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The future of grandparenthood in South Asia: The role of population aging and educational expansion

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The future of grandparenthood in South Asia: The role of population aging and educational expansion

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Abstract

Grandparents are an integral part of family support systems, serving as both providers and consumers of instrumental, financial, and emotional care. They also play a central role in transmitting cultural and financial capital to their grandchildren. Grandparenting, which refers to the care, support, and engagement grandparents provide to their grandchildren, is a socially expected phenomenon in South Asia. Grandparents are often expected to play active caregiving roles and typically co-reside with their grandchildren. While previous research has explored grandparenting across various socioeconomic groups, little is known about how evolving sociodemographic trends might impact grandparenthood in the future. Using data from the United Nations and the Wittgenstein Center for Global Human Capital, we explore how national-level sociodemographic changes are expected to affect the number of living grandparents per grandchild, as well as the age, sex, and educational profiles of grandparents across South Asia. We project that grandparental availability will increase, with grandparents becoming older and better educated. Specifically, the average age of grandparents in South Asia is expected to rise by six to eight years from 2024 to 2100, and the number with post-secondary education will increase significantly. These shifts are likely to affect the balance of care exchanged between generations, with potential benefits and challenges for grandparents, parents, and grandchildren.

Keywords: Grandparents, Caregiving, Education, Population Ageing, Delayed Reproduction, South Asia

1. Introduction

Grandparenting is a common phenomenon that is observed worldwide. Grandparenting refers to the roles and activities of grandparents in providing care, emotional support, guidance, and other forms of assistance to their grandchildren, although the social expectations of grandparents differ across regions (Cherlin & Furstenberg, 1992). In some cultures, grandparenting is deeply ingrained and highly anticipated as a form of duty, while in others, the social expectations of grandparents are relatively low. Grandparents play a pivotal role in the family support system, in which each family member supports the others in different ways. Grandparents provide physical care, financial support, and emotional support and facilitate the transmission of values and cultural practices to their grandchildren. Even after death, grandparents contribute to their grandchildren's wealth through intergenerational wealth transmission. In cases in which parents are absent or cannot provide primary care (due to living arrangements, illness, death, a time-demanding paid job, etc.), grandparents often become the primary caregivers of their grandchildren (Cowling et al., 2015; Martin et al., 2021; Zhao et al., 2018). The benefits of grandparental care and support extend not only to their grandchildren, but to other family members as well. By stepping in as caregivers, grandparents provide parents with more freedom to participate in the labor market, reducing their caregiving burden and work-life strain (Compton & Pollak, 2014; Posadas & Vidal-Fernandez, 2013). Parents can also greatly benefit from the advice and emotional support that grandparents can offer from their own parenting experience (Coall & Hertwig, 2010; Nie et al., 2023).

We anticipate a significant shift in the characteristics of grandparents in the future, when there will be more living grandparents who are both older and better educated than grandparents in the past. These changes are likely to be driven by three key factors. First, delayed fertility means that individuals are having children, and consequently grandchildren, at older ages, leading to a later entry into grandparenthood. Second, increasing life expectancy implies that more people are surviving to older ages, resulting in a larger population of grandparents remaining alive until older ages. Third, the expansion of education is producing a growing number of highly educated individuals. As educational attainment continues to rise, future grandparents will likely be better educated than those of earlier. Taken together, these trends of delayed reproduction, rising life expectancy, and increasing education are expected to create a future population of grandparents who are not only more in terms of number, but are also older and more educated than ever before.

In this study, we ask the following research question: **How are changing sociodemographic trends in South Asian countries likely to reshape the characteristics of grandparents and their potential role in caregiving in the future?** Understanding these shifts in the characteristics of grandparents is important, as individuals in South Asia depend heavily on informal care. As well as providing support, grandparents may need support themselves. By studying how the age, sex, and educational characteristics of grandparents change over time, we can provide insights into whether grandparents are willing to provide or in a position to offer any form of support to their grandchildren, or whether they are likely to require similar support themselves. These findings can guide policymakers in designing targeted policies aimed at both increasing the care supply for grandparents by providing necessary support and resources and developing robust formal care

systems when grandparents do not want are less able to provide care. Such policies would help individuals balance their family caregiving responsibilities, ensuring both the well-being of grandparents and the sustainability of the family support system.

While this study primarily focuses on how the age, sex, and educational profiles of grandparents are likely to change in the future, it does not directly explore the specific types of care provided by or required from grandparents. Instead, it draws on findings from previous research to examine how the sociodemographic characteristics of grandparents may influence the supply of and demand for informal care within families.

Grandparenting can have a complex impact on the health and well-being of older adults, including both positive and potentially negative effects. For grandparents, caring for their grandchildren can foster a strong sense of purpose, improve their social connections, and enhance their emotional health as they become active contributors to their families (Lai et al., 2021; Mansson, 2016). Many studies from China provide evidence of these positive effects, showing that grandparenting reduces symptoms of depression among older adults. This benefit is partly due to the reciprocal relationships formed, whereby grandparents receive emotional and financial support from their adult children as they assist with childcare (Hong et al., 2023; Liu et al., 2020; Wang et al., 2024). However, grandparenting can also be physically and mentally demanding, especially when the grandparents' responsibilities are intense or when they take on custodial roles as primary caregivers. A meta-analysis by Danielsbacka et al. (2022), which examined 117 studies from 1978 to 2019, found that grandparents who provided custodial care experienced declines in their health and well-being. In contrast, grandparents who engaged in less intense caregiving, such as occasional or supportive roles without co-residing with their grandchildren, reported better well-being outcomes. These findings are further supported by the results of a qualitative study from India in which grandparents in skipped-generation households reported negative mental health impacts, while those in multigenerational households expressed feelings of happiness and companionship (Barman & Sahoo, 2024).

1.1 Household Dynamics and Family-Centered Welfare in South Asia

South Asian countries are strongly family-oriented, with individuals relying heavily on family for physical, financial, and emotional support due to limited formal welfare systems, especially in the areas of childcare and elder care. This led to the high prevalence of multigenerational households and co-residence. In the absence of comprehensive social programs, multigenerational households are common, with families pooling resources and responsibilities across generations The UN's Demographic Year Book 2022 showed that around 30% of households in South Asia are three-generational households, and around 1% are skipped-generational households in which parents are absent and grandparents live under the same roof as their grandchildren (UN, 2022). This prevalence varies by countries for example, three-generational households are prevalent, with the Maldives having the highest share of such households at 35.86%, followed by Pakistan (33.29%) and India (30.15%). In most South Asian countries, except in Iran, over 20% of households are structured as multigenerational (UNDESA,

2022). Iran stands out, as only 3% of Iranian households are multigenerational, reflecting the country's higher urbanization rate and relatively developed economy. Despite these differences, informal family care remains essential across the region, including in Iran, where cultural expectations strongly reinforce the idea that adult children should care for their aging parents (Amini et al., 2020). In Iran, as in the rest of South Asia, the use of formal elder care institutions is often viewed as a last resort.

Thus, all of these countries are characterized by a reliance on family-centered care, which compensates for the lack of formal welfare systems. However, the degree of dependence on family care varies. For instance, in India and Nepal, where social welfare systems are minimal, families bear the primary responsibility for elder care. India's National Social Assistance Program (NSAP) provides only modest pensions to economically vulnerable seniors, and public healthcare services are often inadequate (Government of India & Ministry of Rural Development, 1995). Similarly, Nepal's old-age allowance under the Senior Citizens Act is insufficient to cover living and healthcare expenses (Acharya et al., 2023; Ministry of Women, Children and Social Welfare, 2006). In contrast, Iran's more advanced social welfare framework reduces dependence on family support, although cultural preferences for family care persist.

