

Demography is a very exciting science in Europe these days. Many new research challenges have arisen, and politicians and the media seem to be paying much more attention to demographic issues than they did even 10 years ago. Newspapers, weekly journals, and television news programs are full of stories about population aging, "demographic factors" in pension adjustments, the closing of schools in rural areas, and so on.

Probably most surprising for me has been the large number of people now using the word "demographic" and seeming to know what it means. I still have a T-shirt that my friends at the University of Pennsylvania gave me when I completed my Ph.D. in demography. It says in big letters: "I am a demo... what?" These days, especially in Europe, many more people know the word "demographer."

What lies behind this new interest in demography in Europe? Undoubtedly it has to do with concerns about possible negative consequences of population aging and with the fact that the planning horizon for social security issues typically is no longer than 25–30 years. Only recently did the retirement of the baby-boom generation appear on the radar screen of social security planners, causing some panic and hectic activities aimed at reforming the system after decades of complacency. Demography is now cited as the reason why pension promises made in the past may have to be broken in the future.

In the German-speaking world in particular, this new interest in demography has also resulted in new research institutions. In 1996, the Max-Planck Institute (MPI) for Demographic Research was founded in Rostock and—at a much smaller scale—in 2002, the Vienna Institute of Demography (VID) was formed by expanding and internationalizing a small institute of the Austrian Academy of Sciences. Rather than seeing themselves as "national" demographic institutes, these two institutes focus on research questions that cross national boundaries. To further strengthen this transnational dimension of demographic research in Europe, the directors of MPI, INED, NIDI, and VID (together with IIASA) have agreed to intensify collaboration under the name EDRE (European Demographic Research Ensemble). This effort, open to demographers from all over Europe, will help to establish a European demographic research environment that is conducive to the efficient and high-quality study of the various challenges associated with Europe's new demography. *W.L.*

*IIASA and Austrian Academy of Sciences
Sign Agreement on Collaboration in Demography*

Addressing the Challenges of Europe's New Demography

Europe is entering demographic *terra incognita*. The imminent expansion of the European Union (EU) to Central and Eastern Europe provides a welcome opportunity to address the broader issues of Europe's current demographic metamorphosis and its likely future population structures, which already pose significant challenges to today's social and economic policies. The continent that was at the forefront of the demographic transition that has now reached almost every corner of the world is again entering a new phase in its demographic evolution. This phase is full of uncertainty, with no one able to say exactly how low fertility is likely to fall and how high life expectancy may still go. Previously unquestioned upper limits to life expectancy and lower limits to fertility now appear to be convenient assumptions without a solid scientific basis. Our limited knowledge about the longer-term demographic trends requires new approaches to systematically dealing with the uncertainty in all three components of population change: fertility, mortality, and migration. (For this reason, one of the first collaborative activities of the International Institute for Applied Systems Analysis [IIASA] and the Vienna Institute of Demography [VID] was to

