, closer to two hours in Mongolia, and more than four hours in South Korea.

Breaking down the total care need into its components, the relative magnitudes of time for care activities are quite different in the three countries. In Ghana, on average, each child aged 0–14 receives 21 min of direct care per day from all female caregivers, each elderly member aged 65 and over receives 4 min per day, and each household member of any age receives 29 min of indirect care per day. Children and elderly receive very little direct care from men (a total of five minutes per day, on average, from all male caregivers), and men undertake very little indirect care. In contrast, reflecting the different typical household composition in South Korea and perhaps also the different expectations about the time parents should invest in each child, there a child receives 118 min per day of direct care from female household members and 30 min per day from all males.<sup>25</sup> An elderly person receives an average of 6 min per day of direct care from females and about

3 min from males. We note that these direct care for elderly persons do not include meal preparation or housecleaning tasks that also help the elderly; those activities are included as indirect care. Women in the household provide 78 min per day in indirect care activities for each member while men spend 16 min per member per day in those activities.

In Mongolia, the time spent on direct childcare by women and men falls between the averages in Ghana and South Korea—39 min per day per child by women and 9 min by men. Mongolian women spend about the same amount of time on indirect care per recipient as do Ghanaian women, but Mongolian men's indirect care time greatly exceeds that of men in the other two countries. Quite striking is that Mongolian men provide almost as much time for indirect care activities as women do. One explanation given for this is its socialist legacy which emphasizes co-responsibility for household work, from winter risk management to childrearing, and a collective work ethic, especially in the steppes (Ericksen, 2014).

The right-most column of Table 4 summarizes the gender allocation of unpaid care time. In the three countries, the bulk of care work is borne by women. Of total care time, women contribute 85 percent in Ghana and 80 percent in South Korea, with Mongolia being an outlier as women's share there is 68 percent. In all three countries, women contribute at least 80 percent to child care, but the country patterns are different for elder care and indirect care. Women's share accounts for 70 and 67 percent of elder care and 86 and 83 percent of total indirect care time in Ghana and South Korea, respectively. In Mongolia, women's share is 86 percent of elder care, but only 55 percent of indirect care. This finding about women bearing the heavier load of unpaid care work is similar to the finding in many previous studies (ILO, 2018a).

The reasons for these marked country-specific differences in caregiving are closely linked to household structure (Table A2) and care norms as well as to the level of economic development.<sup>26</sup> On household structure, Korean households tend to be nuclear families with very few young children; the total births per woman in 2019 was 0.92. In contrast, Mongolian and Ghanaian households tend to be multi-generational households and typically have more children—2.9 and 3.9 total births per woman, respectively (United Nations, 2019b). The level of economic development in the three countries influences too the amount of time and resources that families typically invest in each child because of prevailing views about the level of human capital that is associated with having a good job.<sup>27</sup> However, we note that in Ghana and Mongolia, the reported child care could be underestimated if a larger portion of child care is undertaken as a secondary activity or as supervisory care compared to South Korea and thus not captured by time-use surveys (Suh & Folbre, 2016).

The principal livelihoods in the three countries are also very different. South Korea is highly industrialized, with 25 percent of its workers employed in manufacturing and 70 percent in services in 2019, and has the largest formal sector (World Bank Group, 2020). By comparison, Mongolia and Ghana are significantly more agricultural—but these two economies are also different from one another. The Mongolian economy has traditionally depended on nomadic, pastoral agriculture, while Ghana's agriculture relies on crop farming. The nomadic lifestyle of the rural population in Mongolia and its dependence on livestock raising where men are responsible for long-distance herding, building, and repairing winter and spring shelters, often taking their young sons with them

<sup>23</sup> Time-use surveys do not collect time from paid or unpaid non-resident caregivers, though some of the time-use surveys collect data on time exchanges between households, thus, recording time given by a household member to care for members in another household but not time received from another household. At the country level, however, if a time-use survey is nationally representative, then data from that survey should be able to capture the aggregate levels of time given and time received.