1.2 Sociodemographic trends influence grandparents' age, sex, and educational characteristics

In this study, we focus on grandparents in South Asia. According to the United Nations, South Asia comprises nine countries: Afghanistan, Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan, and Sri Lanka. This region includes some of the world's most populous countries, such as India, Pakistan, and Bangladesh, and it is the most populous region in the world. For this study, we focus on eight of these countries, excluding Afghanistan. Education in Afghanistan differs starkly from that in other South Asian nations. Under Taliban rule from 1996 to 2001, girls' education was heavily restricted. Although educational access improved somewhat after the Taliban's initial fall, allowing millions of children, including girls, to attend school, the group's return to power in 2021 reintroduced strict bans on female education, barring girls from secondary and higher education (UNESCO, 2024). Since we do not have the data to reflect those changes in educational access, this study is limited to eight other South Asian countries where educational progress is not hindered as it is in Afghanistan.

Demographic trends are reshaping family structures across South Asia, with increasing life expectancy, declining fertility rates, and delayed childbearing observed throughout the region. However, the pace of these changes differs between countries. For instance, Sri Lanka and Iran have higher life expectancy rates, with Sri Lanka reaching 77 years in 2024, compared to India's 72.2 years. Similarly, delayed childbearing is more pronounced in Bangladesh, where the mean age at first birth increased from 18 years in 2011 to 19.4 years in 2022, compared to Nepal, where it rose more slowly from 20.2 years in 2011 to 20.6 years in 2022 (Measure DHS, 2012; Ministry of Health and Population et al., 2022). These demographic changes are not only aging populations across the region but also altering the age and sex composition of grandparents. With life expectancy increasing, more individuals are living longer and transitioning into the role of grandparents, often at older ages. Additionally, declining fertility and delayed reproduction mean

that grandparents are more likely to be older and part of smaller family units. Gender dynamics are also affected, as women, who generally have higher life expectancy than men, represent a larger proportion of the grandparent population, particularly in older age groups. For example, in 2024, the share of the population aged 65 and above was 12.1% in Sri Lanka, compared to 7.15% in India with women constituting a majority of these older populations (UN, 2024; NIPORT et al., 2011; NIPORT & ICF, 2022).

Education is also improving in South Asia, but disparities remain. For example, in 2020, the Maldives had the lowest proportion of adults aged 65+ with post-secondary education (0.39%), while Iran had the highest (6.87%). By 2050, this share is expected to increase significantly across all countries, albeit with varying levels of progress. By 2050, this proportion is projected to reach 13.08% in the Maldives, while in Nepal, this share is projected to increase more modestly, from 1.72% in 2020 to 4.62% in 2050. Despite these differences, the trend of rising educational attainment is observed across the region, driven by demographic changes that result in each new generation benefiting from better access to education (K. C. et al., 2024). These trends in educational expansion suggest that future grandparents in the region will be more highly educated than previous ones.

Despite the extensive body of literature on demographic changes, education expansion, and socioeconomic development in South Asia, there is a significant gap in the research on how these shifts impact the sociodemographic characteristics of family members and the caregiving roles associated with these characteristics. South Asia has experienced substantial demographic shifts and is projected to continue experiencing them until the end of the 21st century. These shifts include declining fertility rates, delayed reproduction, and increasing life expectancy, which profoundly alter the age-sex structure of populations (UN, 2024). While many studies show that South Asia's population is expected to age and highlight the challenges this trend will bring, the impact of an aging population on the supply of and the demand for informal care within the family is still not well understood. Additionally, how the type of informal care supply is changing within families has not been examined in relation to the dramatic improvements in educational attainment (K. C. et al., 2024) across all countries in this region. Although some studies have projected that the number of grandparents in South Asian families will increase in the future due to changing fertility and mortality patterns (Alburez-Gutierrez et al., 2023), the details of the characteristics of these grandparents, such as age, sex, and education, which may influence the type of care they can provide to their grandchildren and to other family members, are not yet known.

As the sociodemographic landscape in South Asian countries evolves, informal caregiving dynamics are likely to shift significantly. With rising educational levels, delayed reproduction, increasing life expectancy, and changing family structures, traditional caregiving roles, especially those filled by grandparents, are likely to shift. Thus, substantial changes in both the capacity and the willingness of grandparents to provide hands-on care are anticipated. As the majority of South Asian countries currently have weak to non-existent formal social welfare systems to support childcare, elder care, and work-life balance for adults, families face significant pressure to meet these growing demands on their own (Waidler et al., 2021). Policymakers need to proactively consider how changes in care demand and supply will affect families and society in the coming years. Strategic planning and targeted investments in social

welfare will not only support families, but can also strengthen the broader economy by enabling individuals to balance family and work responsibilities more effectively.

1.3 Influence of grandparents' age, sex, and educational characteristics on the nature of grandparental care

Family systems theory (Bowen, 1993) explains how changes in the characteristics of one family member affect the entire family system. Due to changing sociodemographic trends, South Asian countries are experiencing shifts in family structures, which are likely to influence caregiving dynamics within families. As demographic transitions progress, future grandparents are expected to be older and better educated, which may reshape traditional family support systems. For instance, younger, healthier grandparents may more capable of assisting with childcare but face challenges in balancing caregiving with paid work, while older grandparents with increasing health needs may themselves require care from other family members, which highlights the interconnected nature of caregiving responsibilities (Hamilton & Suthersan, 2021). Additionally, as more women gain education and enter the workforce, caregiving roles within families are likely to shift. The evolving age and educational profiles of grandparents can influence both the care they provide to grandchildren and the support they require themselves. These changes are expected to shape patterns of informal care, formal care demand, labor force participation, and economic outcomes, which points to the importance of considering grandparental characteristics and family interdependencies when designing policies to address caregiving inequalities.

The age of grandparents plays a significant role in the care and support they provide to their grandchildren. Older grandparents often accumulate more wealth and life experience, which allows them to support their families through intergenerational transfers (Shwalb & Hossain, 2017). A study (Pfeffer & Killewald, 2018) on US families demonstrated that a grandparent's wealth is closely correlated with a grandchild's wealth, as wealth is transmitted across generations through gifts, bequests, education, marriage, homeownership, and business ownership. While older grandparents may offer more wealth and experience, their health tends to decline as they age, which can place additional care demands on the family, and can strain the family's finances. Additionally, older grandparents have fewer years left to spend with their grandchildren, which can limit the duration of intergenerational transfers. These findings are aligned with the linked lives theory, which offers an additional lens through which to frame the complexities of grandparental care. This theory emphasizes the interconnected trajectories of family members over time, positing that the advantages and disadvantages experienced by one generation can significantly influence subsequent generations (Elder, 1998). In South Asia, where multigenerational households are common, the resources and constraints of grandparents, such as their education, wealth, and health, can shape the educational and economic stability of their children and grandchildren.

Younger grandparents are usually more physically active, allowing them to engage more in household tasks and play with their grandchildren. They have more years ahead to foster stronger intergenerational bonds. However, many younger grandparents are engaged in the labor market, which limits the time they have to spend with their grandchildren and to provide them with informal care. A large number of younger grandparents in South Asia belong to the "grand

sandwich generation," who are responsible for caring for both their young grandchildren and their elderly parents (Alburez-Gutierrez et al., 2021). This balancing act imposes considerable strain, as these grandparents are required to divide their time, attention, and resources between these distinct caregiving roles. As a result, they may struggle to provide the level of attention and support their grandchildren require, potentially impacting the quality of the care they can offer. This dual responsibility can also take a toll on their physical and mental health, as the demands of caregiving may aggravate their own age-related health issues. Transitioning to grandparenthood also requires significant emotional and psychological adjustment. Many grandparents, especially those in the grand sandwich generation, may find it challenging to navigate these evolving family roles, as the caregiving expectations placed on them often exceed their own capacity to provide support and limit the time they can spend on self-care and social networking. Arpino & Bordone's (2017) research suggests that for grandmothers across Europe, having regular caregiving responsibilities for their grandchildren can negatively impact their social engagement levels, reducing their participation in activities such as volunteering, educational or training courses, and involvement in political or community organizations. Similarly, Leimer & van Ewijk's (2022) study on Western European countries highlights that grandmothers who provide daily childcare may experience grandparenthood as a burden, which can detract from their overall well-being. However, the results show an insignificant impact on grandfathers.

