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The World at 8 Billion

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COMMENTARIES

The World at 8 Billion

**POPULATION
AND
DEVELOPMENT
REVIEW**

NOVEMBER 2022

Population and Development Review seeks to advance knowledge of the relationships between population and social, economic, and environmental change and provides a forum for discussion of related issues of public policy.

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Introduction

RAYA MUTTARAK AND JOSHUA WILDE
EDITORS

All places are now accessible, all are well known, all open to commerce; most pleasant farms have obliterated all traces of what were once dreary and dangerous wastes; cultivated fields have subdued forests; flocks and herds have expelled wild beasts; sandy deserts are sown; rocks are planted; marshes are drained; and where once were hardly solitary cottages, there are now large cities...

What most frequently meets our view (and occasions complaint), is our teeming population: our numbers are burdensome to the world, which can hardly supply us from its natural elements; our wants grow more and more keen, and our complaints more bitter in all mouths, whilst Nature fails in affording us her usual sustenance...

Tertullian, *A Treatise on the Soul*, Chapter 29, about 200 AD.

When Tertullian considered the overpopulated state of the world over 1800 years ago, the global population was around 200 million. Today, November 15, 2022, marks the day the UN has estimated the world will officially reach 8 billion inhabitants, approximately forty times what it was in Tertullian's day. Despite centuries of population pessimists from Tertullian to Malthus to Ehrlich and beyond, world population continues to march ahead. Often this march has been more of a crawl but sometimes it is a sprint – enabled by historical milestones like the twin Industrial and Green revolutions and the epidemiological transition.

While overpopulation alarmism is still alive and well, these fears have eased substantially since the 1970s, when concerns over “the population bomb” and mass starvation transformed into more nuanced consternation over climate change and economic well-being. However, this easing of tensions may not be from détente between population optimists and pessimists, but rather because concerns regarding global overpopulation may soon become moot: population growth is slowing to the point that world population is projected to peak in the 2070s-2080s, and then begin a long, slow decline. This does not mean the world is any less anxious regarding demographics than before: on the contrary, fear of population growth is giving way to the

looming specter of population ageing and decline, and the economic stagnation many believe must inevitably follow.

We at *Population and Development Review* decided to solicit a collection of brief reflections from the demographic science community on the meaning of this population peak. What are the implications of adding one billion people into the world in just twelve years? It is a highly relevant question for PDR and its readers. These commentaries emphasize issues of population ageing, sustainable development, and climate change mitigation and adaptation, as well as investments in universal education and health, and addressing inequalities within and across countries. Demographic science has much to contribute to our understanding of current and future population composition and distribution and how this shapes future economies, cities, ecosystems, climate, and human population itself. Thanks to our contributors for offering us much demography-related food for thought as we mark this important milestone.

Sustainable Development and the World at 8 Billion

POPULATION DIVISION, UNITED NATIONS
DIVISION OF ECONOMIC AND SOCIAL AFFAIRS

IN 2015 UNITED NATIONS Member States adopted the 2030 Agenda for Sustainable Development,¹ a 15-year plan to end poverty, protect the planet, and improve the lives and prospects of everyone, everywhere. As the world's population approaches 8 billion people – a milestone the United Nations projects for 15 November 2022² – it is worthwhile to reflect on the implications of population growth for efforts to achieve the Sustainable Development Goals (SDGs).³

Over time the growth of the world's population has become increasingly concentrated among the poorest countries, most of which are in sub-Saharan Africa. Continued population growth in such low-resource settings poses challenges to progress in social and economic development by necessitating an ever-increasing investment of resources to meet the needs of growing numbers of people, in particular with respect to health, education, housing, energy, water, and sanitation.

At the same time, achieving the SDGs, particularly those related to health, education, and gender equality, can contribute to slowing global population growth. High fertility is often linked to a lack of choice and empowerment among women and girls. Expanded opportunities for education and employment contribute to fertility decline by changing incentives and intentions around marriage and childbearing and by promoting individual autonomy and decision making, especially for women and girls. Universal access to sexual and reproductive health care, including family planning, and the protection of reproductive rights enable individuals and couples to better realize their fertility intentions, reducing the number of unintended pregnancies and often leading to lower levels of fertility.

If countries where the population has been growing rapidly achieve a substantial and sustained decline in fertility, smaller cohorts of dependent children and youth will result in an increased concentration of the popula-

Population Division, United Nations Division of Economic and Social Affairs.

tion in the working ages, favoring faster growth in income per capita (often called the “demographic dividend”).

