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IMPACT OF FUTURE DEMOGRAPHIC CHANGES IN EUROPE

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IMPACT OF FUTURE DEMOGRAPHIC TRENDS IN EUROPE

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Abstract: The aim of the paper is to look at the future of populations of the Council of Europe member states, identify the main trends and discuss their policy implications. The analysis focuses on the impact of future demographic trends on the following social domains: education, labour market, health and elderly care, and social protection. The study aims to be policy-oriented, and to provide recommendations of feasible policy responses to the demographic change. The analysis of population dynamics in the coming 45 years is based on the United Nations population projection from 2005.

Keywords: population projections, future demographic trends, labour market changes, population policies, social security

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Executive Summary

The aim of the paper is to look at the future of European populations, identify the main trends and discuss the policy implications of these changes. The analysis focuses on the impact of future demographic trends on the following social domains: education, labour market, health and elderly care, and social protection. The whole study aims to be policy-oriented, and to provide recommendations of feasible policy responses to the demographic change. The basis for the analysis of population dynamics in the coming 45 years is the United Nations (2005) population projection.

The structure of the study is as follows: Section 2 contains information about the source of the data (the 2004 revision of the population projections of the United Nations). Section 3 presents an assessment of the projection assumptions, with focus on the possible impact on the results of the study. Section 4 contains a quantitative analysis of trends in population size, as well as sex and age structures, with a description and illustration of the main tendencies. Section 5 is devoted to the review of the recent literature on the impact of demographic change on various aspects of development: education, labour market, health and elderly care, as well as social protection. These issues are further corroborated in Section 6, on the basis of an analysis and interpretation of the trends presented before. This section also includes a qualitative analysis of possible policy outcomes, as well as an evaluation of feasible responses to the demographic change from the policy-oriented perspective. Finally, Section 7 contains main conclusions with respect to the policy challenges and recommendations for the future, as well as suggestions for further studies in this field. In addition, the study contains an extensive Annex, providing insights into future demographic prospects of the member states of the Council of Europe. The Annex contains information on expected trends in population size, as well as in the sex and age structures.

The paper starts with the discussion of the UN projection. We criticised assumptions on the unrealistically high level of fertility, leading in general to overestimation of birth numbers, in comparison to other projections and forecasts. Mortality is slightly higher than assumed in other studies. One may suggest that UN projection will generate more numerous and younger populations in comparison to that may realistically be expected, and what is predicted by other specialists.

In order to offer a compact analysis of the results of the UN projection, the countries under study have been grouped into six larger clusters, taking into account their geographical, historical and cultural proximity: Central Europe, European and Trans-Caucasian part of the former Soviet Union, Northern Europe, Southern Europe, South-Eastern Europe and Western Europe. In all 42 countries under study, the total population size is envisaged to decline from 808 million in 2005 to 763 million in 2050, i.e. by 6% over the 45-year period under study. The short-term increase expected for 2005–2014 is a result of the positive population momentum from the past. This is, however, going to come to an end in the first half of the

21st century all over Europe, not only in the most developed countries of the former EU-15. Despite the fact that the population decline is far from dramatic, substantial changes are envisaged in the population structure by age, reflecting the further advancements of the process of population ageing, as indicated by the dynamics of three dependency ratios. Although the young-age dependency ratio (population below the age of 15 years to population aged 15–64), is expected to stabilize about 25 percent, the old-age dependency ratio (regarding population over 65) is envisaged to more than double, from 22% in 2005 to 45% in 2050. In particular, the dependency ratio concerning population aged over 80 years is going to more than treble from 5% to 15% in the same period. These changes are going to result in an increase of the total dependency ratio from 47% to 71%. It means that the overall demographic burden of the population outside of the productive age on the population aged 15–64 years is going to increase by a factor of 1.5. The study shows clearly that depopulation will concern some of European countries whereas ageing will be an universal phenomenon. In consequence, the societies have to adjust to the new, grey demography.

In terms of policy measures an increase in fertility and an increase in labour force participation should be two main priorities, as they directly reduce the speed of population change. One of the consequences of ageing will be problems with maintaining of the social, especially retirement, security systems, which, despite recent reforms are still vulnerable. It is recommends that retirement age is increased. Increase in labour force participation has been identified by Bijak et al. (2005) as a very efficient tool to reduce ageing-related imbalances on the labour markets in a short- and middle-term. Some countries already introduced necessary legislative changes. Finally, development of atypical forms of employment, catering for those who can not or do not want to work full time is necessary.

All efforts should be made to reduce future demand for health care services in future. Lutz and Scherbov (2005) have shown that increase in disability-free life expectancy may allow for maintaining the costs of health and care services. It has been argued that keeping the cost of health care and social services on current levels in terms of the share of GDP spent on them will be conditional on economic growth and controlling of the cost of medical care.

An important ethical issue concerns the very probable brain drain of highly qualified personnel in health care from poorer countries by the more affluent ones. Freedom of labour mobility and globalization results in almost unrestricted mobility of highly skilled and significant economic losses of poor countries.

1. Introduction and background

Demographic change is contemporarily one of the key policy issues, as it influences many areas of social and economic life. Of a special relevance are problems related to population ageing, i.e. increase of the share of the elderly in the population. Ageing, in the contemporary world being an immanent feature of the developed societies, including Europe, is a process that will no doubt continue in the future. Another demographic issue of a growing importance and relevant for policymaking is international migration. Both these population processes have a significant impact on labour markets, economic growth and social cohesion, considering primarily the social inequalities, as well as on many other aspects of life.

For these reasons it is of key importance to assess the most likely future development paths of demographic processes for the purpose of policymaking and planning, together with their plausible 'error margin'. This information is provided in a variety of population projections and forecasts produced either by official statistical authorities, international organizations or by individual researchers. The outcomes of these projections and forecasts can provide an important input for the design of future policies, as well as for the final political decisions.

This research is going to contribute to the analysis and development of links between the demographic projections on one hand, and socio-economic decision making in the member states of the Council of Europe on the other. The focus of this study is on the impact of projected future population changes on various aspects of social and economic life, and on deriving relevant policy implications. Taking into account advances in knowledge on demographic processes since the previous publication concerning this topic, prepared under the auspices of the Council of Europe (Cliquet, 1993), there is a deep need for such a study.

The direction and magnitude of the impact of population change on labour markets, economic growth and social cohesion is in many cases not clear. There are, however, indications that especially population ageing may have negative side-effects on the social, economic and political life, most importantly including (United Nations, 2002):

- increasing public expenditure on pensions, social security and health services;
- decreasing number of persons in working age (in the labour force) and an increase in the overall economic burden on the working population (intergenerational transfers);
- increasing risk of collapse of the pay-as-you-go components of pension systems;
- changing public health patterns and the requirement for appropriate medical care due to the increasing number of the elderly, including the oldest-old (85 years or more);
- increasing risk of intergenerational conflicts, due to changes in resource distribution and a growing pressure on providing ever more means for the elderly.

Although today these issues are not critical yet, certain policy measures need to be implemented as soon as possible, in order to prevent from serious problems related to ageing

of population in the future. Ageing is therefore an important policy challenge, concerning many areas of life: health care, economy, social security systems, education, as well as changes in the attitudes and practices towards the elderly and their role in the society (National Research Council, 2001). Especially with respect to economy, the relevant research has been already ongoing in various fields, including issues like labour markets (Johnson and Zimmermann, 1992; Snel and Cremer, 1994), productivity and innovativeness (Council…, 1996), economic growth (Lindh and Malmberg, 1998) and fiscal sustainability (Aaberge et al., 2004). A thorough overview of the problems related with ageing in various aspects of economic and social life, as well as their possible policy implications has been recently presented for the case of Australia in a publication of the Productivity Commission (2005).

From the policy point of view, the crucial reference has to be made to the outcome of the Expert Group Meeting on Policy Responses to Population Ageing and Population Decline, held by the United Nations Population Division in New York in 2000. The meeting directly followed the publication of the controversial United Nations (2000) report on 'replacement migration' as a hypothetical remedy to offset the negative effects of ageing. With respect to Europe, the major contributions have been made both from a demographic (Lesthaeghe, 2000), as well as from the policy point of view (Fotakis, 2000). Currently, it seems that there is no shortcut policy path, as there is no feasible solely demographic 'solution' to population ageing, and the remedies for its negative outcomes need to be primarily sought elsewhere, among the non-demographic policies (Coleman, 2002). On the other hand, policy measures aimed at reducing the side-effects of the demographic change, should be considered wherever possible, as a part of a wider set of policies aimed at dealing with the consequences of ageing. Special attention should be paid to migration policies, which contemporarily constitute a very sensitive issue.

The current study has therefore the following aims:

- to provide an overview of future demographic trends in the Council of Europe member states for 2005–2050;
- to provide a policy-relevant analysis and interpretation of these trends.

The analysis focuses on the impact of future demographic trends on the following social domains: education, labour market, health and elderly care, and social protection. The whole study aims to be policy-oriented, and to provide recommendations of feasible policy responses to the demographic change. A thorough analysis of the possible policy outcomes is also offered, allowing for a detailed evaluation of the proposed solutions. In geographic terms, the analysis covers 42 member states of the Council of Europe. Andorra, Liechtenstein, Monaco and San Marino have been not considered due to absence of statistical information in the United Nations (2005) report and related database.

The structure of the current study is as follows: Section 2 contains information about the source of the data (the 2004 revision of the population projections of the United Nations). Section 3 presents an assessment of the projection assumptions, with focus on the possible impact on the results of the study. Section 4 contains a quantitative analysis of trends in population size, as well as sex and age structures, with a description and illustration of the main tendencies. Section 5 is devoted to the review of the recent literature on the impact of demographic change on various aspects of development: education, labour market, health and elderly care, as well as social protection. These issues are further corroborated in Section 6, on the basis of the analysis and interpretation of the trends presented before. This section also includes a qualitative analysis of possible policy outcomes, as well as an evaluation of feasible responses to the demographic change from the policy-oriented perspective. Finally, Section 7 contains a summary of results and main conclusions with respect to the policy challenges and recommendations for the future, as well as suggestions for further studies in this field. In addition, the study contains an extensive Annex, providing insights into future demographic prospects of the member states of the Council of Europe. The Annex contains information on expected trends in population size, as well as in the sex and age structures.

2. Data issues

The study is based exclusively on the recently released medium variant of the United Nations (2005) population projections provided in the report World Population Prospects: 2004 Revision. The analysis is done in 5-year intervals for the period 2005–2050. Unlike in the case of the recent population projections of the Eurostat (2005), which cover 27 member and accession countries of the European Union, the UN source provides a full geographic coverage of the Council of Europe member states. The advantages of using a single source are that the projections follow a common methodology used simultaneously for all countries under study, and that this ensures more international comparability and consistence of the data used than there would be while using various sources for different countries.

The main disadvantages of relying solely on the United Nations (2005) projections are that: (1) they are based on more rough assumptions as in the case of the Eurostat projections; (2) they do not allow for a regional sub-division; and (3) they are done in 5-year age groups. The first issue is discussed more thoroughly in the further part of this section, devoted to the projection assumptions. The second problem would pertain even if the regional projections of the Eurostat (2005) were used for 27 EU member and accession countries, for which they are available. For the majority of the remaining 15 countries no reliable sub-national projections exist, which anyway would be a serious drawback in the analysis for the Russian Federation, Ukraine or Turkey, where a significant regional variation of the processes under study can be expected. Therefore, in this study we decided to perform the analysis on the country level, despite the fact that we are perfectly aware of the existence of a large intra-country differences in the pace and shape of population ageing processes, especially in large countries.

The problem of disaggregating the 5-year age groups in order to estimate the size of the functional groups has been overcome by using the Karup-King interpolation of the 5-year into the 1-year age groups (method discussed for example in Shryock and Siegel, 1971: 681–701). The functional age groups, for which future demographic trends are analyzed, are as follows:

- Pre-school age group: 0–5 years;
- School-age group: 6–18 years, distinguishing three levels: elementary (6–11), lower secondary (12–15), and upper secondary (16–18);
- Tertiary-education age group: 19–23 years;
- Working-age group: 24–64 years, distinguishing younger (24–34), middle-aged (35–44), and older (45–64) groups;
- Elderly population: 65 or more years, distinguishing the group of 65–79 years of age, and the oldest-old population (80+).

The division into functional age groups is pretty standard and follows a general practice in research, however the brackets assumed will not fit all countries' educational system and retirement legislation. Possibly the creation of the *Tertiary-education age group* requires

some justification. Traditionally this group belongs to the young working age population. However, the proliferation of tertiary education and the needs of university sector to know what is the size of their potential clientele justifies the creation of a separate group.

For more transparency of the results, the countries under study have been grouped into six larger clusters, taking into account their geographical, historical and cultural proximity. These clusters have been defined as follows:

- *Central Europe* (8 countries): the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia.
- *European and Trans-Caucasian part of the former Soviet Union* (*FSU*): 6 countries (excluding the three Baltic EU members included in the Central European cluster) – Armenia, Azerbaijan, Georgia, Moldova, the Russian Federation, and Ukraine.
- *Northern Europe* (7 countries): Denmark, Finland, Iceland, Ireland, Norway, Sweden, and the United Kingdom.
- *Southern Europe* (6 countries): Cyprus, Greece, Italy, Malta, Portugal, and Spain.
- *South-Eastern Europe* (8 countries): Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Former Yugoslav Republic of Macedonia, Romania, Serbia and Montenegro, and Turkey.
- *Western Europe* (7 countries): Austria, Belgium, France, Germany, Luxembourg, the Netherlands, and Switzerland.

The Central Europe and FSU clusters, as well as most of the countries in the South-Eastern cluster (apart from Turkey) share their common political and economic history of communism or 'real socialism', at least between the World War II and the late 1980s. Adversely, Northern, Western and Southern clusters comprise countries from the other side of the 'iron curtain'. The rationale of grouping Turkey together with the remaining, post-socialist South-Eastern countries is to obtain a cluster encompassing all the current and the (likely) future EU accession and candidate countries.

3. Discussion and criticism of the assumptions of the projections

In this section of the study we will look at the assumptions made by the United Nations in their 2004 round of population projections and assess them critically. At the time of writing of this study there was only limited documentation of the UN projections, namely the *World Population Prospects. The 2004 Revision. Highlights* (United Nations, 2005). The key three volumes with the results of projections are pending, however the on-line database at «www.unpopulation.org» and the results on a country by country basis have been available.

It is very difficult to assess the assumptions made by the UN demographers, among others because it is unclear what product they offer. Conventionally we classify the results of run of population dynamics models into forecasts, projections and simulations. Projections extrapolate the trends observed in the past and tell us, what are the consequences of keeping observed population trends intact for a certain period of time (Rogers, 1975; Willekens and Rogers, 1978). Ahlburg and Lutz (1998) noted that projection is always correct by definition, unless there are arithmetical errors in the projection model. Forecasts tell us what the forecasters believe will happen with the population, in other words what is the most likely population change. Simulation is based on any, be it feasible or not, assumptions on the evolution of components of population change which are fed into the population dynamics model (Kupiszewski, 2002). If we adhere to this nomenclature, it would be quite a challenge to establish what the UN actually offers. However, we assume that they prepared a forecast, what is justified by the title "World Population Prospects", despite the fact that in the entire text of the *World Population Prospects. The 2004 Revision. Highlights* (United Nations, 2005) they have never used the word "forecast".

Given the function of the UN *World Population Prospects* in the international community and frequent references to it as to a forecast (see for example Keilman, 1998, and Bongaarts, 1997), and keeping in mind that many forecasts are termed in literature "projections", we will treat what UN terms as "prospect" or "projection" as it was a forecast. Therefore it will be justified to assess the plausibility of assumptions made by the UN demographers as if they were forecast assumptions.

The UN assumptions have been examined from the point of view of their feasibility and compared with existing projections and forecasts prepared by national statistical institutions (only forecasts for 40 years, for Turkey and Iceland, and longer ahead have been taken into account, with only two exceptions: Ireland and Poland), and with two predictions for at least 25 countries: the official Eurostat projection from 2004 («epp.eurostat.cec.eu.int») and recent Central European Forum for Migration Research forecast (Bijak, 2004; Saczuk, 2004; Bijak et al., 2004; 2005).

3.1. Assumptions on fertility change in the UN 2004 population projection

The key assumption adopted in the United Nations (2005) projection is that total fertility rate will eventually converge in all countries to 1.85. The UN demographers consider two cases, one for countries with observed TFR in 2000–2005 higher than 1.85 (in the case of the Council of Europe member states it refers to Albania, France, Iceland, Ireland and Turkey) and the second for those with TFR below this value. In the former case they decrease fertility, based on generalised historical experience of all countries, until the TFR reaches the target value. If such derived trajectory of change departs significantly from the observed patterns, it was modified for the period of several years, to avoid very sharp discontinuities in trends. For countries which experienced TFR below 1.85, for the first 5–10 years the trajectory of change would follow the trend, after this period an increase by 0.07 child every 5 years is assumed, until the target level is reached. That means that some countries will not reach the target level within the 50 years of projection.

The assumptions made may be analyzed from two points of view: The first is how do they compare with the assumptions made in other projections and, if there are any significant differences, how they are justified. The other point of view of analysis is to examine the justification of assumptions made.

Let us start with the latter insight into the justification of assumptions made. The key question which has not been really answered by the UN is, why the world-wide convergence of TFR should occur. In fact there would be difficult to offer any rationale behind such changes. There is no doubt that we observe a reduction in fertility which encompasses the whole world and in consequence certain reduction of span between highest and lowest observed levels of fertility, but nothing can really justify a hypothesis on full convergence, especially that the countries with higher levels of fertility experience relatively modest decrease. Much more reasonable would be an assumption of convergence of fertility in clusters of countries, constructed according to certain criteria, as this is practiced in the population projections and forecasts of the European Union and CEFMR. In consequence we may expect that the UN projection overestimates fertility in low fertility countries, mostly European Union southern and eastern member states and Slavonic post-Soviet states. At the same time the UN projection underestimates fertility in Northern Europe and in southern post-Soviet countries and Turkey, which so far experienced relatively high fertility. This suggestion is in line with the comparison of assumptions made by other forecasters, namely national statistical institutes, Eurostat and CEFMR, presented in Table 1.

A quick analysis of this table shows that assumptions made in the UN projections on the target total fertility rate are respectively by 46%, 42% and 36% higher for Poland, Cyprus and Romania and Germany than those of assumed by national forecasters, and for Iceland and Turkey accounts respectively for 90% and 88% of the level assumed by the national forecasters. Also assumptions made by Eurostat for the EuroPop 2004-based projections are for some countries, such as Italy or Spain lower by 1/3 in comparison to those of UN

projection. The reader should be therefore aware of the fact that the UN projection uses somewhat simplified and aggregated assumptions concerning fertility, in many cases elevated in comparison to the assumptions made in other projections and forecasts.

Table 1. Assumed total fertility rates for selected projections around 2050

Country	EuroPop 2004 (2050)	National (2050)	CEFMR (2052)	UN 2004 (2050)
Albania	n.a.	n.a.	n.a.	1.85
Armenia	n.a.	n.a.	n.a.	1.85
Austria	1.45	1.40	1.50	1.85
Azerbaijan	n.a.	n.a.	n.a.	1.85
Belgium	1.70	1.70	1.80	1.85
Bosnia and Herzegovina	n.a.	n.a.	n.a.	1.82
Bulgaria	1.50	n.a.	1.40	1.76
Croatia	n.a.	n.a.	n.a.	1.85
Cyprus	1.50	1.30	n.a.	1.85
Czech Republic	1.50	1.62	1.50	1.78
Denmark	1.80	1.80	1.90	1.85
Estonia	1.60	1.77	1.60	1.85
Finland	1.80	1.77	1.90	1.85
France	1.85	1.80	1.90	1.85
Georgia	n.a.	n.a.	n.a.	1.85
Germany	1.45	1.40	1.50	1.85
Greece	1.50	n.a.	1.50	1.78
Hungary	1.60	1.90	1.50	1.81
Iceland	n.a.	2.05	n.a.	1.85
Ireland	1.80	1.75*	1.90	1.85
Italy	1.40	1.43	1.50	1.85
Latvia	1.60	n.a.	1.50	1.82
Lithuania	1.60	1.65	1.50	1.79
Luxembourg	1.80	1.80	1.80	1.85
Malta	1.60	n.a.	n.a.	1.85
Moldova	n.a.	n.a.	n.a.	1.74
Netherlands	1.75	1.80	1.90	1.85
Norway	n.a.	1.80	1.90	1.85
Poland	1.60	1.20*	1.50	1.76
Portugal	1.60	1.70	1.70	1.85
Romania	1.50	1.30	1.40	1.78
Russian Federation	n.a.	n.a.	n.a.	1.85
Serbia and Montenegro	n.a.	n.a.	n.a.	1.85
Slovakia	1.60	1.70	1.50	1.71
Slovenia	1.50	1.50	1.50	1.74
Spain	1.40	1.50	1.50	1.85
Sweden	1.85	1.85	1.90	1.85
Switzerland	n.a.	1.50	1.50	1.85
The FYROM	n.a.	n.a.	n.a.	1.85
Turkey	n.a.	2.1	n.a.	1.85
Ukraine	n.a.	n.a.	n.a.	1.67
UK	1.75	1.80	1.80	1.85

Sources: Eurostat (2005), national statistical offices, Bijak (2004), United Nations (2005)
* Numbers extrapolated from target values for earlier years.

It should be, however, noted that the low variant of the UN (2005) forecast assumes convergence of TFR to 1.35, what seems to be a more realistic value, although the notion of pan-European convergence of fertility patterns is still questionable.

3.2. Assumptions on mortality change in the UN 2004 population projection

The future changes in mortality are expressed by the UN forecasters in terms of life expectancy at birth for males and females. The methodology used is described very briefly in the following way: "Mortality is projected on the basis of models of change of life expectancy produced by the United Nations Population Division. These models produce smaller gains the higher the life expectancy already reached. The selection of a model for each country is based on recent trends in life expectancy by sex." (United Nations, 2005: 22). Importantly the impact of HIV/AIDS pandemics in 60 most affected countries is explicitly taken into account. This is the major and much appreciated development in population forecasting.

Among the Council of Europe member states two countries, namely Russian Federation and Ukraine have their target life expectancy at birth in 2050 reduced by respectively 3.2 and 2.6 years as a result of the AIDS-related deaths. One should note here that the UN assumed that both the rate of recruitment of individuals to high risk groups and the infection rate will decrease substantially. Simultaneously, due to the increased use of antiretroviral drugs would increase the life of those infested with HIV.

The values of target life expectancy around 2050 for the United Nations projections and some other forecasts is shown in Table 2. The differences between the values assumed by the UN and by national forecasters and other institutes are rather small, not exceeding 5%. Only in the case of Turkey and Greece for males and Turkey and Slovenia for females the differences are between 5 and 6%. The UN assumption are generally less optimistic than assumptions made by other forecasters, what may be detrimental to the quality of the results, keeping in mind that in most ex-post assessment of forecasts it turned out that the forecasters have overestimated the mortality change. However, the condition that gains in life expectancy depend on its level can be questioned. There is no evidence of correlation between levels of mortality and rates of mortality improvements (see e.g. Vaupel, 1998).

3.3. Assumptions on international migration in the UN 2004 population projection

The assumptions on international migration in the UN projection are very short: "The future path of international migration is set on the basis of past international migration estimates and an assessment of the policy stance of countries with regard to future international migration flows." (United Nations, 2005: 22). However, based on data published on assumed migration gains and losses Table 3 with net annual migration for each country has been prepared. It is surprising to see, that in the majority of cases as from 2005–2010 international migration is set to be constant. Even more surprised are dramatic changes between 2000–2005 and 2005–2010: for example migration in Spain is supposed to drop from 405 thousand to 120 thousand. Permanent negative net migration form Poland may also be questioned. The net migration gain of Europe in the decade 1990–2000 is estimated to be 1139 thousand, to drop in the decade 2000–2010 to 937 thousand and in the decade 2040–2050 to 699 thousand (United Nations, 2005: 19). These changes are small at the scale of the continent.

Table 2. Assumed values of life expectancy at birth for selected projections around 2050

Country	Males				Females			
	EuroPop 2004 (2050)	National (2050)	CEFMR (2052)	UN 2004 (2050)	EuroPop 2004 (2050)	National (2050)	CEFMR (2052)	UN 2004 (2050)
Albania	n.a.	n.a.	n.a.	77.4	n.a.	n.a.	n.a.	82.7
Armenia	n.a.	n.a.	n.a.	74.6	n.a.	n.a.	n.a.	80.0
Austria	83.6	82.0	84.5	82.7	87.7	87.0	88.7	87.1
Azerbaijan	n.a.	n.a.	n.a.	71.2	n.a.	n.a.	n.a.	77.6
Belgium	82.3	83.9	84.2	81.1	88.3	88.9	88.2	86.7
Bosnia and Herzegovina	n.a.	n.a.	n.a.	76.4	n.a.	n.a.	n.a.	81.5
Bulgaria	78.2	n.a.	79.4	75.9	82.6	n.a.	83.0	81.6
Croatia	n.a.	n.a.	n.a.	77.8	n.a.	n.a.	n.a.	83.3
Cyprus	81.9	79.0	n.a.	80.9	85.1	85.0	n.a.	85.8
Czech Republic	79.7	78.9	82.2	78.3	84.1	84.5	86.1	84.1
Denmark	80.9	81.0	84.1	80.0	83.7	84.0	86.8	84.6
Estonia	74.9	75.9	76.1	75.1	83.1	81.4	84.6	82.5
Finland	81.9	82.4	84.1	82.1	86.5	86.4	88.5	87.1
France	82.7	84.3	84.4	81.5	89.1	91.0	89.5	88.0
Georgia	n.a.	n.a.	n.a.	73.1	n.a.	n.a.	n.a.	79.6
Germany	82.0	81.1	84.4	80.9	86.9	86.6	88.4	86.5
Greece	80.3	83.0	84.5	79.6	85.1	86.9	87.9	84.5
Hungary	78.1	77.0	79.0	76.4	83.4	83.0	84.2	83.0
Iceland	n.a	82.1	n.a	84.3	n.a.	84.8	n.a.	87.8
Ireland	82.4	78.9*	84.3	81.0	87.0	84.0*	87.7	86.1
Italy	83.6	81.4	84.7	82.2	88.8	88.1	89.6	88.1
Latvia	74.3	n.a.	75.7	75.2	82.5	n.a.	83.5	83.1
Lithuania	75.5	72.5	77.0	75.5	83.7	83.4	84.9	83.5
Luxembourg	81.6	n.a.	84.1	80.8	86.7	n.a.	88.5	86.5
Malta	81.8	n.a.	n.a	81.5	85.0	n.a.	n.a.	86.3
Moldova	n.a.	n.a.	n.a	74.1	n.a.	n.a.	n.a.	80.0
Netherlands	80.2	79.6	84.6	80.6	83.6	82.6	87.9	85.8
Norway	n.a.	84.2	84.7	82.7	n.a.	88.1	88.5	87.2
Poland	79.1	80.6*	80.8	77.2	84.4	85.4*	86.0	83.3
Portugal	80.4	79.0	83.5	79.4	86.6	84.7	87.7	85.4
Romania	77.6	n.a.	78.2	75.4	82.0	n.a.	82.3	81.3
Russian Federation	n.a.	n.a.	n.a	68.9	n.a.	n.a.	n.a.	76.5
Serbia and Montenegro	n.a.	n.a.	n.a	76.5	n.a.	n.a.	n.a.	81.7
Slovakia	77.7	77.7	80.4	77.2	83.4	83.4	85.2	83.6
Slovenia	79.8	83.6	84.7	83.4	85.2	86.2	89.0	87.6
Spain	81.4	74.0	82.7	78.9	87.9	81.0	87.7	85.4
Sweden	83.3	83.6	84.5	81.4	86.5	86.2	89.6	88.3
Switzerland	n.a.	82.5	84.7	82.8	n.a.	87.5	89.6	88.3
The FYROM	n.a.	n.a.	n.a.	77.2	n.a.	n.a.	n.a.	82.0
Turkey	n.a.	70.9	n.a.	75.2	n.a.	76.0	n.a.	80.1
Ukraine	n.a.	n.a.	n.a.	70.8	n.a.	n.a.	n.a.	78.0
UK	82.9	81.0	84.5	81.5	86.6	85.0	87.6	85.4

Sources: Eurostat (2005), national statistical offices, Bijak (2004), United Nations (2005). * Numbers extrapolated from target values for earlier years.

Moreover, if constant absolute numbers of net migration smaller than zero are assumed, like for example in the South-Eastern Europe and the FSU countries, this leads to an artificial acceleration of the depopulation process, given negative population growth. In our view, in such cases it would be better to specify the assumptions in terms of migration rates (intensities) rather than crude numbers. Of course, we are perfectly aware that the UN projections are made on a global scale and the zero migration balance world-wide needs hold, which is much more straightforward if assumptions are made in terms of numbers, not rates.

Table 3. Observed (1995–2005) and assumed values of net migration per year according to medium variant of the UN population projection, 2004 revision

Country	1995–2000	2000–2005	2005–2010	2010–2015	2015–2020	2020–2025	2025–2030	2030–2035	2035–2040	2040–2045	2045–2050
	Annual net migration in thousands										
Albania	–53	–20	–15	–10	–10	–10	–10	–10	–10	–10	–10
Armenia	–45	–20	–15	–10	–8	–8	–8	–8	–8	–8	–8
Austria	9	20	20	20	20	20	20	20	20	20	20
Azerbaijan	–26	–20	–10	–10	–10	–10	–10	–10	–10	–10	–10
Belgium	20	13	13	13	13	13	13	13	13	13	13
Bosnia and Herzegovina	70	8	8	0	0	0	0	0	0	0	0
Bulgaria	–10	–10	–10	–10	–10	–10	–10	–10	–10	–10	–10
Croatia	–30	20	10	0	0	0	0	0	0	0	0
Cyprus	6	6	5	5	5	5	5	5	5	5	5
Czech Republic	10	10	10	10	10	10	10	10	10	10	10
Denmark	17	12	12	12	12	12	12	12	12	12	12
Estonia	–9	–2	0	0	0	0	0	0	0	0	0
Finland	4	8	8	8	8	8	8	8	8	8	8
France	44	60	60	60	60	60	60	60	60	60	60
Georgia	–70	–50	–30	–15	–15	–15	–15	–15	–15	–15	–15
Germany	227	220	220	200	200	200	200	200	200	200	200
Greece	60	36	35	35	35	35	35	35	35	35	35
Hungary	20	10	10	10	10	10	10	10	10	10	10
Iceland	0	0	0	0	0	0	0	0	0	0	0
Ireland	18	39	20	20	20	20	20	20	20	20	20
Italy	120	120	120	120	120	120	120	120	120	120	120
Latvia	–11	–2	–2	–2	–2	–2	–2	–2	–2	–2	–2
Lithuania	–22	–4	–4	–4	–4	–4	–4	–4	–4	–4	–4
Luxembourg	4	4	4	4	4	4	4	4	4	4	4
Malta	1	1	1	1	1	1	1	1	1	1	1
Moldova	–14	–8	–8	–8	–8	–8	–8	–8	–8	–8	–8
Netherlands	32	30	30	30	30	30	30	30	30	30	30
Norway	13	12	12	12	12	12	12	12	12	12	12
Poland	–14	–16	–16	–16	–16	–16	–16	–16	–16	–16	–16
Portugal	35	50	50	40	40	35	35	35	35	35	35
Romania	–70	–30	–20	–5	–5	–5	–5	–5	–5	–5	–5
Russian Federation	460	80	50	50	50	50	50	50	50	50	50
Serbia and Montenegro	–20	–20	–6	–6	–6	–6	–6	–6	–6	–6	–6
Slovakia	2	1	2	2	2	2	2	2	2	2	2
Slovenia	2	2	2	2	2	2	2	2	2	2	2
Spain	135	405	120	60	60	60	60	60	60	60	60
Sweden	12	31	20	20	20	20	20	20	20	20	20
Switzerland	16	8	8	8	8	8	8	8	8	8	8
The FYROM	–1	–2	–2	–2	–2	–2	–2	–2	–2	–2	–2
Turkey	27	–50	–10	–10	–30	–30	–30	–30	–30	–30	–30
Ukraine	–140	–140	–100	–100	–100	–100	–100	–100	–100	–100	–100
United Kingdom	115	137	130	130	130	130	130	130	130	130	130

Source: United Nations (2005)

3.4. Concluding remarks

The users of the results of the population projection UN should be aware of simplification and unrealistically high the assumptions of fertility, leading in general to overestimation of birth numbers, in comparison to other projections and forecasts. Mortality is slightly higher than assumed in other studies. Fix net international migration is rather unrealistic and defining assumptions in absolute numbers may generate high errors for small countries with high net migration. One may suggest that UN projections will generate more numerous and younger populations in comparison to what may realistically be expected and what is predicted by other specialists. However, population forecasting is an uncertain business and as Keilman (1998) concludes, the ex-post errors of earlier revisions of UN projections are within reasonable range, often generated by discontinuities in trends, for which demographers have not found a satisfactory solution.

