II. POPULATION AGE COMPOSITION

The age composition of a population is important for several reasons. The proportions of children and older persons have much to do with the balance of national expenditures on schools, childcare, immunization and reproductive health, as against expenditures on old-age social security systems and health care for chronic and degenerative disease. The ratio of the population aged 65 and over to the working-age population is a fundamental consideration in the design of public pension arrangements, and the ratio has its micro-level expression in the age structure of the family, affecting the possibilities for private care of children and older persons. Political clout may also be linked to relative population proportions (Preston, 1984). Moreover, as was noted in chapter I, age structure alters the way in which the forces of fertility and mortality are expressed in rates of population growth.

In 2005 the more developed regions, least developed countries, and other less developed countries present the distinctive age profiles so often seen in the pages of demographic textbooks (figure II.1). The legacy of high fertility is clearly evident in the pyramid for the least developed countries, whose wide base testifies to the relatively high crude birth rates found in those countries.[1] Suggestions of recent fertility decline are apparent in the pyramid for the other less developed countries, which is drawn in at the base compared to that of the least developed countries. Note, too, that at the top of the age pyramid for the other less developed countries, there are somewhat more women than men. This feature is more pronounced in the population pyramid for the more developed regions, in which women clearly outnumber men at older ages, mainly a consequence of better overall survival among females (see chapter IV for more details). Also notable is the relative evenness of population proportions across age groups in the more developed regions, indicating steadier fertility levels coupled with higher survival probabilities to all ages. The smaller size of the more recent birth cohorts reflects decreasing fertility rates.

These pyramids are point-in-time snapshots of age distribution. Past levels and trends of fertility, mortality, and migration shape their contours. Reading the stories that age structures tell requires an exploration of their evolution over time.

A. THE MEASUREMENT AND EVOLUTION OF AGE STRUCTURES

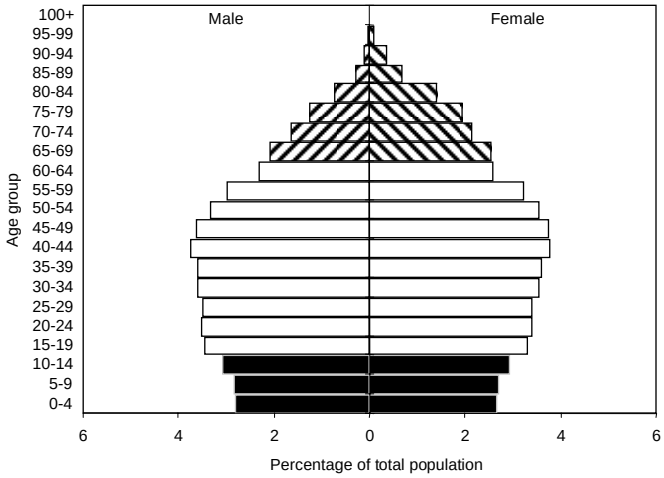
The estimated and projected changes in age structure can be assessed in two related ways: by examining the proportions of the total population in different age groups and by comparing the sizes of the different age groups. Special attention is usually given to the population aged under 15, 15-64, and 65 and over (table II.1, figure II.2).

The more developed regions show much higher proportions of older persons than the two groups of countries from the less developed regions. Furthermore, the percentage of people aged 65 and over is expected to increase in the more developed regions, rising from 15.3 per cent in the year 2005 to 25.9 per cent by 2050. Meanwhile, the proportion of children and youth under 15 in these regions will decrease slightly, from 17.0 per cent in 2005 to 15.6 per cent by 2050. In the less developed regions, qualitatively similar changes are underway, but the relative sizes of the three age groups are quite different from their sizes in more developed regions. For example, the proportion of older persons in the least developed countries is expected to rise between 2005 and 2050, but only from 3.2 per cent to 6.6 per cent, according to the medium variant. A larger change expected in these countries is a sharp decline in the proportion of children and youth under 15 years of age, which will fall from 41.8 per cent in 2005 to 28.9 per cent in 2050. Consequently the proportion of 15-64 will rise from 55.0 per cent to 64.5 per cent in the same period.