Despite a gradual slowing in the pace of growth of the world’s population, the United Nations projects that it will surpass 9 billion around 2037 and 10 billion around 2058. This growth will contribute to increasing consumption and production and thus magnify the harmful impacts of economic processes on the environment, such as global warming, deforestation, and loss of biodiversity. Yet overall, the rise in per capita income has been more important than population growth in driving increased production and consumption; and the countries most responsible for creating the current climate emergency are those with the highest per capita incomes and relatively slow or even negative rates of population growth.

While lower-income countries have a much smaller material footprint and have so far contributed little to climate change, their energy consumption will need to increase substantially if they are to develop economically and meet the needs of their growing populations. To ensure access to clean and sustainable energy sources that can fuel economic growth while minimizing environmental damage, lower-income countries will need substantial financial and technical assistance.

Changes in population size and composition are largely foreseeable, having been shaped by demographic processes that unfold over decades. Population estimates and projections, such as those in the United Nations *World Population Prospects*, enable Governments to anticipate and adapt to demographic changes. Policymakers should incorporate present and future population trends in all aspects of development planning, identifying where programmes can be scaled up to reach growing numbers of people in need, and where shifting demographic profiles offer opportunities to accelerate progress towards sustainable development while ensuring that no one is left behind.⁴

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The Urban Century

DEBORAH BALK

AS THE PLANET reaches 8 billion people, we expect that the future population of the world will be older and more urban, and the overwhelming share of population growth will take place in the cities and town of Asia, Africa, and Latin America (UN, 2019, NRC 2003). Concurrent with this demographic future, we can expect a warmer planet, one with more frequent and intense storms and more flooding as well as sea-level rise, drought, and wildfires (IPCC, 2022a). Cities are important in part because their compactness offers critical opportunities in the mitigation of climate change (IPCC, 2022b), but also because their locations place their residents at disproportionate risk of exposure to climate change hazards (Dodman et al., 2022). For example, whereas 1 out of every 10 people globally lives in a low-lying zone proximate to seacoast, 1 in 7 urban resident lives in this zone (McGranahan et al., 2007).

What does it mean to be more urban? In Asia, Africa, and Latin America, it means many people will live in megacities (with populations greater than 10 million), and some of those cities will also be located in ecologically vulnerable areas such as low-lying coastal zones (MacManus et al. 2021), and in particular in Asia, in deltaic areas (McGranahan et al., in review) at very high risk of flooding and other seaward hazards. Other parts of Asia will see its cities facing future water shortages (McDonald et al. 2011). Elsewhere (notably, Europe and North America) urban growth is occurring in areas proximate to well-established urban centers but also in between these locations in areas classified with a range of terms including, suburbs, peri- and ex-urban areas (Lerch 2022, Leyk et al., 2021, Balk et al., 2021, Golding and Winkler, 2020), perhaps challenging climate mitigation efforts and lying beyond the scope of larger city adaptation plans (Hogan and Ojima, 2008, Masson et al., 2014).

The demographic study of urbanization has focused on national-level (or subnational-level) trends and processes, and, while important, that approach is inadequate for understanding the heterogeneity and inherent complexity of populations living in urban areas at a range of spatial scales (Montgomery and Balk, 2011). It is now well accepted that urban processes are not easily classified by a simple dichotomy, and much new work that combines population and settlement data (largely derived from Earth observing satellites)

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helps to bring the classification along a continuum into focus (Dijkstra et al., 2021, Dorelien et al., 2013). Such new classifications should be seen as an opportunity to engage in an important discourse: what does it mean to be urban from a range of disciplinary and spatial and temporal perspectives? Globally consistent measures are important as are locally informed ones (Balk et al., 2021) not only for understanding current patterns but for preparing for the future, particularly with respect to climate change (Balk et al., 2022, Jiang and O'Neill, 2017, Zoraghein and O'Neill, 2020).