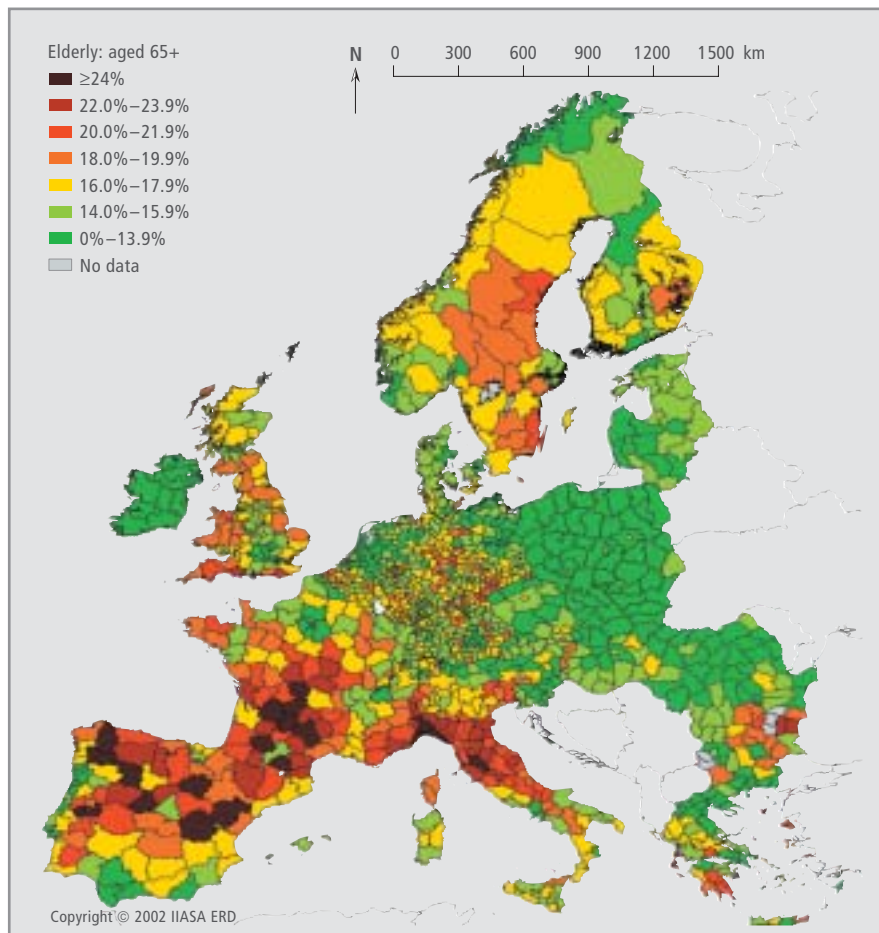


Figure 1 Percentage of population aged 65 and older in Europe by regional units (NUTS 3).

jointly organize a seminar on "How to Deal with Uncertainty in Population Forecasting," with a selection of the papers presented soon to appear as a special issue of the *International Statistical Review*.)

However, we also know that, because of the great population inertia and the influence of the age structure of the cohorts that have already been born, demographic trends are

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POPNET

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more stable and more predictable than are many other social and economic phenomena. This near certainty of age-structure changes over the next few decades needs to be conveyed to policy makers and the public in an appropriate way. Probabilistic (or stochastic) population forecasts are one way to try to quantify how the certainty (or uncertainty) of different demographic variables changes over time. Another certainty of Europe's demographic dynamics related to its age structure is the fact that the current 15 member countries of the EU have just entered a period of negative population momentum. This means that even in the purely hypothetical case that fertility instantly increases to replacement levels (with no mortality changes and no migration), the population will decline due to smaller and smaller cohorts of potential future parents, a consequence of low fertility over the past three decades. In other words, independent of future fertility, mortality, and migration, an additional force toward population shrinkage and stronger population aging has started to be effective in Europe. (This issue was recently discussed in a contribution to *Science*, which is reprinted on pages 6–7 in this issue of *Popnet*, representing another product of collaboration between IIASA and the VID).

The scientific study of Europe's new demography is a very broad and exciting field that needs the input of many institutions and individuals around Europe (bearing in mind that Europe does not end with the expanded EU-25, but goes much further to the East). Here, we will only mention three examples of research topics to be addressed jointly by IIASA and the VID.

The demography of Europe's regions

An important feature of Europe's current demographic landscape that is unlikely to disappear in the future is the great regional

heterogeneity. Figure 1 on the previous page shows the proportions of the population above age 65 in the various regions of Europe. The map reveals great differences among the regions, with parts of Northern Italy, Spain, and France already showing proportions above 24 percent, and areas in Central and Eastern Europe showing proportions generally below 14 percent. These huge differences are the consequence of age-specific regional migration patterns as well as different life expectancies and past fertility levels. In the future, this map will almost certainly show much more red and dark colors, especially in the eastern part. Given the generally low spatial mobility of the European population (especially compared with the population of the United States), these regional age structures will be highly relevant for many of the challenges related to population aging, ranging from local labor markets to the provision of schools and old-age care.

In this context, we plan to work on sub-national population projections in Europe. Special emphasis will be placed on true multi-state urban/rural projections, instead of simply superimposing assumed total proportions urban on existing national population forecasts, as is conventionally done.