<sup>24</sup> Not all time-use surveys collect data on all household members (Buvinic & King, 2018). We chose these three countries partly because their time-use surveys do. For our estimates, the averages for child and elderly care are estimated only for the households that reported nonzero time for direct child or elderly care. At the country level, this estimation approach allows us to include interhousehold exchanges of direct care time. Hence, households that do not have either a child or an elderly member but reported nonzero time for such care category contribute are captured in our national averages. The implicit assumption is that such reported care time is unpaid and thus not reported as paid work.

<sup>25</sup> To confirm that the country differences are due not only to economies of scale but also to differences in care preferences that may in turn be affected by and arrangements, we compared the direct care time averages across the countries, holding constant the number of children in the household, and found striking per-child direct care time differences among the three countries.

<sup>26</sup> The per-capita GDP levels of the three countries vary widely—US\$ 4,212 in Ghana, 12,245 in Mongolia, and 36,776 in South Korea in 2011 constant purchasing power parity (PPP) dollars (World Bank Group, 2020).

<sup>27</sup> In South Korea, the expected completed years of schooling is 16.4, as compared with 14.2 and 11.5 in Mongolia and Ghana, respectively (UNDP, 2020).

**Table 4**

Average unpaid care time given per type of recipient in Ghana, Mongolia, and South Korea, by gender of caregiver and type of care.

Country	Care per recipient (minutes/day)	Female	Male	Total	Female share (%)
Ghana	Direct child care	21.3	3.0	24.3	87.5
	Direct elderly care	4.1	1.8	5.9	70.0
	Indirect care	28.9	4.6	33.6	86.2
	Total care time	54.3	9.4	63.7	85.2
Mongolia	Direct child care	38.6	8.8	47.4	81.5
	Direct elderly care	3.2	0.5	3.7	86.1
	Indirect care	28.5	23.2	51.7	55.2
	Total care time	70.4	32.5	102.9	68.4
South Korea	Direct child care	117.8	30.3	148.2	79.5
	Direct elderly care	5.9	2.9	8.7	67.0
	Indirect care	77.9	15.9	93.7	83.1
	Total care time	201.6	49.1	250.6	80.4

Notes: Average care times are in minutes/day provided by a caregiver per type of care recipient. Total time is calculated according to the numerator in Eq. (5). Data sources: Authors' calculations using 2009 Ghana Time-Use Survey, 2011 Mongolia Time-Use Survey, 2014 South Korea Time-Use Survey; UN World Population Prospects, 2019 revision (United Nations, 2019a); ILOSTAT modelled estimates of the labor force participation by age and sex (2019); and IHME Years Lost to Disability (YLDs), 2017 revision (Global Burden of Disease Collaborative Network, 2018).

(Cooper & Gelezhamstin, 1994),<sup>28</sup> may explain men's high participation in care work, along with Mongolia's socialist past which we have already mentioned.

Before presenting our estimates of the intensive margin of care need, two caveats are worth mentioning here. *First*, although we use time-use surveys that collect data from all members of the household in order to form a complete picture of care time within the household, this is not a requirement for estimating an aggregate measure of care dependency as long as the data for the population segments  $c$ ,  $j$ , and  $k$  are nationally representative. *Second*, due to data limitations, our estimates of future care need are based on the implicit assumption that the current arrangements for childcare, elder care, and care support activities in the household stay the same, including the use of paid care and unpaid care. Care arrangements, however, have been shifting as a result of several forces that we can already observe: Economic development processes and the manner in which these interact with social norms and practices can change gender roles. Increased demand for secondary and post-secondary education make older children less available to help with unpaid care work. Greater urbanization that is accompanied by higher residential prices increase the prevalence of nuclear households, breaking kinship networks and making co-residence with older relatives less affordable and thus reducing unpaid care for those relatives. Higher labor force participation rates among women make child and elder care and even indirect care activities harder to meet through unpaid care, increasing the demand for paid child and elder care and indirect care services. The magnitude of future care needs implies that the tension between the competing time demands of care and market work will increase. Analyzing multi-year data from household and time-use surveys can reveal the shifts in these care arrangements and provide policymakers a way to anticipate the need for paid care services (e.g., Pendry, Barrett, & Victor, 1999; Long & Harris, 2000).