In the urban century, we will need to understand the growth (or decline) of cities as well as national-level urbanization trends. While a careful assessment of the relative contributions of fertility and migration (and mortality) – the basic processes of demographic change – to city growth remains largely unanswered, some research has shown that fertility can be expected to significantly influence city growth (Balk et al. 2009). Similarly, cities have a long history of receiving and sending, and benefitting from, international and domestic migrants. But in a departure from the last century, future migration is likely to be between urban areas, not from rural to urban areas, though measures of internal migration do not currently allow for a clear assessment of such patterns (Bell et al., 2015). Cities are remarkably dynamic and diverse demographically (e.g., in fertility, mortality, and migration status by race, ethnicity, or place of origin but also in marital patterns and living arrangements) and socioeconomically (e.g., education, poverty status, wealth, employment type), and with this diversity comes inequality and associated vulnerabilities. While cities are comparably young (especially in comparison to rural areas), the population of cities is also aging, compounding risks expected with future climate change (e.g., Molinsky and Forsyth 2022). In order to understand city growth and the demographic and socioeconomic well-being of the cities of tomorrow, we need a data infrastructure that matches the dynamism of cities (Montgomery 2008).

Cities are intrinsically spatial, but demographic studies of urbanization tend to treat cities and urban growth in a spatial vacuum, leaving important questions about the form of population change (e.g., whether it occurs vertically or horizontally; as “infill” or the edges of cities) and the demographic heterogeneity of that change (e.g., whether that growth occurs disproportionately to the those living in slums or substandard housing) largely unanswered (Montgomery and Balk 2011). These answers are important because the form of urban growth has implications for both sustainability and climate mitigation and adaptation (e.g., Solecki et al., 2015, Dodman et al., 2022). Furthermore, engagement and representation in adaptation plans is not uniform across or within cities; given that the urban poor and residents of informal settlements, in particular, have been identified as particularly vulnerable to climate change impacts (Satterthwaite et al., 2020, Hardoy and

Lankao, 2011), understanding changes in demographic characteristics and socioeconomic conditions in spatial terms will become even more important.

The 21st century is the urban century. Therefore, it needs an evidence base fit for it: the statistical infrastructure needs to be able to observe all-urban *and* within- and between-city demographic and social patterns and trends. Importantly, it must be able to contribute to an understanding of those trends in spatial terms so that scientists, policy makers, and city residents can adapt to the stormier and hotter reality of the coming decades. Envisioning, projecting, planning for, and understanding our urban future will require interdisciplinary approaches and scientific-community engagement (Hamstead et al, 2021, Balk et al., 2022, Keller and Limaye, 2020), a proposition that I invite readers to embrace wholeheartedly.

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Beyond Eight Billion: Why Population Continues to Matter for Global Development

ALEX EZEH

POPULATION CONCERNS DOMINATED the global development scene throughout the second half of the twentieth century. The United Nations decennial World Population Conferences, starting with Rome in 1954, followed by Belgrade, Bucharest, Mexico City, and Cairo, served as a platform for discussions on global development.^{1,2} Bucharest (1974) underscored the interdependence between demographic variables and development and called for demographic targets as integral part of socio-economic development policies.³ Mexico City (1984) reaffirmed most of the agreements reached in Bucharest but called for attention to human rights, education, health, and well-being as equally important domains of global development.⁴ Throughout this period, concerns around population focused on rapid population growth in low- and middle-income countries and its relationship to socioeconomic development.^{5,6,7} Many bilateral agencies and foundations that supported global development agendas had large population programs and most of the funding, up to 75% of the support for population-related activities, went to family planning programs.^{8,9} Large investments were also made to strengthen population data, including the World Fertility Survey that was conducted in more than forty countries between 1974 and 1980 and the Demographic and Health Surveys which have been implemented in more than ninety countries since the mid-1980s.

The 1994 International Conference on Population and Development (ICPD) in Cairo represents a seismic shift in global discourse on population concerns. Perhaps most fundamental was the fact that the ICPD Program of Action, while recognizing the strong connections between population and development, called for a focus on meeting the needs of individuals within the framework of universally recognized human rights standards rather than seeking to achieve specific demographic targets. Post 1994, fertility and fam-

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ily planning almost became synonymous with “population control”, which quickly became a tabooed word in global development.¹⁰ Second, concerns about the impact of HIV and AIDS, especially in Sub-Saharan Africa which was (and still is) the region with the highest rates of population growth and the most affected by the scourge of HIV and AIDS, resulted in significant shifts in development assistance funding away from population issues. By the turn of the century, “population” had virtually disappeared as a factor in global development plans and discourses, both in the MDG of 2000 and the SDG of 2015. Even Africa’s Agenda 2063 makes no reference to population as a factor in achieving the “Africa we Want” even though that Africa’s population will almost triple in the 48 years between 2015 and 2063.¹¹