The great uncertainty about future old-age mortality and the resulting number of very old people

Figure 2 gives the uncertainty distribution of the future proportion of the population above age 80 in Western Europe. The distribution comes from the IIASA 2001 world population projections as published in *Nature* (Lutz et al., 2001), which are also discussed more extensively in a forthcoming book (Lutz and Sanderson, forthcoming). The different colors indicate the fractiles of the

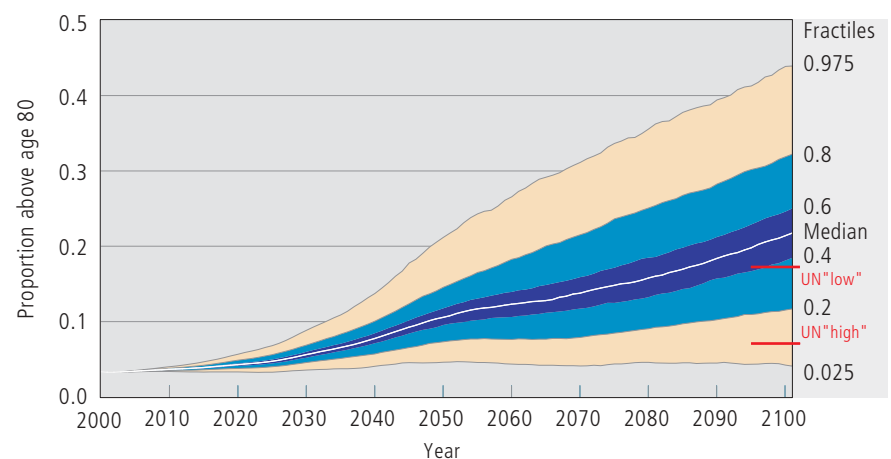


Figure 2 Proportion of population above age 80 in Western Europe (UN "low" scenario for 2100 = 0.17, UN "high" scenario = 0.07).

resulting distribution of 2000 simulations of cohort component projections, drawing from uncertainty distributions of fertility, mortality, and migration as discussed in the publications cited above. The white line gives the median of the distributions of future proportions above age 80, while the purple area gives the inner 20 percent, and the blue and yellow areas give the 60 and 95 percent intervals, respectively.

The figure shows that currently around 3 percent of the population is above age 80, and that this proportion will not change much over the coming decade. After the year 2030, however, the uncertainty range opens up very quickly. In 2050, the 95 percent interval already goes from around 4 percent at the low end to more than 20 percent at the high end, with the median at around 10 percent. In other words, in 2050 the proportion above age 80 is likely to be three times as high as today, but it could even be six times as high. Its actual level will depend mostly on future old-age mortality—whether life expectancy will level off toward a maximum or whether it will continue to increase unabated. This difference becomes even much more significant during the second half of the century. By the end of the century, the 95 percent interval is extremely wide, ranging from essentially the current level of 3 percent to an incredible 43 percent of the population above age 80. Even the median shows a proportion of about 20 percent. Societies with such significant proportions of the population above age 80 will clearly be very different from today's societies. Most likely, however, an average 80-year-old person during the second half of the century will be in much better physical health than an average 80-year-old person today. Another interesting research question is how a rightward shift in the age pattern of disability will affect the future number of disabled elderly in need of care. First tentative multi-state calculations indicate that if the age profile of disability were to shift to the right by two years per decade, even this tremendous increase in the number of elderly would not result in an increase in the number of disabled people.

Figure 2 also shows two red lines for the year 2100. These give the proportions of the population above age 80 as provided by the "high" and "low" variants of the most recent United Nations (UN) long-range projections (UN, 1999). Since the UN does not use alternative mortality assumptions in their variants, it is not surprising that the range is extremely narrow. Also, the UN seems to expect much lower improvements in life expectancy in Western Europe. This illustrates that the traditional variants approach that only varies the fertility assumptions is a highly problematic