4. Trends in future population size by sex and functional age groups

This section contains a quantitative analysis of trends in population size and structure in the 42 Council of Europe member states under study, describing and illustrating the main tendencies in terms of various dependency ratios, as well as shares of the functional age groups. The discussion is offered for clusters of countries defined in the previous section, followed by an identification of countries with some specific characteristics (e.g., with extreme or outlying values of certain parameters). The latter information shall provide insights into identification of certain problems related to demographic change, that may be especially visible in some countries or regions. For all countries under study, the most relevant information is provided in tables and figures in the Annex.

The dependency ratios used in this study are defined the following way:

- *Old-Age Dependency Ratio* (ODR): ratio of the size of population aged 65 years or more to the size of population in the broadly-understood 'productive age' (15–64 years), multiplied by 100% for the transparency of presentation;
- *Oldest-Old-Age Dependency Ratio* (OODR): the size of population aged 80 or more divided by the 'productive age' population size, multiplied by 100%.
- *Young-Age Dependency Ratio* (YDR): ratio of the size of the youngest population (under 15 years) to the size of population in the 'productive age', multiplied by 100%;
- *Total Dependency Ratio* (TDR): sum of the Old-Age Dependency Ratio and the Young-Age Dependency Ratio, TDR = ODR + YDR.

The definitions of dependency rates are not linked directly to the functional age groups, in order to keep comparability with other studies.

4.1. Future population changes in Europe – a global picture

In all 42 countries under study, the total population size is envisaged to decline from 808 million in 2005 to 763 million in 2050, i.e. by 6% over the 45-year period under study. The short-term increase expected for 2005–2014 is a result of the positive population momentum from the past. This is, however, going to come to an end in the first half of the 21st century all over Europe, not only in the most developed countries of the former EU-15 (cf. Lutz et al., 2003). The sex ratio is expected to remain relatively stable, with the share of males in the total population about the level of about 48.3%.

Despite the fact that the overall population decline is far from dramatic, the expected depopulation in some countries will be staggering and substantial changes are envisaged in the population structure by age, reflecting the further advancements of the process of population ageing, as indicated by the dynamics of three dependency ratios. Although the YDR is expected to stabilize about 25 percent, the ODR is envisaged to more than double, from 22% in 2005 to 45% in 2050. In particular, the OODR concerning population aged over

80 years is going to more than treble from 5% to 15% in the same period. These changes are going to result in an increase of the total dependency ratio from 47% to 71%. It means that the overall demographic burden of the population outside of the productive age on the population aged 15–64 years is going to increase by a factor of 1.5.

With respect to the absolute sizes of population in particular functional age groups, the most notable decline, on average by 27%, is observed for all age groups between 12 and 44 years, encompassing students of the secondary and tertiary schools, as well as younger and middle-aged workers. A slightly smaller decline, by 13% on average, is envisaged for children aged 0–11. The absolute size of the population of older workers, aged 45–64 years, is hardly going to change in the coming 45 years (a slight decline by 3%). In contrast, the population of older age groups is going to increase: by 41% for the population of 65–79 years of age, and by 155% (thus, by a factor of 2.5) in the case of the oldest-old. Changes in absolute sizes and relative shares of particular functional groups in the total population are presented in Table 4.

Table 4. Changes in the size of the functional age groups, 2005–2050 in all 42 countries according to medium variant of the UN population projection, 2004 revision

Age group	2005		2020		2035		2050		Change 2005 = 100
	thousands	share	thousands	share	thousands	share	thousands	share	
0–5	53 300	6.6%	50 795	6.3%	47 212	6.0%	46 574	6.1%	87.4
6–11	55 318	6.8%	52 677	6.5%	48 129	6.1%	47 518	6.2%	85.9
12–15	41 398	5.1%	35 796	4.4%	33 193	4.2%	31 806	4.2%	76.8
16–18	34 594	4.3%	26 941	3.3%	25 677	3.2%	23 948	3.1%	69.2
19–23	58 744	7.3%	45 487	5.6%	44 155	5.6%	40 586	5.3%	69.1
24–34	128 872	15.9%	117 356	14.5%	100 252	12.6%	94 073	12.3%	73.0
35–44	119 989	14.8%	115 157	14.2%	96 056	12.1%	90 211	11.8%	75.2
45–64	195 955	24.2%	222 383	27.5%	217 714	27.4%	189 672	24.8%	96.8
65–79	93 834	11.6%	105 842	13.1%	131 326	16.6%	132 269	17.3%	141.0
80+	26 093	3.2%	37 259	4.6%	49 580	6.2%	66 643	8.7%	255.4

Source: Own computations based on the United Nations (2005) projections

4.2. Future population changes in particular clusters of countries

In the *Central European* cluster, a sharp decline of the population size is expected, from the initial 73 million in 2005 to 60 million in 2050, thus by 18% in the analysed period. Notably, the decrease is envisaged for the whole period under study. The sex ratio is going to slightly fluctuate, with the share of males oscillating around the level of 48.1%.

The substantial population decline is additionally featured with a rapid advancement of the population ageing process. The YDR is going to fluctuate between 20 and 23 percent, following the waves of more and less numerous generations, being the legacy of the World Wars and post-war baby booms of the 20th century. Within the period 2005–2050, the ODR is going to almost treble, increasing from 19% to 53%. Even faster growth dynamics is going to consider the OODR, reaching 15% by the end of the period under study, starting from the initial 4%. The overall demographic burden of the population outside of the productive age on

the population aged 15–64 years measured by the TDR is going to increase by a factor of 1.8, from 42% to 76%.

The absolute sizes of almost all functional age groups but the two oldest ones (65–79 and 80+ years of age) is going to decrease over the period under study. The expected decline is most dramatic for students of secondary and tertiary schools, as well as for younger workers – on average by almost a half. The increase of population of the age group 65–79 years is going to amount to 62% of its size in 2005, while of the oldest-old – to 147%.

In the projections for the *Former Soviet Union* (*FSU*) members of the Council of Europe, even more dramatic population changes can be observed. Over the period 2005–2050, the overall population size is expected to continuously decline, in total by over a quarter, from 210 million to 157 million people. This is partly due to permanent negative net migration in all countries of the region except Russia. The share of males is expected to oscillate in the range of 45.7–46.4%, much less than in the remaining clusters and in the whole Europe. This is a consequence of the current sex structure, as well as of the assumption of a pertaining mortality disadvantage of males. It is worth noting that, similarly as in the case of the South-Eastern Europe, the FSU region is dominated by a single country, in this case the Russian Federation, with 68% of the total population of the cluster.

The aggregate indicators reveal that the overall demographic burden on the productive-age population (TDR) in the FSU cluster is expected to increase by more than a half, from 42 to 66 percent over the period under study. This is mainly a result of doubling of the ODR, from 20% to 40% (with more than trebling OODR, from 3 to 10 percent). At the same time, for the YDR a slight fluctuation is envisaged, resulting in a delicate increase from 23% in 2005 to 26% in 2050. Again, this can be attributed to the demographic consequences of the history of the post-Soviet region, especially the World War II, which has dramatically distorted the population pyramids of countries in this part of Europe. With respect to the functional age groups, the only increase is envisaged for the elderly population (by 13% for people aged 65–79 and by 109% for the oldest-old), and the most dramatic decline is going to concern students of secondary and tertiary schools and younger workers – on average by almost a half.

The *Northern European* cluster is an example of a projected steady population increase, in total by 13% in the period under study, from 88 million people in 2005 to 100 million in 2050. The sex ratio is expected to be relatively stable, with the share of males oscillating around the average European level of slightly over 49%.

Due to relatively high levels of fertility not only at the beginning, but also throughout the projection period, with the assumed total fertility rate (TFR) over 1.7, changes in population structures in the Northern cluster are expected to be less dramatic than elsewhere in Europe. In this case, population ageing is going to be driven more by an expanding increasing life expectancy than by a rapidly shrinking base of the population pyramid due to very low fertility. This is reflected by the dynamics of the dependency ratios: a stable YDR about 27%

throughout the projection period, the ODR increasing from 24% to 40% (in which, the OODR more than doubling from 7% to 15%), both together resulting in the growth of the TDR from 51% in 2005 to 67% in 2050.

It is worth noting that the increase of the overall demographic burden on the productive-age population is not very rapid in comparison to other clusters, due to the reasons mentioned above, as well as to the fact that population ageing in Northern Europe is relatively advanced already in 2005. Moreover, the dynamics of the ODR and TDR is expected to decrease over time, and a stabilization of the values of both indicators is envisaged already from 2035 onwards. This is most likely a result of constant fertility and constant immigration volume. It supports the findings of Pollard (1973) and Espenshade et al. (1982), who showed that in a population with below-replacement fertility, constant immigration leads to a stationary population with a stable age structure.

Interestingly, for almost all functional groups under the age of 64, with the exception of middle-aged workers aged 35–44 years, the changes, either positive or negative, are not expected to be very large, fitting within the ±10% band in relation to their values from 2005. Only in the case of groups comprising population aged 65–79 and 80 or more years, the increase is expected to be substantial – by 48% in the former case and by 129% in the latter. Apart from the these exceptions, the relative shares of functional age groups in the total population are not going to change much.

The *Southern European* cluster is an example of a very high dynamics of the process of population ageing expected for the period 2005–2050, despite rather moderate changes in the overall population size (a decline from 124 to 117 million people, thus by 6%), and a stable sex structure (with about 48.8% of males). Concerning the aggregate measures of the demographic burden, Southern Europe can be considered as a 'leader of ageing' among the all clusters of Council of Europe member states. Between 2005 and 2050, all dependency ratios are expected to increase, the YDR from 21 to 24 percent, and the ODR from 27 to 65 percent, including the unprecedented OODR growth from 7% to 25%. This dynamics results in an increase of the total dependency ratio from 48% in 2005 to 91% in 2005, thus from the situation in which each person outside the working age 'depends' on two persons aged 15–64, to the one with this ration very close to 1:1. In Southern Europe the average ODR, OODR and TDR values at the end of the projection period are the highest among all clusters under study, and significantly higher than the respective all-European averages.

With respect to the absolute sizes of population in particular functional age groups, the most notable decline is observed for the younger workers (24–34 years) – by 43%, for the middle-aged workers (35–44 years) – by 35%, and for the students in tertiary education age (19–24 years) – by 27%. In general, an absolute decline is going to consider to a smaller or larger extent all age groups, apart from the two oldest ones, concerning people aged 65 years or more. In the latter case, the population size is expected to increase, by 42% for the group of 65–79 years of age, and by 171% for the oldest-old.

In the whole *South-Eastern Europe*, the projected total population size is expected to increase by 14%, from 127 to 147 million in the period 2005–2050, with a slight decline marked only since 2043. The percentage of males is going to decrease from 49.8% to 49.2%, thus towards the all-European average. The population growth, however, does not imply slowing down the population ageing. Tendencies observed for the dependency ratios are clear: despite the decline of the YDR from 36% to 27% in the period under study, the ODR is expected to more than double, from 14% to 32%. At the same time the dependency ratio of the oldest-old is going to increase from 2% to 7%. The dynamics of the total dependency ratio: a decline from 50% in 2005 to about 46% in the period 2015–2020, and its subsequent increase to 58% by the end of the period under study, indicates strong changes in the age structure of the South-Eastern European population, the majority of which (58%) in 2005 is comprised of the population of Turkey.

The figures shown above indicate that the South-Eastern population is presently still very young (with high initial YDR values), and that the ageing process, although also inevitable, is expected to progress with a time delay towards the Western European pattern. This conclusion is supported by an analysis of population change in particular functional age groups. Population between 0 and 23 years of age, comprised of children and students at all levels of education, is going to shrink by about 20% in the period 2005–2050. A slightly smaller decline is envisaged for the younger workers (by 14%), while the remaining groups are going to grow both in the terms of absolute values and shares in the total population: the middle-aged workers by 7%, the older workers by 51%, the persons aged 65–79 by 121%, and the oldest-old by almost 300%.

In *Western Europe*, the total population size is hardly going to change over the projection period: after a slight increase from 186 million in 2005 to 190 million in 2028, a further decline to the level of 185 million in 2050 is envisaged. The share of males in the total population is expected to slightly decline, from 48.9% to 48.6%.

Despite hardly any changes in the overall population size, substantial shifts are envisaged in the population structure by age, reflecting further advancements of the process of population ageing, as shown by the dynamics of three dependency ratios. Although the YDR is expected to increase only slightly, from 24 to 27 percent, the ODR is envisaged to almost double, from 26% in 2005 to 48% in 2050. At the same time, the OODR regarding population aged 80 years or more is going to grow from 7 to 20 percent. These changes are going to result in an increase of the total dependency ratio by a factor of almost 1.5: from 51% to 75%. It is worth noting that, similarly as in the case of the Northern Europe, a stabilization of the ODR and TDR values is envisaged from the year 2035 onwards, after a period of an increase at a declining pace.

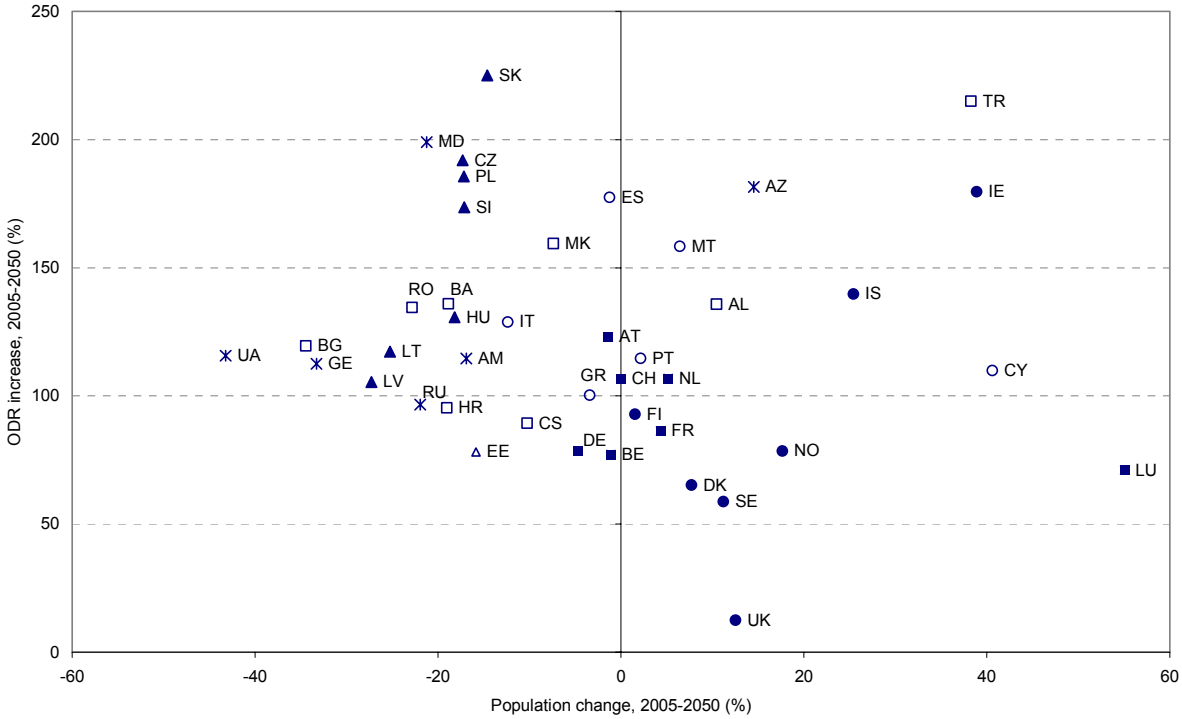
Again, absolute population sizes of the functional age groups below the age of 64 years are expected to decline in the period 2005–2050, most significantly (by 30%) in the case of middle-aged workers (35–44 years). As in all other clusters, the population of the older age

groups is going to increase: by 25% for the age group 65–79 years, and by 158% for the oldest-old.

4.3. Future population changes: identification of some specific issues

The cluster-based overview presented in the previous subsection does not provide insight into the within-group heterogeneity of particular sets of countries. It appears that, although the clusters to some extent follow common patterns of population change, there are some country-level outliers. An illustration is presented in Figure 1, showing countries on a two-dimensional chart, with the overall dynamics of population change in the period 2005–2050 shown on the horizontal axis, and the dynamics of population ageing, approximated by the ODR increase, on the vertical one. Countries are marked with their 2-letter ISO codes, explained on the first page of the Annex.

Figure 1. Population change and ODR growth (%), 2005–2050, in the Council of Europe member states, according to medium variant of the UN population projection, 2004 revision



Clusters: □ - South-Eastern, ✳ - FSU, ▲ - Central, ● - Northern, ○ - Southern, ■ - Western.
Source: Own computations based on the United Nations (2005) projections

From Figure 1 it can be seen that Luxembourg is a clear outlier in terms of expected population growth from the rest of Western Europe, otherwise relatively homogenous. The same applies to Azerbaijan, Ireland and Turkey with regard to both indicators shown. The former is the only country in the FSU cluster with projected positive population growth. In Central Europe, despite high homogeneity according to the overall (negative) population change, the dispersion of the dynamics of ageing is quite high, and the same conclusion applies to Northern Europe, although with positive population growth. In general, very high

values of the indices of the ODR dynamics consider countries with relatively young population structures at the beginning of the projection period (e.g., in the Slovak and Czech Republics, Turkey, Moldova, Poland, Azerbaijan, Ireland, Spain, or Slovenia). On the other hand, the ODR for the United Kingdom is expected to increase only slightly, which is a unique case among the countries under study.

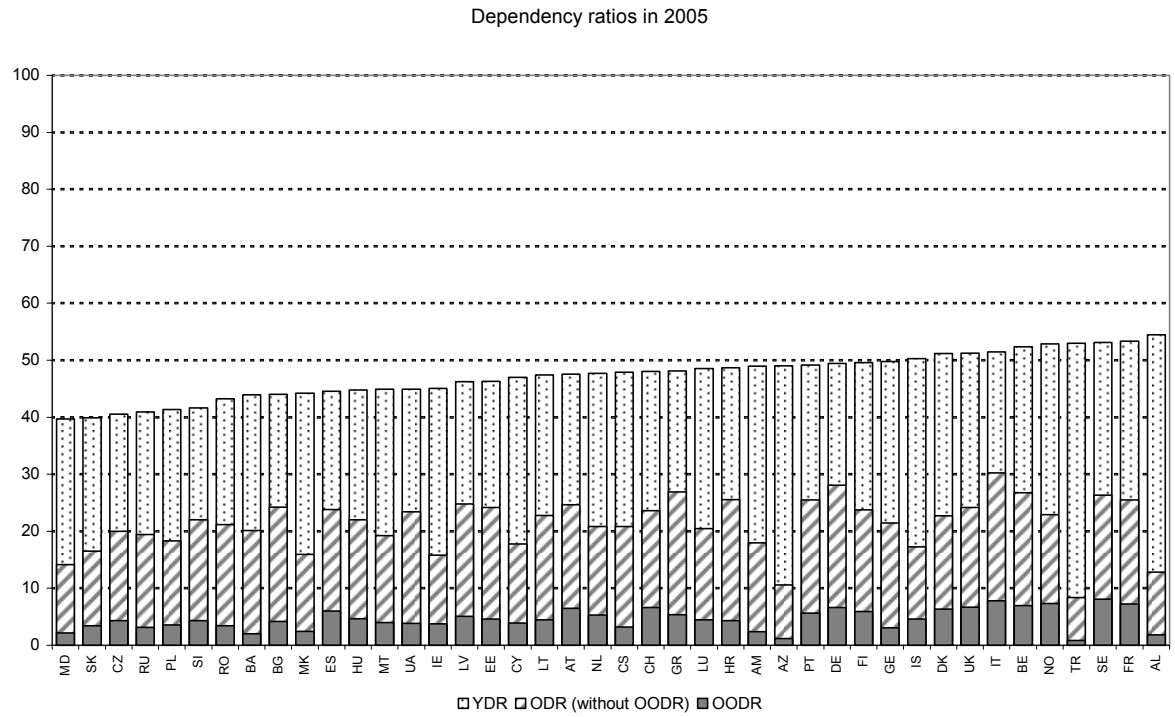
Changes of various dependency ratios in all 42 countries are illustrated in Figures 2(a) and (b), the former showing initial situation in 2005, and the latter – the outcome of the population ageing process in 2050. With respect to the overall demographic burden on the population in the productive age, measured by the TDR, in 2005 the dispersion of this indicator is very low: the values vary from 40% for Moldova to 54% for Albania. The latter country, however, together with Turkey and Azerbaijan, are examples of very young populations, with extremely low (as for Europe) values of the ODR and OODR. For this reason, these countries are at the lowest end on the scale of the TDR projected for 2050, with values of this indicator less than 60%. On the highest end there are two 'leaders' of population ageing in Europe: Italy and Spain, both characterised by the TDR values over 90%, and also by very high ODR and OODR indicators.

The oldest-old dependency ratio projected for 2050 for Italy is close to 30%, much higher than for the other countries, not to mention the ones from the lower end of the scale, like Turkey with the OODR of about 5%. From Figures 2(a) and (b) it can be seen that according to the projections of the United Nations (2005), not only the dependency ratios (the TDR, the ODR and the OODR) are going to increase all over Europe, but also the differences between particular countries with respect to these indicators are going to be greater in 2050 than they are expected in 2005.

High heterogeneity also concerns the dynamics of particular functional age groups, which is crucial for long-term public policy planning in such areas like child and elderly care or education, as well as from the point of view of labour markets, etc. The country-specific indices of change for the whole period are shown in Table 5, with both secondary-school age groups (12–18 years) shown together, so as the three working age groups (24–64 years). With respect to children aged 0–5 years, an increase in their numbers between 2005 and 2050 is expected only for Luxembourg, Cyprus, Sweden, the United Kingdom, Denmark, Switzerland, Malta and Norway.

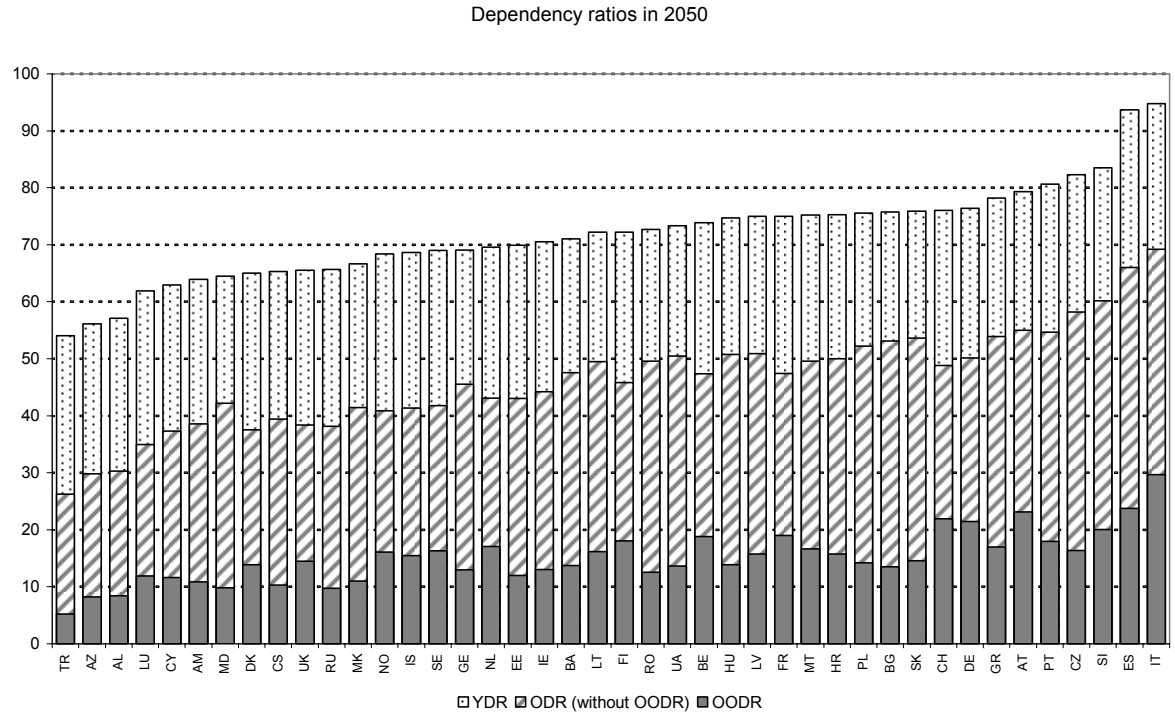
In general, only in Luxembourg, the UK, Ireland, as well as in some Scandinavian countries, an increase in the population at the school age is expected for almost all levels of education (primary, secondary and tertiary). In all other countries, a decline of pre-working age population is envisaged, most significant for some of the FSU and South-Eastern European countries, particularly in Ukraine, Georgia, Moldova, Bulgaria and Romania, followed by the countries of Central Europe. This indicates that in most of the continent, the demand for child-care and education facilities will be shrinking.

Figure 2(a). Proportions of particular dependency ratios in country-specific TDRs, 2005, according to medium variant of the UN population projection, 2004 revision



Note: Countries are ranked by increasing total dependency ratios (TDR = total height of the bars).
Source: Own computations based on the United Nations (2005) projections

Figure 2(b). Proportions of particular dependency ratios in country-specific TDRs, 2050, according to medium variant of the UN population projection, 2004 revision



Note: Countries are ranked by increasing total dependency ratios (TDR = total height of the bars).
Source: Own computations based on the United Nations (2005) projections

Table 5. Changes in the absolute sizes of particular functional groups, 2005–2050 (%) according to medium variant of the UN population projection, 2004 revision

Country	Pre-school (0–5)	Primary education (6-11)	Secondary education (12-18)	Tertiary education (19-23)	Productive age (24–64)	Elderly (65–79)	Oldest-old (80+)
Albania	–25.1	–30.7	–37.1	–29.7	23.8	115.2	411.1
Armenia	–23.6	–38.9	–59.4	–59.5	–11.0	33.5	245.8
Austria	–5.2	–15.1	–23.5	–21.7	–18.4	42.2	190.3
Azerbaijan	–11.0	–26.2	–43.2	–34.3	28.0	150.5	678.5
Belgium	–7.4	–10.7	–13.7	–11.0	–13.7	25.2	134.1
Bosnia and Herzegovina	–23.9	–36.6	–43.2	–44.9	–28.6	27.2	377.4
Bulgaria	–36.1	–35.8	–53.3	–58.3	–43.8	6.4	70.6
Croatia	–15.7	–27.1	–35.5	–41.5	–29.7	10.9	148.1
Cyprus	25.7	10.0	–4.0	–2.6	34.4	134.2	269.6
Czech Republic	–17.2	–23.7	–41.8	–44.8	–34.7	70.4	142.0
Denmark	–2.4	–7.0	4.5	24.5	–4.9	42.7	117.3
Estonia	–8.0	–5.6	–39.6	–46.2	–22.3	14.6	88.1
Finland	–2.7	–11.8	–14.5	–11.1	–11.8	37.3	169.6
France	–12.9	–8.1	–8.7	–11.7	–8.0	42.6	140.0
Georgia	–43.9	–50.9	–62.5	–60.2	–34.9	5.1	150.0
Germany	10.2	–4.7	–16.0	–15.2	–19.8	7.7	162.9
Greece	–4.8	–8.5	–16.2	–31.8	–18.4	37.5	153.7
Hungary	–21.6	–29.4	–38.4	–38.6	–30.9	44.2	101.5
Iceland	–5.2	–10.6	–11.3	–1.3	16.6	128.0	277.8
Ireland	–2.8	14.5	4.6	–14.8	24.5	205.2	313.1
Italy	–18.9	–16.8	–18.2	–23.7	–33.5	20.0	159.8
Latvia	–23.6	–27.6	–56.2	–58.8	–34.1	8.0	86.4
Lithuania	–24.5	–43.1	–60.0	–56.6	–29.9	16.4	131.7
Luxembourg	37.5	34.5	44.0	57.2	39.7	106.0	271.4
Malta	2.9	–16.0	–26.1	–24.0	–7.8	97.6	241.7
Moldova	–29.5	–43.1	–60.9	–62.5	–23.5	80.4	204.7
Netherlands	–10.3	–9.9	–5.9	3.3	–10.0	53.2	197.4
Norway	2.3	–5.1	0.8	17.2	5.7	69.2	137.6
Poland	–22.6	–33.7	–49.1	–56.7	–27.8	72.6	164.7
Portugal	–11.1	–6.3	–4.5	–20.7	–15.8	56.4	166.9
Romania	–30.5	–31.9	–49.9	–52.6	–31.5	33.8	134.6
Russian Federation	–16.5	–7.1	–40.8	–52.1	–28.9	15.8	108.2
Serbia and Montenegro	–20.7	–23.0	–30.9	–34.9	–16.2	32.9	156.3
Slovakia	–25.0	–36.8	–49.6	–53.5	–27.0	103.6	188.5
Slovenia	–21.1	–24.9	–39.1	–48.0	–33.8	45.7	196.7
Spain	–10.4	5.5	–4.9	–32.3	–26.7	74.9	192.5
Sweden	12.0	3.8	–11.7	6.1	1.0	40.6	103.8
Switzerland	5.2	–10.4	–13.3	–5.8	–17.3	32.9	178.4
The FYROM	–20.2	–29.5	–39.2	–40.0	–14.5	81.2	267.6
Turkey	–16.7	–14.5	–6.9	–4.8	51.6	286.3	736.0
Ukraine	–41.7	–48.6	–65.6	–68.0	–48.5	–10.5	68.1
UK	10.3	0.3	–5.5	5.5	3.4	40.7	122.3

Source: Own computations based on the United Nations (2005) projections

With respect to population of the working age (24–64 years), which can be seen as the labour force potential, apart from the mentioned countries of Western and Northern Europe, an increase over the coming 45 years is projected also for the three countries with young population structures at the beginning, i.e. Turkey, Azerbaijan and Albania. In contrast, a steep decline in the working-age population is envisaged for the remaining post-socialist countries. The age group 65–79 years is expected to increase almost universally, with the exception of Ukraine, where a decline by 10.5% is predicted. All over Europe, an increase in

the numbers of the oldest-old is expected, slowest (by under 100% over the period under study) in Ukraine, Bulgaria, Latvia and Estonia, and fastest in the youngest countries: Albania (by 411%), Azerbaijan (by 679%) and Turkey (by 736%). These numbers show, how much the demand for the elderly care is going to increase until 2050.