The gender of grandparents plays a significant role in shaping grandparental care. Research consistently shows that grandmothers are more likely than grandfathers to provide care for their grandchildren (Buchanan & Rotkirch, 2018; Fuller-Thomson et al., 1997; Reitzes & Mutran, 2004; Zanasi et al., 2023). Grandmothers often leave the labor market once they have grandchildren, unlike grandfathers, who generally continue working until the traditional retirement age. Research indicates that women’s labor force participation rate decreases by around 30% when they become grandmothers, while this effect is minimal for grandfathers (Backhaus & Barslund, 2021; Rupert & Zanella, 2018). On the other hand, grandparental childcare has been positively associated with mothers' participation in the labor force (Aassve et al., 2012; Arpino et al., 2014; Posadas & Vidal-Fernandez, 2013). Therefore, grandparents play a vital role in providing childcare to enable parents, and particularly women, to engage in other essential activities, including labor force participation (Dommaraju & Wong, 2022; Zahra et al., 2023). Moreover, the type of care grandparents provide also differs based on their gender: grandmothers are more involved in activities like cooking, cleaning, caring for grandchildren when they are sick, and helping with homework, while grandfathers tend to be less engaged in these day-to-day tasks (Gessa et al., 2020). A study from Bangalore, India, confirms this pattern, demonstrating that grandmothers play a more active role in their grandchildren's lives (Gray et al., 2019). This study also shows that grandchildren tend to have more frequent communication and involvement in family activities, such as festivals and rituals, with their grandmothers, while their grandfathers are more likely to provide them with guidance and advice.

Educational attainment can improve the nature of the care provided by grandparents. The literature has suggested that higher educational attainment among grandparents is associated with better cognitive development, more educational activities, and better academic performance in their grandchildren (Di Gessa et al., 2022; McGarrigle et al., 2018; Sheppard & Monden, 2018). Better educated grandparents are better equipped to utilize resources such as books, educational

toys, and extracurricular activities, fostering an enriching environment for their grandchildren. Higher educated grandparents also tend to be healthier, allowing them to spend more quality time with their grandchildren (Song & Mare, 2019). Since higher education is linked to lower fertility rates in South Asia (Adhikari et al., 2024), these grandparents tend to have fewer children, and their children are likely to follow the same pattern, resulting in fewer grandchildren. This allows grandparents to spend more time and resources on each grandchild. Additionally, higher educated grandparents often have more wealth due to the higher income levels associated with education, enabling them to provide greater financial support to their family members (Psacharopoulos, 1994). Grandparents with higher education influence the socioeconomic status not only of their own children but also of their grandchildren through the intergenerational transfer of educational benefits. Studies have shown that parents with highly educated grandparents are more likely to have higher educational attainment and socioeconomic status, which they then pass on to their own children (D'Addio, 2007; Dubow et al., 2009; Mastekaasa & Birkelund, 2023). Thus, grandparents' education is a significant factor in their grandchildren's educational outcomes and socioeconomic status. Also, higher educated grandparents are more likely to remain active in the labor force until later in life (Zaccagni et al., 2024), which may allow them to offer more financial but less physical support to their grandchildren.

Lower educational attainment among grandparents is also associated with certain challenges, particularly in terms of health and financial stability. Research indicates that individuals with less education often lack access to information about health risks and preventive measures, which can contribute to poorer health outcomes over time (Hassen et al., 2022). This limited health literacy often results in higher rates of chronic illness and decreased overall well-being, potentially impacting their ability to provide consistent, active care. For instance, studies from the Global North show that highly educated individuals are more likely to experience healthy aging and better physical resilience than their less educated peers (Wu et al., 2020). Financially, having a lower educational level is associated with reduced lifetime earnings and limited wealth accumulation, which may constrain the financial support grandparents can provide (Raghupathi & Raghupathi, 2020). A recent study from India similarly found that elderly individuals, especially those with lower educational and economic backgrounds, are more likely to remain in the workforce at an advanced age, usually by necessity rather than by choice (Balachandran & Satheesha, 2024). This creates a complex dynamic whereby families may depend on grandparents for both caregiving and financial stability. At the same time, these grandparents face challenges due to their limited resources, and may require support from younger family members to meet their needs. Despite these constraints, grandparents with lower educational attainment often adopt a more traditional approach, focusing on providing day-to-day support such as caregiving, feeding, and meeting basic needs. They tend to emphasize physical well-being and instill values through the transmission of life skills and cultural traditions to their grandchildren (McGarrigle et al., 2018).

2. Data and Method

We model the characteristics of grandparents using aggregate demographic information. As a first step, we implement kinship models that take age, year, and sex-specific population counts, as well as fertility and mortality rates, as input, and return expected kinship structures for an average member of the population as output. These methods were first proposed by Goodman et al., (1974). The age distribution of grandparents at the time of the focal individual's birth is estimated using a two-sex, time-variant kinship model, as outlined and implemented in R package "DemoKin"(Williams et al., 2023). Results pertain to an average member of the population, whom we will refer to as "Focal" hereafter for convenience. When we describe the grandparents of Focal, the interpretation in this context is based on the reference point of a grandchild.

This model begins by estimating the age distributions of the Focal's mother and father, who are assumed to be the only biological parents at the time of the Focal's birth. The age distribution of the parents is inferred from age-specific fertility rates for each country. Given that the grandparents are the parents of the Focal's parents, their age distribution at the time of the Focal's birth is derived by combining the age distribution of the mother's parents at the mother's birth and the father's parents at the father's birth, adjusted by the age distribution of the Focal's parents at the time of birth. The model's core formula is:

$$K(x + 5, t + 5) = UtK(x, t) + \beta(x, t)$$

Here, the vector $K(x, t)$ represents the number of grandparents of age x at time t. Ut is the survival matrix, representing the surviving grandparents from age x to $x + 5$. $\beta(x, t)$ represents the recruitment of new grandparents, which varies depending on the type of kin in the model. Since no new biological grandparents can appear after the birth of a grandchild (this model does not account for step-kin), the recruitment term is:

$$\beta(x, t) = 0$$

Therefore, the expected number of grandparents at age $x + 5$ and time $t + 5$ is the number of surviving grandparents from age x to $x + 5$ at time t to $t + 5$.

We estimate and project the number of grandparents for a randomly selected individual of a specific age from the population from 1950 to 2100 using the median estimates of fertility and survival probabilities from the 2024 revision of World Population Prospects (UN, 2024). To estimate the grandparents from both the patrilineal and the matrilineal side, we require fertility and survival probability rates for both males and females. Since WPP does not provide male fertility rates, we use female age-specific fertility rates. We adjust them according to the male age distribution based on the differences in the mean ages at fatherhood for males and the mean ages at childbearing for females in each country, as recommended by (Schlüter et al., 2024). The mean ages at childbearing and fatherhood are sourced from (Schoumaker, 2019). For each country, the difference, Δ, between the mean age at fatherhood and the mean age at childbearing is calculated. Male age-specific fertility rates are then derived by adding this difference to the female age-specific fertility rates.

$$Fx(m) = Fx(f) + \Delta$$

Δ represents the difference in the mean age at fatherhood and the mean age at childbearing. This Δ closely aligns with the average spousal age difference at marriage documented in (Dommaraju, 2024) in respective South Asian countries. This close alignment further validates the method used to approximate male fertility in South Asia, where out-of-wedlock births are rare. Δ is kept constant over the study periods because of the data limitations for the mean age at fatherhood.