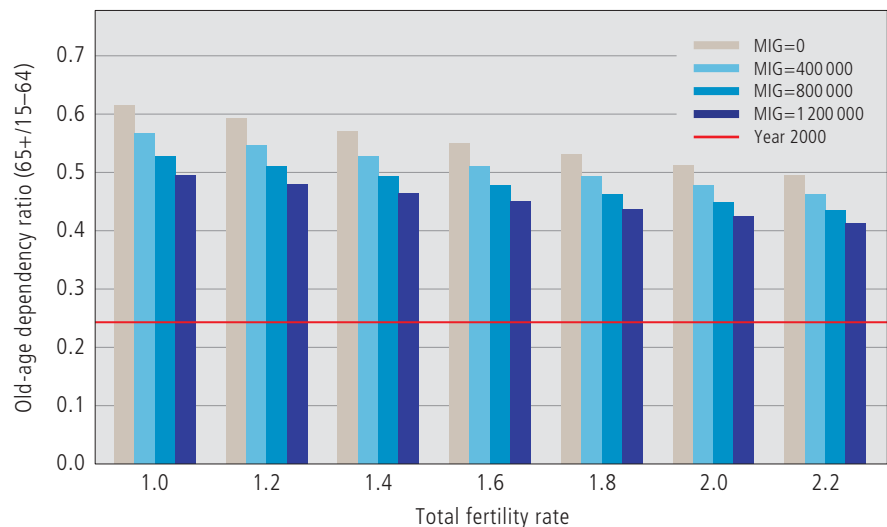


Figure 3 Old-age dependency ratio for the EU-15 in 2050 according to alternative projections assuming a wide range of fertility and annual net migration (MIG) levels. The level for 2000 is marked as a red line.

way of dealing with uncertainty and certainly should not be interpreted as giving a "plausible range," as is often done. Clearly, the future course of old-age mortality and disability provides us with many difficult but highly important research questions.

Can immigration compensate for low fertility?

Another often debated question is whether young immigrants from outside Europe can replace Europe's "missing babies," giving rise to the notion of "replacement migration." Calculations by the UN (2000) show the number of immigrations needed (under one specific path of fertility and mortality) to keep the total population, the working-age population, or the old-age dependency ratio constant. For the last of these, the result is absurdly high numbers of immigrants. In Figure 3, we show some alternative calculations for the EU-15 in which both fertility levels and immigration levels are systematically varied.

The figure shows the old-age dependency ratio in 2050 (the horizontal line gives the 2000 level) under seven different (constant) fertility and four different (constant) migration levels. The figure makes it clear that even the highest fertility (an unlikely total fertility rate [TFR] of 2.2) combined with the highest migration (an equally unlikely net-migration gain of 1.2 million per year) will result in a very significant increase in old-age dependency. The figure also shows that there clearly is some compensation between fertility and migration. A TFR of 1.0 combined with a migration gain of 1.2 million per year yields the same old-age dependency ratio in 2050 as a TFR of 2.2 and a migration gain of

zero. There even is a pretty clear linear relationship: 1 million immigrants per year have the same effect as a TFR difference of 1.0. On a more realistic scale, the effect of 100,000 additional immigrants per year corresponds to that of an increase in the TFR of 0.1. This same relationship holds for the future population size in the EU-15 (see Lutz and Scherbov, 2003).

Many more such questions suggest themselves for rigorous demographic analysis as Europe ages rapidly.

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Vienna Institute of Demography (VID)

In 2002, the Vienna Institute of Demography (VID), part of the Austrian Academy of Sciences, was significantly expanded and internationalized. The Institute, headed by Wolfgang Lutz (director) and Richard Gisser (deputy director), concentrates on combining scientific excellence and relevance in analyzing and projecting demographic trends and evaluating the social, economic, and political consequences in a European context. The VID combines innovative methodological work with empirical analysis and the communication of science-based insights. The VID works in close scientific collaboration with the International Institute for Applied Systems Analysis (IIASA). Around 15 scientists from different countries and disciplines work at the VID, which also has a distinguished visitors program.

Forthcoming International Seminars

VVW '03 – Viennese Vintage Workshop 2003 Age-Structured Models in Population Dynamics and Economics 27–28 October 2003

The workshop will concentrate on different areas for the application of age- and/or duration-structured dynamic systems, such as demography, economics, sociology, epidemiology, and ecology.

Main coordinators: Gustav Feichtinger (VID, Vienna University of Technology), Vladimir Veliov (Vienna University of Technology), Christian Almeder (Vienna University of Technology).

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Agent-Based Computational Modeling in Demography, Economics, and the Environment 4–7 December 2003

This workshop aims to bring together scientists developing and applying agent-based models in demography, economics, and environmental studies to discuss common features in their modeling frameworks and potential applications across disciplines.