In addition to country-specific changes in absolute sizes of particular functional age groups shown above, the dynamics of their shares in total populations is presented in the Annex, both in the graphical and tabular form. In this case, a clear, pan-European pattern is an increase of shares of the older age groups (over 65 years) at the expense of the pre-working and working age ones.

5. Demographic change and development: a literature review

This section is devoted to an overview of the recent literature on the impact of demographic change, especially population ageing, on various aspects of socio-economic development. The section is structured into two parts: the first one is devoted to a review of the possible ways of impact of demographic change on economic growth, and the second one – on social cohesion, broadly understood as a minimization of social inequalities and exclusion. These two main topics aim to briefly address some specific issues, like economic productivity, labour market, education, (health-) care and social protection. In both subsections, in contrast to some other demographic studies (e.g., United Nations, 2000), we try to show both the positive and negative outcomes of the demographic changes: not only threats, but also challenges and opportunities for the future generations. We are perfectly aware that the economic growth and social cohesion are not the only factors of socio-economic life that are affected by the demographic change. However, as there is a huge amount of research on ageing – the United Nations (1998) survey listed about 300 projects concerning this topic conducted during the decade 1989–1998 only in 26 European countries – the current overview is by necessity brief and limited to selected major issues.

5.1. Possible ways of impact of demographic change on economic growth

There is no single path in which population change affects economy. Population decline can be expected to decrease the global output (for example measured by the GDP), although it needs not to negatively affect the output per capita, because of the presence of additional determinants, like the increase of productivity. Simon (1989) lists several factors, through which population growth can be positively associated with economic development, notably: presence of more innovations in a larger society, easier division of labour, as well as the presence of economies of scale. However, in the empirical studies, a prevailing direction of the relationship between population growth and economic performance is not clear, as it has been observed for example by Johnson (1999), as well as discussed in the recent report of the Productivity Commission (2005). Similar ambiguities apply to population ageing, where there is a variety of possible ways of interactions between the impulse (demographic change) and the response of the economic system (economic growth). As the issues related to the economic outcomes of ageing are more complex than in the case of the population growth alone, the current overview is going to concentrate on the former problem.

Many literature sources indicate that the ageing process is associated with increasing expenditures on health and elderly care, as well as on pension systems (e.g., United Nations, 2002). However, its influence on health care expenditures is to some extent disputable: for example, Seshamani (2004) argues that the height of the latter is not related to the age of an individual as such, but to the proximity of death, and is thus not sensitive to the ageing process – people live longer, but also longer stay healthy. In general terms, many authors (Roseveare et al., 1996; Fougère and Mérette, 1998; Grant et al., 2004) argue that ageing is

going to increase the fiscal burden and public debt, which will in consequence negatively influence the economic performance. Grant et al. (2004) noted that the overall decline in the working population size can act in the same direction, as there will be less tax-payers and more people who will receive benefits due to changes in the proportions of particular age groups in the population. The shrinking of the labour supply can affect the economic performance also directly, along the same paths as the population decline, but some additional caution is needed here. As it has been noted for example by Kryńska (2005), the labour market balances labour supply and labour demand, and thus the possible future changes of the demand for labour in Europe should be also considered. The latter issue is ambiguous, as significant changes on labour markets are observed already at present: some enterprises employ the workforce from countries with lower costs of labour, while some other increase the productivity of their resources (physical and human capital), which altogether results in a jobless economic growth on a country-level scale. From this point of view, shrinking of the labour force is not a threat to the overall performance of the economy, as it can be substituted by other factors.

Some authors point to the fact that another factor that is most likely very sensitive to population ageing is innovativeness (Council…, 1996; Nahuis et al., 2000). The rationale is that innovations, which are crucial for productivity growth, are age-specific, and are much more likely to be developed by people at younger ages. Lower innovativeness implies decreasing returns from the investments in the physical capital, leading ultimately to an overall decrease in productivity. At the same time older employee are often also more senior and in consequence, more expensive. This way of thinking seems to be shared by at least some employers, as it has been shown in a Dutch survey prepared by Remery et al. (2003), where older workers are expected to generate additional costs, rather than benefits to the companies. This prevents older workers from being employed and from being able to utilize their human capital gathered through the years of work experience.

Another way in which productivity can be negatively affected by ageing is through a decline in private savings (Auerbach et al., 1989; Roseveare et al., 1996; Fougère and Mérette, 1998). This is expected to result in an increase of the cost of credit, a decline in the investments in the physical capital, further decrease in returns from such investments, and eventually in a productivity fall.

The issue of the direction of the impact of ageing on productivity is also disputed without reference to innovativeness and savings-related factors. For example, productivity can decline because of the increasing share of the elderly who are generally less efficient (Skirbekk, 2005), or adversely, it can remain unchanged, other factors equal, because productivity is a feature of a particular economic system, not directly linked to the age structure of the workforce (Lindh, 2005).

It has to be stressed that the mentioned ways of negative impact of ageing on economic growth are at least to some extent mitigated by the factors acting in the positive direction. As

it has been noted by Lindh and Malmberg (1999), the increase in size of the older working population (50–64 years of age) is likely to give positive effects on the economic output. A possible explanation of this finding is that older workers can benefit from the increasing returns from human capital (understood here as "the knowledge, skills, competences and other attributes embodied in individuals that are relevant to economic activity" (OECD, 1998: 9, after: Schuller, 2001: 19) due to their work experience (Johnson, 1999). In the effect, productivity can be expected to increase and labour costs to decline. This possibility is clearly linked to the ability to work longer in good health resulting from the increasing health-care investments, concerning the older part of the workforce and the retired population alike. Nevertheless, it has to be noted that the direct impact of human capital increase on economic growth is a disputable issue, given the lack of consistent empirical evidence (Monteils, 2004).

With respect to the notion of an expected decrease of innovativeness of an ageing society, there is a counter-argument that ageing can be expected to stimulate demand for labour-saving inventions, which in effect will increase productivity (Council…, 1996). Further, as it has been noted by Fougère and Mérette (1998: 2), "…population ageing could create more opportunities for future generations to invest in human capital formation, which would stimulate economic growth and reduce significantly the apprehended negative impact of ageing on output per capita". Although this requires further investments in education, the ultimate effect can be definitely worth some additional effort in that respect. Also Blanchet (1992) noted that the presence of the continuous on-the-job training in the ageing society means that there is a longer period of human capital accumulation, resulting in higher returns from the experience gained throughout the working life, and thus in an increase of productivity.

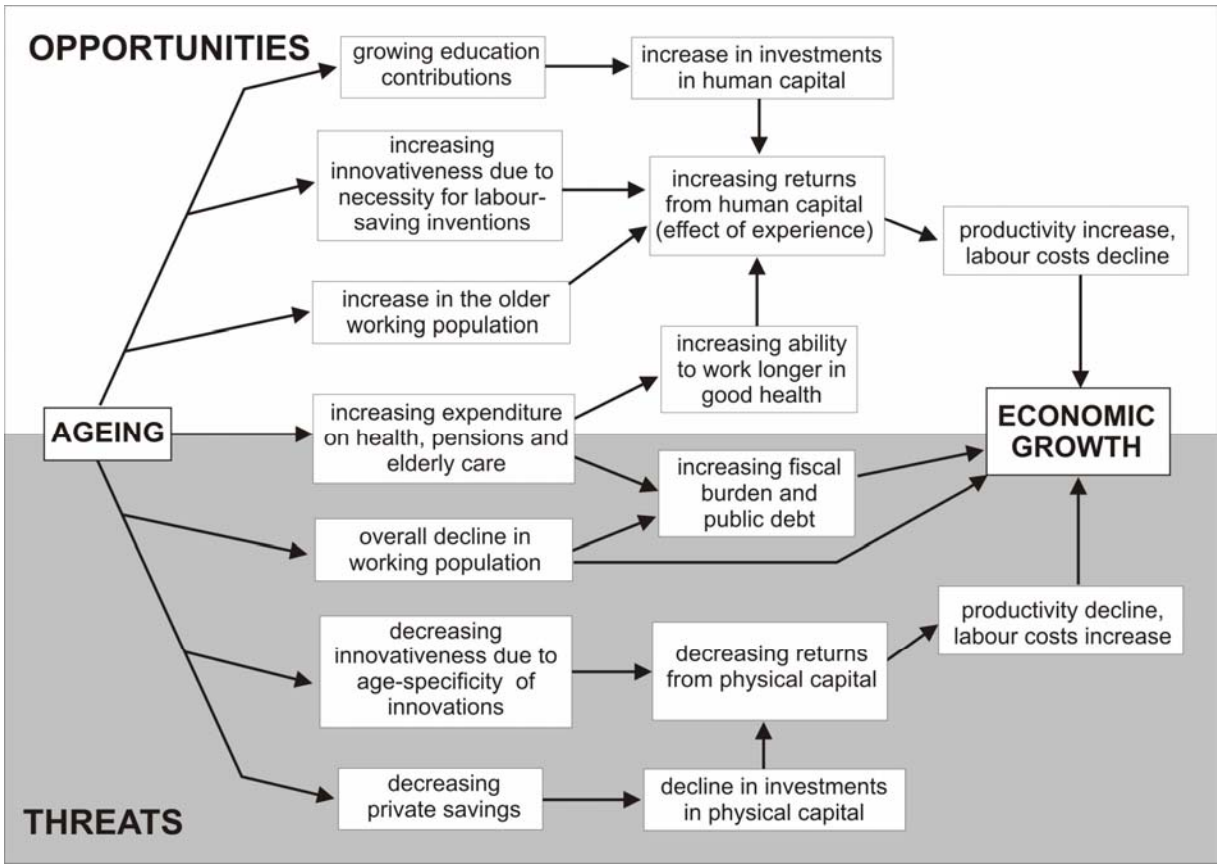
A brief overview of the basic theoretical framework of the interrelations between the population ageing and economic growth, presented above on the basis of an overview of the selected literature, is summarised in Figure 3. Further information on links between ageing and economy, corroborating the above-mentioned paths of influence and presenting some other, more detailed connections, is contained in the books of Johnson and Zimmermann (1992), Snel and Cremer (1994), Siebert (2001), as well as the report of the Productivity Commission (2005).

Many authors, who have prepared formal studies of a general economic equilibrium in ageing societies (e.g., Auerbach et al., 1989; Aaberge et al, 2004), argue that an important part of the analysis of interactions between population change and economic performance is a study of the impact of possible policy responses.

Auerbach et al. (1989: 6) noted that "the fundamental lesson of general equilibrium analysis is that allowing for adjustments (and assuming that economies are sufficiently flexible for such adjustments to take place) leads to smaller costs from adverse population developments". Such adjustments may include for example raising the retirement age, or reduction of benefits of the pensioners. On the other hand, Auerbach et al. (1989) pointed out that in that respect

there is a clear trade-off of benefits between earlier and later generations, which has to be taken into account by the policy-makers. In addition, Aaberge et al. (2004) noted that future problems with fiscal sustainability can be manageable if tax reforms are directed into giving more incentives to increase the labour supply. These issues will be further corroborated in Section 6.

Figure 3. Possible ways of impact of population ageing on economic growth



Source: own elaboration on the basis of the quoted literature

5.2. Possible ways of impact of demographic change on social cohesion

The term 'social cohesion' is rather general, and due to its nature it cannot be defined in a very strict and formal way. In the current study we will refer to the broad definition adopted by the Council of Europe (2004: 2) that "social cohesion is the capacity of a society to ensure the welfare of all its members, minimising disparities and avoiding polarisation". According to this definition, two very important dimensions of social cohesion are minimisation of poverty and of social exclusion of more vulnerable groups.

There is much less literature available on the links between demographic dynamics and social cohesion, than it is the case with possible economic outcomes of population processes. Of course, the economic and social situation are tied together: phenomena like poverty, exclusion and unemployment are closely interrelated (Atkinson, 1998). Therefore, one of the paths of possible impact of population change on social cohesion is via its influence on the economic

growth, both in terms of opportunities and threats posed on the development, as presented in the previous subsection. The research of Alam et al. (2005) concerning the countries of Central and Eastern Europe, covering partially the area of interest in the current study, showed that output growth in this countries in the period 1998–2003 was clearly related with poverty reduction. Nevertheless, the remarks made in the previous subsection, regarding issues like a jobless growth, remain in force, and constitute limiting factors of the possible impact of demographic change on social cohesion exclusively through better or worse economic performance.

One of the important sources of information on the impact of demographic change on social exclusion (and thus on cohesion) is a comprehensive overview prepared by Avramov (2002). She noted that social exclusion is very much age- and gender-specific. As in the countries and period under study no drastic changes of the sex composition of the populations are expected, as indicated in the empirical overview in Section 4 and shown in the country-specific figures in the Annex, this issue will not be discussed here. Furthermore, in our view, the crude population growth or decline alone does not have a direct impact on social cohesion, other than through the economic intermediaries (innovativeness, division of labour, and economies of scale), quoted in the previous subsection after Simon (1989). Therefore, the current overview is going to concentrate on the impact of population ageing on poverty, exclusion, and other components of social cohesion.

Two important outcomes of population ageing are the changes in the age structures, as well as the overall decline in the size of the working population. These factors combined pose increasingly more serious problems with the sustainability of social security and welfare systems, most notably the pay-as-you-go pension schemes. This process will likely result in two further problems: a decrease in the income of the elderly (pensioners), as well as an increase in the overall economic burden on the working population (intergenerational transfers) to provide means for the aged population (United Nations, 2002). As according to Avramov (2002) elderly people are a social group that is more vulnerable to poverty and exclusion than the younger ones, ageing can in this way deepen social inequalities in terms of income available to various age groups. On the other hand, an increased burden on the working population translates to deepening of inequalities in terms of contributions paid by various age groups to keep the social welfare systems working. Moreover, there are also several ethical issues raised by ageing, which can have pose an additional threat to social cohesion, as they are related to the future family relationships and intergenerational conflicts over limited resources, as discussed in much more details in Lesser (1999). A similar issue is related to age-discrimination (‘ageism’) on the labour market (e.g., Walker, 2001), which itself is another factor posing threat to social cohesion.

In terms of new opportunities resulting from the ageing process, a very important possibility is opened through the increase and life-long accumulation of the human capital, discussed in the previous subsection. Development of human capital itself can be a way to reduce unemployment and poverty, reduce the number of the socially excluded and thus contribute to

greater social cohesion. These solutions can be especially important in areas with structural economic drawbacks. Alam et al. (2005: 37) stated that "education and health service delivery should be strengthened in lagging regions to ensure adequate human capital formation as a route out of poverty".

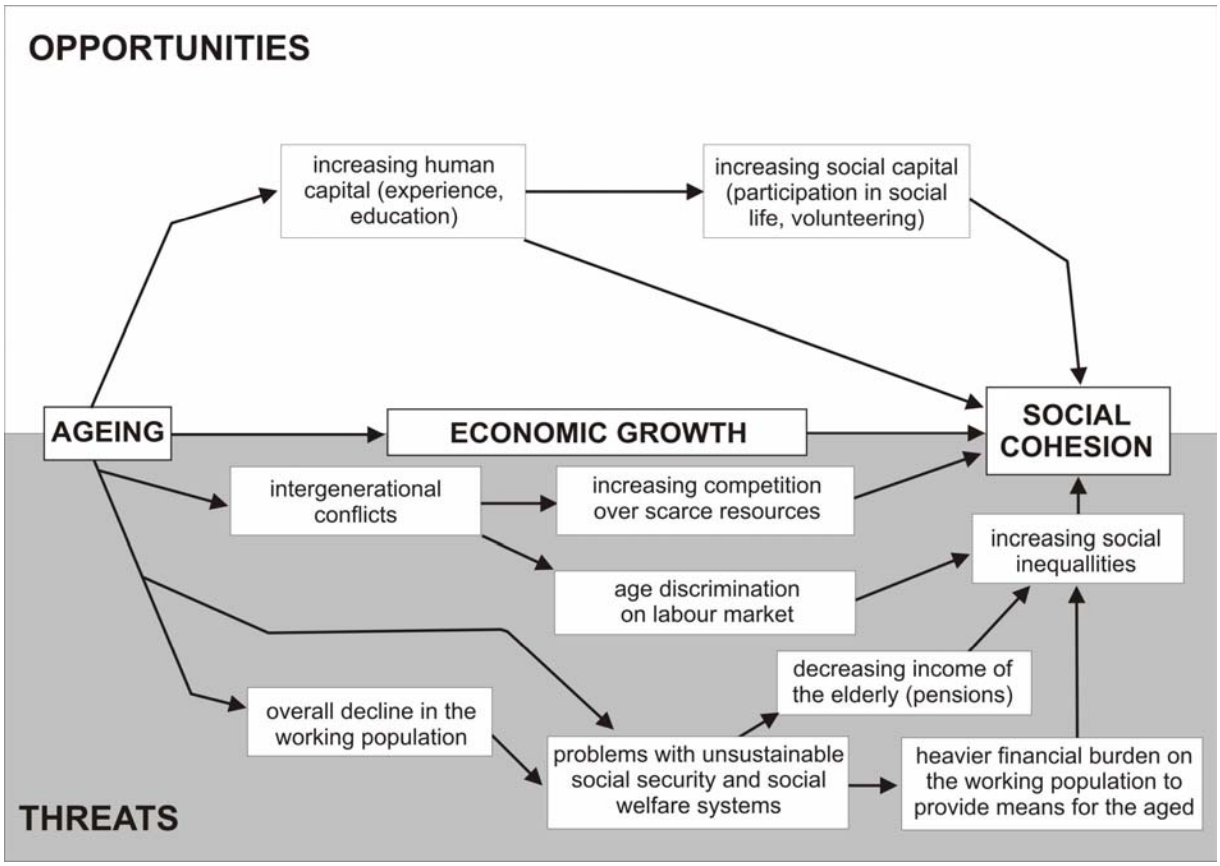
High levels of education and human capital are also strongly related to the building of social capital (Coleman, 1988; Portes, 1998), a complementary and at the same time more general concept related not only to the features of individuals, but also of their mutual relationships (cf. Schuller, 2001). According to Putnam (1995: 67), social capital "refers to features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit". An increased level of participation in social life and volunteering implied by high levels of social capital can be also seen as a way to reduce social exclusion, considering for example activity of various NGOs, charities, etc. (Heuser, 2005). As it has been shown in the study of the Productivity Commission (2005), older people are (slightly) more willing to volunteer than the younger ones.

Important requirements for taking advantage of the above-mentioned opportunities include on one side the presence of possibilities of life-long learning and gathering experience by people as they age, and on the other side – a proper socio-economic environment, most notably the health-care system, to maintain good health conditions of the elderly population. These both factors are very important prerequisites of 'active ageing' (cf. Avramov and Mašková, 2004; Schoenmaeckers, 2004). In that respect, some optimistic expectations can be made about the future, because, as noted by Avramov (2002), ageing does not mean exclusively the increase of the expectancy of life, but also of the disability-free life. This corresponds with the key finding of Seshamani (2004), quoted in the previous subsection, that people live not only longer, but also healthier lives. On the other hand, according to Walker (2001), a main obstacle in the active ageing process is age discrimination on the labour market, which will be an increasingly more important problem, as population ageing will be progressing. From the policy point of view, there is still much left to improve in that respect.

The presented list of factors in play between population change and social cohesion is by no means complete. Adversely, as it has been indicated by the National Research Council (2001), there is currently a need for further, cross-national and multi-disciplinary research, aimed at obtaining a better insight as to the nature of the mechanisms in question, and to the prevailing direction of their influence: in which dimensions is ageing an opportunity, respectively poses a threat to the society. Only such a complex research would provide the necessary input for the political decision-making.

A brief overview of the interrelations between the population ageing and social cohesion, made on the basis of the argumentation presented above, is summarised in Figure 4.

Figure 4. Possible ways of impact of population ageing on social cohesion



Source: own elaboration on the basis of the quoted literature

6. Demographic change and development: results and policy implications

The projected population changes in the Council of Europe countries, shown in Table 6 below, are very far from homogenous. Some countries are expected to increase their population substantially. The population increase in Luxembourg would be by 55%, in Cyprus by 41%, in Ireland by 40%, and in Turkey by 38%, In Albania, Azerbaijan and in Northern Europe the increases would be between 10 and 25%. Countries in which decrease of populations is expected are all Slavonic countries and almost all former so-called socialist countries (both categories partially overlapping), some of them with staggering changes: Ukraine would drop to 57% of original population, Bulgaria to 66%, Georgia to 67%, while Latvia, Lithuania, Moldova, Romania and Russia to between 70 and 80%. It is very difficult to generalise the patterns observed. One may speak of the post-Soviet area of decreasing population, Northern European area of population growth, a mixed picture in the South, with affluent South-European countries loosing population, Turkey and Albania gaining, and a generally stable population size in Western Europe.

Table 6. Population change over the period 2005–2050 according to medium variant of the UN population projection, 2004 revision

Country	Population change (2005=100)	Country	Population change (2005=100)
Albania	110.5	Latvia	72.7
Armenia	83.1	Lithuania	74.8
Austria	98.6	Luxembourg	155.1
Azerbaijan	114.5	Malta	106.5
Belgium	98.9	Moldova	78.7
Bosnia and Herzegovina	81.1	Netherlands	105.2
Bulgaria	65.6	Norway	117.6
Croatia	81.0	Poland	82.8
Cyprus	140.6	Portugal	102.2
Czech Republic	82.7	Romania	77.2
Denmark	107.7	Russia	78.0
Estonia	84.1	Serbia and Montenegro	89.7
Finland	101.5	Slovakia	85.4
France	104.3	Slovenia	82.9
Georgia	66.7	Spain	98.8
Germany	95.3	Sweden	111.2
Greece	96.6	Switzerland	100.0
Hungary	81.8	The FYROM	92.6
Iceland	125.4	Turkey	138.3
Ireland	138.9	Ukraine	56.8
Italy	87.6	United Kingdom	112.5

Source: Own computations based on the United Nations (2005) projections

In terms of policy implications, the curbing of population decline may be a priority for some countries, especially those with a very high projected depopulation, as Ukraine, Bulgaria, or characterised by some peculiarities as unusual overmortality of males, as in Russia. In response to the changing situation most of governments in Central, South-Eastern and Eastern

Europe assessed that the population growth, as observed at the turn of the centuries, was not satisfactory and decided to pursue population policies aiming at increase of population growth rates, whereas in other European states the aim was to maintain status quo and not to intervene (Zoubanov, 2000). On the other hand, there are numerous non-governmental organizations, advocating needs for population reduction on environmental grounds, such as World Population Awareness and World Overpopulation Awareness («www.overpopulation.org»), World Population Balance («www.worldpopulationbalance.org») or the German Foundation for World Population (DSW) («www.dsw-online.de») to mention just a few.

One should be aware, that the Medium variant of the UN (2005) forecast is very optimistic as far as European countries are concerned, due to unrealistically high assumptions on future fertility. In the low variant, with target TFR level equal 1.35, depopulation would be much more widespread in Europe. In this variant only the populations of Cyprus, Iceland, Ireland, Luxembourg, Norway and Turkey would increase, the rest would decline. It should be also noted that among countries with growing populations only Turkey counts as a large country. As all other countries would depopulate, the European population would decrease by 30% from 2005 to 2050.

However, the most important feature of the dynamics of population in the coming half century, as projected by the UN, will be the process of ageing. Commonly ageing is defined as the increase in the share of elderly population in the total population. Either because of this definition, or due to much more significant changes occurring at the top of age pyramid, or both, researchers usually focus on the process of increase of elderly population, quite often ignoring the consequences of declining young populations, which frequently is another side of ageing.

It is expected that over time we will face a profound decline in the size of population in all young functional groups: pre-school, primary education, secondary education and tertiary education. Even a very superficial inspection of Tables 4 and 5 shows clearly that, given the UN projection comes true, these changes will be very significant and almost universal.

The only country in which the UN expects that between 2005 and 2050 there will be an increase in the number of the young in all functional age groups is Luxembourg. In addition the projected gains are astonishingly high, between 34% for the primary education age group and 57% in the tertiary education age group. This is a unique pattern of population development in Europe, mostly generated by assumed high net migration gains and the overall projected increase in population size from 465 thousand in 2005 to 721 thousand in 2050. Some other countries, namely Norway, Sweden, the UK will experience moderate increases in three out of four younger functional age groups, and Cyprus, Denmark and Ireland in two. In terms of social and economical consequences these increases should be fairly easy to accommodate as, except Luxembourg and to lesser extent Cyprus, they are moderate and relatively slow. There is no doubt that Luxembourg will have to adjust to the increase in youth population, building nurseries, kindergartens, schools of all types and

expanding its tertiary education capacity, however the problem is more general: how to cope with 55% increase in population over 45 years.

On the other end of the spectre of changes in young populations are countries in which the numbers are expected to go down. A vast majority of countries – 31 out of 42 – fall into this category, but in some the predicted changes are alarming. Georgia's young population will decrease in 2050 to less than a half of its size in 2005. Far going decrease is also expected in other countries of the former Soviet Union: in Armenia, Latvia, Lithuania, Moldova and Ukraine. In all these countries at least two out of four functional age groups will decrease by more than half. To the same group belongs also Bulgaria. In general, the largest reduction will concern the secondary and tertiary education age groups.

Changes in the two oldest age groups: elderly (65–79) and the oldest-old (80+) are even more dramatic. The only country in which a decrease in elderly and moderate increase in oldest old population is envisaged is Ukraine. This is due to a dramatic decline in the total population, due to assumed 100,000 annual loss of population due to migration and very high mortality in working age population, which in fact prevents substantial ageing. (Kupiszewski and Kupiszewska 1999). Bulgaria, Estonia and Latvia also may expect a relatively modest increase in the number of elderly. On the other end of the spectrum are Turkey, Azerbaijan, Albania, Bosnia and Herzegovina and Ireland, with expected increase in the oldest old age group ranging from 736% to 313%. Turkey and Ireland are the only two countries in which the elderly population is expected to rise by more than 200%. This age group will more than double also in Albania, Azerbaijan, Cyprus, Iceland, Luxembourg and Slovakia.

Demographic consequences of these changes are quite obvious: they mean on one hand a rapid shrinking of the cohorts entering the procreation age in the second half of the 21st century what will result in a further decline and ageing of population after 2050. On the other hand we will face ageing, both in terms of proportion of elderly in total population and in the absolute numbers of elderly, at the scale unprecedented in human history. The literature on the relationships of these changes and the socio-economic development has been reviewed in section 5. The list of ageing-related policy issues which have to be addressed is very long indeed: restructuring of health and social services, increasing demand for labour in certain sectors of services and decrease in demand in others, changes in structure and decrease of fiscal income coupled with increasing budget expenditures, restructuring and possible decline of savings, changes and possible drop in productivity, reduction in educational sector, changes in demand for goods and consequent to it restructuring of production, decrease in the pool of potential soldiers and need to reformulate defence strategies, increasing role of immigrants in ageing societies and possibly raising problems with their integration, depopulation of certain regions, in particular rural and remote, and the need to reshape the delivery of services and distribution systems, the list may go on and on. Below we will offer a more detailed discussion of selected issues and problems, in particular those which have not been discussed in demographic literature, or have been simply neglected.

There is no doubt whatsoever, that the coming decades will test the efficiency of population policies to its limit. These policies could be roughly divided into two groups: policies aiming at reversal or more likely slowing down of unwanted changes and reactive policies, aimed at cushioning the consequences of unavoidable changes. Both classes of policies have been disputed widely (United Nations, 2004; Grant et al., 2004; Macura et al., 2005), so below we will try not only to reiterate issues and arguments, but also to venture into less penetrated areas. We will start discussing the policies aiming at slowing down changes which are considered unfavourable first.

From the demographic point of view the ageing process can be slowed down in two ways: by increasing immigration and by increasing fertility. United Nation (2000) for the world and Bijak et al. (2005) for Europe have shown clearly that the increase of immigration needed to maintain certain parameters of population (for example ODR or parameters characterising labour force), so called "replacement migration" , is an infeasible options due to immense numbers of immigrants needed and due to the fact that immigrants adopt quickly demographic patterns of host societies and very soon there is a need for additional migrants to counter the ageing of both indigenous population and the previous wave of immigrants. Bijak and al (2005) estimated that in order to maintain the unchanged ODR in each of 27 European countries the magnitude of migrants in total that would be needed in these countries from the outside world would have to be 827.8 million by 2052, well above any reasonable absorption capacity of Europe in the coming fifty years. The issue of "replacement migration" has been widely debated. Population and Environment: A Journal of Interdisciplinary Studies (2001) devoted to the problem a special issue. Coleman (2000, 2002) has been one of the most vocal critics, noting, among others, that the cultural changes induced by migration of such magnitude as stipulated in the UN report would change completely the social fabric and cultural and ethnic composition of receiving societies, leading to true replacement migration. Saczuk (2003) provided multidimensional critical analysis of the concept of "replacement migration", summarizing the debate.

One of the important points raised by many discussants was that, from the social and political points of view, it would be more feasible to increase fertility. However, we are not aware of any attempt to estimate what would be the level needed to avert ageing in a reasonably short period of time. One can expect that it would have to be much higher than replacement level, what brings in a question on what policy measures could stimulate such increase, if even the replacement-level fertility is out of reach of all but very few European countries.

Initially the attempts at the explanation of the decline in fertility predominantly originated from economy. The decline in fertility in developed countries has been explained in many ways. The hypothesis of Easterlin (1968, 1975) suggested that fertility is explained by the relation of the income of a cohort compared to the income of this cohort's parents, and, in consequence to the relative size of cohorts, which determines the relative change in living standards. Another theoretical approach developed by a pioneer in family economics, Becker (1991) stems from the neo-classical economic theory approach in family studies, which

perceives demand for children being treated as akin to the demand for goods and services. Becker explains the drop in fertility in the developed countries by the increasing 'opportunity costs' of having children. Socio-demographic explanation of fertility decrease, called the second demographic transition was offered by Lesthaeghe and van de Kaa (Lesthaeghe, van de Kaa 1986, van de Kaa 1987). This theoretical framework stresses the role of changes in values and norms, such as increasing individualism, rejection of institutional control, need for self-fulfillment, in the modern society resulting in the changes of the demographic patterns, in particular of the fertility-related behaviour. Okólski (2004) suggested that the crisis of the traditional family as an institution that followed the modernization processes in the developed countries, can be seen as one of the major factors underlying the fertility decline.