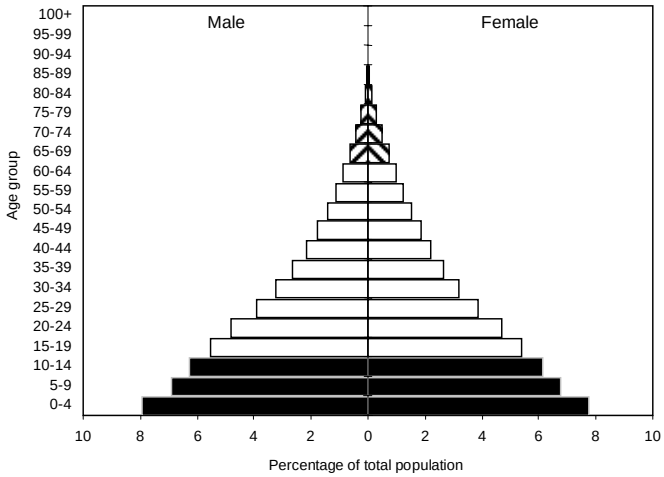
The major change anticipated for the more developed regions is thus, in effect, a transfer of population from the working ages to ages 65 and over. To express the changes differently, the

Figure II.1. Population pyramids, by development group, 2005

A. More developed regions



B. Least developed countries



C. Other less developed countries

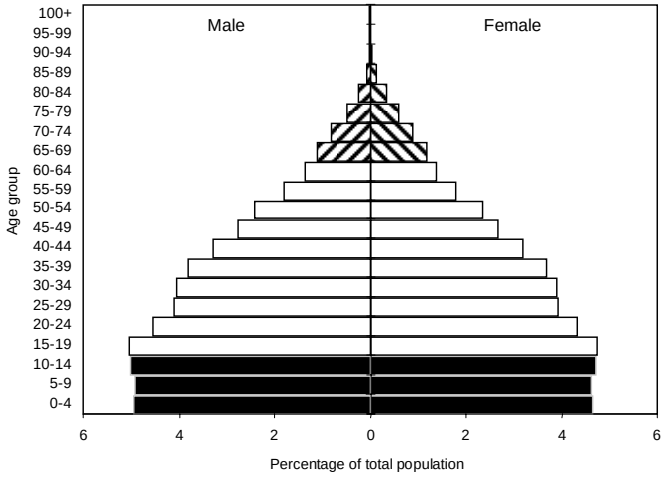


TABLE II.1. AGE COMPOSITION AND DEPENDENCY RATIO, BY DEVELOPMENT GROUP AND MAJOR AREA, ESTIMATES AND MEDIUM VARIANT, 2005 AND 2050