Main coordinators: Thomas Fent (VID), Alexia Fürnkranz-Prskawetz (VID), Francesco Billari (Max-Planck Institute for Demographic Research), Jürgen Scheffran (Potsdam Institute for Climate Impact Research).

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Seminars

The VID is also organizing an interdisciplinary seminar series on topics concerning demographic research. The *Vienna Demographic Colloquium* is hosting presentations by guests as well as staff members to promote the exchange of knowledge. The seminars are open to everyone. Unless otherwise indicated, the venue is the seminar room of the VID. The current program is available at www.oeaw.ac.at/vid/events/events_e.html

The Institute currently has four research groups:

The *Comparative European Demography* group, led by Dimiter Philipov, focuses on comparative analysis of union formation or dissolution and fertility, with special emphasis on its timing, spacing and levels, and causal mechanisms. This group also conducts in-depth analysis of the effects of public policies and welfare on family formation in different parts of Europe and is assembling a comparative demographic database for the regions of Europe. In addition, it serves as a scientific partner advising the European Commission on demographic issues. The group will also study demographic trends and population change by making comparisons among the countries and regions in Europe.

Headed by Richard Gisser, the *Demography of Austria* research group provides expertise on population issues in both the Austrian and European contexts. Its concern is research on the structure and development of the Austrian population. The group also takes part in multilateral European networks and studies.

In cooperation with the Population Project at IIASA, the *Population Dynamics and Forecasting* group works at the forefront of methodological development in the fields of

population forecasting and simulation of demographic processes, with special emphasis on multi-state analysis and probabilistic projections. This research group is under the guidance of Sergei Scherbov.

Within the conceptual and methodological framework of dynamic systems, the *Population Economics* group focuses on investigating demographic and macroeconomic interactions, on the one hand, and population–environment interactions, on the other. Research within the group falls into five broad categories: macroeconomic consequences of population aging; the role of age structure in explaining long-term economic growth; models of population–development–environment interactions; agent-based computational demography; and human capital formation. This group is led by Gustav Feichtinger and Alexia Fürnkranz-Prskawetz.

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Update from the Asian MetaCentre

The Asian MetaCentre for Population and Sustainable Development Analysis was founded in 2000 with funding from the Wellcome Trust (www.wellcome.ac.uk). The Centre was established through the collaborative efforts of the former Center for Advanced Studies (now the Asia Research Institute [ARI], www.ari.nus.edu.sg) at the National University of Singapore; the College of Population Studies (CPS, www.chula.ac.th/college/cps), Chulalongkorn University, Thailand; and the International Institute for Applied Systems Analysis (IIASA, www.iiasa.ac.at), Austria. The National Centre for Epidemiology and Population Health (NCEPH, <http://nceph.anu.edu.au>) of the Australian National University joined as a principal collaborator in 2002. The Asian MetaCentre is headquartered at the ARI in Singapore.

New People

Professor Gavin Jones joined the Asian MetaCentre headquarters as a visiting senior research fellow from March to May 2003. The headquarters of the Asian MetaCentre also welcomed three new post-doctoral fellows: Santosh Jatrana, Mika Toyota, and Xiang Biao.



Participants in the Asian Population Network workshop "Urbanisation, Transport and Health in Asia" held at the National Centre for Epidemiology and Population Health (NCEPH), Australian National University, Canberra, 16–19 February 2003.

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Forthcoming Workshops

Migration and Health in Asia Bintan, Indonesia, 22–24 September 2003

This workshop will examine the relationship between migration and health in an Asian context. Participants will address the health issues of migrants from multi-disciplinary social science perspectives—including demography, human geography, sociology, anthropology, and psychology—based on a broad range of empirical case studies from China, Japan, Taiwan, Thailand, Singapore, Indonesia, Philippines, Laos, Cambodia, Nepal, India, Bangladesh, Australia, and New Zealand.

Past and Future Demographic Trends by Level of Education in the Countries of South-East Asia Bangkok, 6–17 October 2003

Following the "Projections of Human Capital" workshop in October 2002, this meeting aims to finalize the projections of education and human capital in six Southeast Asian countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam) and will be the basis for a book comprising country-specific chapters and a comparative overview.