The key question is, what policies should be implemented to increase fertility in the European countries. Common wisdom says that increase of protection of family and in particular of females, increased social transfers to families with children, various family and child benefits, tax breaks, development of various social services orientated towards families and children etc. should do the trick. Similarly common knowledge is that the pronatalist policies are inefficient (Caldwell et al., 2002). Economic theory suggests alternative answers: If we expand maternity-related benefits, what should have a clear pronatalist effect, the cost of taxation and therefore of labour would increase, resulting in worsening of the economic situation of a country, usually considered as antinatalist phenomenon. Increased protection of pregnant women and young mothers on the labour market, which in theory should have a strong pronatalist effect, results in declining willingness of entrepreneurs to employ women, being a strong antinatalist factor. The measurement of actual effectiveness of social transfers on fertility is difficult. Caldwell et al. (2002) in their review paper refer to a number of attempts of such measurement, but they noted that it is rather difficult to arrive at decisive conclusions: massive social transfers, around 10% of the government budget, resulted in a significant increase in fertility in Central Europe in the 1960s and 1970s, as did massive transfers in Sweden in the 1980s. However, smaller transfers and less coherent policies usually generated dubious effects.

Palomba (2003) and Hantrais (2005) point at the importance of reconciliation of employment and family life as important factor influencing fertility. Gornick et al. (1996) noted that in highly developed countries, such as Belgium, Denmark, Finland, France and Sweden, pursuing pronatalist policies through a variety of benefits and women's protection on the labour market have lead to positive results, at the same time keeping mothers on the labour market. Ability to retain job or to be able to transfer to another job removes a major factor reducing fertility – a fear of poverty or relative poverty among young couples. On the other hand in the Anglo-Saxon countries that are rather economic, as far as protection of mothers on the labour market is concerned, the fertility level has been reasonably high.

If we take seriously the theory of second demographic transition, which links fertility decrease to changes in social values and beliefs, an attractive direction of state policy should be a modification of attitudes and values in young generations. Return to the old values does

not seem to be feasible, but the development of more equal parental responsibilities, as in Scandinavian countries, may be an efficient tool of increase in fertility.

To summarise these very brief considerations, it is difficult to decide if the pronatalist policies are effective and which policies should be pursued. Quite likely large-scale, expensive and long-lasting social transfers will be difficult to maintain in future, as competing needs, especially coming from oldest generations, will limit these transfers. Availability of family supporting services, such as kindergartens, as well as a transformation of attitudes might be another option, less expensive and offering good value for money. Advocating and supporting of maternity-friendly employers and reduction of burden of maternity on employers, increasing the chances for keeping jobs by mothers or re-employment after pregnancy may result in an increase of readiness to have children among families. However one should not expect any radical change in fertility: return to replacement level of fertility in Europe does not seem to be likely, therefore shrinking of population and ageing will be the dominant demographic future in the coming half of a century.

Issues linked to and policies aimed at cushioning the consequences of unavoidable demographic changes are very numerous, and some of them are discussed below. An important and much debated question is the sustainability of pay-as-you-go retirement systems. A simple model describes the relation between the inflow of cash to the pool and outflow to the retired:

$$r \cdot P_{ea} \cdot LF_{ea} \cdot W_{ea} = P_r \cdot (1 - LF_r) \cdot P,$$

where:

P_{ea} – population at the age of economic activity;
LF_{ea} – labour force participation rate for population at the age of economic activity;
W_{ea} – average wage for population at the age of economic activity;
r – contribution rate;
P_r – population at the retirement age;
LF_r – labour force participation rate for population at the retirement age;
P – average pension.

Rewriting the above equation we obtain:

$$r = P_r/P_{ea} \cdot (1 - LF_r)/LF_{ea} \cdot P/W_{ea}.$$

This simple relationship shows clearly that ageing (increase of the P_r/P_{ea} term) could be compensated in three ways: by increasing the contribution rate r, by decreasing the pension-to-wage rate P/W_{ea} or by increasing labour force participation $LF_{ea}/(1 - LF_r)$. Increase in the contribution rate and decrease of the substitution (pension-to-wage) rate are political decisions. The former one in general is not an option as it means the increase in the cost of labour, leading to rise in unemployment and pricing enterprises out of the market, what in

many cases leads to bankruptcies. Schnapp and Kostorz (2002) indicate that in Germany there will be a need to increase contribution paid to maintain retirement benefits from current 19.1% to 30.0% of gross income in 2040. The decrease of substitution rate bears important social implications, such as worsening of the situation on many households, possibly leading to poverty. However, this solution will be very difficult to accept in countries cherishing the idea of the state being responsible for the wellbeing of its citizens, known as the European social model. An overview of retirement policies has been offered by Kotowska (2003).

Bijak et al. (2005) have shown that from the point of view of sustainability of labour markets a promising solution is to increase the level of labour force participation. Based on Saczuk's (2004) assumptions of an universal increase in labour force participation rates, especially in the youngest and the oldest age groups, Bijak et al. (2005) estimated that the number of "replacement migrants" needed to maintain certain demographic and labour market parameters would decrease very substantially, in some countries studied to socially acceptable levels. This would suggest that the policies aiming at the increase in labour force participation rates may be effective in curbing the consequences of demographic imbalances. They will also help, but not necessarily save, the pay-as-you-go retirement systems. Kotowska (2003) presents a wide spectrum of policies which should be implemented to improve the existing situation and minimise future threats through increase in labour force participation of elderly population, ranging from antidiscrimination policies, through removing economic incentives for earlier retirement, to incentives for employees to retain older and possibly less efficient labour.

Demographic imbalances are not the only issue at stake. Various aspects of imbalances on labour market are also important, however maintaining the pay-as-you go pension system is not the only reason to be interested in this aspect of population change. The imbalances on the labour market could have another important adverse effect: the lack of labour needed to maintain the growth or at least the stability of economy. At least two issues are to be taken into account: whether older labour force will maintain the productivity of younger one and whether there will or will not be lack of labour due to decreasing cohorts at the age of economic activity.

The debate on the link between productivity and ageing has not proved to be conclusive. Skirbekk (2003: 19) states "An important cause of these age-related productivity declines is likely to be reductions in cognitive abilities across the life span. Some abilities, such as perceptual speed, show relatively large decrements from a young age, while others, like verbal abilities, show only small changes throughout the working life. Although older individuals have longer experience, they learn at a slower pace and have reductions in their memory and reasoning abilities. In particular are senior workers likely to have difficulties in adjusting to new ways of working." This short quotation encapsulates the complex debate in the core of which is the assessment whether the speed of decrease in cognitive abilities related to ageing may be offset and to what degree by higher level of human capital, experience or knowledge of procedures, value of which is dependent on the occupation. The situation is

further complicated by the possible changes on the labour market in the future:

Kryńska (2005) noted that it is very likely that future labour markets may have very different shape: some jobs will disappear, atypical forms of unemployment, such as part time employment, job share or teleworking will proliferate. Given massive ageing of the labour population, especially in some countries, it is inevitable that certain drop in productivity may occur. The evolving age composition of labour force will require modification of attitudes to elderly workers: companies need to start to value older employees and to adapt their mode of operations to the changing demographic environment. Balancing all factors, especially for long range – half century – perspective, is quite difficult, nevertheless the policy imperative is quite clear: societies have to adapt to ageing labour and to very likely economic decline in future. In further discussion the importance of sustained economic growth for financing of health care services will be shown.

Another important issue is the impact of ageing on services sector, notably health service, social security services and education. Basically there are two aspect of the change in demand: first, if there will be a need for additional resources in order to provide more health and care services to the ageing population. Schoenmaeckers (2005) noted that governments have to prepare for massive investment in the construction and maintenance of retirement homes and staff training. Second, if there will be a growing discrepancy in labour demand and supply in medical and care sectors, most likely leading to brain drain in these professions.

The first effect of the reducing proportion of young people and increasing proportion of old people will be the need to restructure hospital wards with various specialization. Many wards will have to undergo transition from paediatrics to geriatrics and other specializations dealing with diseases prevalent at old age, such as Alzheimer disease, cancer or osteoporosis, requiring re-training of personnel, refurbishing hospitals and, in some cases, kitting wards with new diagnostic and therapeutic equipment. As this process will occur gradually, quite likely there will be only limited pressure on fiscal institution to provide additional funds. Probably, more important factor will be a general sustained increase in cost of medical procedures, linked to technological and pharmacological development. Another question is, whether there will be an increase in demand for health services. Raising numbers of elderly would suggest this will happen. Much of the existing debate evolves around the question to what extend the health and care cost of ageing may be offset by healthier elderly populations. A study by Manton and Gu (2001) demonstrated that in the USA age-standardised rates of disability have fallen by 0.56% per year between 1994 and 1999 and at a slower pace in preceding years. Lutz and Scherbov (2005) have shown that the increase of disability-free life by 2 years per decade will result in 2050 in around the same number of disabled in the EU-15 as observed in 2000. This simulation suggests that investment in health prevention may be a very sensible option, both reducing direct health care expenditures and improving the quality of life of the elderly.

Changes in the cost of health care are another enigma. Richardson and Robertson (1999) run a

set of simulations for Australia, trying to assess what the cost increase would be, if any, and what are other factors increasing or offsetting the cost. The key finding of their study is that the age structure evolution is not the most important factor in the change of cost of health services calculated as a percentage of the GDP. First they tested the effect of changing population age structure given unchanged size of population and the GDP, taking into account Fuchs (1984) hypothesis, stating that a number of years to death rather than a number of years from birth is decisive for the cost of medical care. They found that, given fixed cost of health services for a fix number of population with projected age distribution, the simulation resulted in the increase of the cost of health services from 8.4% of GDP in 1995 to 11.8% in 2051. However, for projected population (both size and age structure) and reasonable increase of GDP by 2.1% p.a. the costs would drop to 5.3% of GDP. Lifting the assumption on the fixed cost of health service and replacing it with the cost increase along observed past trend, results in the health expenditure rising to 19.2% given 2.1% increase in GDP. However, GDP rise at 3.6% per annum would reduce the cost in 2051 slightly below the level observed in 1995.

The simulations of Australian researchers show clearly, that it is not the population ageing, but the cost of health care and the development of economy which determine the significance of health expenditures in the overall budget. Morgan and Hurley (2002) point at the cost of pharmaceuticals and diagnostics as two main factors which may push the cost of medical care up. This view is seconded by Schoenmaeckers (2005), who noted that the cost of medicines is an important factor impacting the cost of health services. Also Höhn (2000) noted that in Germany the attitudes of patients and doctors constitute a significant factor of the increase of the cost of health care. The evidence suggest that the effect of population ageing itself can be compensated by a moderate economic growth and therefore would not bankrupt the health care budget, but economic stagnation and rising costs of health care per illness may well do it. Schoenmaeckers (2005), who run simulations of GDP growth in ageing societies, assess that the some, usually most affluent, European countries should enjoy reasonable increase in the GDP per capita, however he is not that sure what the situation might be in other countries.

The picture offered by Australian scientists calls for responsible labour and economic policies, but to what extend is it applicable to Europe? The answer is: not directly, as the pattern of population dynamics differ (Australia's population will increase substantially, from 20 to 28 million from 2005 till 2050), but the structural changes are expected to be of similar nature to European.

There is an interesting discussion on the impact of ageing on demand for health and social services needed to take care of larger cohorts of old people. It was argued that the increase in disability-free life expectancy may curb the demand for care services in future and that the decline in disability levels has been already observed, but there is anecdotal evidence that the demand for care services is and will be growing. These two findings may be in fact consistent, the incidence of disability may be going down, but need for everyday help, related strictly to ageing, not to disability, may be growing. It is enough to browse classified advertisements in newspaper and professional medical journals in Central Europe, to see that there is a large

scale, organized recruitment of medical staff needed to fill in the labour shortages in health service and social security systems in old EU member states. In high demand are nursing homes nurses, dentists and specialised doctors.

On the other hand, a research by Kaczmarczyk (2005) showed that the scale of emigration of medical personnel from Poland is within reasonable limits: 2.2% of doctors and 1.2% of nurses applied for certificates confirming their qualifications. No doubt, actual migration is lower. This should not leave the governments of sending countries complacent. First, affluent countries have a long history of brain drain from poorer countries, what is excellently documented in literature. To give just few examples: Dovlo and Nyonator (undated) noted that 75% of graduates of the University of Ghana Medical School emigrated within a decade from graduation of first out of ten cohorts. Similarly Stilwell et al. (2004) showed that among doctors trained in Cape Verde more than ¾ work in Portugal. Similar situation is for other Portuguese-speaking African countries. If the emigration of doctors and nurses continue, problems with human resources in developing countries will spread to developed countries which are not on the top of the list of wealth. One of possible by-products of ageing, in particular of the increase in numbers of people at the age 80+ may be a massive drain of health care personnel from poorer countries.

There is one final aspect of the changes in age structure which is overlooked in demography, but important: declining school age populations will impact seriously educational sector, resulting in decrease in number of teachers and, above all, the need for closing down schools in sparsely populated areas. In consequence the density of school network will be lower, making access to education for those children living in depopulating areas, more and more difficult. According to the projection, Armenia, Bulgaria, Georgia, Lithuania, Moldova and Ukraine will have in 2051 less than 50% of children observed now in secondary education age. Given a strong regional dimension of depopulation (for evidence for Europe, see Rees and Kupiszewski 1999) the regional losses in most disadvantaged regions might be much higher, leading to far-going reshaping of school network and increasing the catchment areas. UNDP (2004) noted that in Bulgaria there were also positive effects of concentration of schools in larger localities, namely raise in attendance.

There is a number of other issues, such as evolution of production patterns and products, modification of retail and services network, possible modification of financial sector due to shrinking assets and increased risk aversion among elderly, or demise of some and creation of new professions. They will all have a profound impact on societies, but will not be discussed here in depth.

7. Conclusions

The study shows clearly that depopulation will concern some of European countries whereas ageing will be an universal phenomenon. In consequence, the societies have to adjust to the new, grey demography.

There are two questions: are the demographic changes, in particular ageing, unavoidable? Here the answer is simple: yes, at this stage of demographic development, they are. This has been confirmed not only by the United Nations (2005) projection, but also by the Eurostat projection from 2004, and by the CEFMR forecasts (Bijak et al., 2005). The second question is: will the consequences of these changes be detrimental to societies? Here the answer is more complex: it depends. They consequences are very difficult to predict, as they will, to a large extent, depend on the policies adopted by governments and societies' readiness to accept necessary changes.

In terms of policy measures the increase in fertility and the increase in labour force participation should be two main priorities, as they directly reduce the speed of population change.

One of the consequences of the ageing will be problems with maintaining of the social, especially retirement, security systems. Bismarck's system of social security, invented in the 19th century worked well in young, growing populations, with significantly lower life expectancy than retirement age. In ageing, shrinking populations with life expectancy much higher than retirement age they may became dysfunctional and threatened by bankruptcy. World Bank (2005) warns that social security systems in new EU member states, despite recent reforms are still vulnerable. Oksanen (2004) noted that the EU response to ageing must come from retirement systems, and recommends that the retirement age is increased. Similar opinion is presented by Schoenmaeckers (2005), who specifically noted that early retirement schemes should be abandoned. Turner's report (Pensions Commission, 2005) suggests that the retirement age in the UK should reach 69 years in 2050, whereas Caldwell, Caldwell and McDonald (2002) assess that retirement at 75 years is needed in Germany in order to keep a constant ratio of retired to working population, fixed at 35%. Past experience in modifying social security systems show how difficult the task is (Höhn, 2000).

An increase in labour force participation has been identified by Bijak et al. (2005) as a very efficient tool to reduce ageing-related imbalances on labour markets, especially in the short- and middle-term (up to 50 years, depending on the country in question). To increase the labour force participation we have to say good-bye to the pan-European tendency to start retirement in late fifties and add several years to the effective retirement age. Some countries already introduced necessary legislative changes. We have also to introduce incentives to get people to legal employment. This most likely can be done by reducing cost of employment and liberalising labour codes, so that the unemployed find employment quickly enough not to slip into poverty, but also firms can adjust the demand for labour to the flow of contracts

without being financially penalised. The removal of unnecessary costs linked to termination of employment would constitute an incentive for many employers and employed in the black economy to come out and contribute to the social security systems. Finally, development of atypical forms of employment, catering for those who can not or do not want to work full time is necessary.

All efforts should be made to reduce future demand for health care services in future. Lutz and Scherbov (2005) have shown that increase in disability-free life expectancy may allow for maintaining the costs of health and care services. Unlike other measures suggested in this section, this one will directly increase the wellbeing of people.

It has been argued that keeping the cost of health care and social services on current levels in terms of the share of GDP spent on them will be conditional on economic growth and controlling of the cost of medical care. In order to keep economic prosperity it is an imperative to get national budgets balanced and to start to accumulate surpluses to be able to support economy in future, when such support will be indispensable to stimulate flagging economies. In other words, generations on labour market now should not keep living on the cost of future generations, they should rather start saving to help future generations support them in the long period of retirement. Provision should be made for the states to be able to compensate in future possible lower productivity of older working populations.

An important ethical issue concerns the very probable brain drain of highly qualified personnel in health care from poorer countries by the more affluent ones. Freedom of labour mobility and globalization results in almost unrestricted mobility of highly skilled and significant economic losses of poor countries.

Has this wish-list has a chance to be delivered? It requires governments to take unpopular steps: reducing budget deficits, and making people work more and take more responsibility for their financial future. There are some signs that politicians realise what demography will bring to the nations they govern, the most difficult problem is how to convince the societies.

References

Aaberge, R, U Colombino, E Holmøy, B Strøm, and T Wennemo (2004). *Population ageing and fiscal sustainability: An integrated micro-macro analysis of required tax changes*. Discussion Paper 367, Oslo: Statistics Norway Research Department.

Ahlburg, D A, and W Lutz (1998). "Introduction: The need to rethink approaches to population forecasting." *Population and Development Review*, *Supplement: Frontiers of Population Forecasting*, 24: 1–14.

Alam A, M Murthi, R Yemtsov, E Murrugarra, N Dudwick, E Hamilton, and E Tiongson (2005). *Growth, Poverty, and Inequality. Eastern Europe and the Former Soviet Union*. Washington, DC: The World Bank.

Atkinson, A B (1998). "Social Exclusion, Poverty and Unemployment." Pp. 1–20 in: *Exclusion, Employment and Opportunity*, edited by A. B. Atkinson and J. Hills. CASE paper 4, London: London School of Economics.

Auerbach, A J, L J Kotlikoff, R P Hagemann, and G Nicoletti (1989). *The economic dynamics of an ageing population: the case of four OECD countries*. Department of Economics and Statistics Working Paper 62. Paris: OECD.

Avramov, D (2002). *People, Demography and Social Exclusion*. Population studies No. 37. Strasbourg: Council of Europe.

Avramov, D, and M Mašková (2004). *Active ageing in Europe. Volume 1*. Population studies No. 41. Strasbourg: Council of Europe.

Becker, G S (1991). *A Treatise on the Family. Revised and Enlarged Edition*. Cambridge, MA: Harvard University Press.

Bijak, J (2004). *Fertility and mortality scenarios for 27 European countries 2002–2052*. CEFMR Working Paper 3/2004. Warsaw: Central European Forum for Migration Research.

Bijak, J, M Kupiszewski, and A Kicinger (2004). *International migration scenarios for 27 European countries 2002–2052*. CEFMR Working Paper 4/2004. Warsaw: Central European Forum for Migration Research.

Bijak, J, D Kupiszewska, M Kupiszewski, and K Saczuk (2005). *Impact of international migration on population dynamics and labour force resources in Europe.* CEFMR Working Paper 1/2005. Warsaw: Central European Forum for Migration Research.

Blanchet, D (1992). "Does an ageing labour force call for large adjustments in training or wage policies?". In: *Labour markets in an ageing Europe*, edited by P. Johnson, and K. F. Zimmermann. Cambridge, MA: Cambridge University Press.

Bongaarts, J (1997). *Future population growth and policy options*. New York: Population Council.

Cliquet, R (ed.) (1993). *The future of Europe's population: a scenario approach*. Strasbourg: Council of Europe.

Caldwell, J C, P Caldwell, and P McDonald (2002). "Policy responses to low fertility and its consequences: A Global survey." *Journal of Population Research*, 19 (1): 1–24.

[Council of Economic Advisers on the Economic Effects of Aging] (1996). "Council of Economic Advisers on the Economic Effects of Aging." *Population and Development*

Review, 22 (1): 184–192.

Council of Europe (2004). *Revised Strategy for Social Cohesion*. European Committee for Social Commission, CDCS (2004) 10, 27 April 2004. Strasbourg: Council of Europe.

Coleman, D A (2000). *Who's afraid of low support ratios? A UK response to the UN Population Division Report on 'replacement migration'*. Paper for the "Expert Group Meeting on Policy Responses to Population Ageing and Population Decline," United Nations Population Division, New York, 16–18 October.

Coleman, D A (2002). "Replacement migration, or why everyone is going to have to live in Korea: a fable for our times from the United Nations." *Philosophical Transactions of the Royal Society B*, 357 (1420): 583–598.

Coleman, J C (1988). "Social capital in the creation of human capital." *American Journal of Sociology*, 94 (Suppl.): S95–S120.

Dovlo, D, and F Nyonator (undated). Migration by Graduates of the University of Ghana Medical School: A Preliminary Rapid Appraisal. Mimeo, accessed on 19 November 2005 from «www.who.int/entity/hrh/en/HRDJ_3_1_03.pdf».

Easterlin, R A (1968). *Population, Labor Force, and Long Swings in Economic Growth: The America Experience*. General Series 86. New York: National Bureau of Economic Research.

Easterlin, R A (1975). An Economic Framework for Fertility Analysis, *Studies in Family Planning*, 6 (1): 54–63.

Espenshade, T J, L F Bouvier, and W B Arthur (1982). "Immigration and the Stable Population Model." *Demography*, 19: 125–133.

Eurostat (2005). *Eurostat Population Projections 2004*. Luxembourg: Eurostat (forthcoming).

Fotakis, C (2000). *Demographic Ageing, Economic Growth and Pensions Sustainability in the EU: The Option for Migration*. Paper for the "Expert Group Meeting on Policy Responses to Population Ageing and Population Decline," United Nations Population Division, New York, 16–18 October.

Fuchs, V R (1984). "'Though Much is Taken': Reflections on Aging, Health and Medical Care." *Milbank Memorial Fund Quarterly*, 62: 143–166.

Fougère, M, and M Mérette (1998). *Population Ageing and Economic Growth in Seven OECD Countries*. Working Paper 1998-03. Ottawa: Department of Finance.

Grant, J, S Hoorens, S Sivadasan, M van het Loo, J DaVanzo, L Hale, S Gibson, and W Butz (2004). *Low Fertility and Population Ageing. Causes, Consequences and Policy Options*. Santa Monica-Leiden-Cambridge-Berlin: RAND Corporation.

Gornick, J C, M K Meyers, and K E Ross (1996). *Public Policies and the Employment of Mothers: A Cross-National Study.* Working Paper # 140, Luxembourg: Luxembourg Income Study.

Hantrais, L (2005). *Living as a Family in Europe*. Paper for the "European Population Conference 2005," European Population Committee of the Council of Europe. Strasbourg, 7–8 April.

Heuser, B L (2005). "Social Cohesion and Voluntary Associations." *Peabody Journal of Education*, 80 (4): 16–29.

Höhn, C (2000). *Policy responses to population ageing and population decline in Germany*.

Paper for the "Expert Group Meeting on Policy Responses to Population Ageing and Population Decline," United Nations Population Division, New York, 16–18 October.

Johnson, P, and K F Zimmermann (eds.) (1992). *Labour markets in an ageing Europe*. Cambridge, MA: Cambridge University Press.

Johnson, P (1999). "Ageing in the twenty-first century: implications for public policy." Pp. 11–31 in: *Policy Implications of the Ageing of Australia's Population. Conference Proceedings, Melbourne, 18-19 March.* Melbourne: Productivity Commission.

Keilman, N (1998). "How accurate are the United Nation World population projections?" *Population and Development Review. Supplement: Frontiers of Population Forecasting*, 24: 15–41.

Kaczmarczyk, P (2005). "Czy Polsce zagraża 'drenaż mózgów'?" *Biuletyn Migracyjny*, 3: 2. Warsaw: Center of Migration Research, Warsaw University, and Center of International Relations.

Korcelli, P (2003). "Migracje kompensacyjne a kształtowanie podstaw polskiej polityki imigracyjnej." *Europa XXI*, 9: 143–151.

Kotowska. I E (2003). "Older workers in the labour market and retirement policies." Pp. 55–122, in: *The economically active population in Europe*, edited by R. Palomba and I. E. Kotowska, Population Studies 40, Council of Europe: Strasbourg.

Kryńska, E (2005). *Critical assessment of the labour force evolution in Europe*. Paper for the conference "Demographic Perspectives of Europe", Central European Forum for Migration Research, Warsaw School of Economics and IOM. Warsaw, 19 October.

Kupiszewski, M and D Kupiszewska (1999). *Forecasts of regional structures of the elderly populations in Central and Eastern Europe.* Paper presented to the ECE UN conference "Status of the older population: Prelude to the 21st Century." Sion, 13–15 December.

Lesser, H (ed.) (1999). *Ageing, Autonomy and Resources*. London: Ashgate.

Lesthaeghe, R (2000). *Europe's demographic issues: fertility, household formation and replacement migration*. Paper for the "Expert Group Meeting on Policy Responses to Population Ageing and Population Decline," United Nations Population Division, New York, 16–18 October.

Lindh, T, and B Malmberg (1999). "Age structure effects and growth in the OECD: 1950–1990." *Journal of Population Economics*, 12 (3): 431–449.

Lindh, T (2005). "Productivity is a System Property and Need Not Decrease with the Age of the Workforce." *Vienna Yearbook of Population Research*, 2005: 7–9.

Lutz, W, B C O'Neill, and S Scherbov (2003). "Europe's Population at a Turning Point." *Science*, 299: 1991–1992.

Lutz, W, and S Scherbov (2005). "Will population ageing necessarily lead to an increase in the number of persons with disabilities?" *Vienna Yerbook of Population Research*, 2005: 219–234.

Macura, M, A MacDonald, and W Haug (eds.) (2005). *The new Demographic Regime. Population Challenges and Policy responses.* New York and Geneva: United Nations.

Manton, K G, and X Gu (2001). "Changes in the prevalence of chronic disability in the United States black and non-black population above the age 65 from 1982 to 1999."

Proceedings of National Academy of Sciences, USA, 98 (11), 6354–6459.

Monteils, M (2004). "The analysis of the relation between education and economic growth." *Compare*, 34 (1): 103–115.

Morgan, S, and J Hurley (2002). *Influences on the "Health Care Technology Cost-Driver"*. Discussion Paper no. 14, Commission on the Future of Health Care in Canada.

Nahuis, R, E Canton, and H de Groot (2000). *Vested interests, ageing and growth*. CPB Report 00/3. The Hague: Centraal Planbureau.

National Research Council (2001). *Preparing for an Aging World: The Case for Cross-National Research*. Washington, D.C: National Academy Press.

Oksanen, H (2004). *On the economic effects of population ageing, notably on public finances*. Paper presented to OSCE Seminar on Demographic Prospects in the OSCE area: Economic and security implications. Trieste: Organization for Security and Co-operation in Europe.

OECD (1998). *Human Capital Investment: An International Comparison*. Paris: Organization for Economic Cooperation and Development, Centre for Educational Research and Innovation.

Palomba. R (2003). "Reconciliation of work and family." Pp. 11–53, in: The economically active population in Europe, edited by R. Palomba and I. E. Kotowska, Population Studies 40, Council of Europe: Strasbourg.

Pensions Commission (2005). *A New Pension Settlement for the Twenty-First Century. The Second Report of the Pensions Commission*. London: The Pensions Commission.

Pollard, J H (1973). *Mathematical Models for the Growth of Human Populations*. Cambridge, MA: Cambridge University Press.

Portes, A (1998). "Social Capital: Its Origins and Applications in Modern Sociology." *Annual Review of Sociology*, 24: 1–24.

Population and Environment: A Journal of Interdisciplinary Studies (2001). Vol. 22 (4).

Productivity Commission (2005). *Economic Implications of an Ageing Australia*. Research Report. Melbourne: Productivity Commission.

Putnam, R D (1995). "Bowling Alone: America's Declining Social Capital." *Journal of Democracy*, 6 (1): 65–78

Rees, P H, and M Kupiszewski (1999). *Internal migration and regional population dynamics in Europe: A synthesis.* Collection Demography. Strasbourg: Council of Europe.

Remery, C, K Henkens, J Schippers, and P Ekamper (2003). "Managing an aging workforce and a tight labor market: views held by Dutch employers." *Population Research and Policy Review*, 22 (1): 21-40.

Richardson J, and I Robertson (1999). *Ageing and the Cost of Health Services.* Working Paper 90, Health Economics Unit, Centre for Health Program Evaluation Monash University: West Heidelberg.

Rogers, A (1975). *Introduction to multiregional mathematical demography*. New York: John Wiley.

Roseveare, D, W Leibniz, D Fore, and A Wurzel (1996). *Ageing populations, pensions systems and government budgets: Simulations for 20 OECD countries*. Economics Department Working Papers 168. Paris: OECD.

Saczuk, K (2003). *Development and Critique of the Concept of Replacement Migration.* CEFMR Working Paper 4/2003. Warsaw: Central European Forum for Migration Research.

Saczuk, K (2004). *Labour force participation scenarios for 27 European countries, 2002–2052*. CEFMR Working Paper 5/2004. Warsaw: Central European Forum for Migration Research.

Schnapp, F E, and P Kostorz (2002). "Demographische Entwicklung, soziale Sicherungssysteme und Zuwanderung," *ZAR*, 5/6: 163–171.

Schoenmaeckers, R C (2004). *Active ageing in Europe. Volume 2: Demographic characteristics of the oldest-old*. Population studies No. 47. Strasbourg: Council of Europe.

Schoenmaeckers, R C (2005). *Population Ageing and its Challenges to Social Policies*. Paper for the "European Population Conference 2005," European Population Committee of the Council of Europe. Strasbourg, 7–8 April.

Schuller, T (2001). "The Complementary Roles of Human and Social Capital." *Isuma: Canadian Journal of Policy Research*, 2 (1): 18–24.

Seshamani, M (2004). *The Impact of Ageing on Health Care Expenditure: Impending Crisis or Misguided Concern?* London: Office of Health Economics.

Shryock, H S, and J S Siegel (1971). *The Methods and Materials of Demography*. Washington, DC: US Government Printing Office.

Siebert, H (ed.) (2002). *Economic Policy for Ageing Societies*. Berlin: Springer-Verlag.

Simon, J (1989). "On aggregate empirical studies relating population variables to economic development." *Population and Development Review*, 15 (2): 323–332.