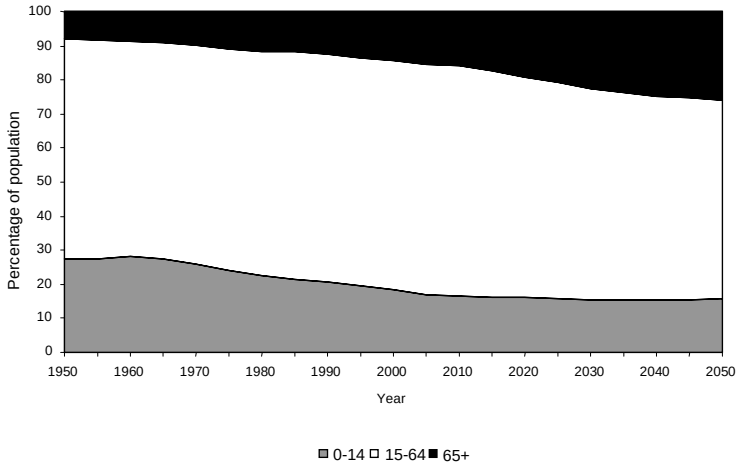
Development group or major area	Population (thousands)			Percentage			Dependency ratio (per 100)		
	0-14	15-64	65+	0-14	15-64	65+	Total	Child	Old-age
				A. 2005					
World	1 821 044	4 167 986	475 719	28.2	64.5	7.4	55.1	43.7	11.4
More developed regions	205 871	820 348	185 046	17.0	67.7	15.3	47.7	25.1	22.6
Less developed regions	1 615 173	3 347 638	290 673	30.7	63.7	5.5	56.9	48.2	8.7
Least developed countries	317 290	417 597	24 502	41.8	55.0	3.2	81.8	76.0	5.9
Other less developed countries	1 297 884	2 930 041	266 171	28.9	65.2	5.9	53.4	44.3	9.1
Africa	375 578	499 590	30 767	41.5	55.1	3.4	81.3	75.2	6.2
Asia	1 085 986	2 568 786	250 644	27.8	65.8	6.4	52.0	42.3	9.8
Europe	115 473	497 154	115 762	15.9	68.3	15.9	46.5	23.2	23.3
Latin America and the Caribbean	168 147	358 934	34 265	30.0	63.9	6.1	56.4	46.8	9.5
Northern America	67 653	221 993	40 961	20.5	67.1	12.4	48.9	30.5	18.5
Oceania	8 207	21 529	3 319	24.8	65.1	10.0	53.5	38.1	15.4
				B. 2050					
World	1 832 572	5 778 393	1 464 938	20.2	63.7	16.1	57.1	31.7	25.4
More developed regions	193 420	722 042	320 738	15.6	58.4	25.9	71.2	26.8	44.4
Less developed regions	1 639 152	5 056 350	1 144 200	20.9	64.5	14.6	55.0	32.4	22.6
Least developed countries	502 294	1 118 934	114 139	28.9	64.5	6.6	55.1	44.9	10.2
Other less developed countries	1 136 858	3 937 416	1 030 060	18.6	64.5	16.9	55.0	28.9	26.2
Africa	555 663	1 252 474	128 815	28.7	64.7	6.7	54.7	44.4	10.3
Asia	953 891	3 352 796	910 515	18.3	64.3	17.5	55.6	28.5	27.2
Europe	98 111	375 078	180 134	15.0	57.4	27.6	74.2	26.2	48.0
Latin America and the Caribbean	141 403	497 783	143 717	18.1	63.6	18.4	57.3	28.4	28.9
Northern America	74 951	270 437	92 563	17.1	61.8	21.1	61.9	27.7	34.2
Oceania	8 554	29 825	9 194	18.0	62.7	19.3	59.5	28.7	30.8

old-age dependency ratio (the ratio of population aged 65 and over to the population aged 15-64, expressed per 100) will almost double, increasing from 22.6 persons aged 65 and over per 100 persons of working age in 2005 to an expected value of 44.4 in 2050. In Europe, the situation is even more extreme, as the ratio is expected to more than double, reaching 48.0 in 2050. In other words, about two persons of working age will need to support one retiree. The European Economic Advisory Group (2005) has come to the conclusion that, under current conditions and taking into account the projected old-age dependency ratios in several European countries, most pay-as-you-go pension systems in Europe are not sustainable. The old-age dependency ratio, however, is purely a demographic measure of age structure, and it should be used with caution; evidence suggests, for example, that older persons in many societies provide support to their adult children (Morgan, Schuster and Butler, 1991; Saad, 2001).