The 2022 Revision of UN World Population Prospects,¹² which projects a total population of 8 billion people by November 15, 2022, and a continued increase in global population size to 10.43 billion by 2086, provides a unique moment to consider new perspectives on population and why population still matters for global development. First, the continued focus of global attention on population size is grossly misplaced. Rather than size, it is the rate of population change that matters the most; and both high rates of population growth and population decline matter. While the issue of rapid population growth has dominated population concerns to-date, the issue of rapid population decline will likely dominate future population concerns. In 2022, there more than forty countries and territories that are experiencing population decline due to low fertility. By 2050, that number will more than double to over ninety countries and territories, and, by 2100, population decline will pose a much greater challenge to development globally.

Second, contrary to the experiences of high-income countries where population decline and its associated aging has progressed slowly over a long period, allowing countries time to adjust and develop systems to cope with the change, including the adoption of immigration policies that attract much younger and more educated populations from poorer countries, population decline in poorer regions will be more rapid with significant distortions to their population structure. Poorer countries will also have less capacity to attract younger and qualified immigrants.

Third, the divergent demographic experiences currently unfolding creates a confusing and an awkward context for meaningful discussion of population issues at the global level. The countries currently facing the challenges of population decline are largely high-income countries. Some of them are increasingly exploring options for more pronatalist policies at home that would incentivize higher fertility.¹³ These, however, are also the traditional funders of family planning programs in poorer countries where fertility and the rate of population growth remain rather high. The divergent policy responses at home and abroad will increasingly raise moral and ethical questions about why high-income countries continue to support family planning programs in

poorer countries while promoting pro-natalist policies on home soil. Yet, the implications and consequences for a country like Niger to have its population increase from 26 million today to 67 million by 2050 or 167 million by 2100, using the medium variant of the 2022 WPP Revision, is as challenging as having the population of South Korea decline from 52 million currently to 24 million by 2100. And these projected rates of change may underestimate the true rates of change given the very low and very high ages at first birth in Niger and South Korea, respectively.

As we reflect on a world of 8 billion people, it is time to think beyond the numbers and see what the divergent demographic experiences and the significant shifts in the distribution of the global population portend for global development and universal wellbeing.

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Demography's Lessons for Addressing the Climate Emergency in The World of 8 Billion

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IN THE ABSENCE of forceful societal interventions, planetary warming will accelerate. Today's climate emergency is reminiscent of the population explosion¹ predicted by new awareness of population doubling times in the 1960s and 70s. The world's population doubled between 1804 and 1927 to reach 2 billion. In 1960, thirty-three years later, it reached 3 billion. In 1974, only fourteen years later, it reached 4 billion. By 1987, it was 5 billion; then in 1998, it was 6 billion; then, 7 billion in 2010, and now, 12 years later, it is 8 billion. Effective and accessible family planning has slowed population growth to less than 1% per year, so that future doubling times will lengthen. Demographers' experiences with slowing population growth hold lessons for how they can also contribute to addressing the climate emergency.

The first lesson: data is vital. After WWII, the United Nations supported national statistical offices to produce reliable, methodologically comparable population measures.² However, additional data was needed to understand women's reproductive behavior in countries with high rates of fertility. In 1972, the World Fertility Survey began collecting population representative data in 42 low- and middle-income and 20 high-income countries about women's family planning knowledge, attitudes, and practices in the middle- and low-income countries.³ The Demographic and Health Surveys continue this mission today.⁴

To address the climate emergency, demographers are combining population data with modeled spatial data on temperature, precipitation, and climate events as spatially granular levels to identify climate effects on human fertility, mortality, migration, and other health-related outcomes.^{5,6,7,8} However, population data at smaller spatial scales, with a fuller range of salient measures, and across more geographies is needed to understand the full range of environment-population relationships.^{9,10}

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The second lesson: systemic change affects human behavior. To varying degrees in any given context, universal primary education, economic development, and greater rights for women created opportunities that motivated people to delay childbearing, thus slowing population momentum.^{11,12,13} Health care systems that included reproductive health care gave people the opportunity to plan their families and expect that they and their children would live healthy lives.¹⁴ In short, people changed their fertility behavior because societal systems changed.