To incorporate education alongside the age and sex of grandparents, we use the 2023 revision of the Wittgenstein Centre for Demography and Global Human Capital (WIC) (K. C. et al., 2024). These data provide the population proportion across six educational groups: no, some primary, primary, lower secondary, upper secondary, and higher secondary education, available for each country, sex, five-year age group, and five-year period from 2020–2025 to 2095-2100. We compare the age, sex, country, and time between our estimated grandparents' data and the WIC's education data. Once the age, sex, country, and time period are matched, we apply the education distribution of the population of a given subgroup to the number of grandparents, assuming they follow the same educational distribution as the general population. The different sets of education data are used for three different Shared Socioeconomic Pathways (SSPs), SSP1, SSP2, and SSP3, to examine how grandparents' education changes under different socioeconomic scenarios. Each SSP scenario represents distinct trajectories of future socioeconomic development. SSP1, or the "Sustainability" scenario, envisions a future where countries prioritize sustainable development and strive for greater equality. In this scenario, education is rapidly expanding, with significant investments being made to ensure broad access to education for all. This leads to substantial improvements in human capital across countries and regions, with a focus on sustainable growth and social equity. SSP2, known as the "Middle of the Road" scenario, reflects a future that continues along current global trends. Here, educational progress proceeds steadily, much like it has in recent decades. The scenario assumes moderate improvements in education and human capital without major disruptions or rapid advancements, maintaining a consistent pace of development. SSP3, or the "Regional Rivalry" scenario, describes a world where countries and regions become more isolated and inward-focused, concentrating on their interests. Under this scenario, economic growth is slow, and education and social welfare progress is limited. As a result, this pathway leads to greater inequality between countries and regions, with some areas experiencing significant setbacks in educational development (O'Neill et al., 2017).

To estimate the education distribution of grandparents, we assumed that it follows the same distribution as the general population, adjusted for age and sex at each time period. To validate this assumption, we compare the education distribution applied to grandparents in the WIC data with the distribution of co-residing grandparents derived from household-level data in the Demographic and Health Surveys (DHS). First, we identify grandparents based on the relationship information in the data, then compare the weighted education distribution of grandparents, separated by age and sex, in Bangladesh, India, and Nepal. See Appendix 1A and 1B.

3. Results

Grandparents living longer than before

Using data from the 2024 revision of the World Population Prospects (WPP), we estimated and projected the number of grandparents for individuals across specific age groups by grandparents' age and sex from 1950 to 2100. Figure 1 illustrates the average number of living grandfathers and grandmothers for a Focal aged 0-4 across seven South Asian countries during this period. A Focal can have up to two grandmothers and two grandfathers, one from each side (matrilineal and patrilineal) of the family. However, in most cases, not all of the Focal's grandparents are alive at the time of their birth or as they age. Thus, individuals rarely have the maximum of four living grandparents. The results show a clear increase in the average number of living grandparents over time, from around two in 1950 to nearly four by 2100. Across all countries, grandmothers consistently outnumber grandfathers, and this trend is more pronounced in some countries than others. The Maldives, Iran, and Nepal have the highest average number of living grandparents, with only small differences between the average numbers of grandmothers and grandfathers.

In contrast, Pakistan and Bangladesh have the lowest numbers of living grandparents, with larger differences between grandmothers and grandfathers. Sri Lanka has the largest gap between the number of living grandfathers and grandmothers per Focal. This gap may be attributable to the deaths and the long-term health consequences of the civil war in Sri Lanka that lasted from 1983 to 2009. An estimated 70,000 individuals lost their lives as a direct result of the conflict. Adult male mortality from external causes, such as war and fire, increased significantly during the war period, particularly among men aged 34 to 64 years. In contrast, the level of external cause mortality among females was less than half that of males (Vithana et al., 2014).

The number of grandparents a Focal has varies not only by country and time period, but also by the Focal's age. For example, the average Focal aged 0-4 has nearly four living grandparents, as shown in the figure. However, the average number of living grandparents a Focal has decreases with age. This decline occurs because as the Focal grows older, their grandparents also age, and thus have lower survival probabilities. Furthermore, since women generally live longer than men and tend to enter grandparenthood earlier than men due to age differences between partners, a Focal is likely to have more living grandmothers than grandfathers as they grow older (see supplementary information A for empirical results).

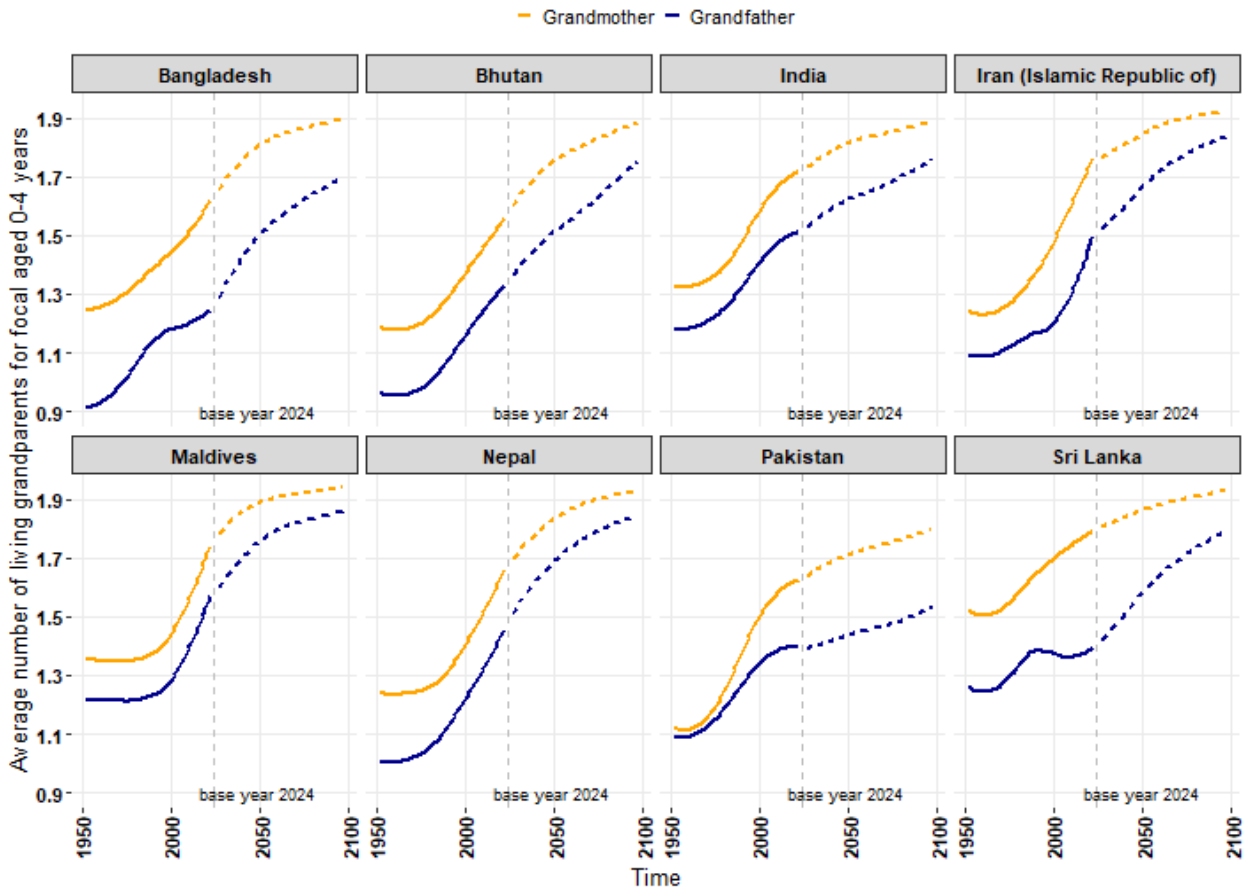

Figure 1: Increasing trend of the estimated and projected average number of living grandparents for a Focal aged 0-4 years from 1950 to 2100. The dotted lines show projected values.