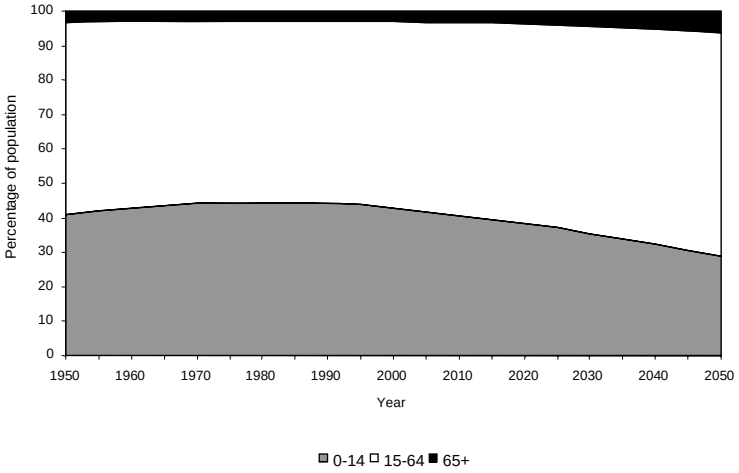
The old-age dependency ratio is expected to increase even more rapidly in the other less developed countries, more than doubling from 9.1 in 2005 to 26.2 in 2050. Because many of the world's most populous nations are in the other less developed countries category, such percentage changes imply large changes in absolute numbers of the older persons. According to these projections, the less developed regions as a whole will achieve by mid-century an age structure similar to that of today's more developed regions.

Figure II.2. Percentage of population aged 0-14, 15–64 and 65 and over, by development group, estimates and medium variant, 1950–2050

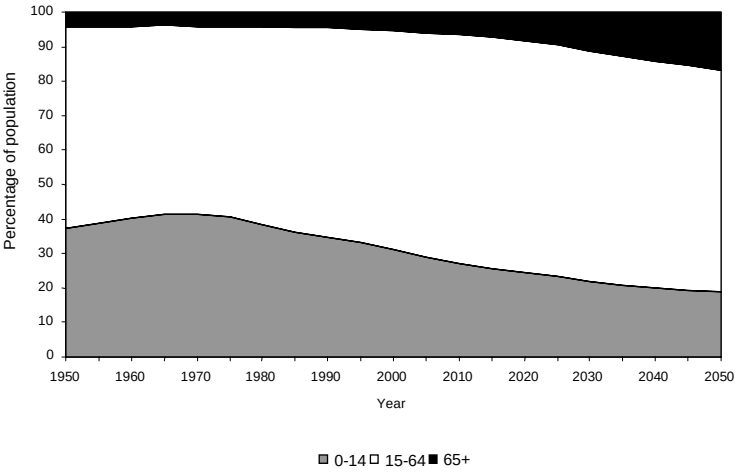
A. More developed regions



B. Least developed countries



C. Other less developed countries



In the least developed countries, the child dependency ratio (the ratio of population aged 0-14 to the population aged 15-64, expressed per 100) is projected to decline substantially, from 76.0 youth per 100 people of working age in 2005 to 44.9 in 2050. In the other less developed countries, the ratio will fall from 44.3 to 28.9 over the period 2005–2050. In the more developed regions, the child dependency ratio will rise slightly during the projection period, from 25.1 to 26.8.

A related measure of dependency and potential social support needs is the total dependency ratio, defined as the ratio of the sum of the population aged 0-14 and the population aged 65 and over to the population aged 15-64 (per 100). The total dependency ratio is based on the notion that persons under 15 and those 65 and over are likely to be in some sense dependent on the population in the working ages of 15-64 (United Nations, 2002). Those in the working ages are assumed to provide direct or indirect support to those in the dependent ages (Kinsella and Gist, 1995).