Systemic changes will also change people's behavior in mitigating and adapting to climate changes. Mitigation efforts focus on reducing greenhouse gas emissions and transitioning to clean and renewable energy sources. In contrast, adaptation will be necessary in many societal systems. Demographers' challenge is to develop empirically testable theories and frameworks for investigating how social, economic, political, and cultural systems mediate climate effects on fertility, mortality, and migration, and other forms of human health and well-being.¹⁵

The third lesson: there is no global policy approach. Analyses of the aforementioned data demonstrated the potential of family planning to limit births and reduce maternal and infant mortality. In a series of World Population Conferences between 1954 and 1994, governmental delegations from United Nations member states, representatives of non-governmental organizations, and other stakeholders debated how best to slow population growth. Action plans included universal education, economic development, training and support for reproductive health care professionals and clinics, and promoting women's rights in general but especially reproductive rights. Across the world, countries developed programs and policies that met their specific cultural, political, and health needs.¹⁶

Since 1994 the United Nations Framework Convention on Climate Change has met regularly to set national goals limiting greenhouse gas emissions, the cause of global warming. Each nation developed action plans appropriate to their political, economic, cultural, and environmental conditions, but they still struggle to achieve their goals.¹⁷ By bringing data and theory together in a lively global debate, demographers produced knowledge and informed policies that slowed population growth and improved human lives. Demographers have an opportunity to make a similar contribution in the climate emergency, in particular informing how demographic trends and population dynamics are relevant for upscaling climate change mitigation, adaptation, and vulnerability reduction.

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8 Billion and Then What?

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THE WORLD POPULATION reached 7 billion in 2011 according to the United Nations (UN 2022). It is estimated at 8 billion in 2022 (symbolically fixed on the date of November 15). According to the UN medium scenario, it will attain 9 billion in 2038, and 10 billion in 2059. The number of years between these milestone dates (11, 16, and 21 years) when the global population reaches a round number indicates that population growth is expected to decelerate further, as it has been since the 1960s when the world population was increasing at a rate of 2.3% per year. Furthermore, the number of people on earth will most likely peak in the second half of the 21st century and start declining thereafter, according to all institutions beside the United Nations that are providing long-term global projections to 2100, i.e., the Institute for Health Metrics and Evaluation (IHME) and the Wittgenstein Centre for Demography and Global Human Capital (WIC). The peak will be reached in 2064 according to the IHME at the level of 9.7 billion, at the same level but in 2070 according to WIC, and in 2086 according to the United Nations at the higher level of 10.4 billion. In all projections, the main driver behind the decline will be the ongoing fertility transition, with more and more countries achieving below replacement fertility. Indeed, by 2100, only a handful of countries would have a fertility rate above 2.1 live births per woman, and the highest fertility is predicted to be in Niger (West Africa) with 2.22 live births according to the UN medium scenario.

One very striking fact is that the 2 to 3 billion people who will be added to today's world population will be born in countries that are now most stricken by poverty, mostly in sub-Saharan Africa. The sub-continent is likely to triple its present size of 1.2 billion to 3.4 billion by the end of the century. Meanwhile, with the expected increase in life expectancy, most countries will need to deal with shrinking and ageing populations. Sixty-five percent of all 237 countries and territories that are in the UN dataset would experience negative population growth rate in 2100. While sinking population numbers are probably good news for humanity and for the planet, the sheer number of people does not necessarily fully reflect on the sustainability of ecosystems

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on earth. What is important is not only how many people there are or will be but what behaviour they adopt and will adopt in their everyday life. It is equally essential to know to what extent human beings and the systems in which they will live (economic, social, environmental, geopolitical, technical, etc.) will be equipped to face the challenges of the future. It is likely that this future demographic path, without recent precedent, will require significant changes at the individual level but above all at the larger, societal level. Just like the human population will move away from a situation of permanent growth, it is possible that the whole human and economic system will be radically obliged to do the same.

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The Data We Need for the Future We Want

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THE WORLD'S POPULATION IS projected to reach 8 billion on November 15, 2022. This makes it an ideal moment to think about how demographers and other scientists account for and project population, and how demographic data and models represent and shape lived experience of people worldwide—particularly those who identify as women. The United Nations has recently adopted an innovative Bayesian approach to predict future fertility and mortality rates (Raftery et al. 2014). This effort generates more reliable confidence intervals around the world's potential futures than the UN's previous deterministic method. However, it still relies on older demographic methods and theory: the cohort component model, a projection method that came into widespread use nearly 100 years ago (Kiser 1973), and demographic transition theory, first articulated during World War II, according to which modernization triggers a fertility decline that will continue until replacement levels are achieved (Kirk 1996).