Future grandparents will be older and better educated

Figure 2 illustrates the projected average number of living grandfathers (dotted line) and grandmothers (solid line) in India for each Focal age group shown on the x-axis, ranging from 0–4 years to 25–29 years, across different time periods. The total area under each curve represents the overall number of grandfathers and grandmothers alive at a given time for a Focal of a specific age group. The vertical lines represent the mean ages of grandfathers (blue) and grandmothers (orange). The results are shown for the Focal age groups 0-4, 5-9, 20-24, and 25-29, while the Focal age groups 10-14 and 15-19 are excluded to keep the graph concise. This provides a clearer illustration of how the age gap between grandfathers and grandmothers gradually decreases as both the Focal and their grandparents age.

The age distribution of the grandparents varies by time, sex, and the age of the Focal, with a noticeable shift toward older ages over time and as the Focal grows older. In the future, more grandparents are expected to be alive, but these grandparents will generally be older than they are currently. For instance, for a Focal aged 0-4 years, the mean age of their grandmothers is forecasted to increase from around 53 years in 2024 to approximately 59 years by 2094, while

the mean age of their grandfathers is expected to rise from about 57 years in 2024 to 63 years in 2094. The age distribution of the grandparents also changes with the age of the Focal. As the Focal ages, the number of their living grandparents decreases, and a higher proportion of their surviving grandparents will be grandmothers, who tend to be younger than grandfathers. The grandparents of a Focal aged 25-29 years are expected to be older than the grandparents of a Focal aged 0-4. For a Focal aged 25-29 years, the mean age of their grandmothers is projected to increase from 72 years in 2024 to around 80 years by 2094, while the mean age of their grandfathers is expected to rise from 75 years to approximately 83 years over the same period. By the end of the projection period, the number of grandparents, as well as the age structure of both grandfathers and grandmothers, are converging across South Asian countries. The results for other countries are provided in supplementary information B.

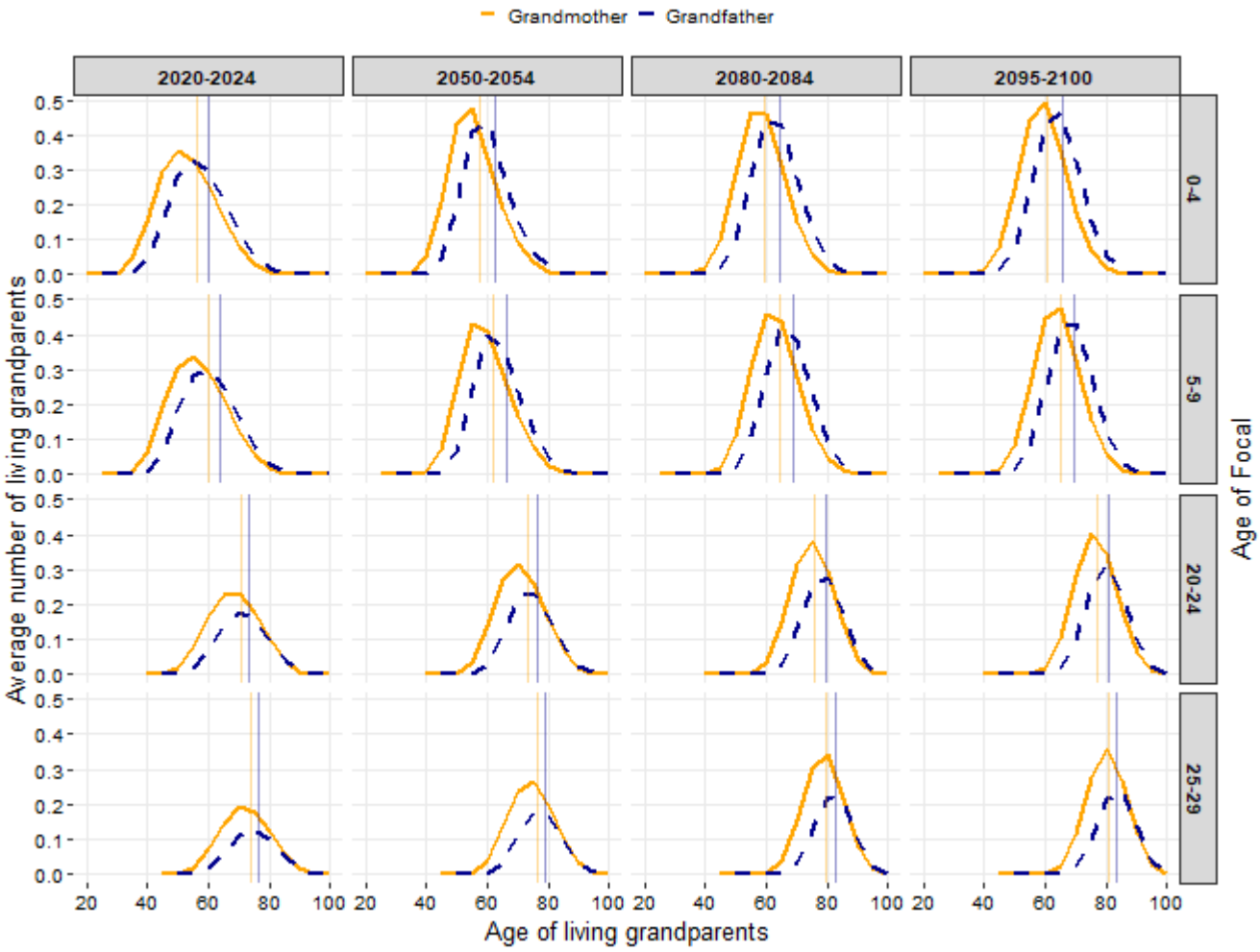

Figure 2: The projected average number of grandparents by age and sex for a Focal of different ages from 2020 to 2100 in India shows that in the future, grandparents will be older than they are currently. The vertical line shows the mean ages of grandfathers (blue) and grandmothers (orange).

Next, we applied the education distribution from the Wittgenstein Centre for Demography and Global Human Capital (WIC) to the grandparents based on their age and sex for each country and time period. As the education distribution is available for five-year periods, we chose the grandparent's number, age, and sex distribution at the middle year of each five-year period. For example, the education distribution of 2020-2024 is applied to the grandparents of 2022.

Figure 3 presents the grandmothers' age and education distribution across different periods (2020-2024, 2050-2054, 2080-2084, and 2090-2094) for a Focal aged 0-4 in each country. The education distribution of grandmothers is based on the education distribution of the female population for a given age and time under SSP2 scenarios from the WIC. To conserve space, we have presented only the results for grandmothers, while the results for grandfathers are provided in the supplementary information B. The results indicate a clear upward trend in educational attainment over time. In the 2020-2024 period, the majority of grandmothers had either no formal education or only incomplete primary education. However, as educational attainment is expected to expand significantly over time, most grandmothers are projected to have at least upper secondary education in later periods. For example, for a Focal aged 0-4 in Nepal, the share of grandmothers with no formal education is projected to decrease from approximately 75% in 2020-2024 to 17% by 2050-2054 and only 1% by 2090-2094, while the proportion of grandmothers with post-secondary education is projected to rise from 1.3% in 2020-2024 to 24% by 2090-2094.

The education distribution of grandmothers also varies by country. In 2020-2024, the majority of grandmothers in Nepal and Pakistan had no formal education, while during the same period, the majority of grandmothers in Sri Lanka had post-secondary education. These differences in the education distribution persist throughout the projection period. Additionally, because a grandparent's educational level is influenced by both age and sex, an older Focal (with older grandparents) tends to have a higher proportion of grandparents with lower levels of education. The complete empirical results, including the results for grandfathers and other age groups, are provided in supplementary information B.