### 3.2. The intensive margin of care for Ghana, Mongolia, and South Korea

Table 5 presents our estimates of the intensive margin of future care need in millions of hours per day for each type of recipient, and translates this need into full-time equivalent workers per

<sup>28</sup> In pastoral areas such as steppes, women are responsible for herding small stock and milking, in addition to performing domestic tasks such as product processing, cleaning, washing, and sewing (Cooper & Gelezhamstin, 1994). Older boys and girls help collect wood for fuel and water (Terbish & Floro, 2016). This gender division is common in steppes, given the number of workers within the household.

week, where full-time work is defined alternatively as 40 or 48 of work hours per week. We consider full-time and part-time market work in our estimation in part to acknowledge that part-time workers are more likely to be unpaid caregivers in the home than full-time workers and in part to limit the maximum time that individuals are assumed to spend on both market and care work and thus recognize that caregivers have a right to time for self-care.<sup>29</sup>

To underscore the large magnitude of unpaid care need, we express our estimates in terms of the number of paid care workers who would be needed if unpaid caregivers were replaced with paid care workers, and also in terms of their full-time equivalent share of the labor force. This thought experiment illustrates the proportion of the future work force that would have to perform full-time care work in order to meet the country's future unpaid care need. Using 40 h to define full-time work, in Ghana the total care need would be equal to 20.4 percent of the labor force in 2030. The corresponding shares in Mongolia and South Korea would be 35.7 and 42.5 percent, respectively. Using 48 h as full-time equivalent work, these percentages would, of course, be smaller but they would be large nonetheless, illustrating the heavy pressure of future care needs in these economies. By using the same time-use data for the 2015 and 2030 estimates, we implicitly hold care norms and care arrangements constant. The changing care needs for children and elderly in Table 5 are thus due mostly to lower fertility rates (in Ghana and South Korea) and the relative aging of the population (especially in South Korea). In absolute terms, childcare needs would rise in both Ghana and Mongolia but fall in South Korea. However, due to unequal changes in the labor force in the three countries, the share of the labor force needed to replace unpaid care would fall in Ghana and South Korea but rise in Mongolia. The need for elder care would approximately double in the three countries, and whether one assumes a 40- or 48-hour equivalent work, meeting this care need would require employing a larger proportion of their labor force.

<sup>29</sup> The unadjusted LFPR does not reflect the proportion of workers who work full-time and that who work part-time. Table A4 shows the differences in the LFPR of women and men in the three countries, as well as how those rates change when adjusted for hours of work. Using alternative definitions of full-time work to adjust the LFPR, we see shifts in the relative ranking of the countries by these rates. Based on the unadjusted LFPR, Mongolia has the lowest rates for women and men in either age group among the three countries. Korean men have the highest LFPR; Ghanaian women do. Adjusting for full-time equivalent work, the countries' relative positions change for both women and men, but only for those aged 15–64. Adjusting for 40-hour per week full-time work, Mongolia has a higher LFPR for both men and women than Ghana. The average work hours in Mongolia is the highest at 51 h per week. Women's adjusted LFPRs in Korea are hardly different from the unadjusted rates, but they are much higher for men. Ghana's adjusted LFPRs are much lower than the unadjusted rates, especially for women.

**Table 5**  
Unpaid care burden in the total population by age group in Ghana, Mongolia, and South Korea.

	Type of care recipient	Hours/day (millions)		As % of labor force			
				Assuming 40-hour workweek		Assuming 48-hour workweek	
		2015	2030	2015	2030	2015	2030
Ghana	Child	10.5	12.8	11.3	9.7	9.4	8.1
	Elderly	0.5	0.9	0.5	0.7	0.4	0.6
	Adult	9.2	13.0	9.8	9.9	8.1	8.3
	Total	20.2	26.7	21.6	20.4	18.0	17.0
Mongolia	Child	1.4	1.7	14.2	15.4	11.8	12.8
	Elderly	0.1	0.2	1.0	2.0	0.8	1.6
	Adult	1.7	2.1	16.9	18.4	14.1	15.3
	Total	3.3	4.1	32.0	35.7	26.7	29.8
South Korea	Child	28.9	22.1	13.2	10.0	11.0	8.3
	Elderly	10.4	20.2	4.8	9.1	4.0	7.6
	Adult	58.2	51.8	26.5	23.4	22.1	19.5
	Total	97.6	94.0	44.5	42.5	37.1	35.4