The cohort component projection method calculates each country's future population by subtracting expected deaths and adding net migration and expected births. Expected births are determined by multiplying the number of women in each age group by the fertility rate expected under the demographic transition for that group.¹ The attribution of births to women rather than men is convenient — information about the mother nearly always appears on a birth certificate, whereas information about the father might not. (However, demographic metrics such as age-specific fertility rates and net reproduction rates could just as easily have been formulated with men in the denominator.) By calculating fertility as a function of the number of women in a population, demography designated women's bodies as the site of reproduction. And with fertility behaviors situated within the demographic transition, deviations from the model were flagged as potentially problematic, justifying external interventions. Amid widespread anxiety about global

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population growth in the decades following World War II, women's bodies became the target of population control.

The cohort component method suggests two ways to alter future population counts if mortality rates hold constant: change the number of women or change women's rate of childbearing. Population control has mainly operated through family planning programs,² which attempt to do the latter by providing contraceptives and persuading women to use them. Many family planning programs have emphasized long-acting reversible contraceptives (LARCs), which act directly on women's bodies and lower fertility rates by reducing the number of women at risk of conception. Because LARCs are controlled by medical professionals rather than users, feminist technology scholars describe them as "impossible" contraceptives (Senderowicz and Kolenda 2022; Takeshita 2012). Indeed, these methods are often recommended even to women without access to the follow-up medical care necessary to manage side effects or to remove the devices for any reason, including when pregnancy is desired (Britton et al. 2021; Gubrium et al. 2016).

Over the past fifty years, the same research programs that have collected "country-representative"³ demographic data in low-income settings to project population—such as the Knowledge, Attitudes, and Practices of Contraception surveys of the 1960s and 1970s, the World Fertility Survey of the 1970s and 1980s, and today's Demographic and Health Surveys—have promoted the uptake of modern contraceptives, with a heavy emphasis on LARCs (Merchant 2021; Riedmann 1993). Such programs typically represent their goal as decreasing rates of "unmet need" for contraceptives as part of an overall effort to speed a country's development or modernization (Halfon 2007). However, program sponsors also espouse quantitative targets (Hendrixson 2018). The aggregate nature of fertility indicators and LARC-uptake targets elides lived experiences and the multi-level complexity of childbearing and creates conditions ripe for coercion.

Amid the population-bomb anxiety of the late 1960s and early 1970s, coercion seemed to many an acceptable means of reaching the seemingly necessary end of population control (Connelly 2008). But those days are behind us (Lam 2011). We now know that controlling fertility will neither promote development nor protect the environment (National Research Council 1986). Our goals should therefore center on advancing reproductive justice, improving the lives of women and members of other marginalized groups, and promoting equitable and sustainable global and local economies. Achieving these goals will require data capable of assessing the barriers women face in achieving their personally determined health goals – especially in terms of actual lived experience at the local level. Recent efforts to address climate change have demonstrated that interactions between person and place matter for vulnerability assessments and understanding behavioral change. In fact, local climate conditions impact all aspects of women's lives—including

reproductive health goals, needs, and outcomes—in ways poorly captured by existing data and research (Grace 2017; Lau et al. 2021; Sasser 2014). In recognition of reproductive and environmental justice (Cutter 1995; Ross and Solinger 2017), it is more important than ever that data and metrics of success capture women’s true childbearing and family planning needs and experiences. Documenting fertility and family complexities with attention to context is vital and demands new place- and person-based data collection - motivated by the goals and barriers to achieving these goals that women themselves identify.

Notes

1 Demography has traditionally assumed a two-sex model in which everyone is either male or female and only female individuals can conceive.

2 Some evidence suggests that some twentieth-century population control enthusiasts also supported sex-selective abortion to reduce the number of women (Hvistendahl 2011). In the other direction, Kolk and Jebari (2022) demonstrated that the trend toward daughter preference could increase population growth rates.

3 Climate change occurs at very local levels owing to the spatial heterogeneity of natural systems and human–environment interactions. Health surveys were designed (with the use of weights) to be representative for calculating country-level health indicators. However, because the weighting schemes do not consider climate or environmental conditions, the ability of the data to represent general experiences with climate change in a given country is unknown.