Health and Well-Being over the Life Course Bangkok, 12 January–13 February 2004

This workshop will examine the social, psychological, and physical aspects of health and well-being from adolescence through old age, as well as appropriate methodologies for research on this theme in relation to the human life cycle. An important goal of the workshop will be for participants to develop a research proposal on a related topic of interest. Thus on-the-spot training and guidance related to research proposal writing will also be a central component of the workshop.

Contemporary Perspectives on Asian Women as Transmigrant Domestic Workers Singapore, 23–25 February 2004

This workshop aims to illuminate the complex factors that underscore the persistent flows of Asian women as transmigrant domestic workers, their major characteristics, and the associated social, economic, and health issues. Each paper will address the following themes from a comparative perspective: the migrant's experience; the role of the state; the historical and cultural context of gendered mobility and paid domestic work; social, economic, and health impacts; NGO activities and civil society space; and alternative pathways/policy implications.

Recent Activities

Public Seminar on Future Population and Human Capital in Asia Singapore, 17 October 2002

Professor Wolfgang Lutz addressed the issue of population aging and its future implications for the labor force and economic competitiveness, and stressed the importance of human capital formation and higher educational qualifications.

Singaporean Women as Workers, Mothers and Caregivers: Coping with Changes, Challenges and Commitments Singapore, 18 January 2003

The workshop examined the social, cultural, and legal implications of wage employment in the everyday lives of Singaporean women.

The First and Second Demographic Transitions in South-East and East Asia Singapore, 8 May 2003

Professor Gavin Jones focused on the recent Asian experience of a "second demographic transition" and addressed the relevance of the policy proposals emerging in the very-low-fertility countries of Europe to the low-fertility societies of Asia, including Singapore.

Projections of Human Capital Bangkok, 7–18 October 2002

Drs. Sergei Scherbov and Anne Goujon taught participants to produce the aggregate fertility trends for an entire country that result from a combination of education-specific projections using the "PopEd" software.

Urbanisation, Transport and Health in Asia Canberra, 16–19 February 2003

The workshop aimed to examine the health gains and losses associated with different transport systems and investigated the linkages between transport and health in terms of the diversity within Asian megacities, and the diversity between cities in different countries.

Reprint from Science*

DEMOGRAPHICS

POLICY FORUM

Europe's Population at a Turning Point

Wolfgang Lutz,* Brian C. O'Neill, Sergei Scherbov

Europe has just entered a critical phase of its demographic evolution. Around the year 2000, the population began to generate "negative momentum": a tendency to decline owing to shrinking cohorts of young people that was brought on by low fertility (birthrate) over the past three decades. Currently,

Enhanced online at
www.sciencemag.org/cgi/
content/full/299/5615/1991

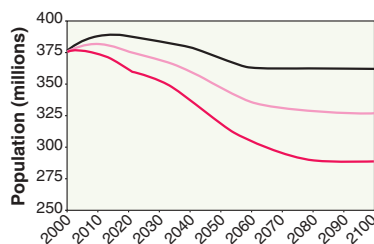
the effect of negative momentum on future population is small. However, each additional decade that fertility remains at its present low level will imply a further decline in the European Union (EU) of 25 to 40 million people, in the absence of offsetting effects from immigration or rising life expectancy. Governments in Europe are beginning to consider a range of policy options to address the negative implications of population decline and rapid aging (1, 2). Social policies and labor laws aimed at halting the further increase in the mean age of childbearing—which contributes to low fertility—have substantial scope for affecting future demographic trends. They also have an additional health rationale because of the increasing health risks associated with childbearing in older women.

Negative Momentum and Low Fertility

Population momentum measures the effect of the current age structure on future population growth (3, 4). A young population has positive momentum (a built-in tendency to grow). An older population can have negative momentum when low fertility leads to smaller numbers of children than of parents, locking in future decreases in the number of parents and a tendency toward population decline. Momentum can be calculated by performing a hypothetical projection in which all forces for change in population size except age structure are removed (5).

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Negative momentum: effect of 20 more years of low fertility on population size in the EU. Population of the 15 member countries of the EU if one assumes that fertility immediately increases to replacement level and remains constant thereafter (black line) or that fertility remains at 1.5 (red line) or 1.8 (pink line) until 2020, when it rises to replacement level.