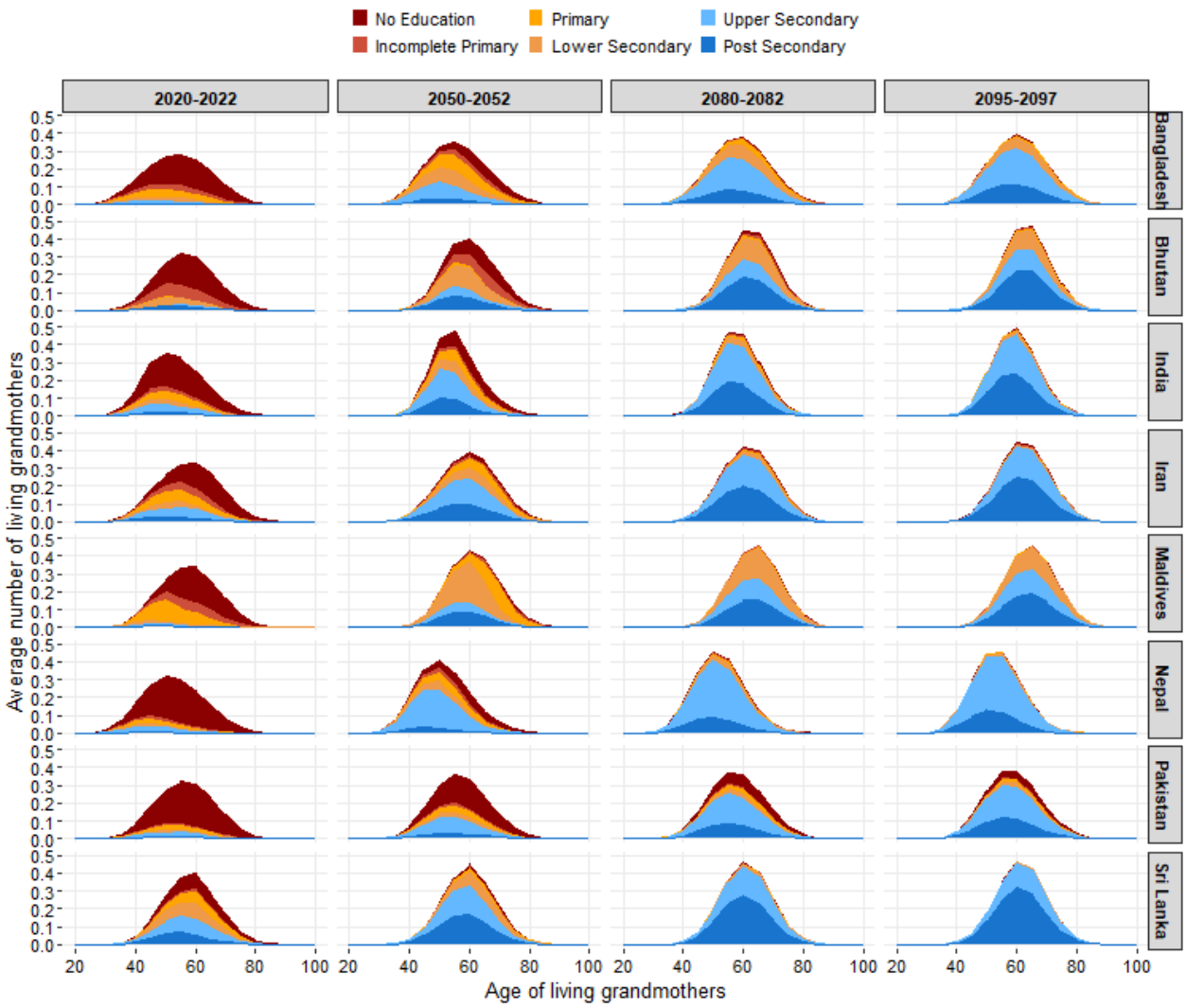

Figure 3: Average number of grandparents by age, sex, and education for a Focal aged 0-4 years from 2020 to 2100

Even though SSP2 is considered the most likely scenario, we also added the education distribution of the grandparents of a Focal aged 0-4 years for the remaining two education scenarios. Figure 4 shows the proportion of grandmothers with each educational level (without considering age) under three Shared Socioeconomic Pathways from 2020 to 2100. Under SSP1, there is a significant improvement in the educational attainment of grandmothers over time. This scenario assumes the rapid expansion of education across all countries. By 2100, the majority of grandmothers are projected to have at least a primary level of education, with a significant proportion reaching secondary and post-secondary educational levels. The share of grandmothers with no formal education diminishes sharply throughout the century, eventually becoming negligible or disappearing.

Under SSP2, the educational levels of grandmothers change less than they do under SSP1. While there is a noticeable increase in the proportion of grandmothers with higher levels of education,

such as secondary and post-secondary education, the change is less pronounced than it is in SSP1. By 2100, a significant proportion of grandmothers still have no formal education or only primary education, although the share is lower than it is in earlier years. Meanwhile, under SSP3, the distribution of educational levels among grandmothers remains largely skewed toward lower levels of education throughout the century. There is only a modest increase in the proportion of grandmothers with primary or higher levels education, and a considerable proportion of grandmothers have no formal education even in 2100.

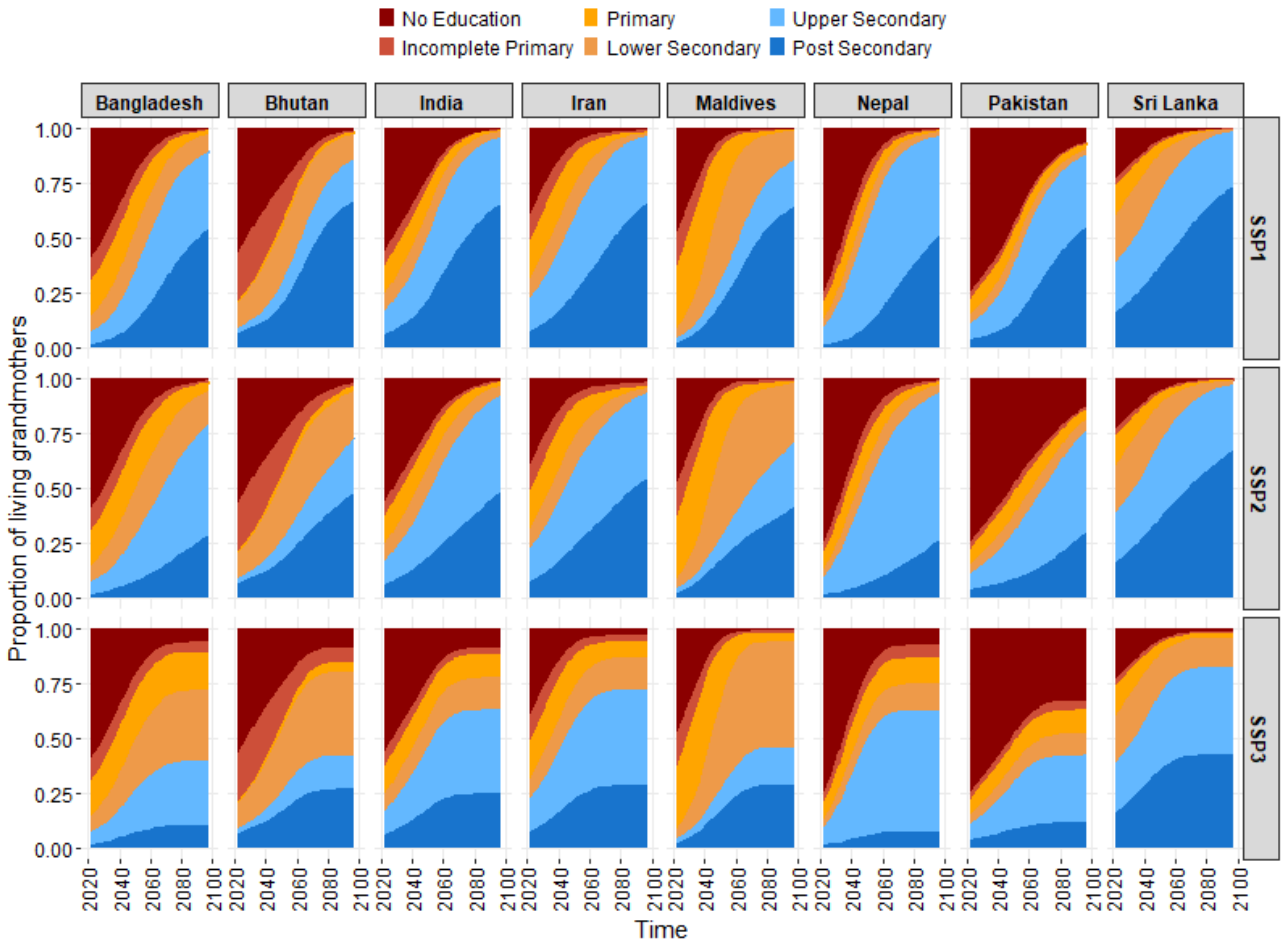

Figure 4: Share of grandmothers by educational level for a Focal aged 0-4 from 2020 to 2100 under different Shared Socioeconomic Pathways (SSPs)