Skirbekk, V (2003). *Age and Individual Productivity: A Literature Survey*. MPIDR Working Paper WP 2003-028. Rostock: Max Planck Institute for Demographic Research.

Skirbekk, V (2005). "Population Ageing Negatively Affects Productivity." *Vienna Yearbook of Population Research*, 2005: 5–6.

Snel, J, and R Cremer (eds.) (1994). *Work and Ageing: A European Perspective*. London: Taylor and Francis.

Stilwell, B, K Diallo, P Zurn, M Vujic, A Orvill, and M Dal Poz (2004). "Migration of health-care workers from developing countries: strategic approaches to its management." *Bulletin of the World Health Organization*, 82: 595–600.

United Nations (1998). *Directory of Population Ageing Research in Europe*. New York and Geneva: United Nations.

United Nations (2000). *Replacement Migration: Is It a Solution to Declining and Ageing Populations?* New York: UN Population Division.

United Nations (2002a). *World Population Ageing: 1950–2050*. New York: UN Population Division.

United Nations (2002b). "Policy Responses to Population Decline and Ageing." *Population Bulletin of the United Nations*, Special Issue 44/45 2002. New York: UN Population Division.

United Nations (2005). *World Population Prospects: 2004 Revision*. New York: UN Population Division.

UNDP [United Nations Development Programme] (2003). *Bulgaria. National Human*

Development Report Rural regions: overcoming development disparities. Sofia: UNDP

Vaupel, J W, R J Carey, K Christensen, T E Johnson, A I Yashin, N V Holm, I A Iachine, V Kannisto, A A Khazaeli, P Liedo, V D Longo, Y Zeng, K G Manton, and J W Curtsinger (1998). *Biodemographic Trajectories of Longevity*. Science 280(1998):855-860.

Walker, A (2001). *Towards Active Ageing in the European Union*. Paper for the "Millennium Project Workshop – Towards Active Ageing in the 21st Century," Japan Institute of Labour, Tokyo, 29–30 November.

Willekens, F, and A Rogers (1978). *Spatial population analysis: Methods and computer programs*. Research Report RR-78-18. Laxenburg: IIASA.

World Bank (2005). Special Topic: Sustainability of Pension Systems in EU8. *World Bank EU8 Quaterly Economic Report* . October 2005.

Zoubanov, A (2000). *Population ageing and population decline: Government views and policies*. Paper for the "Expert Group Meeting on Policy Responses to Population Ageing and Population Decline," United Nations Population Division, New York, 16–18 October.

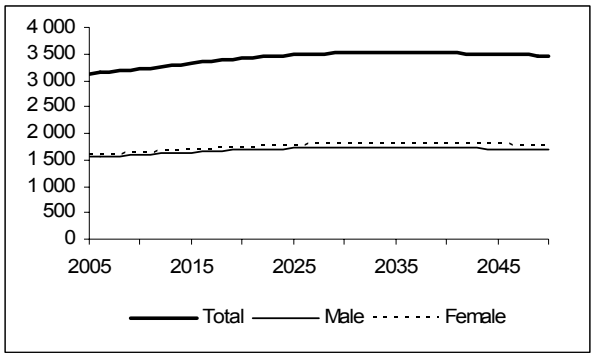
■

Annex. Selected country-specific population trends

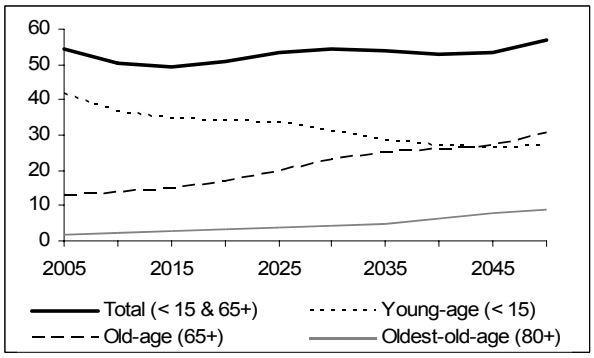
Countries (ISO-2 codes in brackets)

1. Albania

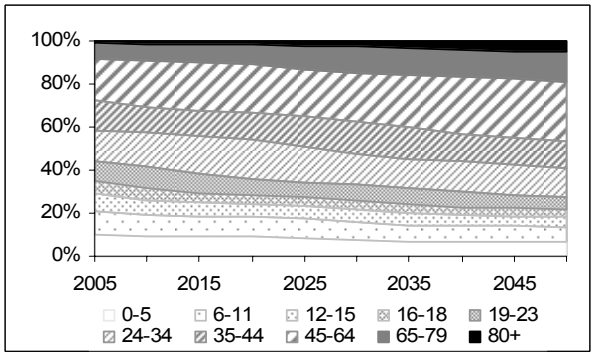
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



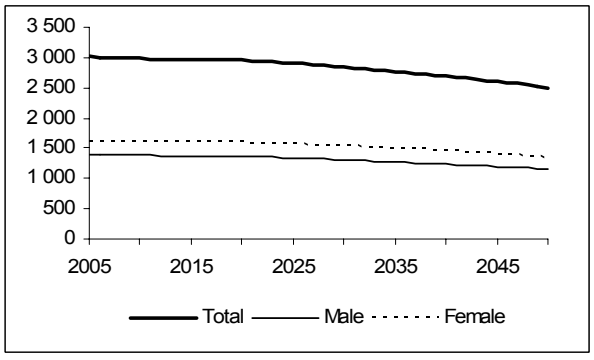
Shares of functional age groups, 2005–2050: percentages



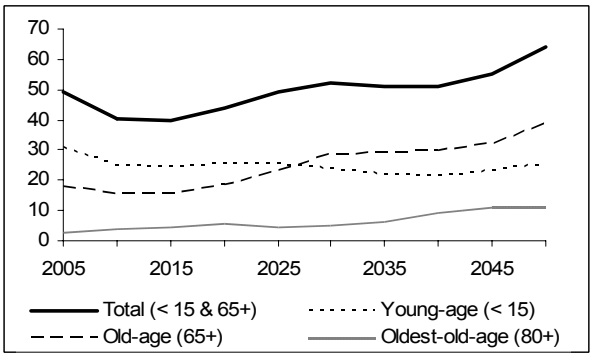
Group	2005	2010	2020	2030	2040	2050
0-5	9,8	9,6	9,2	7,5	6,9	6,7
6-11	11,1	9,6	9,2	8,4	7,0	6,9
12-15	8,1	7,1	5,9	5,9	5,0	4,6
16-18	6,0	5,7	4,2	4,4	4,0	3,4
19-23	9,0	9,4	7,5	6,9	6,9	5,7
24-34	14,6	15,9	18,0	14,6	14,4	13,8
35-44	13,5	12,2	12,6	15,4	12,7	12,6
45-64	19,6	21,5	22,5	22,2	26,3	27,0
65-79	7,1	7,7	9,1	12,4	12,7	13,9
80+	1,2	1,4	1,9	2,5	4,1	5,3

2. Armenia

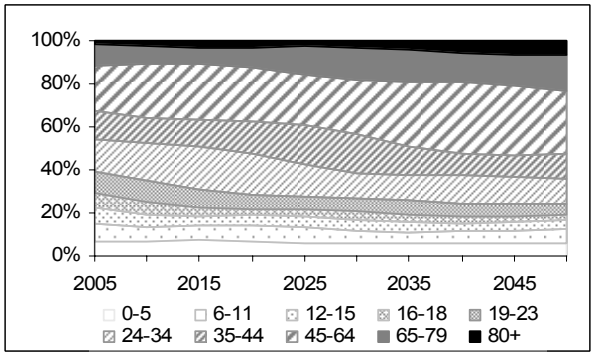
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



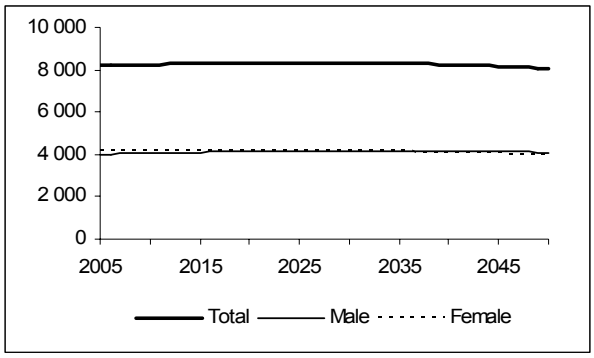
Shares of functional age groups, 2005–2050: percentages



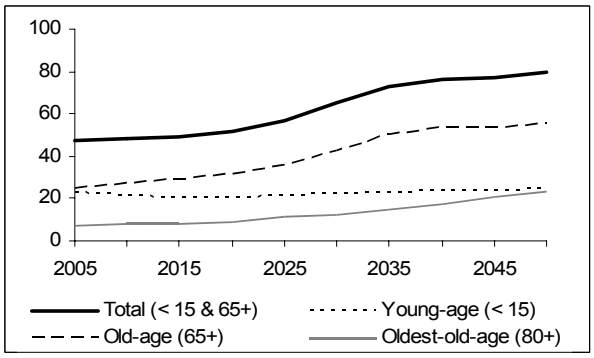
Group	2005	2010	2020	2030	2040	2050
0-5	6,5	7,0	7,0	5,6	5,8	6,0
6-11	8,6	6,6	7,4	6,5	5,6	6,3
12-15	7,7	5,7	4,6	4,9	3,9	4,1
16-18	6,5	5,4	3,1	3,8	3,2	2,9
19-23	9,7	10,2	5,9	5,9	5,9	4,7
24-34	14,8	17,9	19,6	11,9	12,8	11,9
35-44	13,7	11,2	15,0	18,0	10,6	11,6
45-64	20,4	24,9	24,8	24,9	32,8	29,0
65-79	10,5	8,5	9,1	15,6	13,7	16,9
80+	1,6	2,6	3,6	3,0	5,8	6,6

3. Austria

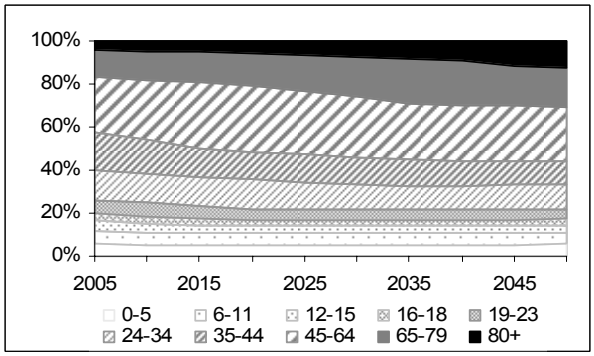
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



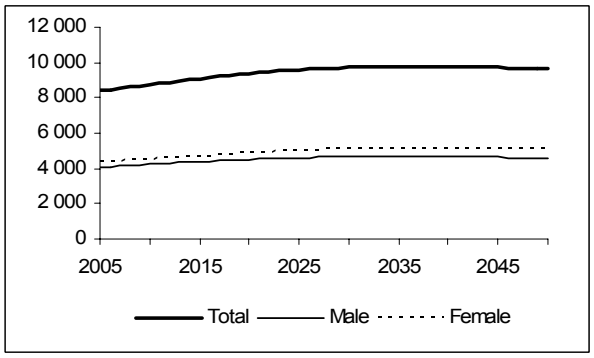
Shares of functional age groups, 2005–2050: percentages



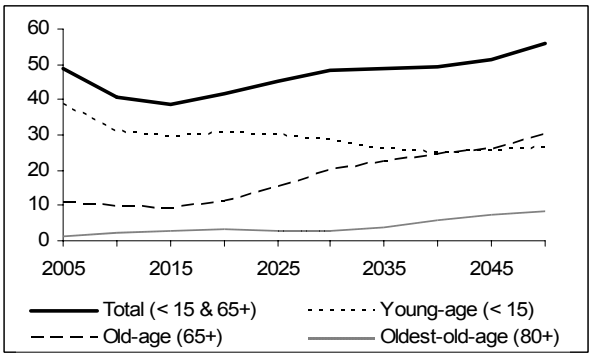
Group	2005	2010	2020	2030	2040	2050
0-5	5,7	5,3	5,3	5,3	5,2	5,4
6-11	6,3	5,7	5,2	5,4	5,3	5,4
12-15	4,7	4,2	3,6	3,6	3,6	3,6
16-18	3,5	3,5	2,8	2,7	2,8	2,7
19-23	6,0	5,9	5,1	4,6	4,8	4,8
24-34	14,1	13,5	13,6	11,7	11,0	11,5
35-44	17,4	15,7	12,7	13,0	11,4	10,8
45-64	25,7	27,8	30,9	27,9	25,8	25,0
65-79	12,3	13,4	15,0	18,5	20,6	17,8
80+	4,4	4,9	5,9	7,4	9,4	12,9

4. Azerbaijan

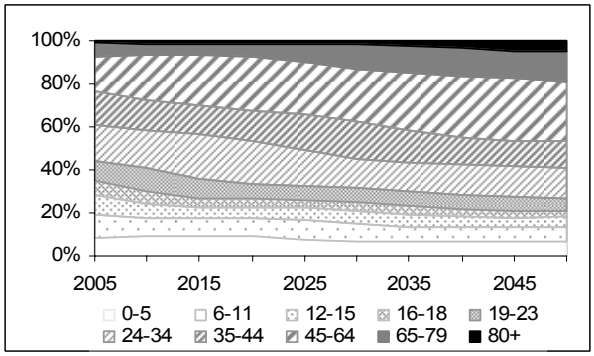
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



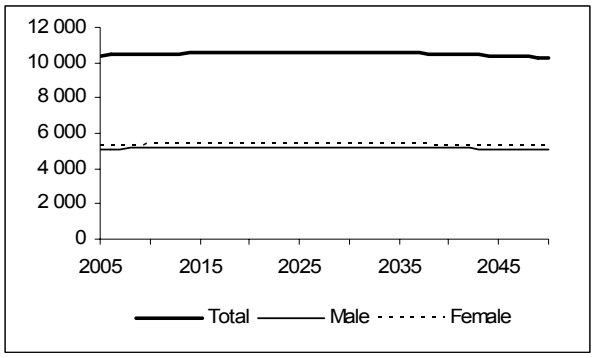
Shares of functional age groups, 2005–2050: percentages



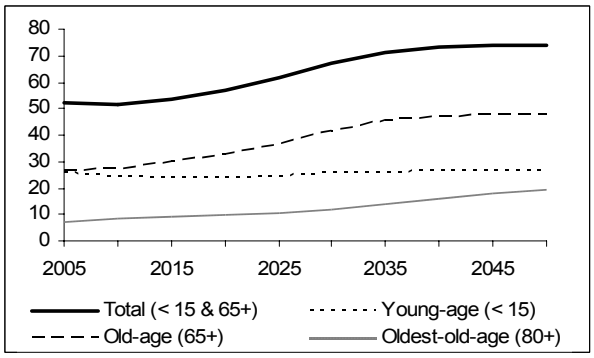
Group	2005	2010	2020	2030	2040	2050
0-5	8,7	8,8	8,8	7,0	6,7	6,7
6-11	10,6	8,3	8,6	7,9	6,6	6,8
12-15	8,7	6,7	5,3	5,6	4,7	4,4
16-18	6,7	6,2	3,7	4,2	3,8	3,3
19-23	9,8	10,6	6,8	6,6	6,7	5,6
24-34	16,5	18,0	20,2	13,6	14,3	14,0
35-44	15,8	13,9	14,4	17,5	11,9	12,7
45-64	16,1	20,6	24,3	24,2	29,0	27,4
65-79	6,3	5,7	5,9	11,6	12,8	13,8
80+	0,8	1,3	2,0	1,7	3,6	5,3

5. Belgium

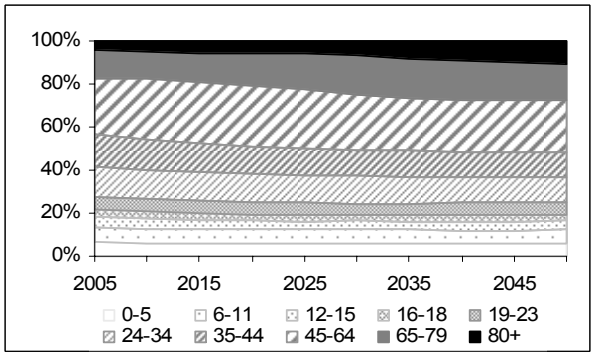
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



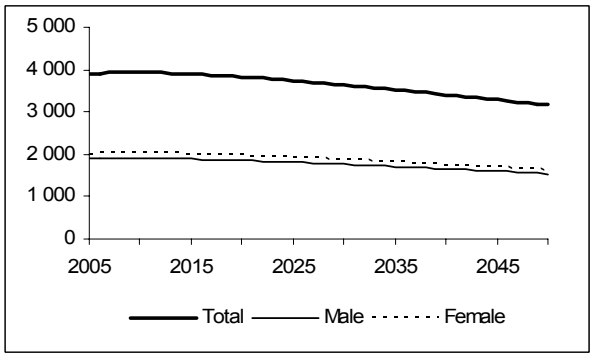
Shares of functional age groups, 2005–2050: percentages



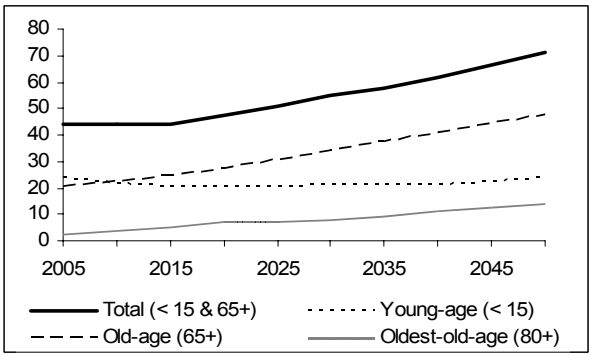
Group	2005	2010	2020	2030	2040	2050
0-5	6,5	6,2	6,1	6,1	6,0	6,1
6-11	6,7	6,5	6,1	6,1	6,1	6,1
12-15	4,7	4,5	4,2	4,1	4,1	4,1
16-18	3,5	3,6	3,3	3,1	3,1	3,1
19-23	6,0	6,0	5,6	5,2	5,3	5,4
24-34	14,1	13,5	13,4	12,5	12,0	12,3
35-44	15,2	14,1	12,4	12,4	11,8	11,4
45-64	25,6	27,9	28,2	25,6	24,5	24,3
65-79	13,0	12,6	14,9	17,9	18,0	16,5
80+	4,6	5,3	6,0	7,0	9,1	10,8

6. Bosnia and Herzegovina

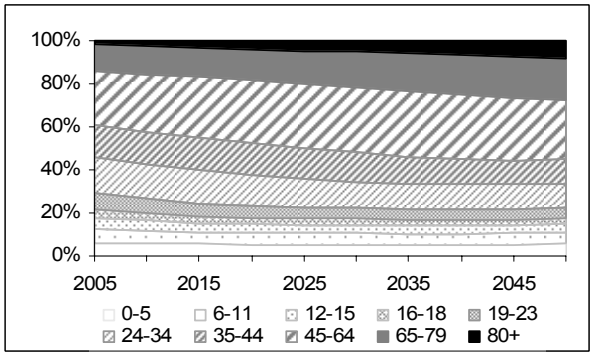
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



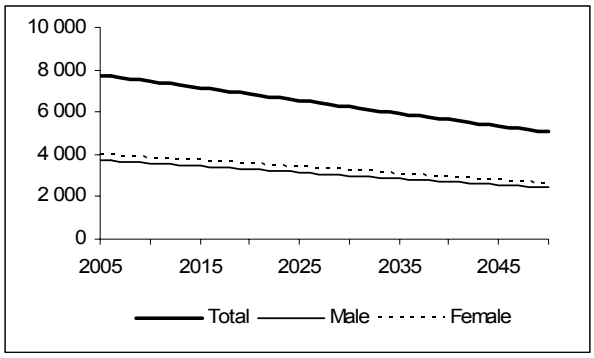
Shares of functional age groups, 2005–2050: percentages



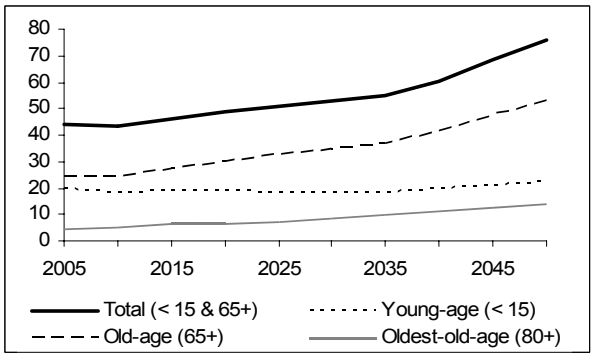
Group	2005	2010	2020	2030	2040	2050
0-5	5,9	5,5	5,4	5,1	5,1	5,5
6-11	7,0	6,1	5,5	5,5	5,2	5,5
12-15	4,9	4,7	3,8	3,8	3,7	3,7
16-18	4,3	3,5	2,9	2,9	2,9	2,8
19-23	7,1	6,9	5,8	4,9	5,0	4,8
24-34	16,4	15,8	14,4	12,4	11,3	11,5
35-44	15,2	14,7	14,7	13,8	12,0	11,0
45-64	25,3	27,3	29,0	29,7	29,7	27,5
65-79	12,6	13,1	14,1	17,1	18,5	19,8
80+	1,4	2,3	4,5	4,9	6,5	8,0

7. Bulgaria

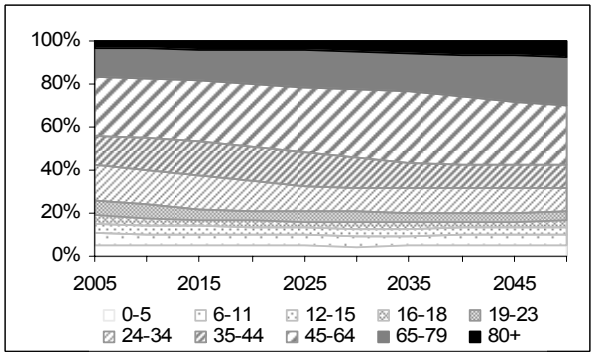
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



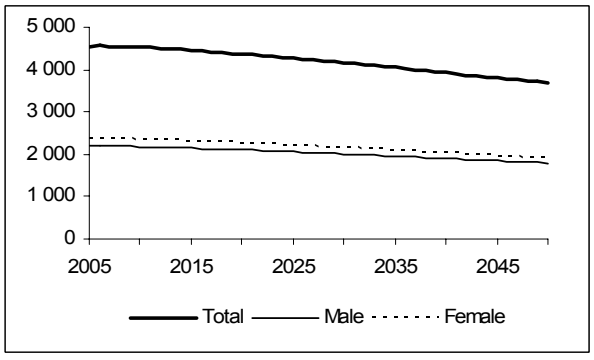
Shares of functional age groups, 2005–2050: percentages



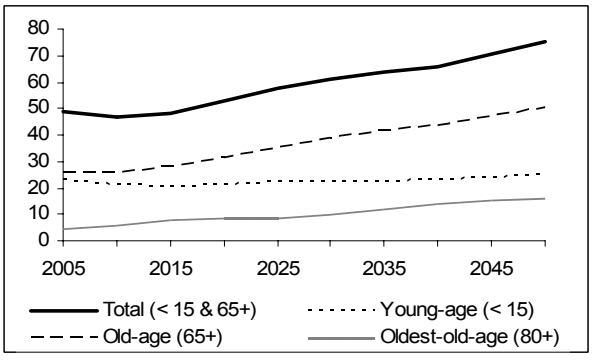
Group	2005	2010	2020	2030	2040	2050
0-5	5,2	5,1	4,8	4,5	4,8	5,0
6-11	5,3	5,2	5,2	4,9	4,8	5,2
12-15	4,5	3,6	3,7	3,5	3,3	3,5
16-18	4,1	3,2	2,9	2,8	2,6	2,6
19-23	6,9	6,7	4,5	4,8	4,6	4,4
24-34	16,5	16,5	14,1	11,0	11,3	10,7
35-44	13,5	14,4	16,0	14,0	10,9	11,2
45-64	27,2	28,1	28,8	31,9	32,2	27,2
65-79	13,9	13,6	16,0	17,3	19,0	22,5
80+	3,0	3,5	4,1	5,2	6,6	7,7

8. Croatia

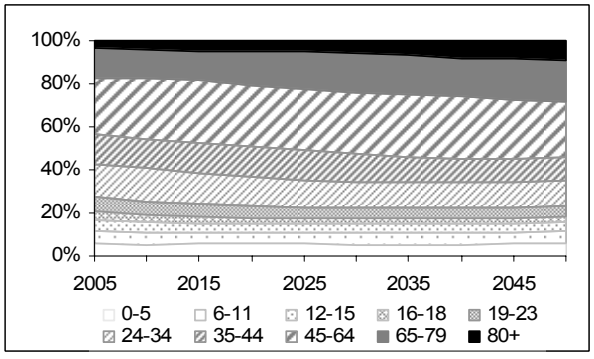
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



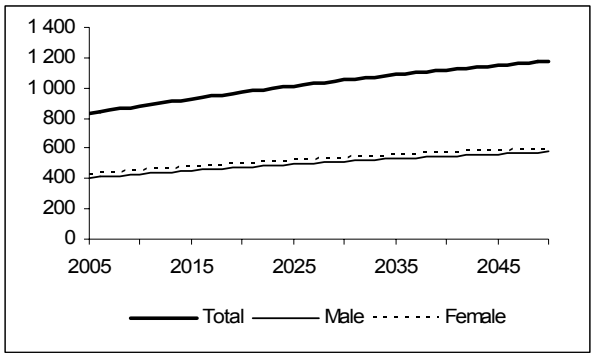
Shares of functional age groups, 2005–2050: percentages



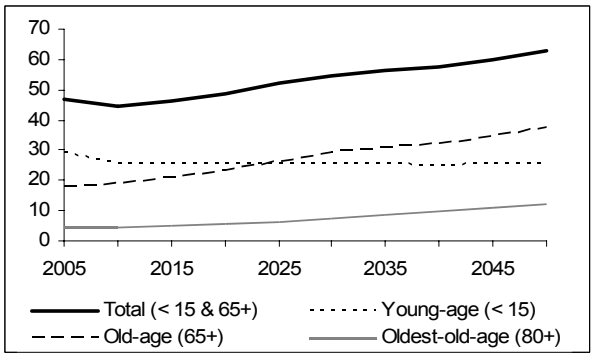
Group	2005	2010	2020	2030	2040	2050
0-5	5,5	5,4	5,5	5,3	5,4	5,8
6-11	6,5	5,8	5,6	5,6	5,4	5,8
12-15	4,7	4,4	3,7	3,9	3,8	3,8
16-18	3,7	3,5	2,8	3,0	3,0	2,9
19-23	6,8	6,2	5,4	4,9	5,1	4,9
24-34	15,1	15,4	13,6	11,7	11,4	11,6
35-44	14,0	13,6	14,5	13,0	11,3	11,0
45-64	26,4	28,4	28,2	28,5	28,6	25,6
65-79	14,3	13,5	15,3	18,2	18,0	19,6
80+	2,9	3,9	5,3	6,0	8,0	9,0

9. Cyprus

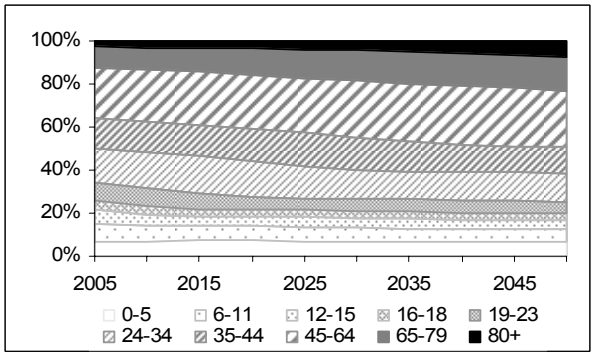
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



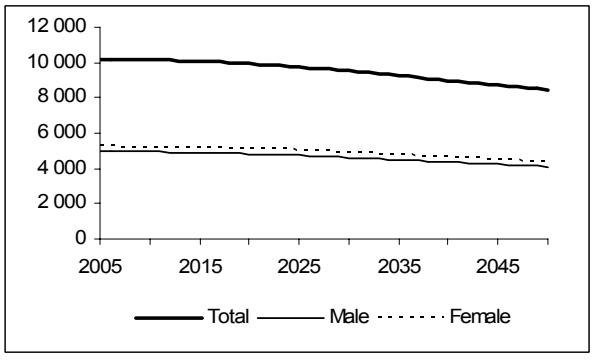
Shares of functional age groups, 2005–2050: percentages



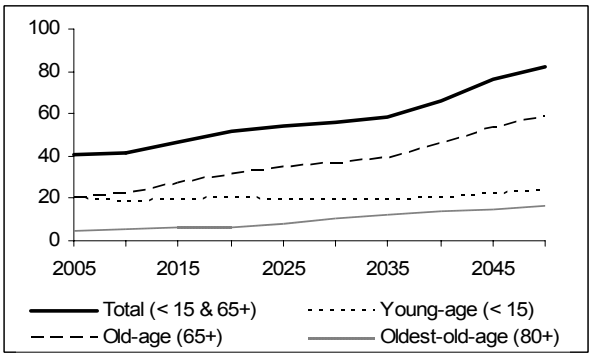
Group	2005	2010	2020	2030	2040	2050
0-5	7,1	7,0	7,1	6,5	6,5	6,3
6-11	8,1	6,9	6,8	6,7	6,4	6,3
12-15	6,2	5,2	4,4	4,5	4,2	4,2
16-18	4,6	4,5	3,2	3,3	3,2	3,2
19-23	7,8	7,7	5,9	5,6	5,7	5,4
24-34	15,9	16,9	16,7	13,4	13,3	13,2
35-44	14,5	13,8	15,0	15,3	12,5	12,4
45-64	23,7	24,7	25,3	26,0	27,8	26,0
65-79	9,4	10,2	12,0	14,1	14,5	15,7
80+	2,8	3,0	3,5	4,6	6,1	7,2

10. Czech Republic

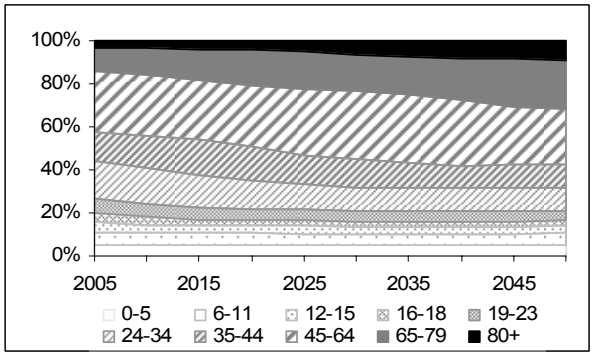
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