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The Most Populous: India's Demographic Journey

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WE ARE AMID TWO major demographic events; the world population reaching a whopping 8 billion and India surpassing China as the world's most populous country. With China and India accounting for nearly 36% of the world's population, the demographic upheavals in these countries have considerable repercussions on the world's demographic position. Undeniably, the demography in these two countries are now entering a new era. China will be experiencing a negative growth of population henceforth and India's growth rate will be at less than one percent per annum with a faster dip hereafter. This is despite the fact that as per the UN projection more than half of the projected increase in population up to 2050 will be concentrated in eight countries which includes India.

There were relentless concerns about the rapidly increasing population in India in the second half of the twentieth century.¹ The population recorded a considerable jump from a mere 358 million in 1951 to around 1.4 billion by 2021, nearly quadrupling the population in a 70-year period. The growth of population was consistently around two per cent per annum for several decades during this period. This improvident rate of population growth raised serious concerns about its impact on economic resources and even questioned the sustainability of the planet. Prime Minister Nehru in his foreword to a book by then famous Indian demographer S. Chandrasekhar remarked: "I think we shall win in both fronts (the economic and demographic) but we shall have to work hard."² This prediction, though delayed, has come true if one examines the data of the first two decades of the 21st century.

India's demography has changed rapidly in recent times. The fertility rate reached replacement level by 2020. Many Indian states are much below replacement level fertility at 2.1 children per woman. The huge demographic heterogeneity observed across states is currently narrowing. In addition to fertility, marked improvements are also observed in bringing down infant and maternal mortality in India. By 2020, the maternal mortality ratio reached around 100 and the infant mortality rate touched 28 per 1000 live births.

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Both are declining at a rate of around 3.5 % per annum in the last twenty years. Thus, the demographic situation can be viewed overall with much more optimism as compared to the serious concerns raised about the sustainability of rapid population growth in the second half of the last century.

The demographic advantage of India in the 21st century rests on the emerging age structure.³ The median age of population in India currently is 28 years – ten years below the level in China. But, by 2050 India's median age will increase by ten years while that of China will be over fifty years. Similarly, the working age population in the age group 15-64 is nearly the same in India and China, currently at around 69 per cent. This proportion will remain nearly constant for India even by 2050. But for China the working age population will come down by nearly ten percentage points to reach 58% by 2050. India will have a demographic opportunity – the so-called demographic dividend – to take advantage of economic benefits in the coming decades.

However, India's ensuing demographic journey is not without challenges. Educational and skill deficit among youths will impact the country more than in other nations due to the very nature of fertility transition. Rapidly increasing numbers of senior citizens without adequate financial security, rapid urbanisation and crowded cities, and skewed sex ratio will be the challenges India must confront even during an optimistic demographic era. While these are undeniably huge challenges, the overall demographic scene currently provides much better hope, optimism, and potential than the period of rapid population growth India encountered in the second half of the last century.

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Eight Billion Ageing Citizens

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THE WORLD POPULATION is steadily growing older. Between 1970 and 2019, the median age of the world population increased from 20.3 to 30 years, while the proportion of the world population aged 50+ increased from 15.4% to 24.5% (UNPD - United Nations Population Division, 2022). The increase in median age and the proportion of older people in the population is a fairly new phenomenon which emerged as countries underwent advanced stages of the demographic transition with decreasing mortality at older ages.

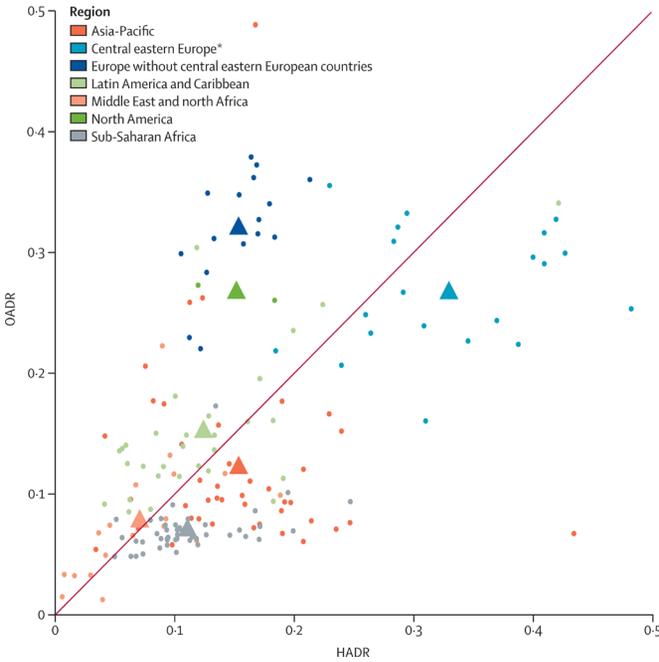
Novel situations often give rise to insecurities, and population ageing has led to some rather apocalyptic forecasts: exploding healthcare costs, high shares of people dependent on others for care and economic support, labour shortages, and economic and cultural stagnation. Fears about population ageing tend to exaggerate the meaningfulness of chronological age as an indicator of health and productive capacity, and underestimate the human capacity to adapt. Technology could potentially compensate for productivity declines or labour shortages caused by an ageing workforce. For example, if existent technologies were to be invested in and implemented worldwide, most of the world's food could be produced by a mere 2.5% of the 800+ million people currently working in agriculture (Vittis et al., 2022) – freeing up a huge pool of people for work in other industries.