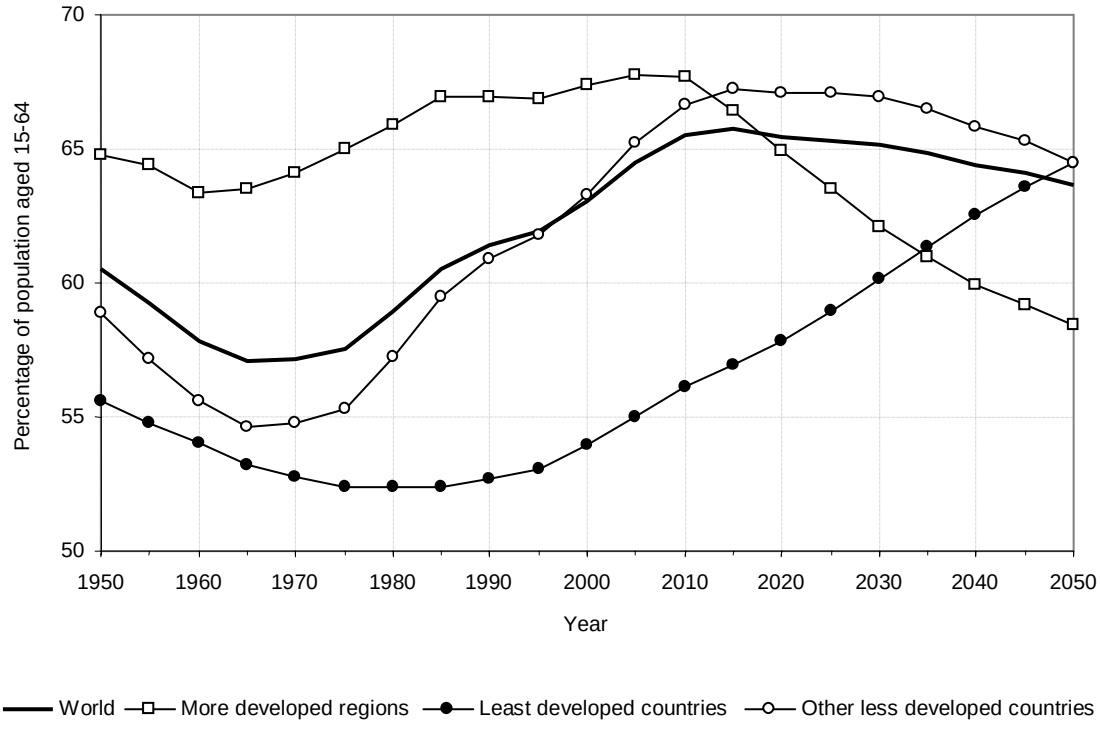
At the world level, the total dependency ratio is not projected to change significantly between 2005 and 2050, increasing only from 55.1 to 57.1. This weak trend, however, is the product of distinct and compensating changes in different regions and areas. The total dependency ratio of the more developed regions is projected to increase substantially between 2005 and 2050, from 47.7 persons in the dependent ages per 100 persons of working age to 71.2, while that of the least developed countries should decline, from 81.8 to 55.1. These respective regional trends are largely influenced by trends in Europe and Africa. In both cases, the trends are strongly determined by transfers of large cohorts from younger to older age groups. In the case of Africa, the main shifts are expected to occur between cohorts of children and youth that will be entering adulthood, while in Europe large cohorts of working-age adults will be entering old age. Among the major areas, Africa currently has the highest dependency ratio in the world (81.3), while Europe has the lowest (46.5). It is anticipated that by 2050, these two major areas will be trading positions, giving an edge to Africa with respect to the demographic bonus premise (see below).

Changes in population age structure have important effects on economic performance, as reflected in measures such as the level of national income per capita and its rate of growth. Income per capita for the total population will grow if income per capita for the working ages grows or if the per cent of the population in the working ages grows. Thus, if other things are held constant, changes in population age structure translate into changes in the growth rate of income per capita.

Over the coming decade or so, the less developed regions will be experiencing increases in their working-age proportions (figure II.3), and, by the compositional argument given above, as that proportion rises, economic growth rates will be pushed upwards[2]. Some authors describe such a period of rising working-age proportions as a demographic bonus period (e.g., Bloom, Canning and Malaney, 2000), during which compositional changes in population temporarily boost levels of income per capita and rates of economic growth. As is evident in the figure, the bonus period is expected to last through the end of the projection period in the least developed countries, but for the other less developed countries, the working-age proportion will level off and then begin to turn down beginning about 2035. In the more developed regions, the working-age proportion is expected to begin its descent soon.