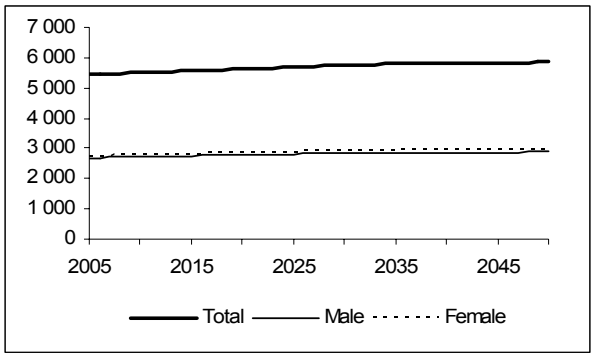
Shares of functional age groups, 2005–2050: percentages



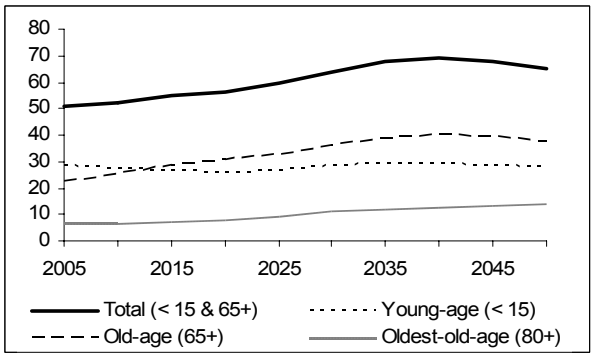
Group	2005	2010	2020	2030	2040	2050
0-5	5,3	5,4	5,1	4,7	4,9	5,3
6-11	5,7	5,3	5,4	5,1	4,9	5,3
12-15	4,8	3,8	3,7	3,6	3,4	3,5
16-18	3,8	3,5	2,8	2,8	2,6	2,6
19-23	6,6	6,3	4,5	4,8	4,7	4,4
24-34	18,3	16,8	13,6	10,7	11,2	10,7
35-44	13,3	15,1	15,9	13,2	10,3	10,9
45-64	27,9	28,1	28,2	31,6	30,6	25,3
65-79	11,1	12,1	16,9	17,1	19,4	23,0
80+	3,1	3,6	4,0	6,4	8,0	9,0

11. Denmark

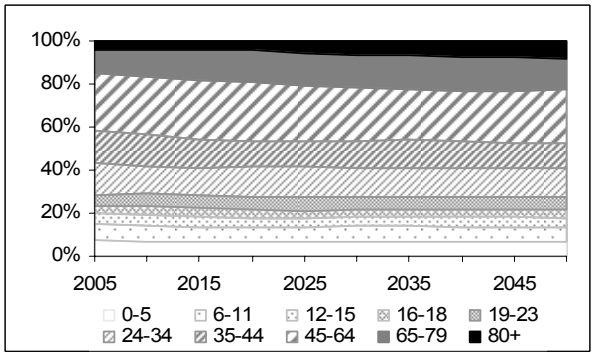
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



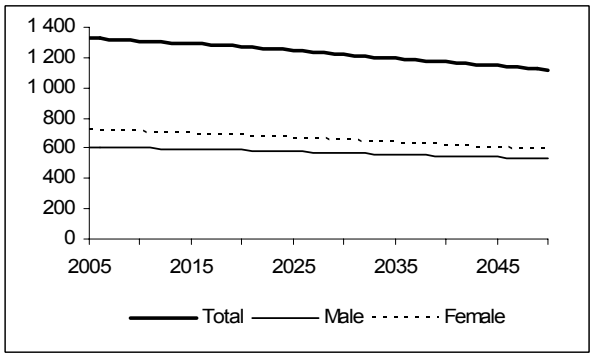
Shares of functional age groups, 2005–2050: percentages



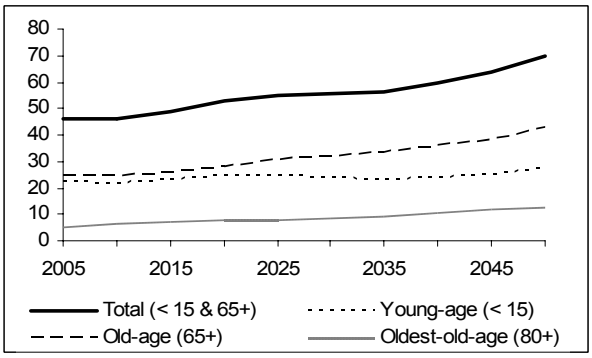
Group	2005	2010	2020	2030	2040	2050
0-5	7,2	6,7	6,6	7,0	6,7	6,6
6-11	7,7	7,4	6,5	6,9	7,0	6,7
12-15	5,0	5,1	4,6	4,4	4,8	4,6
16-18	3,4	3,9	3,7	3,3	3,5	3,6
19-23	5,3	5,9	6,4	5,7	5,8	6,1
24-34	14,6	12,8	13,8	14,0	12,7	13,3
35-44	15,1	14,6	11,7	12,4	12,8	11,8
45-64	26,7	27,2	27,3	24,6	23,1	24,6
65-79	10,8	12,2	14,9	15,4	16,4	14,3
80+	4,2	4,2	4,5	6,4	7,2	8,4

12. Estonia

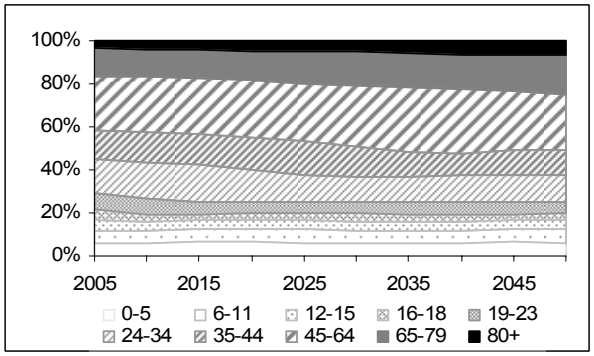
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



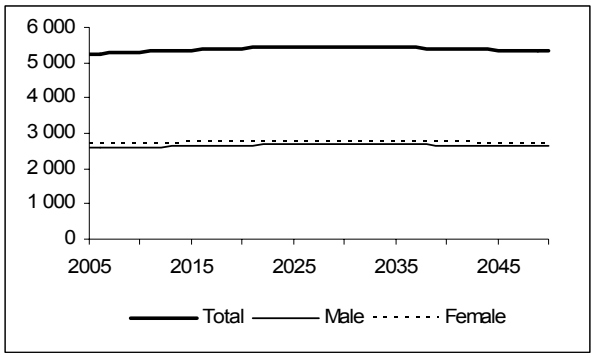
Shares of functional age groups, 2005–2050: percentages



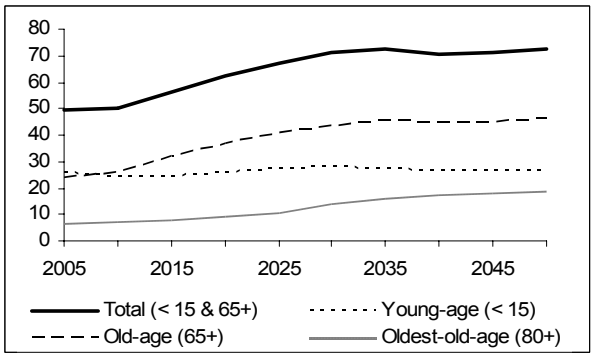
Group	2005	2010	2020	2030	2040	2050
0-5	5,7	6,2	6,3	5,7	6,1	6,2
6-11	5,8	5,7	6,6	6,2	5,8	6,5
12-15	5,2	3,9	4,2	4,4	4,0	4,2
16-18	5,0	3,5	3,0	3,5	3,1	3,0
19-23	7,8	7,8	4,7	5,6	5,6	5,0
24-34	15,5	16,5	15,3	11,2	12,8	12,3
35-44	13,5	13,6	15,0	14,7	10,4	12,1
45-64	25,1	26,1	26,4	28,0	29,7	25,4
65-79	13,4	12,7	13,5	15,6	15,9	18,2
80+	3,2	4,0	5,0	5,2	6,6	7,1

13. Finland

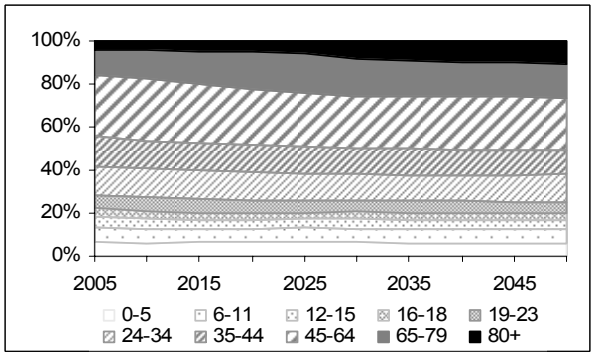
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



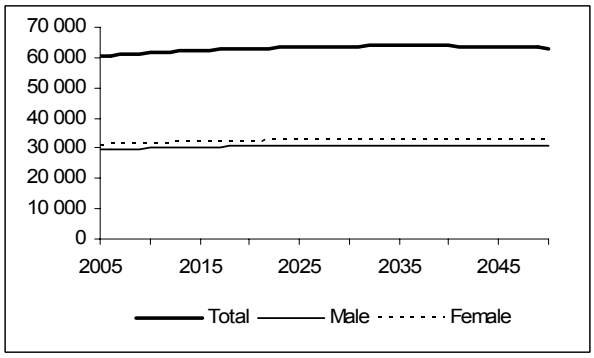
Shares of functional age groups, 2005–2050: percentages



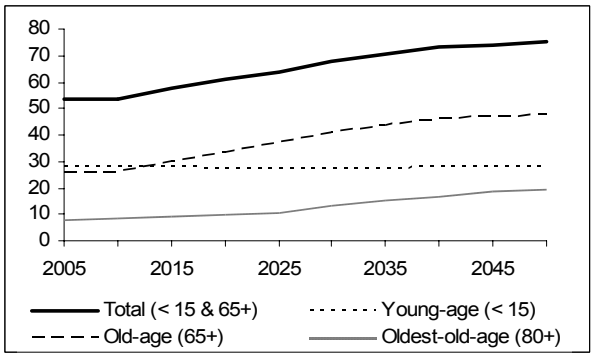
Group	2005	2010	2020	2030	2040	2050
0-5	6,4	6,2	6,5	6,3	6,0	6,2
6-11	7,1	6,5	6,3	6,6	6,2	6,1
12-15	5,1	4,7	4,2	4,4	4,4	4,1
16-18	3,6	3,8	3,2	3,2	3,4	3,2
19-23	6,3	6,1	5,6	5,3	5,7	5,5
24-34	13,4	13,9	13,6	12,2	12,1	12,8
35-44	13,9	12,5	12,5	12,4	11,4	11,3
45-64	28,2	29,1	25,7	24,1	24,8	24,2
65-79	11,9	12,6	17,1	17,6	16,2	16,1
80+	3,9	4,6	5,4	8,0	9,8	10,5

14. France

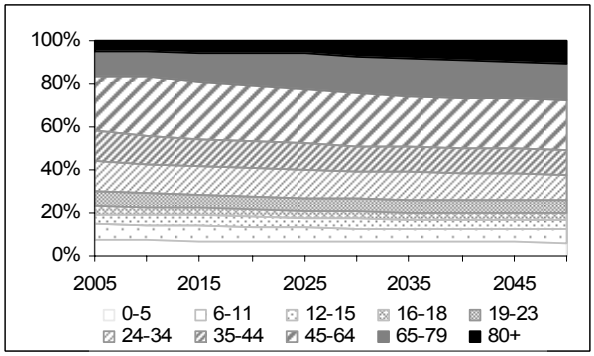
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



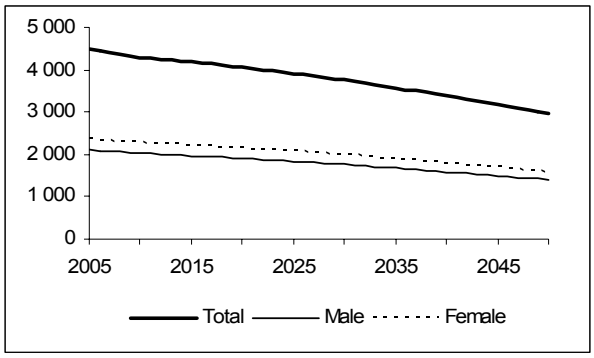
Shares of functional age groups, 2005–2050: percentages



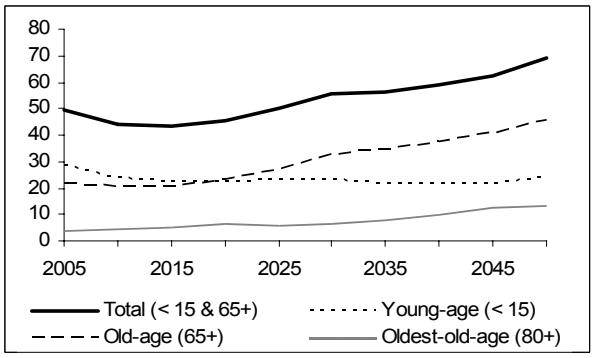
Group	2005	2010	2020	2030	2040	2050
0-5	7,4	7,1	6,6	6,4	6,3	6,2
6-11	7,2	7,3	6,8	6,5	6,4	6,4
12-15	4,8	4,7	4,7	4,4	4,3	4,3
16-18	3,8	3,5	3,6	3,4	3,2	3,3
19-23	6,4	6,2	5,9	5,8	5,5	5,4
24-34	14,4	13,8	13,1	13,0	12,6	12,2
35-44	14,1	13,5	12,3	11,8	11,8	11,7
45-64	25,2	26,9	26,1	24,6	23,4	23,5
65-79	11,9	11,5	15,0	16,8	16,8	16,2
80+	4,7	5,4	5,9	7,5	9,6	10,9

15. Georgia

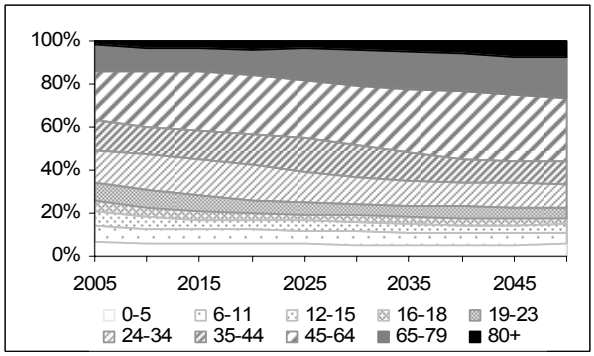
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



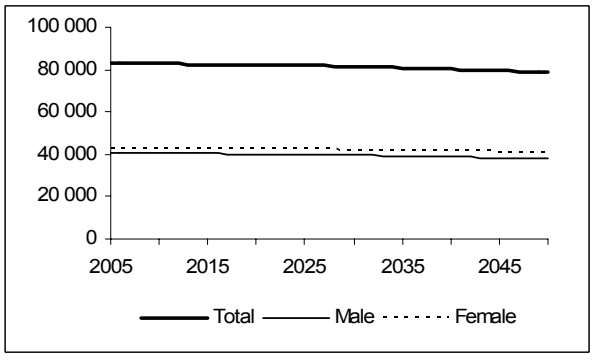
Shares of functional age groups, 2005–2050: percentages



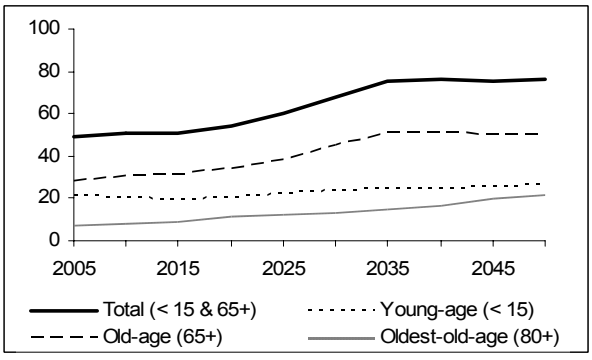
Group	2005	2010	2020	2030	2040	2050
0-5	6,5	6,2	6,1	5,4	5,2	5,5
6-11	7,6	6,7	6,2	6,1	5,4	5,6
12-15	6,5	5,1	4,3	4,3	3,9	3,8
16-18	5,3	4,7	3,4	3,2	3,2	2,9
19-23	8,0	8,5	5,7	5,3	5,4	4,8
24-34	15,4	15,9	17,0	12,0	11,3	11,2
35-44	14,3	13,0	14,0	15,8	11,0	10,3
45-64	22,1	25,9	27,4	27,0	31,2	29,0
65-79	12,2	10,9	11,8	17,1	17,4	19,3
80+	2,1	3,0	4,0	3,8	6,1	7,7

16. Germany

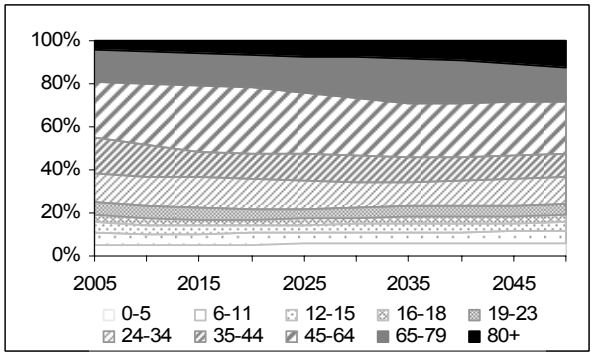
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



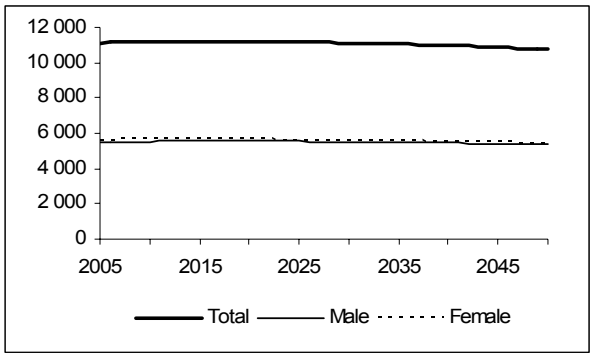
Shares of functional age groups, 2005–2050: percentages



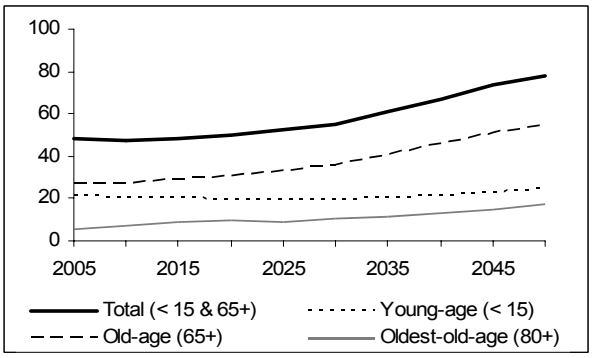
Group	2005	2010	2020	2030	2040	2050
0-5	5,2	5,0	5,4	5,5	5,6	6,0
6-11	5,9	5,5	5,2	5,6	5,7	5,9
12-15	4,3	4,0	3,5	3,7	3,9	3,9
16-18	3,6	3,2	2,8	2,8	3,0	3,0
19-23	6,0	6,1	5,3	4,7	5,2	5,3
24-34	13,0	13,1	13,4	11,9	11,4	12,3
35-44	17,1	14,7	12,1	12,6	11,3	10,8
45-64	26,1	28,1	30,3	26,5	24,9	24,3
65-79	14,4	15,3	15,2	19,1	19,6	16,2
80+	4,4	5,1	6,9	7,4	9,4	12,2

17. Greece

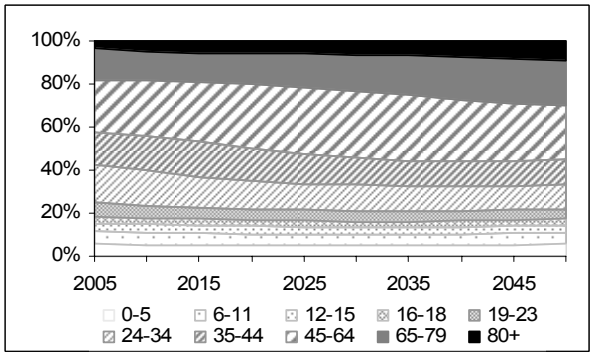
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



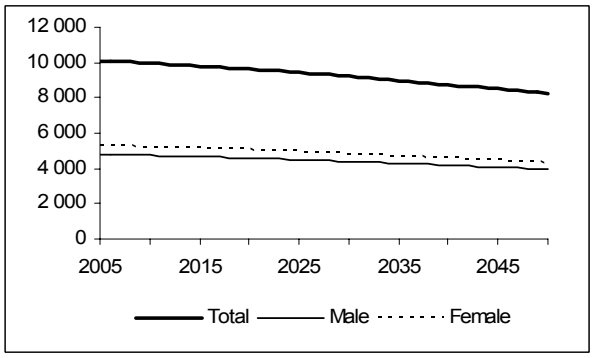
Shares of functional age groups, 2005–2050: percentages



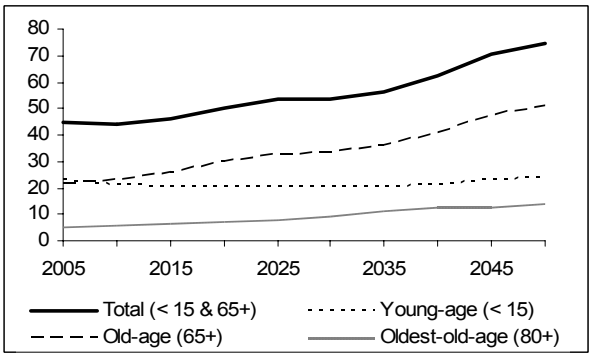
Group	2005	2010	2020	2030	2040	2050
0-5	5,6	5,4	5,0	4,9	5,2	5,5
6-11	5,8	5,6	5,3	5,0	5,1	5,5
12-15	4,0	3,9	3,7	3,5	3,4	3,6
16-18	3,3	3,0	2,9	2,7	2,6	2,7
19-23	6,6	5,5	5,0	4,8	4,6	4,7
24-34	17,2	16,4	12,7	12,0	11,6	11,3
35-44	15,1	15,9	15,7	12,4	11,8	11,6
45-64	24,3	26,0	29,5	31,5	28,4	25,0
65-79	14,5	13,6	14,3	16,8	19,5	20,7
80+	3,6	4,7	6,0	6,3	7,7	9,5

18. Hungary

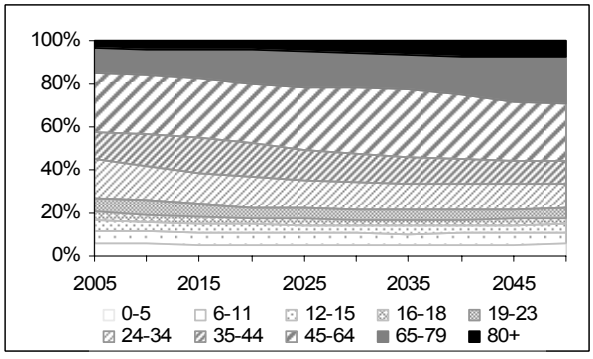
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



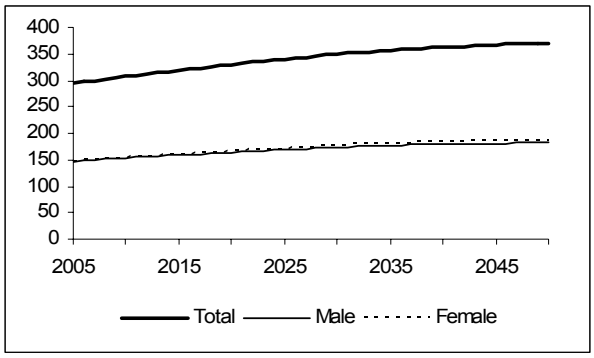
Shares of functional age groups, 2005–2050: percentages



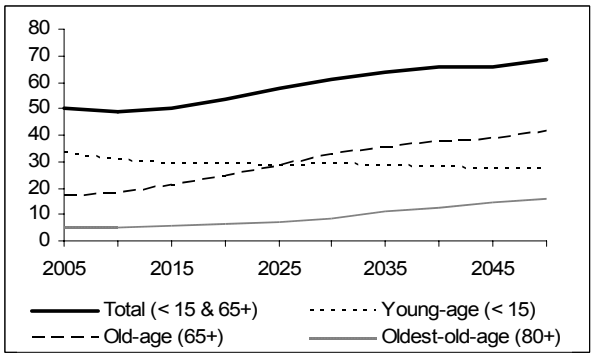
Group	2005	2010	2020	2030	2040	2050
0-5	5,7	5,5	5,3	5,1	5,2	5,5
6-11	6,4	5,8	5,5	5,4	5,3	5,5
12-15	4,9	4,3	3,9	3,7	3,6	3,7
16-18	3,7	3,7	3,0	2,9	2,8	2,8
19-23	6,4	6,3	5,2	5,0	4,9	4,8
24-34	17,7	16,5	14,1	11,9	11,4	11,2
35-44	12,9	14,9	15,6	13,5	11,5	11,1
45-64	27,1	26,9	27,5	30,8	30,2	26,4
65-79	12,0	12,4	15,6	16,2	17,7	21,1
80+	3,2	3,8	4,3	5,6	7,4	7,9

19. Iceland

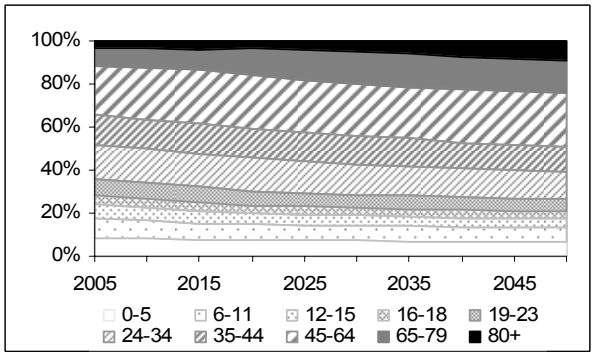
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



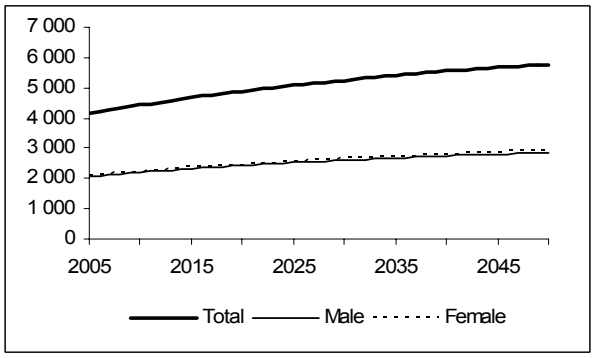
Shares of functional age groups, 2005–2050: percentages



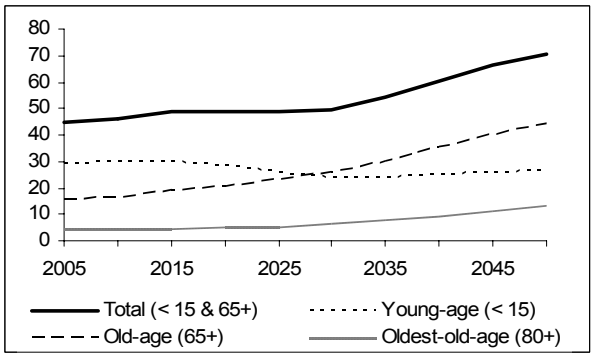
Group	2005	2010	2020	2030	2040	2050
0-5	8,6	8,2	7,6	7,2	6,6	6,5
6-11	9,1	8,3	7,2	7,1	6,7	6,5
12-15	6,2	5,8	4,9	4,6	4,6	4,3
16-18	4,4	4,5	3,8	3,4	3,4	3,2
19-23	7,4	7,2	6,6	6,2	6,0	5,8
24-34	16,0	15,8	15,3	13,9	13,3	13,1
35-44	14,2	13,4	13,3	13,2	12,1	11,9
45-64	22,6	24,5	25,5	24,4	24,5	24,3
65-79	8,4	9,2	12,1	14,9	15,1	15,4
80+	3,0	2,9	3,6	5,2	7,7	9,2

20. Ireland

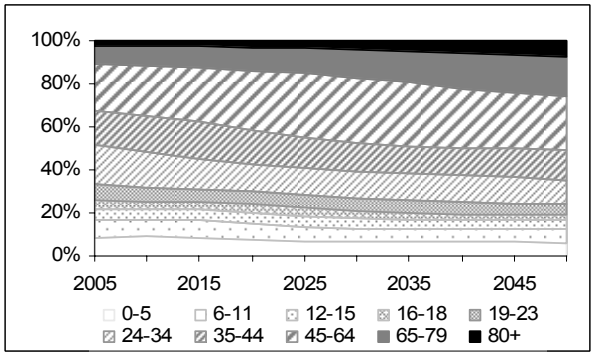
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



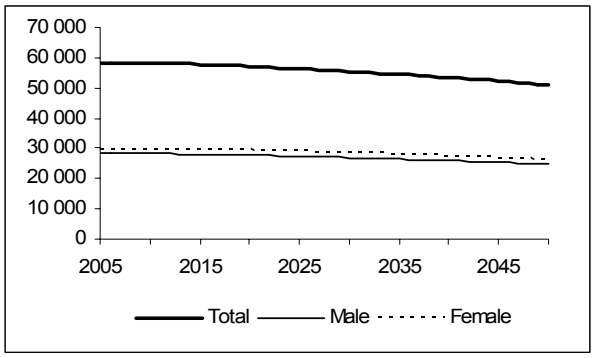
Shares of functional age groups, 2005–2050: percentages



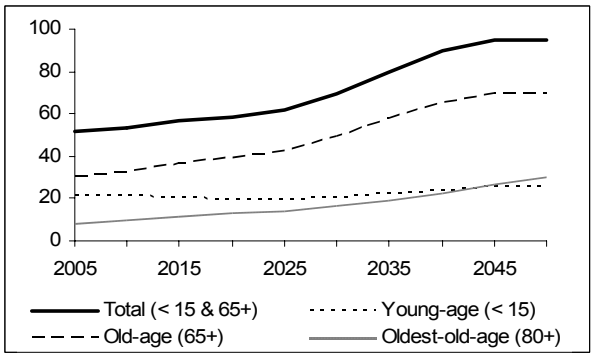
Group	2005	2010	2020	2030	2040	2050
0-5	8,7	8,8	7,2	6,3	6,5	6,1
6-11	7,6	7,9	7,9	6,4	6,1	6,3
12-15	5,3	4,8	5,3	4,5	3,9	4,1
16-18	4,2	3,6	3,7	3,6	3,0	3,0
19-23	7,8	6,4	5,5	6,2	5,2	4,8
24-34	18,0	16,6	12,8	12,4	13,0	11,1
35-44	15,6	17,1	16,2	13,2	12,7	13,5
45-64	22,0	23,5	27,6	30,2	27,5	25,2
65-79	8,3	8,6	10,8	13,0	16,6	18,3
80+	2,6	2,7	3,0	4,2	5,5	7,7