Notes: "Child" is the sum of per-child direct care and indirect care provided to children ages 0–14; "elderly" is the sum of per-recipient direct care and indirect care provided to adults ages 65 and above; "adult" is the per-adult indirect care provided to adults ages 15–64 (adults do not receive direct care by assumption). The projections assume that use of paid care services remains constant between 2015 and 2030. Labor force is defined as all individuals aged 15+ who are employed or seeking work. See Eq. (5). Data sources: Same as sources in Table 4.

In Fig. 7, we show the hypothetical wage bill associated with the number of unpaid care workers needed to meet the intensive margin of care need if those workers were paid, and we present that estimate as a percentage of GDP. This calculation involves the difficult choice of which wage to apply to unpaid care time. A substantial literature actively debates the correct method for estimating the value of family care (van den Berg, Brouwer, & Koopmanschap, 2004; Hoefman, van Exel, & Brouwer, 2013; Suh & Folbre, 2016; Ferrant & Thim, 2019), but our objective here is more modest. We emphasize at the outset that we are not attempting to estimate the economic value, much less the social value, of unpaid family care. The economic value of that care would have to reflect not only the unit price of care time but also its quality and the economic value of care outcomes, net of any public subsidies and tax support expended for care activities. Similarly, the social value would depend on the improvements in the well-being and happiness of the care recipients and of those who care for them, net of the psychic, physical and opportunity costs of caregiving.

With the above caveats, we use the ILO estimates (ILO, 2019) of the mean wage of health care workers, residential care workers, and social service workers in each country to compute the hypothetical wage bill for the estimated full-time workers needed to meet the intensive margin of care need. In 2015, the total wage bill would be equivalent to 17 to 22 percent of GDP in the three countries; applying the average annual growth rate of the mean wage for care and social service workers, in 2030 the wage bill would be equivalent to 16 to 32 percent of GDP. These estimates are relatively similar to the estimated value of care in previous studies, although those studies used different valuation methods. The review by Suh, Chang, Mercer-Blackman, and Hampel-Milagrosa (2020) of a number of these studies reveals that estimates range from 14 percent for Canada, Germany and South Africa to 39 percent for Finland.

#### 4. Summary and policy implications

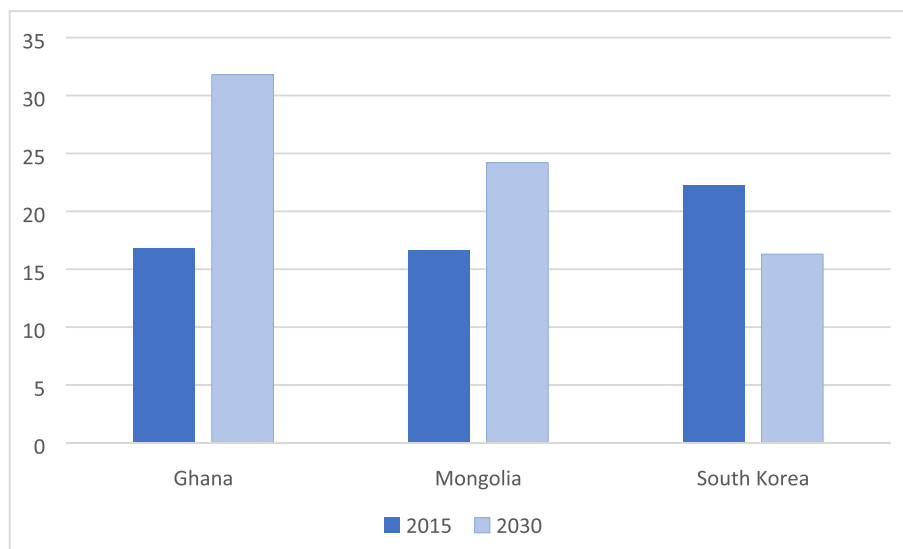
Our estimates of the future extensive and intensive margins of care need relative to the potential supply of caregiving demonstrate the weight of the care burden in low-, middle- and high-income countries. Long-run demographic shifts, epidemiological transitions, and economic changes are changing the number of people who will need care, who those will be, and who can provide care. This measure of the extensive margin of care, however, does