The demographic bonus is produced by a particular sequence of declines in mortality and fertility rates (Bloom and Williamson, 1998; Bloom, Canning and Malaney, 2000). Declines in the early stages of the mortality transition in a population tend to be concentrated in the younger ages, generating larger-than-typical cohorts of young adult survivors. Declines in fertility, generally subsequent to the initial declines in mortality, have their age distribution effects entirely at age zero. The two factors work together to produce a bulge in the age distribution, concentrated at the younger ages. Over time the bulge moves upward through the age distribution, increasing the proportion of the working age population and lowering the total dependency ratio. Typically, a population going through the demographic transition experiences a period of growth, as mortality decline outpaces fertility

Figure II.3. Percentage of population aged 15–64, by development group, estimates and medium variant, 1950–2050



decline. Because of the process just described, the population also goes through a period of lower than normal total dependency. As the demographic transition slows, fertilily decline abates and may eventually reverse (as projected in this report), ending the era of increasingly smaller cohorts that contributed to the bulge. In addition, mortality rates decline at the older ages, increasing the proportion of older persons and reducing the share of population in the working ages. This phenomenon has already appeared in the more developed regions and is well advanced in some countries. In short, the appearance and subsequent disappearance of the demographic bonus is attributable to a sequence of transitions in fertility and mortality.

B. POPULATION AGEING

A primary demographic consequence of fertility decline, especially if combined with increases in life expectancy, is population ageing (box II.1). In 1950, just over 5 per cent of the world population was aged 65 and over. By 2005 that proportion had risen to more than 7 per cent, and it is expected to more than double over the next 45 years, reaching 16.1 per cent in 2050. Globally, the number of persons aged 65 and over will more than triple in size, increasing from 476 million in 2005 to almost 1.5 billion by 2050.

The world's major areas will each participate in the trend toward population ageing but at widely differing levels (figure II.4). Europe will have the highest share of older persons in its populations in 2050, as it does today, while Africa will continue to exhibit the lowest share, owing to its legacy of relatively high fertility and the prospects that, for many African countries, fertility will remain above replacement even at the end of the projection period. The sharpest increases in the proportion of the population aged 65 and over are expected to take place in Latin America and the Caribbean and in Asia, with percentages rising from about 6 per cent in 2005 to about 18 per cent in 2050 in both cases.

As population ageing continues to take place around the world, it becomes increasingly important to differentiate among the age groups of older people. The age group 65 and over can be distrib-