21. Italy

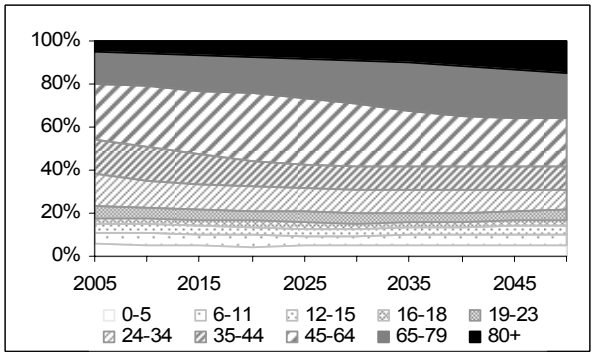
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



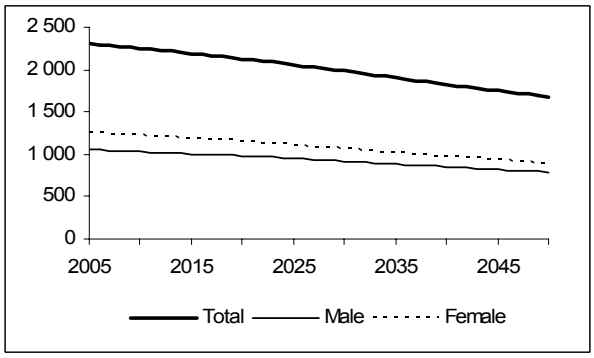
Shares of functional age groups, 2005–2050: percentages



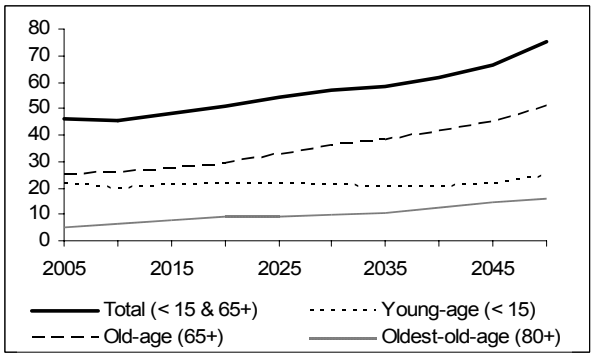
Group	2005	2010	2020	2030	2040	2050
0-5	5,5	5,3	4,6	4,7	5,1	5,1
6-11	5,6	5,6	5,1	4,7	5,1	5,3
12-15	3,9	3,8	3,8	3,2	3,3	3,6
16-18	2,9	2,9	2,9	2,6	2,5	2,7
19-23	5,2	4,9	4,8	4,7	4,2	4,5
24-34	15,1	12,7	11,1	11,1	10,5	9,9
35-44	16,1	15,9	12,1	10,6	10,6	10,3
45-64	25,8	27,8	31,2	29,1	24,1	23,0
65-79	14,8	15,0	16,7	19,7	23,2	20,3
80+	5,1	6,1	7,8	9,5	11,5	15,2

22. Latvia

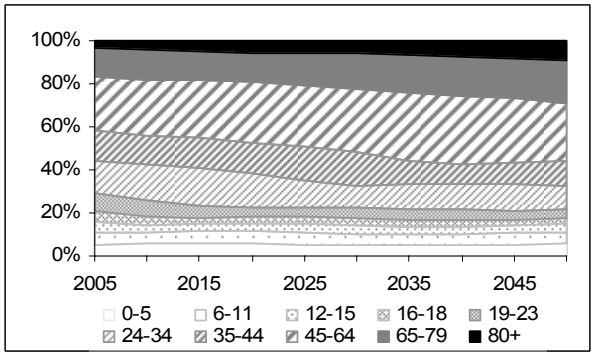
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



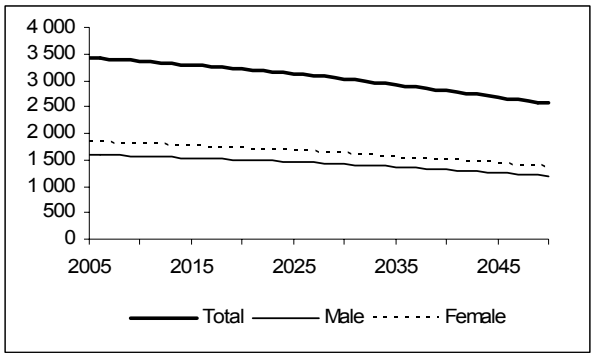
Shares of functional age groups, 2005–2050: percentages



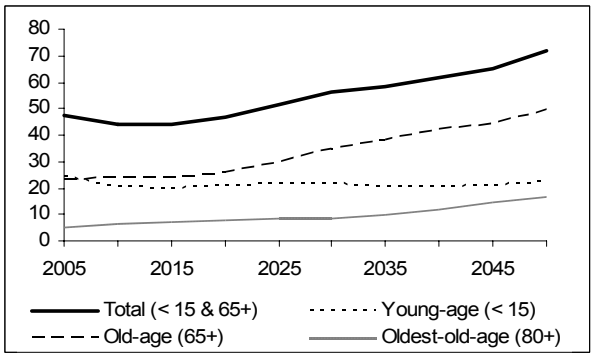
Group	2005	2010	2020	2030	2040	2050
0-5	5,2	5,5	5,6	4,8	5,0	5,5
6-11	5,6	5,2	5,9	5,5	4,9	5,6
12-15	5,4	3,7	3,8	4,1	3,5	3,6
16-18	4,9	3,8	2,8	3,1	2,8	2,6
19-23	7,7	7,9	4,3	5,1	5,1	4,4
24-34	15,2	16,2	15,7	10,2	11,7	11,2
35-44	14,0	13,7	14,8	15,3	9,8	11,3
45-64	24,9	26,1	27,8	28,9	31,7	26,7
65-79	13,5	13,5	13,7	16,8	17,8	20,1
80+	3,5	4,4	5,6	6,1	7,6	9,0

23. Lithuania

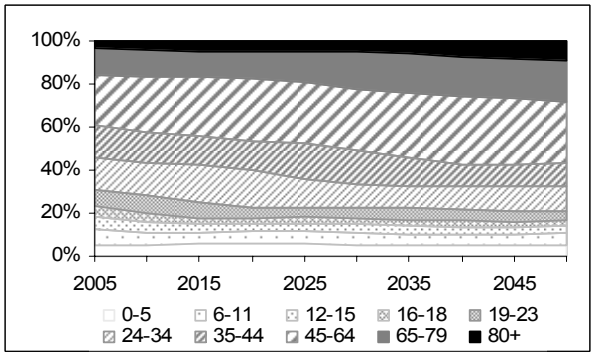
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



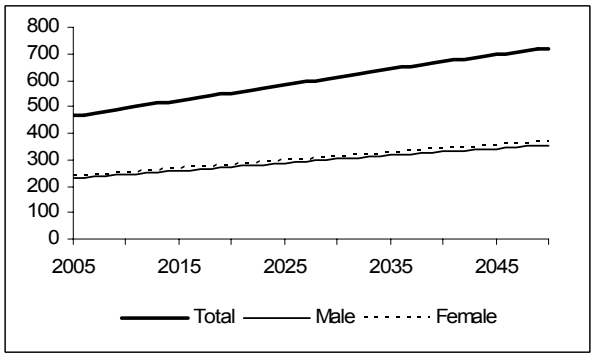
Shares of functional age groups, 2005–2050: percentages



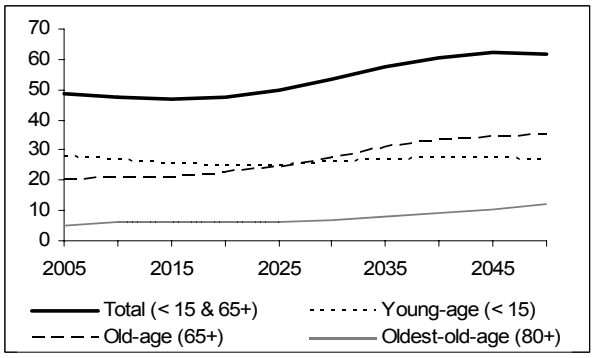
Group	2005	2010	2020	2030	2040	2050
0-5	5,3	5,4	5,7	5,0	4,8	5,4
6-11	6,9	5,5	5,7	5,7	4,9	5,3
12-15	6,1	4,6	3,7	4,0	3,6	3,4
16-18	5,0	4,4	2,7	3,0	2,9	2,5
19-23	7,7	8,2	5,0	4,8	5,2	4,4
24-34	15,0	15,5	16,9	10,8	11,0	11,4
35-44	15,2	14,3	14,0	16,2	10,3	10,5
45-64	23,4	25,6	28,6	28,2	31,4	28,3
65-79	12,4	12,5	12,7	16,9	18,6	19,3
80+	3,0	4,0	5,0	5,3	7,2	9,4

24. Luxembourg

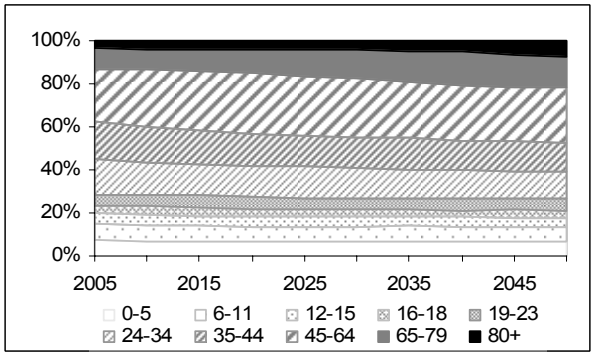
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



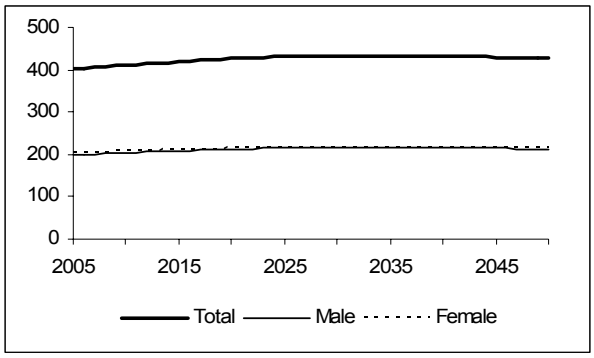
Shares of functional age groups, 2005–2050: percentages



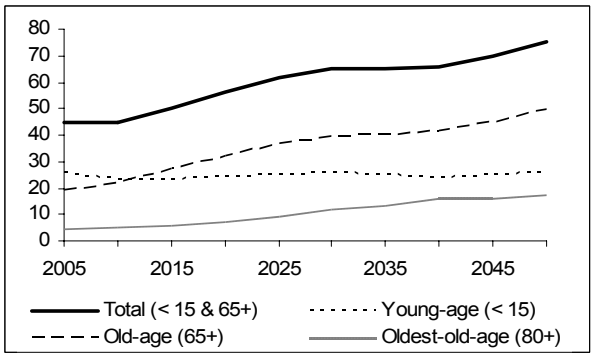
Group	2005	2010	2020	2030	2040	2050
0-5	7,5	7,0	6,7	6,9	6,6	6,6
6-11	7,6	7,3	6,8	6,8	6,7	6,6
12-15	5,0	5,0	4,6	4,4	4,6	4,5
16-18	3,3	3,6	3,4	3,2	3,3	3,2
19-23	5,3	5,5	5,6	5,4	5,2	5,4
24-34	16,0	14,6	14,4	13,9	13,3	13,0
35-44	17,6	17,1	14,9	14,4	14,0	13,5
45-64	24,0	26,3	28,4	27,3	25,4	25,6
65-79	10,7	9,8	11,1	13,6	15,5	14,3
80+	3,0	3,8	4,2	4,2	5,4	7,2

25. Malta

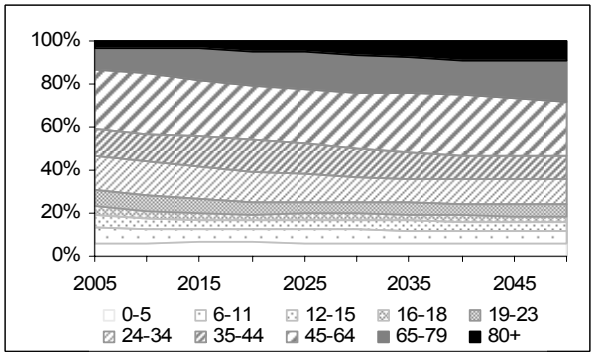
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



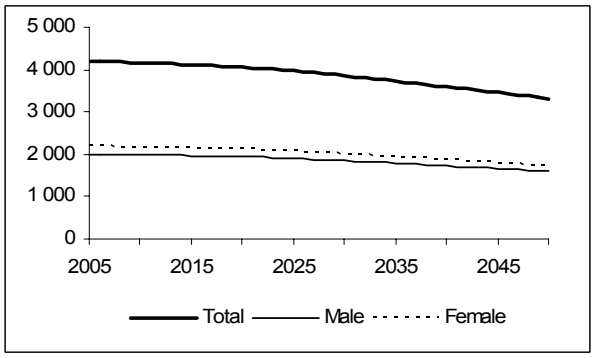
Shares of functional age groups, 2005–2050: percentages



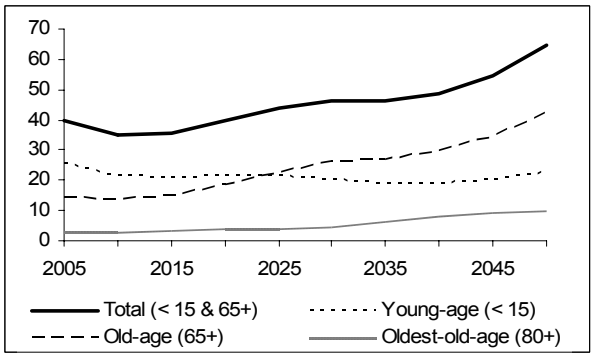
Group	2005	2010	2020	2030	2040	2050
0-5	6,1	6,1	6,4	5,9	5,8	5,9
6-11	7,5	6,1	6,1	6,4	5,9	5,9
12-15	5,6	4,9	3,9	4,2	4,1	3,9
16-18	4,4	4,0	2,9	3,2	3,2	2,9
19-23	7,5	7,0	5,7	5,1	5,3	5,3
24-34	15,8	16,3	14,5	11,6	11,5	12,0
35-44	12,5	12,4	14,5	13,3	10,9	10,7
45-64	27,3	28,0	25,4	26,2	28,2	24,9
65-79	10,3	12,0	16,1	17,2	16,0	18,9
80+	3,0	3,2	4,7	6,9	9,0	9,6

26. Moldova

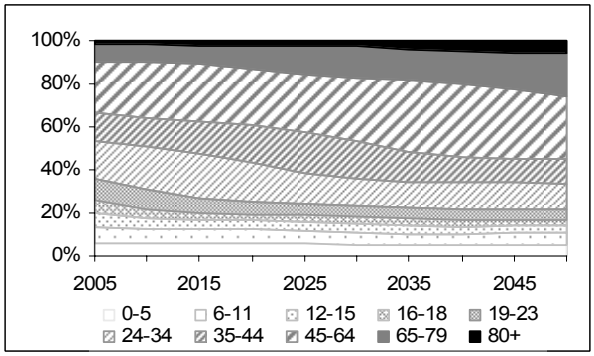
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



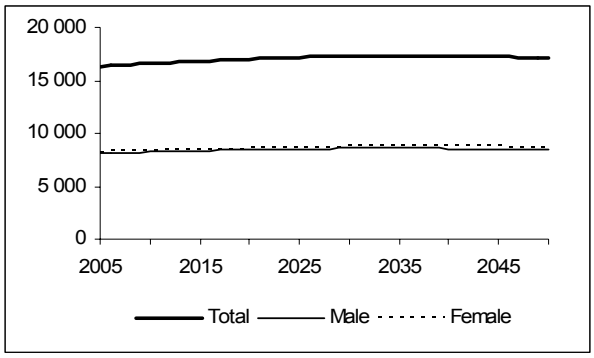
Shares of functional age groups, 2005–2050: percentages



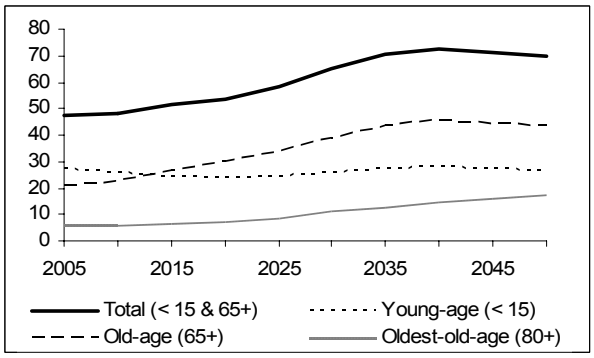
Group	2005	2010	2020	2030	2040	2050
0-5	6,0	6,1	6,0	5,1	5,1	5,4
6-11	7,5	6,1	6,3	5,8	5,0	5,5
12-15	6,5	5,0	4,1	4,2	3,6	3,6
16-18	5,9	4,5	2,9	3,2	2,9	2,6
19-23	9,5	9,4	5,6	5,3	5,3	4,5
24-34	17,5	19,6	18,4	12,0	12,2	11,8
35-44	13,6	13,4	17,4	17,4	11,4	11,7
45-64	23,3	25,7	26,2	29,4	34,6	29,3
65-79	8,6	8,2	10,7	14,7	14,7	19,7
80+	1,5	1,9	2,4	2,9	5,3	5,9

27. Netherlands

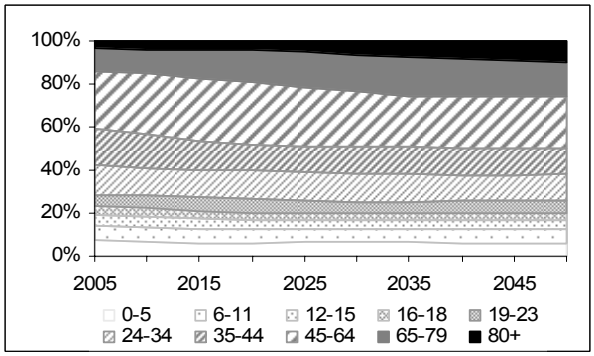
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



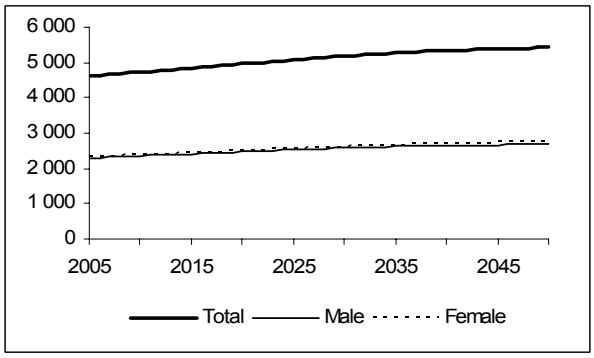
Shares of functional age groups, 2005–2050: percentages



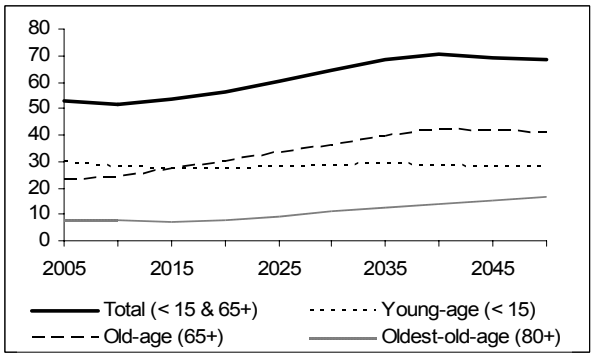
Group	2005	2010	2020	2030	2040	2050
0-5	7,2	6,5	6,1	6,4	6,2	6,1
6-11	7,3	7,2	6,2	6,3	6,5	6,3
12-15	4,9	4,8	4,4	4,1	4,4	4,3
16-18	3,6	3,7	3,6	3,1	3,2	3,3
19-23	5,7	6,0	6,0	5,3	5,3	5,6
24-34	14,1	12,8	13,5	13,3	12,1	12,4
35-44	16,4	15,2	11,8	12,5	12,6	11,6
45-64	26,6	28,6	29,1	25,5	23,6	24,9
65-79	10,5	11,3	14,9	17,2	18,0	15,3
80+	3,6	3,8	4,5	6,4	8,2	10,1

28. Norway

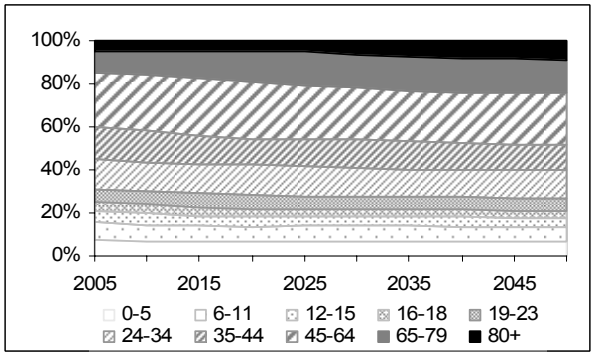
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



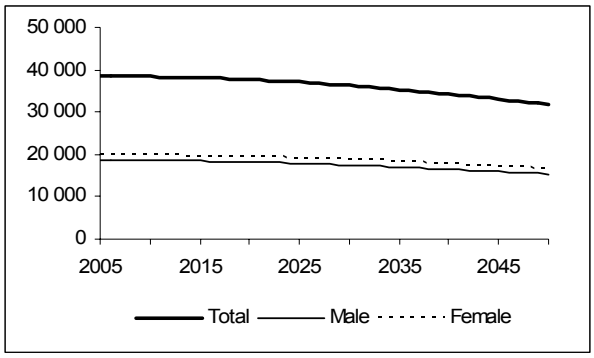
Shares of functional age groups, 2005–2050: percentages



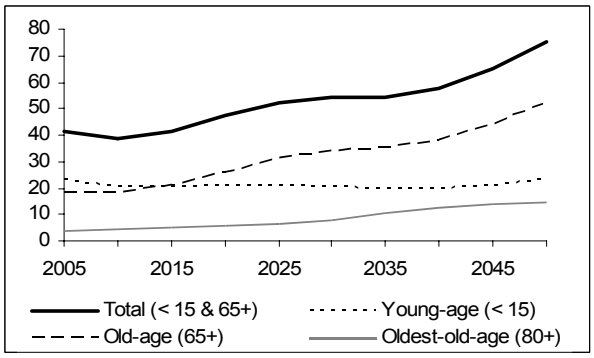
Group	2005	2010	2020	2030	2040	2050
0-5	7,4	6,9	6,9	6,9	6,5	6,5
6-11	8,1	7,5	6,8	7,0	6,9	6,5
12-15	5,4	5,3	4,6	4,5	4,7	4,5
16-18	3,8	4,1	3,6	3,3	3,5	3,4
19-23	5,9	6,4	6,4	5,6	5,7	5,9
24-34	14,5	13,2	14,3	13,6	12,6	13,1
35-44	14,9	14,8	11,8	12,8	12,5	11,6
45-64	25,0	26,1	26,6	24,3	23,2	24,3
65-79	10,3	10,9	14,4	15,4	16,4	14,8
80+	4,7	4,7	4,6	6,5	8,1	9,5

29. Poland

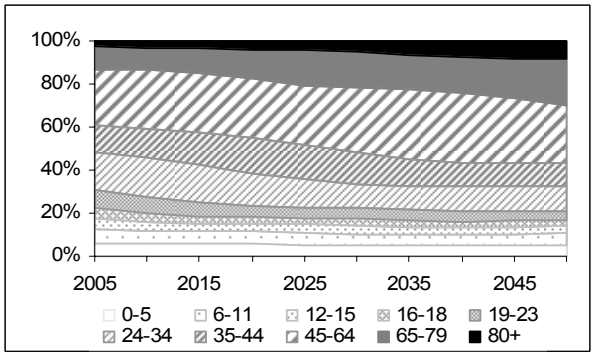
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



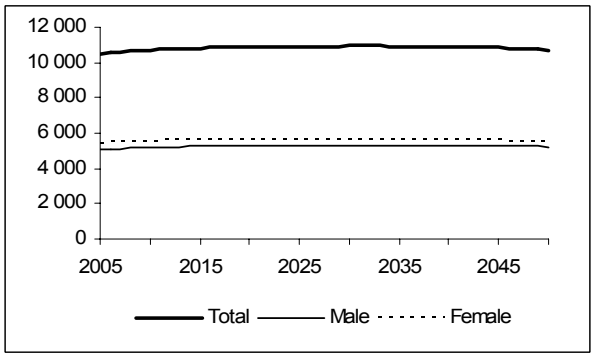
Shares of functional age groups, 2005–2050: percentages



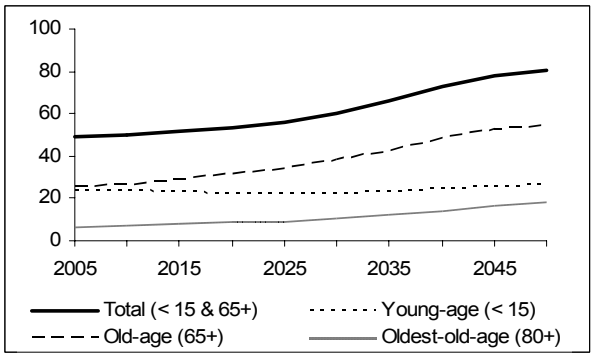
Group	2005	2010	2020	2030	2040	2050
0-5	5,7	5,7	5,6	4,9	4,9	5,3
6-11	6,7	5,8	5,8	5,4	5,0	5,3
12-15	5,4	4,4	3,9	3,9	3,5	3,5
16-18	4,5	3,9	2,8	3,0	2,8	2,6
19-23	8,6	7,3	5,1	5,0	5,0	4,5
24-34	17,2	18,5	15,2	11,4	11,6	11,2
35-44	13,0	13,4	17,0	14,5	10,9	11,2
45-64	26,0	27,9	26,9	30,1	32,2	26,6
65-79	10,4	9,9	13,9	17,0	16,4	21,7
80+	2,5	3,2	3,8	4,9	7,8	8,1

30. Portugal

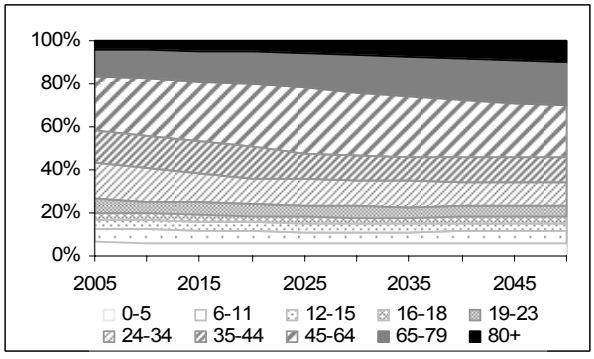
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



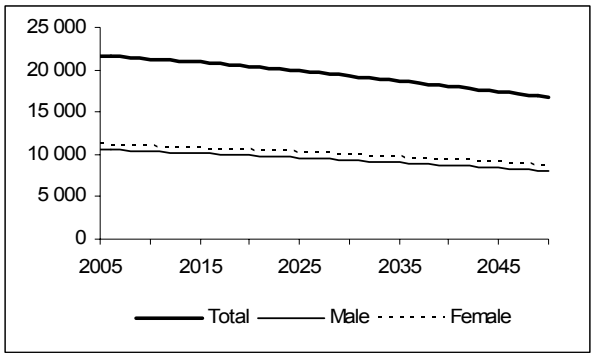
Shares of functional age groups, 2005–2050: percentages



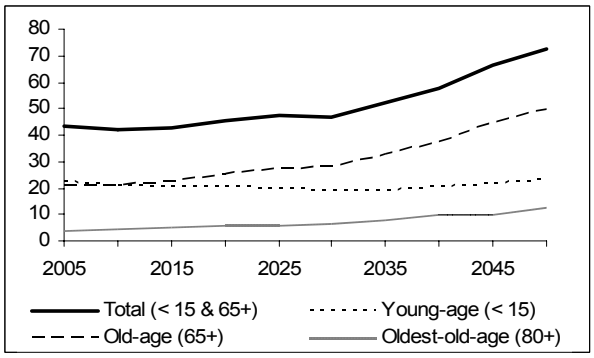
Group	2005	2010	2020	2030	2040	2050
0-5	6,4	6,1	5,5	5,5	5,8	5,6
6-11	6,3	6,3	5,8	5,4	5,7	5,8
12-15	4,2	4,2	4,1	3,8	3,8	4,0
16-18	3,3	3,2	3,2	3,0	2,8	3,0
19-23	6,5	5,5	5,5	5,2	4,9	5,0
24-34	16,8	15,2	12,0	12,0	11,4	11,0
35-44	14,6	15,1	14,3	11,3	11,4	11,1
45-64	24,8	26,5	29,2	29,8	26,4	24,3
65-79	13,3	13,4	15,0	17,6	19,7	20,3
80+	3,8	4,4	5,3	6,3	8,0	9,9

31. Romania

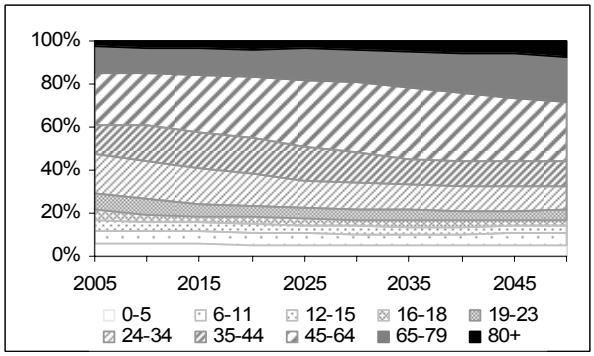
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



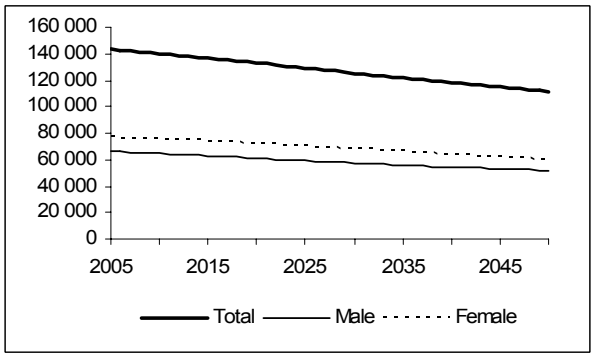
Shares of functional age groups, 2005–2050: percentages



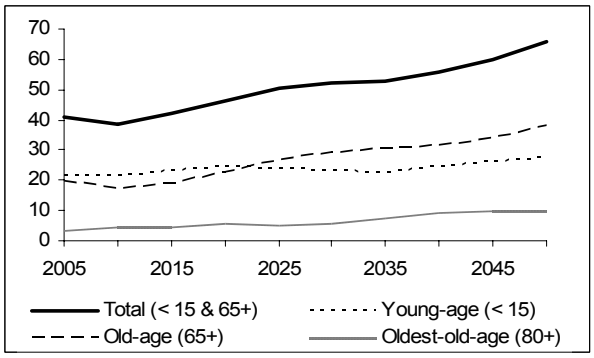
Group	2005	2010	2020	2030	2040	2050
0-5	5,8	5,7	5,3	4,9	5,1	5,3
6-11	6,1	6,0	5,7	5,2	5,1	5,4
12-15	4,9	4,2	4,0	3,8	3,5	3,6
16-18	4,9	3,3	3,1	3,0	2,7	2,7
19-23	7,5	7,7	5,2	5,1	4,8	4,6
24-34	18,0	17,7	15,1	11,9	11,6	11,0
35-44	13,7	16,1	16,5	14,6	11,4	11,3
45-64	24,3	24,7	28,0	32,6	32,0	27,4
65-79	12,4	11,8	13,2	14,8	17,9	21,5
80+	2,4	3,0	3,8	4,1	5,9	7,3