We find that for the 15 member countries of the EU, low fertility brought the population to the turning point from positive to negative momentum around the year 2000. Currently, negative momentum is small (see figure, above); population even grows for 15 years in our momentum projection before declining, because of the large numbers of people born during the baby boom of the 1960s. However, if the current fertility rate of around 1.5 births per woman persists until 2020, negative momentum will result in 88 million fewer people in 2100, if one assumes constant mortality and no net migration.

EFFECTS OF LOW FERTILITY ON POPULATION IN EUROPE

Period of low fertility (years)	Population decline by 2100		Contribution of delay	
	Continued delay (TFR 1.5) (millions)	No further delay (TFR 1.8) (millions)	(millions)	(%)
0	15	15	0	0
10	55	34	22	39
20	88	49	39	45
30	118	63	55	46
40	144	77	67	46

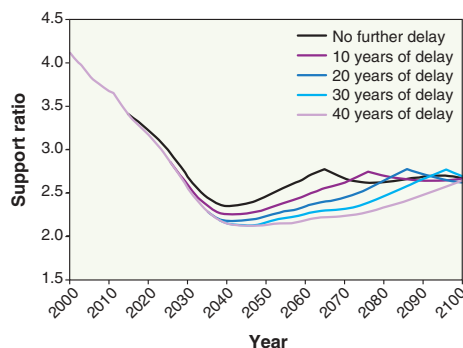
Negative momentum: effect of periods of low fertility on population decline in Europe. The scenarios assume fertility (birthrate) remains constant at 1.5 (continued delay case) or at 1.8 (no further delay case) for the number of years noted in the first column before instantly rising to replacement level. TFR, total fertility rate.

Fertility is currently low in Europe for two reasons: first, women are delaying births to later ages [the tempo effect (6, 7)], and second, even after adjusting for this delay, fertility is below the level necessary for each generation to replace itself fully (low adjusted fertility). Delayed childbearing does not affect the total number of children women have over the course of their lives, provided they do not forgo postponed births altogether. However, it reduces the number of children born during the period in which delay is occurring, which lowers birth rates in that period and contributes to the aging of the population.

The population decline of 88 million resulting from 20 years of low fertility can be separated (Fig. 1) into contributions from the tempo effect and from low adjusted fertility. The tempo effect is assumed to be 0.3 children per woman, roughly consistent with recent experience in 10 EU countries for which data are available (8). Postponement of births may continue, because many social and economic factors still favor later childbearing (9). Adjusted fertility is assumed to remain constant at 1.8. Given these assumptions, if increases in the mean age of childbearing were halted, the period fertility would rise from 1.5 to 1.8. Our simulations show that, under these conditions, substantially less negative momentum is generated, and ultimate population size is only 49 million lower than today's. Thus, 45% of the population decline caused by a birthrate of 1.5 over 20 more years can be attributed to the effect of the increasing age of childbearing women on birth rates. In general, we find that each decade of fertility at current levels leads to declines in ultimate population size of 25 to 40

million, with the contribution of timing remaining around 40% or more in all cases (see table). We arrive at the same conclusion when we assume that, instead of remaining constant, adjusted fertility continues to fall [(10), see supporting online material]. The effect caused by increasing age of childbearing clearly deserves attention not just in adjustments to fertility rates (6, 11), but also

POLICY FORUM



Effect of further delays in childbearing on aging in the EU member states.

when considering determinants of the future size and age structure of Europe's population.

Aging and Delayed Childbearing

Continued increases in the mean age of childbearing will also have significant effects on the age distribution within the population. In the scenario simulating an immediate halt to the delay in childbearing, the "support ratio" declines from about four working-age persons (ages 15 to 64) per elderly person (age 65+) to considerably less than three for most of the remainder of the century (see figure, above), if we assume 0 net migration and no changes in mortality. If the delay in childbearing continued with no change in adjusted fertility, the support ratio would further decline to almost 2, nearly doubling the demographic dependence burden as compared with the present. Twenty years of continued increases in the mean age of childbearing imply an additional decline in the support ratio of about 0.5 workers per elderly person by 2065, the year when the difference is most pronounced. The cumulative effects are substantial. Looked at from the perspective of the working-age population, continued delay of 10 to 40 years will imply that an additional 500 to 1500 million person-years of workers would be needed to support the elderly population over the rest of the century, as compared with a no-delay scenario.