not capture the intensity of future care needs unless it is combined with information about the quantity and quality of care time to meet those needs. We use time-use survey data to estimate this intensive margin of the care, but lack of data on the quality of care does not allow us to take quality into account. About 90 countries now undertake time-use surveys, so it is possible to estimate a time-adjusted but not quality-adjusted care dependency ratio. We estimate the intensive margin of the care burden for three countries—Ghana, Mongolia, and South Korea—which have time-use surveys that provide a fuller, albeit not complete, picture of the care supply in the household because they query all household members. Although time-use survey data are the best resource we have for now, they do not capture several important, hard-to-measure aspects of caregiving, such as time on secondary activities and supervisory care, quality of care work, time transfers from other households, and use of paid care services.

Our estimates of the future care burden reflect not only the effect of factors such as fertility decline, changing causes of morbidity, and aging on care need, but also the influence of factors such as changes in female labor force participation and norms about the gender division of labor between the home and the workplace on the supply side. Most studies of care focus on the supply of care work, without accounting for changing care needs. Considering both need and supply factors, we conclude that to meet the future care burden would require as many as one-fifth to two-fifths of the workforce aged 15 and over, or a wage bill equivalent to about one-sixth to one-third of GDP. Analyzing the contributions to caregiving by gender, given the patterns of unpaid caregiving today, four-fifths of this care burden will fall on girls and women in the family.

Broadly, we see two major roles for government to meet future care needs and to mitigate the burden on families: to support family caregiving through equitable incentives and investments in care, social, and basic infrastructure programs, and to institute regulatory measures in the market for care services in order to protect the well-being of care recipients and caregivers. Below are country examples of these roles.

In the rapidly aging, high-income countries, a focus has been on strengthening their government-funded Long-Term Care Insurance (LTCI) systems. In Japan and Korea, families receive care allowances from the government and are able to purchase private care services if they choose to do so (Peng & Yeandle, 2017). In Germany, the LTCI system is financed through pay-as-you-go social insurance premiums, alongside private insurance for higher earn-



**Fig. 7.** Estimated wage cost of unpaid caregivers if they were paid, as a percent of GDP. Notes: Estimates are calculated by multiplying the estimated total number of unpaid care workers using a 40-hour work week (Table 5) by the average wage for human health and social work. To get 2030 estimates, the average wage for human health and social work is projected forward using the average annual real growth rate of all wages for each country from 2008–2017 (15.2%, 8.3%, and 1.2% for Ghana, Mongolia, and South Korea, respectively) (ILO, 2018b). Data sources: Authors' calculations using mean nominal monthly earnings of employees by sex and economic activity in the ILO's Harmonized Series (ILO, 2019); World Development Indicators (World Bank Group, 2020); Projected Real Gross Domestic Product (GDP) and Growth Rates of GDP for Baseline Countries/Regions (in billion 2010 US dollars) for 2011–2031 (United States Department of Agriculture, 2020b); Global Wage Report 2018/19 (ILO, 2019).

ers and state welfare funds for lower-income households (Peng & Yeandle, 2017).

General government investments in public infrastructure such as safe water, sanitation services, road safety, and health services help to mitigate the family care burden by decreasing the prevalence of diseases and injuries and reducing the cost of support care activities. Mobile reproductive health centers in the Gambia and state-funded home-based care services for HIV/AIDS patients in South Africa have helped disadvantaged families to meet their care needs (Esquivel & Kaufmann, 2017). In Peru, a government early child development program offers daycare services in marginalized urban areas and home visiting services in rural communities that deliver weekly visits and monthly group sessions for toddlers and their caregivers (Josephson, Guerrero, & Coddington, 2017). In the Philippines, a state program for young children includes the delivery of integrated services for children with development disorders and disabilities (King, 2020). These government investments require greater fiscal space which can be created through progressive and redistributive tax structures, more efficient tax collecting, and the introduction of taxes on certain commercial and financial transactions (Fontana & Elson, 2014).