32. Russian Federation

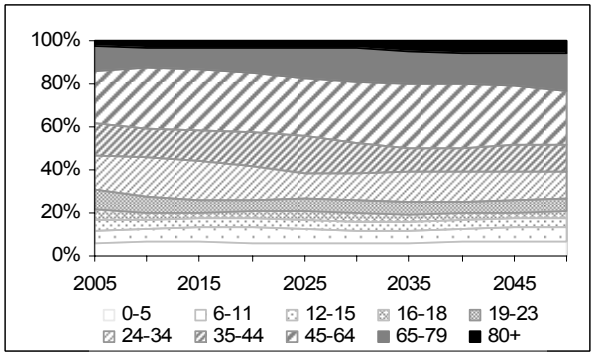
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



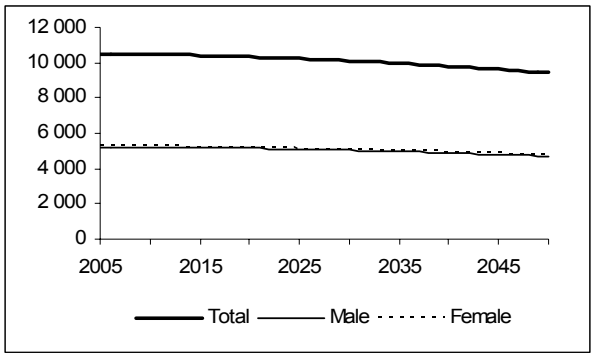
Shares of functional age groups, 2005–2050: percentages



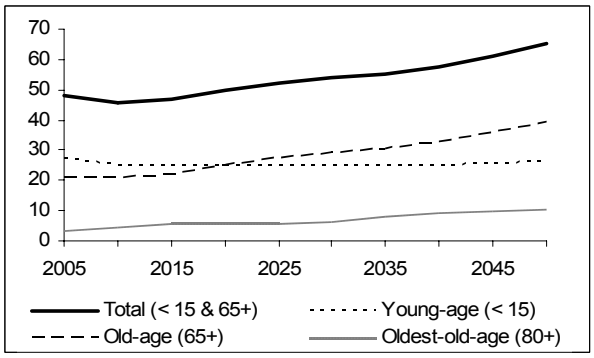
Group	2005	2010	2020	2030	2040	2050
0-5	6,0	6,6	6,2	5,7	6,4	6,4
6-11	5,7	5,9	6,9	6,1	6,1	6,8
12-15	5,1	3,9	4,6	4,5	4,0	4,5
16-18	5,2	3,4	3,2	3,6	3,1	3,3
19-23	8,7	8,1	4,9	6,2	5,7	5,3
24-34	16,4	18,0	15,6	12,0	13,9	12,7
35-44	14,4	13,5	16,0	14,7	11,0	13,0
45-64	24,8	28,0	27,3	28,0	29,6	25,0
65-79	11,6	9,6	11,7	15,7	14,6	17,1
80+	2,2	2,9	3,5	3,6	5,6	5,9

33. Serbia and Montenegro

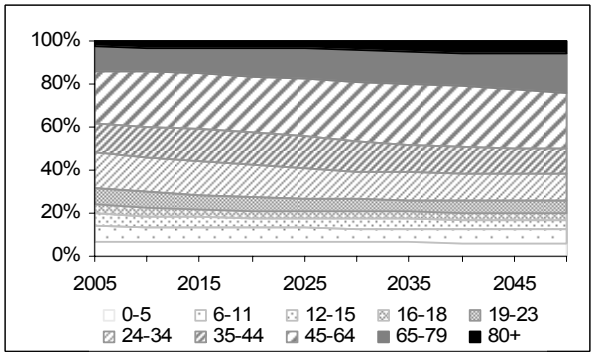
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



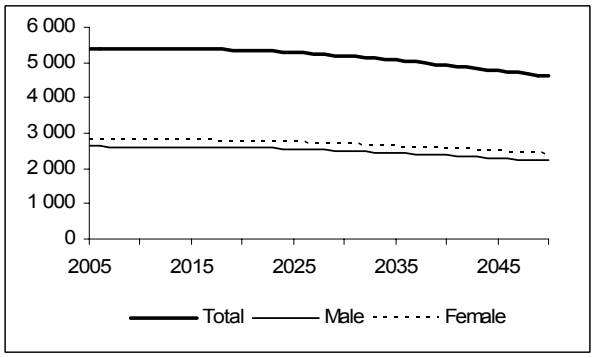
Shares of functional age groups, 2005–2050: percentages



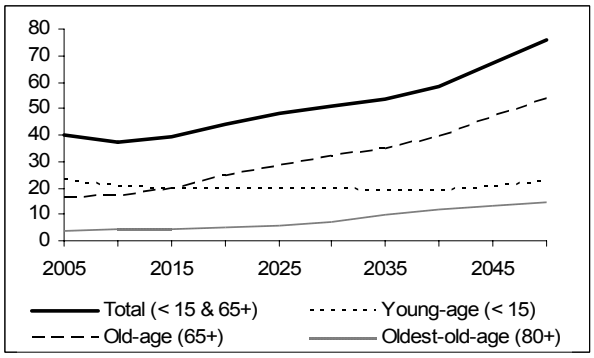
Group	2005	2010	2020	2030	2040	2050
0-5	7,0	6,7	6,6	6,3	6,2	6,1
6-11	7,3	7,0	6,6	6,5	6,4	6,3
12-15	5,4	4,9	4,5	4,4	4,3	4,3
16-18	4,4	3,9	3,5	3,3	3,3	3,3
19-23	7,6	7,2	5,9	5,7	5,6	5,5
24-34	16,2	16,6	15,1	13,1	12,6	12,6
35-44	13,5	13,8	15,1	14,0	12,1	11,8
45-64	24,5	25,8	25,9	27,9	28,6	26,1
65-79	11,9	11,1	13,1	14,8	15,3	17,6
80+	2,2	2,9	3,6	4,0	5,5	6,2

34. Slovak Republic

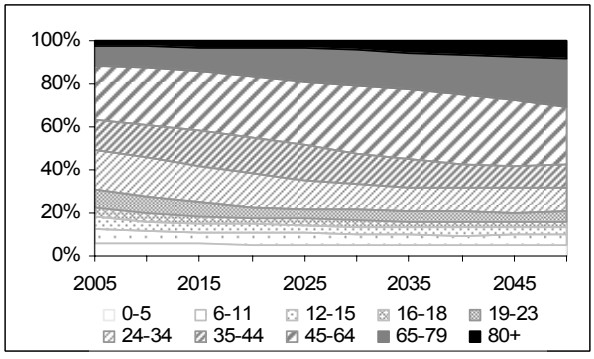
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



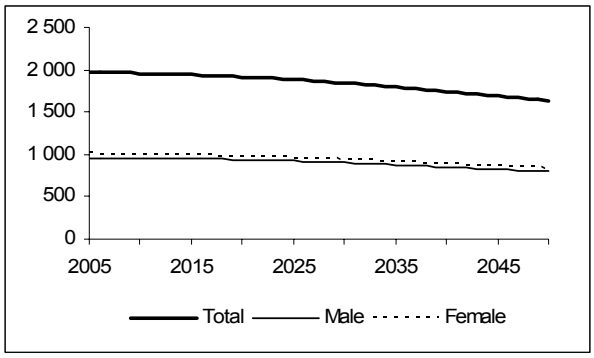
Shares of functional age groups, 2005–2050: percentages



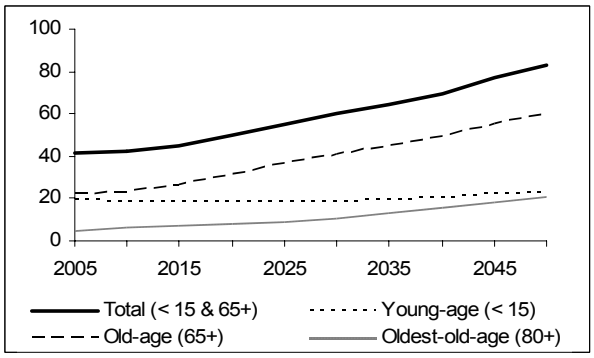
Group	2005	2010	2020	2030	2040	2050
0-5	5,8	5,6	5,4	4,8	4,7	5,1
6-11	6,9	5,8	5,6	5,2	4,8	5,1
12-15	5,5	4,5	3,8	3,7	3,4	3,4
16-18	4,5	4,0	2,8	2,9	2,7	2,6
19-23	8,1	7,4	5,2	4,9	4,8	4,4
24-34	18,4	18,6	15,4	11,5	11,2	10,9
35-44	13,9	14,6	17,0	14,7	11,1	10,9
45-64	25,1	27,0	28,0	31,3	32,6	27,3
65-79	9,3	9,6	13,4	16,5	17,7	22,2
80+	2,4	2,9	3,3	4,6	7,1	8,2

35. Slovenia

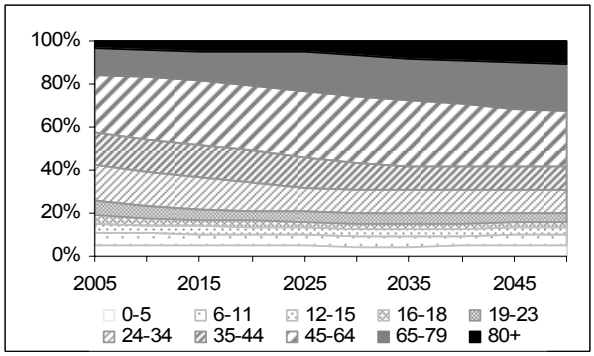
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



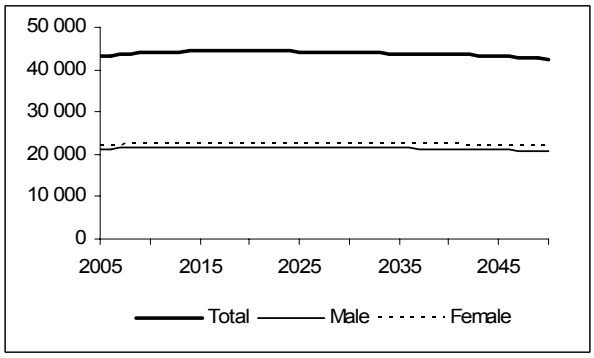
Shares of functional age groups, 2005–2050: percentages



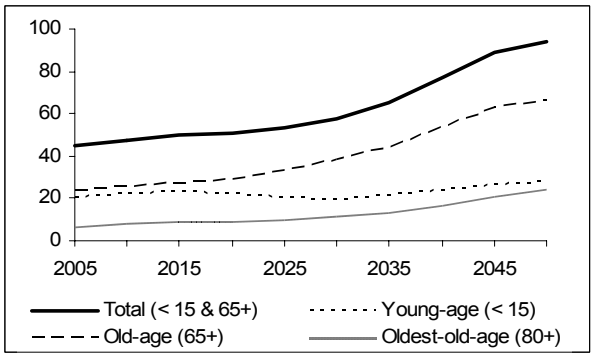
Group	2005	2010	2020	2030	2040	2050
0-5	5,3	5,2	4,9	4,5	4,7	5,0
6-11	5,6	5,3	5,2	4,8	4,7	5,1
12-15	4,2	3,8	3,5	3,4	3,2	3,3
16-18	3,7	3,0	2,7	2,7	2,6	2,5
19-23	6,9	6,1	4,7	4,7	4,5	4,3
24-34	16,6	16,2	12,9	11,0	11,0	10,7
35-44	15,1	14,9	15,4	12,5	10,8	11,0
45-64	27,1	29,3	29,9	30,8	29,4	25,2
65-79	12,5	12,4	15,7	19,2	20,0	21,9
80+	3,1	3,9	5,1	6,4	9,2	10,9

36. Spain

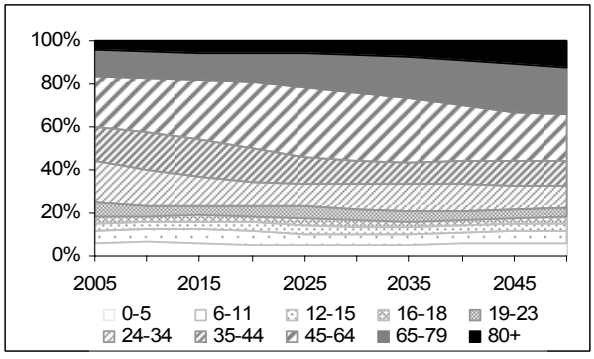
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



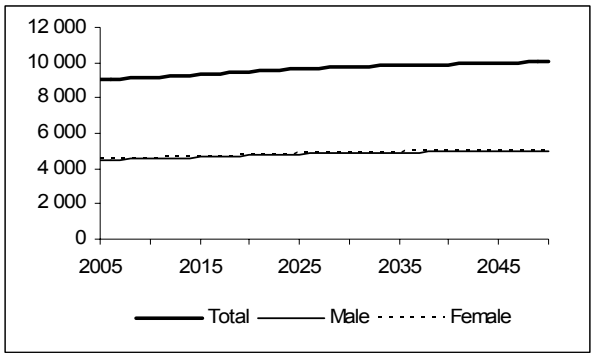
Shares of functional age groups, 2005–2050: percentages



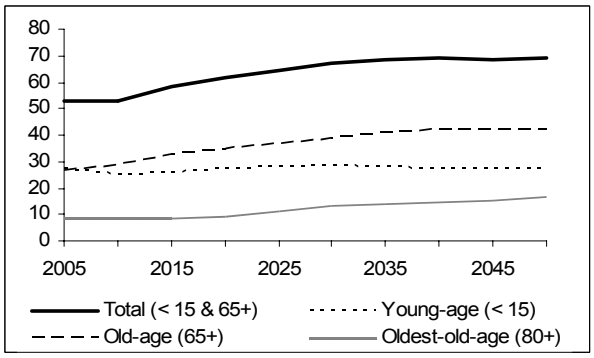
Group	2005	2010	2020	2030	2040	2050
0-5	6,1	6,3	5,3	4,9	5,6	5,5
6-11	5,5	5,9	6,1	5,0	5,2	5,9
12-15	3,7	3,6	4,2	3,7	3,3	3,8
16-18	3,1	2,7	3,1	3,0	2,5	2,7
19-23	6,4	5,1	4,7	5,4	4,5	4,4
24-34	19,2	16,7	11,1	11,4	12,0	10,4
35-44	16,0	17,1	15,6	10,5	10,7	11,6
45-64	23,4	25,5	30,7	32,1	26,0	21,6
65-79	12,3	12,0	13,5	17,2	21,2	21,8
80+	4,1	5,1	5,7	6,8	9,0	12,3

37. Sweden

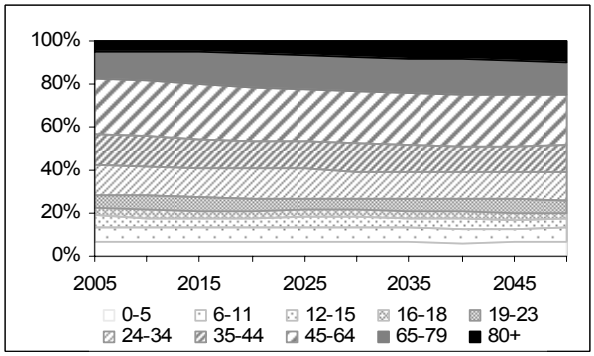
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



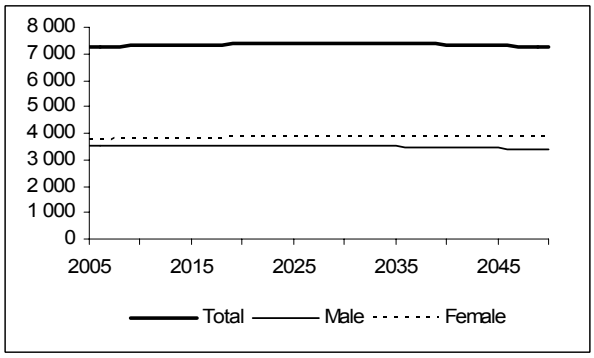
Shares of functional age groups, 2005–2050: percentages



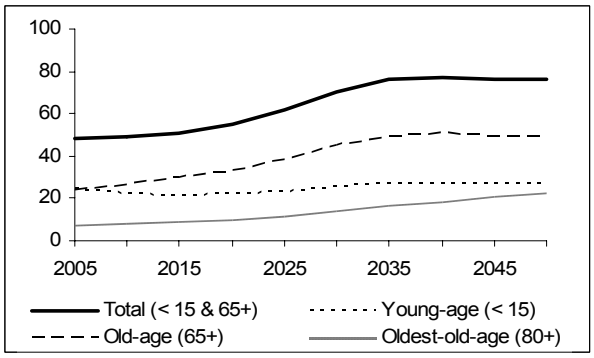
Group	2005	2010	2020	2030	2040	2050
0-5	6,4	6,5	6,9	6,6	6,2	6,5
6-11	6,9	6,4	6,6	7,0	6,5	6,4
12-15	5,5	4,5	4,3	4,6	4,5	4,3
16-18	3,9	4,2	3,3	3,3	3,5	3,2
19-23	5,9	6,7	5,3	5,5	6,0	5,6
24-34	14,0	13,3	14,8	12,3	12,8	13,5
35-44	14,1	13,9	12,0	13,5	11,4	11,8
45-64	26,0	26,0	25,5	24,1	24,3	23,9
65-79	11,9	13,2	15,8	15,4	16,2	15,1
80+	5,3	5,3	5,6	7,8	8,5	9,7

38. Switzerland

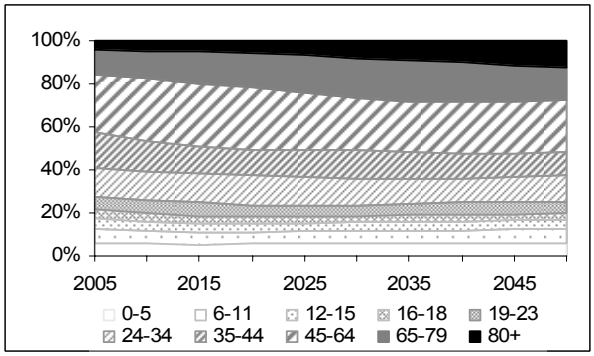
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



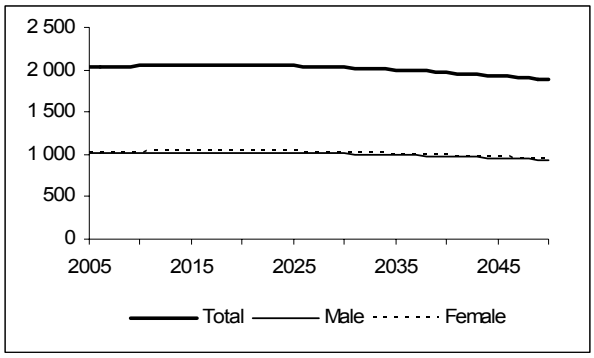
Shares of functional age groups, 2005–2050: percentages



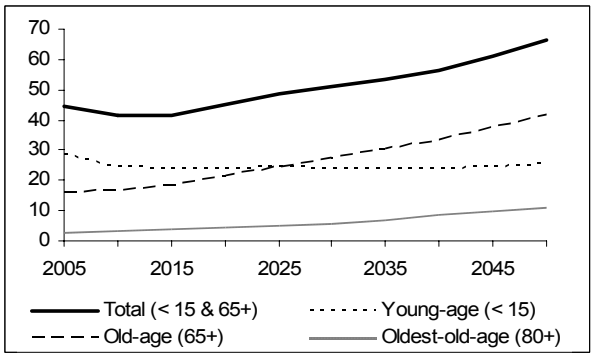
Group	2005	2010	2020	2030	2040	2050
0-5	5,9	5,5	5,7	6,0	5,9	6,2
6-11	6,9	6,1	5,5	6,0	6,1	6,2
12-15	4,9	4,6	3,8	3,9	4,2	4,2
16-18	3,6	3,7	3,0	2,8	3,2	3,2
19-23	5,9	6,1	5,7	4,8	5,2	5,5
24-34	13,6	13,1	13,9	12,4	11,3	12,4
35-44	16,5	14,4	11,9	12,8	11,7	10,7
45-64	26,9	28,6	28,9	24,8	23,9	24,0
65-79	11,5	12,9	15,6	18,2	18,2	15,2
80+	4,5	4,9	5,9	8,1	10,2	12,4

39. “The former Yugoslav Republic of Macedonia”

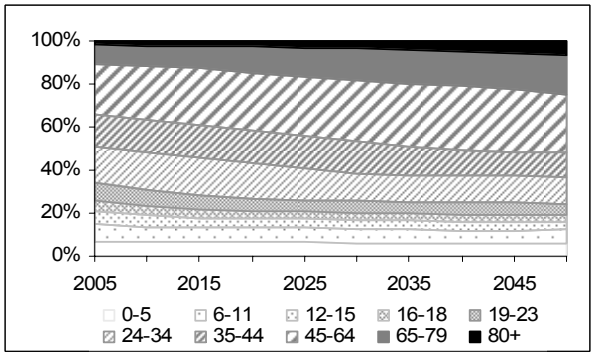
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



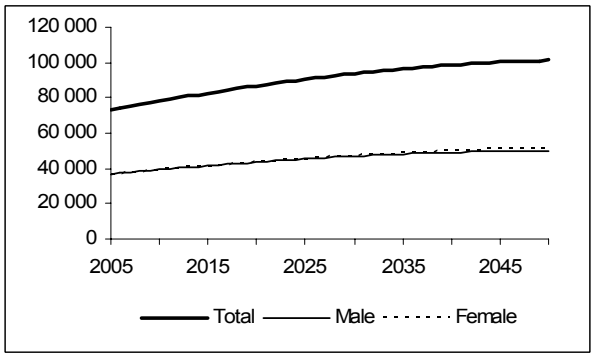
Shares of functional age groups, 2005–2050: percentages



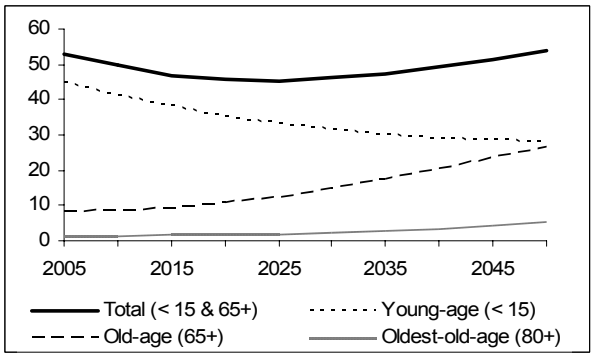
Group	2005	2010	2020	2030	2040	2050
0-5	7,0	6,6	6,6	6,1	6,0	6,0
6-11	8,0	7,0	6,6	6,4	6,0	6,1
12-15	6,2	5,3	4,3	4,4	4,1	4,1
16-18	4,7	4,5	3,3	3,3	3,2	3,0
19-23	8,1	7,7	6,0	5,3	5,6	5,2
24-34	17,2	17,5	16,2	12,9	12,3	12,4
35-44	14,6	14,6	15,6	14,9	12,0	11,4
45-64	23,3	25,0	26,8	28,7	29,8	26,8
65-79	9,4	9,8	11,8	14,5	16,0	18,3
80+	1,7	2,1	2,8	3,5	5,1	6,6

40. Turkey

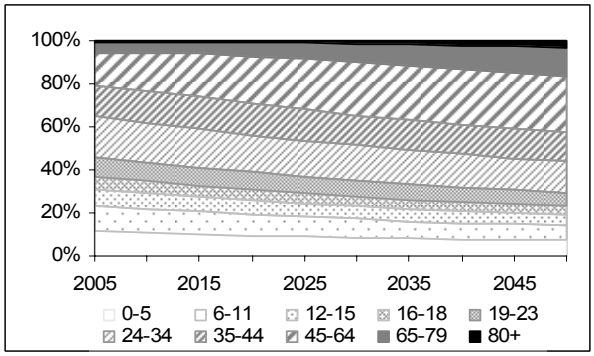
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



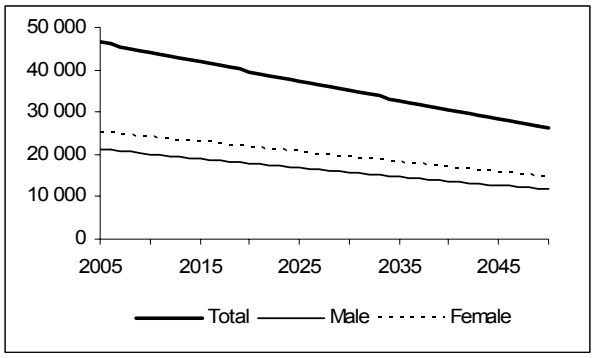
Shares of functional age groups, 2005–2050: percentages



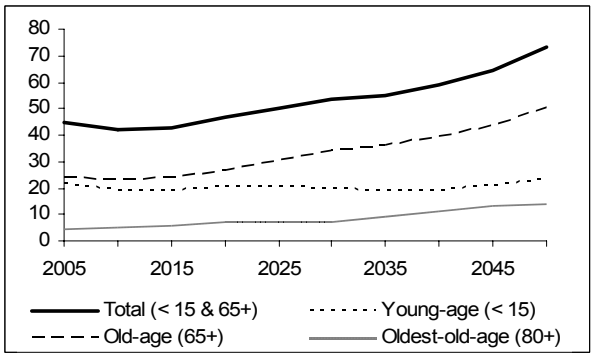
Group	2005	2010	2020	2030	2040	2050
0-5	11,8	11,0	9,5	8,5	7,6	7,1
6-11	11,7	11,1	9,7	8,7	7,8	7,3
12-15	7,5	7,3	6,6	5,9	5,4	4,9
16-18	5,4	5,3	4,9	4,4	4,1	3,8
19-23	9,3	8,5	8,3	7,5	6,9	6,4
24-34	19,2	18,8	17,0	16,5	15,4	14,5
35-44	13,8	14,4	15,1	14,0	14,1	13,5
45-64	15,8	17,9	21,7	24,5	25,2	25,5
65-79	4,9	4,9	6,2	8,8	11,4	13,7
80+	0,6	0,8	1,0	1,3	2,2	3,4

41. Ukraine

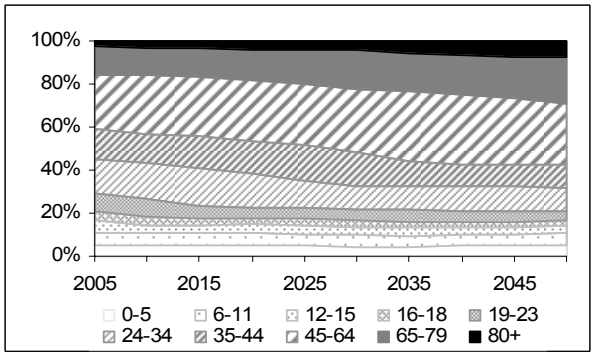
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



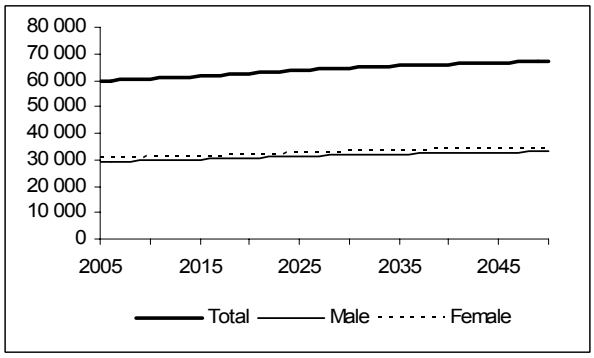
Shares of functional age groups, 2005–2050: percentages



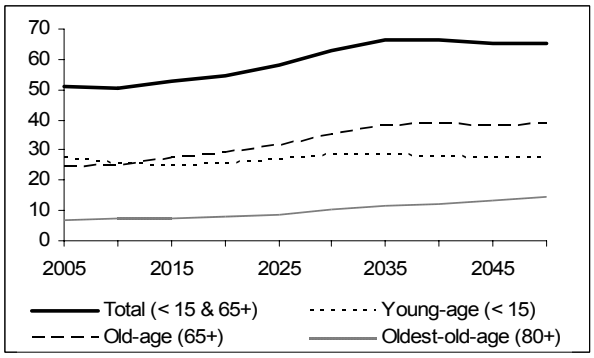
Group	2005	2010	2020	2030	2040	2050
0-5	5,0	5,3	5,2	4,6	4,8	5,1
6-11	5,9	5,2	5,7	5,2	4,8	5,4
12-15	5,4	4,1	3,8	3,9	3,4	3,6
16-18	4,9	3,9	2,8	3,1	2,8	2,7
19-23	7,9	8,0	4,8	5,1	5,0	4,5
24-34	15,7	16,7	16,1	10,7	11,4	10,8
35-44	14,0	13,5	15,3	15,6	9,9	10,8
45-64	25,0	27,3	28,3	29,6	33,0	28,1
65-79	13,5	12,6	13,5	17,7	18,0	21,3
80+	2,7	3,6	4,5	4,6	6,8	7,9

42. United Kingdom

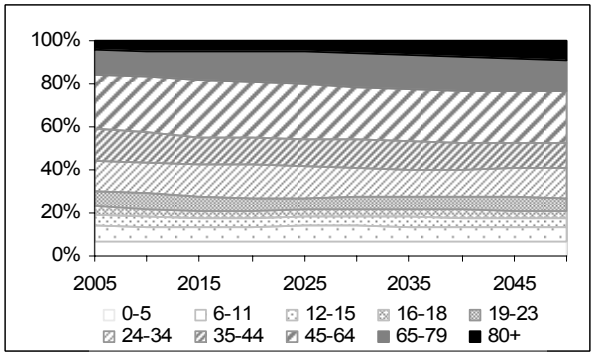
Population size, 2005–2050



Dependency ratios (to pop. 15–64, %), 2005–2050



Shares of functional age groups, 2005–2050: percentages



Group	2005	2010	2020	2030	2040	2050
0-5	6,8	6,5	6,9	7,0	6,5	6,7
6-11	7,3	6,8	6,4	7,0	6,7	6,5
12-15	5,2	4,8	4,3	4,4	4,7	4,4
16-18	4,1	3,9	3,4	3,3	3,6	3,4
19-23	6,5	6,9	6,1	5,6	6,0	6,0
24-34	14,1	14,1	15,1	13,5	12,9	13,8
35-44	15,4	14,1	12,4	13,5	12,2	11,6
45-64	24,8	26,4	26,6	24,4	24,3	24,4
65-79	11,5	11,9	13,9	15,2	16,0	14,4
80+	4,4	4,6	4,9	6,2	7,2	8,8

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