Policy Implications

Over the coming decades, the decisive shift to an older age structure in Europe (12) will challenge social security and health systems, may hinder productivity gains, and could affect global competitiveness and economic growth. It could also strain relations among generations, particularly between those who are on the contributing and receiving ends of public transfer programs. It may also diminish social cohe-

sion, particularly if increasing labor demand leads to substantial immigration from other cultures. Although population aging is the main focus of population-related social, economic, and political concerns in Europe, there is also a deeply rooted fear of population decline (13) associated with a possible weakening of national identity and loss of international political and economic standing.

Policy discussions have primarily focused on adjusting to given demographic trends, by making structural adjustments to pension systems, labor markets, and health and fiscal systems.

With already very high tax rates, however, there is a limit to how much governments can squeeze out of a shrinking labor force. Hence, discussions are beginning to turn to policies that could influence demographic trends themselves. Because substantial increases in immigration remain politically unpopular, fertility may increasingly be considered as a policy variable (14). Childbearing could come to be considered a "social act" (15) rather than a purely private decision.

In 1976, a set of policies was enacted in East Germany that included much improved child-care facilities, financial benefits, and government-supported housing if a woman became pregnant. As a consequence, period fertility in East Germany, which had declined almost in parallel with West Germany, increased from 1.5 to 1.9 (16). The mean age of childbearing stayed below 25 years, while it increased to more than 28 years in the West. In contemporary Western Europe, however, there is pronounced public resistance to explicitly pronatalist policies. This is partly because of infamous birth promotion programs in past fascist regimes and partly because births are often viewed as an obstacle for women pursuing careers and therefore not something the government should promote as an end in itself. Family policies in Europe today are based instead on an equal-opportunities rationale and aim to help women combine child rearing with employment. Such policies seem to have had a small, if any, effect on period fertility (17).

Policies that aim to affect the timing of births rather than family size may be more acceptable. Such policies would have to address some of the prime reasons for continued childbearing delay, including inflexible higher education systems, youth unemployment, housing markets, and especially career patterns built around traditional male life-course models. Revamping the conventional sequence of life course transi-

tions can also help solve conflicts between work and family (18). Health benefits may provide an additional rationale. A continued delay in childbearing has not only led to burgeoning numbers of infertility treatments but also to increasing medical concerns about health risks for mother and child associated with late pregnancies.

Halting the trend toward higher mean ages of childbearing would significantly moderate population aging and decline in Europe. Changes in the timing of births have been pointed out as a possible avenue for slowing population growth in developing countries, in that case by encouraging delays in childbearing (19). Here, we are suggesting the reverse: that discouraging further delays in childbearing could help confront the population-related challenge faced by Europe.

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Supporting Online Material

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Forthcoming IIASA Book

The End of World Population Growth in the 21st Century: New Challenges for Human Capital Formation and Sustainable Development

Wolfgang Lutz and Warren C. Sanderson, Editors

This book provides new ways of thinking about population in the 21st century. While the 20th century was the century of population growth—with the world’s population increasing from 1.6 to 6.1 billion—the book shows that the 21st century is likely to see the end of world population growth and become the century of population aging. At the moment, we are at the crossroads of these two different demographic regimes, with some countries still experiencing substantial population growth and others already facing rapid aging. The new demography of the 21st century produces a new set of challenges for forecasting and understanding the consequences of population changes.

The volume addresses these challenges in a number of ways. It produces probabilistic population forecasts for the world and 13 major regions and introduces new ways of analyzing the uncertainty of these forecasts. It integrates human capital and sustainable development with population change and shows how combining the three provides a new way of unifying our understanding of demographic developments in the 21st century.

The book contains chapters on probabilistic population forecasting; integrated forecasts of population and education changes in world regions; the use of literate life expectancy as an indicator of social development; the interactions between population, the environment, and agriculture in Ethiopia; the effects of education on trends in HIV prevalence in Botswana; China’s future rural and urban population by education; population, greenhouse gases, and climate change; and a new conceptual framework that combines considerations of population growth, age structure, human capital, and the environment and shows that the problems of rapid economic growth and rapid aging can be formulated and analyzed within a unified framework. We call this approach to thinking about 21st century demographic issues “population balance.”

The book will be published by Earthscan
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