The 2018 ILO report's call for "a high road to care work" pertains to the role of work regulations and decent terms and conditions of employment for care workers (ILO, 2018a). Two policy areas are examples of this approach: First, policies that support family caregivers and encourage a more egalitarian sharing of the care burden. In 2015, statutory paternity leave entitlements were provided in 94 of 170 countries, although paid paternity leave remains too short—seven days on average compared to an average of 106 days for maternity leave (Elson, 2017). In Norway, generous family policies, financed with progressive taxation and benefit transfers, have raised women's labor market participation while pulling men toward household work (Kitterød & Lappegård, 2012). In France, a shorter full-time work week for both women and men allows both mothers and fathers to share more equally in paid and unpaid

work (Elson, 2017). In poorer countries with a small formal sector, the challenge to government is to establish programs that integrate health, social insurance and care services for individuals and families, perhaps eliciting community participation in order to alleviate the pressure on its fiscal and administrative capacity, as well as to use measures such as targeted tax relief for caregivers.

Second, labor policies that protect the rights of domestic workers, including migrant workers engaged as caregivers, support family caregiving. Laws have historically protected the rights of workers in enterprises, but such laws have typically excluded migrant workers (King-Dejardin, 2019). In Chile, a 2014 labor law limits the working time of live-in domestic workers, and in Thailand, a 2012 ministerial order ensures paid annual leave and holidays and weekly rest to domestic workers (King-Dejardin, 2019). These laws help to manage the rising demand for paid workers as a result of the aging of populations and women's increased entry into the labor force.

Care work has been accorded relatively low political priority because of the prevailing belief that caregiving is primarily the responsibility of the family and has little impact on economic development and growth. The immense pressure on the care and health sectors due to COVID-19 is rapidly changing that view. The world does not yet know the full impact of this global crisis of 2020 on the sectors of the economy, but its adverse impact on families and health workers and how they have coped are on display every day. This and other health crises and periodic natural disasters are acute reminders of the need for countries to establish robust care systems that acknowledge the contributions of both unpaid and paid caregivers.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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**Appendix A**

**Table A1**  
Economic dependency ratios by world region (%).

World region	Type of dependency ratio	2015	2030
Africa	Child	74.1	64.0
	Elderly	6.1	6.8
	Total	80.2	70.8
Latin America & the Caribbean	Child	38.5	31.8
	Elderly	11.6	17.9
	Total	50.1	49.7
North America	Child	28.5	27.7
	Elderly	22.3	33.0
	Total	50.8	60.6
Europe	Child	23.7	24.1
	Elderly	26.4	37.0
	Total	50.1	61.1
Oceania	Child	36.8	35.6
	Elderly	18.1	24.3
	Total	54.9	59.9
Asia	Child	36.2	31.4
	Elderly	11.0	17.6
	Total	47.2	49.0

**Table A2**  
Specific activities included in time-use survey care categories, Ghana, Mongolia, and South Korea.

	Child Care	Elder Care	Indirect Care
Ghana	Physical care of young children Teaching, training, and helping children Accompanying children to places Minding children (passive care)	Physical care for adults Emotional care and support for adults Accompanying adults to places	Food management Cleaning and upkeep of dwelling and surroundings Do-it-yourself decoration, maintenance and small repairs Care of textiles and footwear Household management Shopping for/purchasing of goods and related activities Shopping for/availing of services and related activities Travel related to provision of unpaid domestic services Unpaid domestic services not covered by the above
Mongolia	Caring for pre-school age and school-age children/physical care Reading, playing and talking to children Assisting with school work Meeting with teachers and attending parent-teacher meetings Other activities related to childcare	Caring for dependents adults/physical care for the ill, disabled, and bedridden Other activities related to caring for dependent adults	Preparing meals/snacks and cleaning up after food preparation, meals or snacks Hand-washing; loading/unloading washing machine Indoor and outdoor cleaning Shopping for/purchasing of goods and related activities Improvement, maintenance and repair of dwellings personal and household goods including computers Vehicle maintenance and minor repairs Collecting water, preparing fuel and heat for dwelling Other activities related to household management
South Korea	Physical care of children aged 0–9 Educational activities with children aged 0–9 Reading and playing with children aged 0–9 Providing medical care for children aged 0–9 Other care for children aged 0–9 Physical care of children aged 10–17 Other care for children aged 10–17 Travel related to child care	Medical care for non-household parents Other caring activities for non-household parents Medical care for non-household family members Other caring activities for non-household family members Travel related to elder care	Cooking and washing dishes Laundry and clothing repair Home cleaning and taking out trash Home repairs and maintenance Shopping Organizing and managing the household Other household chores Travel related to indirect care