4. Discussion

4.1 Key Findings

This study aims to offer the first comprehensive overview of the average number of grandparents per Focal and their age, sex, and educational profiles across South Asian countries. We highlight four key insights. First, the number of living grandparents is expected to increase with a relatively higher number of grandmothers, which means that grandchildren will have more living grandparents. While the availability of grandparents does not directly measure the strength of relationships or the care exchanged between grandparents and grandchildren, this trend may be beneficial, although it could also increase the informal care demand within the family.

Second, future grandparents are expected to be older. Thus, grandparents may find caring for their grandchildren challenging due to their age-related physical limitations. This increase in the grandparents' age could affect their ability to actively support and engage with their grandchildren. Among grandparents, grandmothers are projected to be younger than grandfathers, which suggests that grandmothers may be more physically capable, and might thus play a more active role in grandparental support, compared to grandfathers. This age difference may contribute to grandmothers taking on more physical care than grandfathers.

Third, grandparents are projected to be better educated than ever before, although their educational levels will vary depending on the future education expansion trajectories. We have outlined some of these possible scenarios in our work. While some scenarios project a significant increase in highly educated grandparents, others show a more moderate rise. Nonetheless, future grandparents will generally have higher educational levels than today's grandparents. As education is often associated with better health, some of the grandparenting challenges that tend to arise at older ages might be compensated for by higher education.

Fourth, the age, sex, and educational characteristics of grandparents are connected to the age distribution of their grandchildren. As grandchildren grow older, their grandparents are likely to be older, fewer in number, and generally less educated. This means that older grandchildren may need to support their grandparents. With a larger proportion of grandmothers surviving as their grandchildren age, these grandmothers may increasingly rely on their children and grandchildren for physical, financial, and emotional care.

In addition, while South Asian countries are currently at different stages of the demographic transition, certain aspects of their demographic profiles are expected to converge in the future. Our projections indicate that these countries will have similar numbers of grandparents, and that these grandparents will have similar age, sex, and educational characteristics. This convergence suggests that there is a shared regional trend in the sociodemographic composition of grandparents, and, ultimately, in grandparental care.

4.2 Implications and policy recommendations

This paper highlights the importance of understanding the age, sex, and educational profiles of grandparents when assessing the levels of care and involvement they can provide. Our main objective is to estimate and project for future grandchildren of specific age groups the number of living grandparents they will have, along with the grandparents' age, sex, and educational characteristics. This section discusses the implications of these anticipated changes for future grandparenting and family support systems. While this study does not offer direct empirical evidence regarding these implications, we base our discussion on insights from previous literature. Understanding when and where grandparents with specific age, sex, and educational profiles will emerge is essential for developing targeted policies. These policies can address the type of care grandparents are likely to provide, ensuring that support systems align with the capabilities and needs of grandparents in each country over time. This information is particularly critical for planning social welfare systems in response to changing demographic and educational trends.

As life expectancy continues to increase across South Asian countries along with delayed childbirth, a growing number of individuals will live to become grandparents, with many experiencing grandparenthood later in life. This study shows that future grandparents will be older, on average, than today's grandparents. This aging trend indicates that while the number of living grandparents per child is expected to rise, their ability to provide physical care may decline due to age-related health challenges. Research from South Asia and Southeast Asia shows a high prevalence of functional disability among older adults, particularly among women, although higher levels of education are associated with fewer physical limitations in both sexes (Malik, 2022; Yau et al., 2022). Therefore, older grandparents are likely to encounter difficulties in handling physically demanding caregiving tasks, potentially transferring these responsibilities to younger family members or relying on formal care services to meet their grandchildren's physical needs. Additionally, with more grandparents living to older ages, the burden on the "sandwich generation" and "grand sandwich generation," i.e., those caring for both young children and elderly parents, could increase (Alburez-Gutierrez et al., 2021). This trend might, in turn, put pressure on older women (Saraceno, 2018). Even though highly educated individuals tend to have a longer healthy life expectancy than their less educated counterparts (Crimmins & Cambois, 2002), this demographic shift will still mean that more attention must be paid to developing support systems and policies that address the dual caregiving demands faced by middle-aged adults. Flexible work arrangements, such as remote work options and adaptable schedules, may help middle-aged caregivers balance their professional and family responsibilities. Additionally, accessible and affordable formal caregiving services for children and elderly family members can alleviate the pressure on these adults, reducing the likelihood that they will drop out of the workforce due to caregiving demands.

The sex composition of grandparents also plays a crucial role in determining the nature of the care provided. The results of this study indicate that there will be more living grandmothers than living grandfathers in the coming decades. For younger individuals (0-4 years old), there is a small difference between the number of grandfathers and grandmothers they have each year, but among their grandparents, their grandfathers are relatively older than their grandmothers. These

findings suggest that grandmothers will be able to engage in physical grandparental care more than grandfathers because they are younger. However, as the age of the Focal increases, a shift occurs, with their grandmothers becoming more likely to be in older age groups than their grandfathers who died earlier. This shift indicates that grandmothers will play a crucial role in long-term care provision and have more time than grandfathers for generational exchanges with their grandchildren. Traditionally, grandmothers have been more involved in hands-on caregiving tasks, such as nurturing and daily childrearing activities. However, as the population ages, the continued prominence of grandmothers in caregiving roles can place additional demands on them, as women are more likely than men to experience disability and other health limitations at older ages (Freedman et al., 1980; Murtagh & Hubert, 2004). Therefore, even though grandmothers live longer than grandfathers, they will eventually transition from being caregivers to being care recipients. This shift could place a caregiving burden on other family members, who may need to assist grandmothers as they age. This situation highlights the need for targeted support systems to address older women's unique needs as caregivers and care receivers.

One of the most dramatic shifts we observed in this study is the increase in educational attainment among future grandparents. The changing educational composition of grandparents in South Asia, marked by an increase in the proportion of grandparents with higher levels of education, is expected to have diverse impacts on the nature of grandparental care. As increasing numbers of future grandparents are expected to attain higher levels of education, they are likely to contribute more significantly to their grandchildren's cognitive and emotional development. Studies from China and other countries in the Global North have shown that grandparents' education is positively associated with that of their grandchildren (Deindl & Tieben, 2017; Klein & Kühhirt, 2021; Zeng & Xie, 2014). Educated grandparents often engage in activities that foster intellectual growth, such as helping with homework and providing financial support for educational and extracurricular pursuits. Moreover, because they tend to live longer and in good health, these grandparents are able to offer sustained support over extended periods, potentially contributing to financial support and easing some caregiving responsibilities for parents. However, the literature from the Global North suggests that highly educated grandparents are less inclined to provide direct physical care for their grandchildren, but are more likely to help their grandchildren with homework and emotional support (Di Gessa et al., 2022; McGarrigle et al., 2018). If this trend applies in South Asia, there may be a growing demand for formal childcare services in the future. On the other hand, educated grandparents may not require intensive elder care because of their healthy lifestyles, which could reduce the immediate caregiving burden on middle-aged family members or those of the sandwich generation. To address such cases, formal support systems should consider offering flexible childcare options that enable grandparents to remain engaged in family caregiving while professionals handle more demanding tasks.