Widespread use of the old age dependency ratio has fueled fears about population ageing. Based on an arbitrary age cut-off (typically age 65), the old age dependency ratio (OADR) is the ratio of chronologically older to chronologically younger persons (aged 20-64) in a population. It is used to estimate the so-called “burden” of population ageing: that is, the number of older people that each younger person must support. The underlying premise of the old age dependency ratio is that chronological age is a good proxy for health and productive potential. There is, however, little empirical basis for this assumption.

Age is a poor predictor of how well a person is able to provide support – or need it. Although the risk of poor health and need for support increases as people get older, the relationships between age, health, and productive potential looks vastly different across individuals and populations. The average

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FIGURE 1 Health Adjusted Dependency Ratios & Old Age Dependency Ratios (Skirbekk et al., 2022)



75-year-old in Japan is as healthy as the average 45-year-old in Papua New Guinea (Chang et al., 2019). It is also worth noting that, in many countries, half of working age people have only limited access to the labour market because they are women. The ratio of people in poor versus good health – that is, the health-adjusted dependency ratio – is a more precise indicator of the ratio of people who need versus can provide support in a population. Notably, the health-adjusted dependency ratio (HADR) is about the same in South-Asian and Sub-Saharan Africa as in Western Europe or East Asia – even though the populations of Western Europe and East Asia are chronologically much older (Skirbekk et al., 2022). See Figure 1.

Many of the world’s richer countries have tried to slow down population ageing by trying to increase fertility and/or the immigration of younger people from other countries. I have argued that low fertility should be embraced. Low fertility generally goes hand-in-hand with greater gender equality, and makes it easier to reduce our negative impact on the planet and tackle poverty (Skirbekk, 2022). In any case, efforts to increase fertility are unlikely to succeed. Further, no realistic level of immigration could keep the world’s richer countries as young as they are now. While efforts to slow down population ageing are probably futile, there is considerable room to improve how the world’s 8 billion citizens will get older. Education, adequate financial resources, access to quality healthcare, and healthy lifestyles can help to delay

the onset of age-related health declines, and maximise opportunities to gain from the competencies of an older population. So far, however, few countries have adequately adapted their institutions and infrastructures to better suit the needs of an ageing population (e.g., adjusting pension systems to ensure long-term fiscal sustainability, greater focus on preventative healthcare, incentivising lifelong learning). Nations could also do much more to encourage people to adopt and maintain healthy lifestyles across the entire life span (e.g., (World Health Organization, 2022) and to ensure that everyone has access to adequate education. Education may through for instance greater knowledge, higher income and broader social networks, improve ones capacity to utilize health services. Education can improve one's capacity to alter lifestyles in ways that reduce health risks at later ages. It has been estimated that two-thirds of the world's youth currently lack basic skills (PISA level 1), ranging from 24% in North America to 89% in South Asia and 94% in Sub-Saharan Africa (Gust et al., 2022). The need to adapt to the needs of an ageing population is particularly pressing in low- and middle-income countries where the onset of poor health occurs early and the absolute rise in the number of older individuals is the highest.

Although the onset and magnitude of fertility and mortality decline varies across countries, the populations of all nations around the world are getting older. Ageing on a societal and global scale is a key aspect of the lives of the 8 billion world citizens as of mid-November 2022. The question is thus not whether we will age, but rather how well we will age. Population ageing does not have to spell disaster, but it is up to us to make the best of it.

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