Data sources: 2009 Ghana Time-Use Survey, 2011 Mongolia Time-Use Survey, and 2014 South Korea Time-Use Survey.

**Table A3**  
Household composition by age group, Ghana, Mongolia, and South Korea.

	Percent distribution by number and age of household members (%)					
	0	1–2	3–4	5–6	7+	>0
Ghana						
All ages N = 4,179)		35.0	30.7	22.1	12.2	100
0–4	62.3	35.6	2.0	0.1	0.0	37.7
5–14	48.3	38.2	11.9	1.3	0.1	51.7
15–64	6.6	68.8	20.6	3.4	0.5	93.4
65–74	88.2	11.8	0.0	0.0	0.0	11.8
75+	92.6	7.4	0.0	0.0	0.0	7.4
Mongolia						
All ages (N = 1,322)		28.1	47.4	21.2	3.4	100
0–11	45.6	46.8	7.3	0.3	0.0	54.4
12–14	81.6	18.3	0.1	0.0	0.0	18.4
15–64	4.7	59.5	32.2	3.3	0.4	95.3
65–74	90.6	9.4	0.0	0.0	0.0	9.4
75+	95.2	4.8	0.0	0.0	0.0	4.8
South Korea						
All ages (N = 11,756)		62.5	35.4	2.1	0.0	100
0–4	88.4	8.6	2.9	0.1		11.6
5–14	88.9	8.5	2.4	0.1		11.1
15–64	23.7	17.9	37.0	21.4		76.3
65–74	86.4	8.9	4.7	0.0		13.6
75+	90.1	7.6	2.3	0.0		9.9

Notes: The average household sizes based on the national time-use surveys are: 3.76 in Ghana, 3.53 in Mongolia, and 2.23 in South Korea. Data sources: Authors' calculations using 2009 Ghana Time-Use Survey, 2011 Mongolia Time-Use Survey, and 2014 South Korea Time-Use Survey.

**Table A4**  
Labor force participation rates and average hours worked in Ghana, Mongolia, and South Korea.

Country	Gender	Unadjusted for full-time or part-time work				Adjusted for 40-hour workweek				Adjusted for 48-hour workweek				Average hours per week 2015
		15–64		65+		15–64		65+		15–64		65+		
		2015	2030	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030	
Ghana	Female	65.0	63.1	37.5	34.1	50.5	49.1	29.2	26.5	42.1	40.9	24.3	22.1	31.1
	Male	73.6	72.2	47.0	42.4	64.8	63.6	41.4	37.3	54.0	53.0	34.5	31.1	35.2
Mongolia	Female	56.8	52.6	7.2	6.6	63.9	59.2	8.1	7.4	53.3	49.3	6.8	6.2	45.0
	Male	69.9	63.2	10.9	8.0	89.2	80.6	13.9	10.2	74.3	67.2	11.6	8.5	51.0
South Korea	Female	57.9	60.9	23.4	25.5	57.7	60.8	23.4	25.5	48.1	50.7	19.5	21.2	39.9
	Male	77.8	80.1	42.2	42.9	88.9	91.5	48.2	49.0	74.1	76.3	40.2	40.8	45.7

Notes: Labor force participation rates do not reflect hours worked (unadjusted). To obtain a full-time equivalent labor force participation rate, we adjust for a 40-hour or 48-hour workweek. These adjustments capture differences among the countries in shares of full-time and part-time workers. Data sources: Authors' calculations using ILOSTAT modelled estimates of labor force participation by age and sex (ILO, 2019) and of average actual hours worked by sex (ILO, 2019).

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