4.3 Limitations

We acknowledge some limitations of our approach, which relies on demographic models and data due to the lack of empirical microdata suitable for studying grandparenthood in South Asia.

First, the study assumes a constant age difference between the mean age at childbirth and fatherhood throughout the study period, which may not hold true over time. If this difference changes over time, we will also observe a change in the age distribution of grandfathers and grandmothers.

Second, the implications of these results are largely informed by prior research from the Global North, as studies of this kind are limited in the South Asian context. Therefore, changing patterns in the age, sex, and educational profiles of grandparents may influence grandparenting dynamics differently in South Asia than in the Global North. This limitation highlights the need for further research on grandparenting within South Asia.

Third, the analysis of the education data is based not on an uncertainty limit, but on SSP scenarios. We do not incorporate the uncertainty limit in our projection of future grandparents. Instead, the education distribution of grandparents is given under three different scenarios.

The kinship model used in this study does not directly incorporate education as an input. Instead, it applies the education distributions of the general population, adjusted for age, sex, and time period. As a result, the model does not fully capture the direct effect of education on the age at which individuals become grandparents. For example, individuals with lower educational levels tend to have children at younger ages, while those with higher education typically become parents at older ages. Therefore, individuals who become grandparents at younger ages are likely to have lower educational levels, while those who become grandparents later tend to have higher educational levels. To assess how well the education distribution used in this study aligns with observed distribution in survey data, we compare the proportion of grandparents at each education level by age and sex observed in Demographic and Health Survey (DHS) data from Bangladesh (2018), India (2019), and Nepal (2016). The results show a near-perfect match for grandparents aged 60 and above. However, as expected, there is a slight underrepresentation of grandparents with no formal education and an overrepresentation of those with higher levels of education in our Analysis (see Appendix 1A, 1B). In future work, we aim to incorporate education directly into the multistate kinship model (Caswell, 2020). This was not feasible in the current study due to the lack of education-specific demographic rates for past periods, which are essential for the model. Additionally, the existing multistate kinship model is time-invariant, while we are currently developing a time-variant multistate kinship model. This enhancement will help correct the underrepresentation of younger, lower educated grandparents and the overrepresentation of older, higher educated grandparents.

5. Conclusion

In conclusion, our study projects that increasing life expectancy, delayed reproduction, and educational expansion will likely result in a increasing number of grandparents alive, with the majority being older and highly educated. These demographic changes are expected to significantly impact caregiving dynamics, particularly grandparental care, in South Asia. To address these shifts, combining informal family caregiving with formal support services can enhance the economic stability and well-being of families. Family-friendly services, such as access to affordable childcare, formal care for older people, flexible work arrangements, and

wellness programs for seniors, can enable grandparents to remain actively involved in caregiving without experiencing excessive physical strain. Moreover, these services can empower grandparents to choose whether or not to participate in grandparental care, rather than leaving them feeling obligated to provide care due to a lack of alternatives. Similarly, family-friendly policies and services can help middle-aged parents balance work and care responsibilities. By investing in these support systems, policymakers can help to create an environment where grandparents can play a meaningful role in forms of family caregiving (physical, financial, emotional) that foster strong intergenerational networks and benefit all family members, grandparents, and the wider economy.

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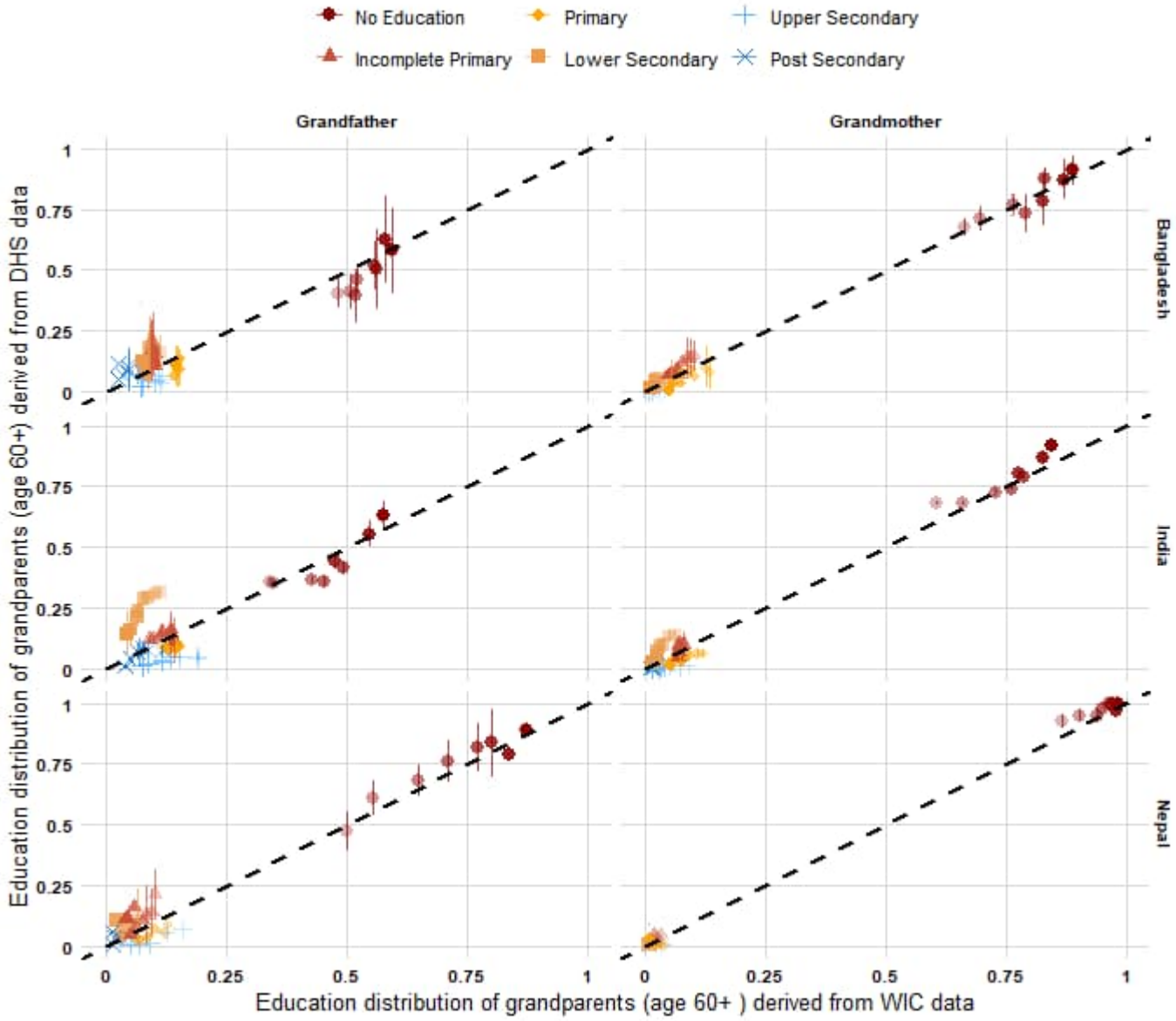
Appendix

Appendix 1 A: Comparison of education distribution of grandparents (aged 40-59 years) from WIC and DHS data in Bangladesh, India, and Nepal for base line year 2020-2024 with age group indicated by color transparency (darker colors represent older grandparents)



Appendix 1 B: Comparison of education distribution of grandparents (aged 60+ years) from WIC and DHS data in Bangladesh, India, and Nepal for base line year 2020-2024 with age group indicated by color transparency (darker colors represent older grandparents)