BOX II.1. DEMOGRAPHIC CHANGES AND AGE STRUCTURE

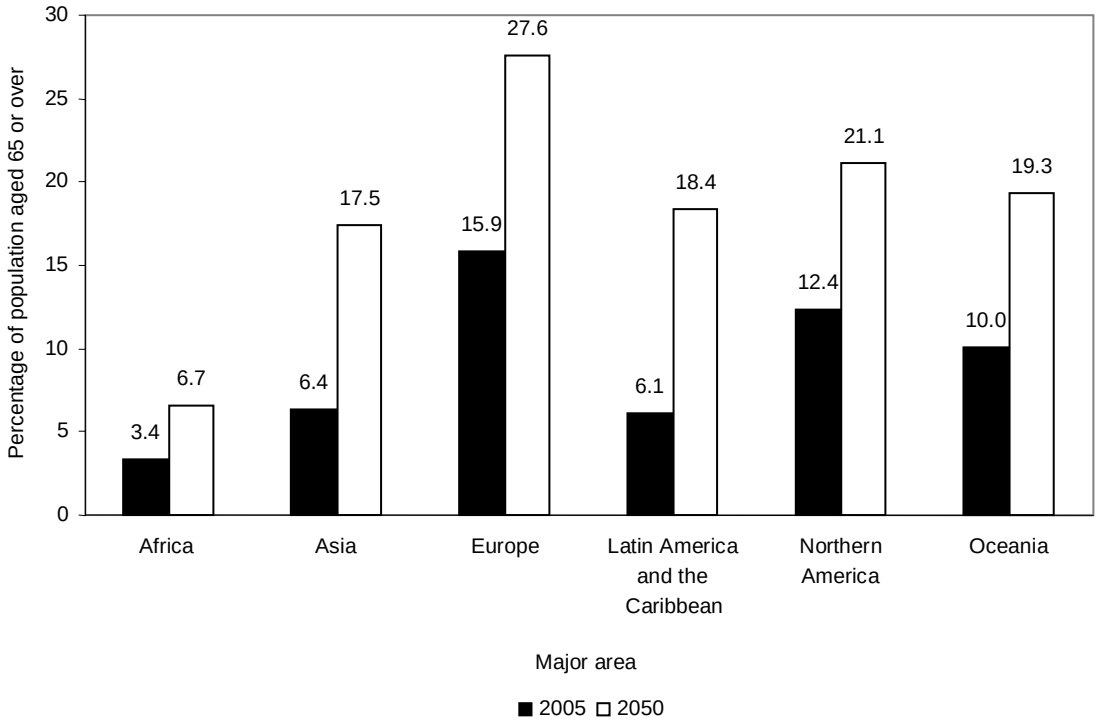
Changes in population growth rate, size and age structure are intrinsically related to changes in migration, fertility and mortality.

International migration has a comparatively weak influence on the overall population growth of a given country, though in some cases it does exert important effects on age structure.

Fertility declines have the effect of reducing the proportion of children and, on balance, raising the proportion of adults and older persons. Thus fertility decline is often associated with population ageing.

Mortality The influence of mortality decline is more complex and is dependent on the stage of mortality transition. The initial stage of mortality decline is one in which mortality risks in infancy and childhood tend to fall more, in proportional terms, than do risks for working-age adults and older persons. Declines in risk of dying at ages 0-5 exert an influence much like that of fertility increases: they tend to raise the population rate of growth and increase the proportion of children in the population. In this way, the initial stages of mortality decline have the seemingly paradoxical effect of making the population as a whole, grow younger, even as the probabilities of survival to the middle and older ages increase. Later, as levels of life expectancy approach and surpass 70 years, the continuation of mortality decline increasingly takes the form of reductions in mortality risks for older people. These changes tend to increase the proportion of older persons in the population as a whole.

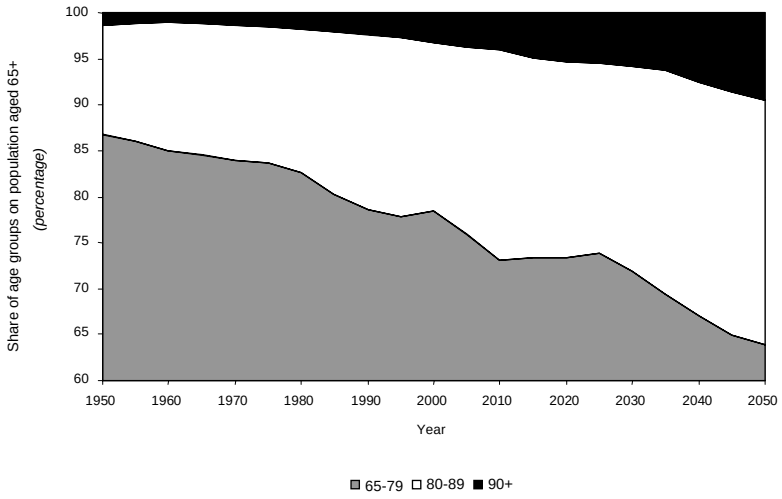
Figure II.4. Percentage of population aged 65 and over, by major area, estimates and medium variant, 2005 and 2050



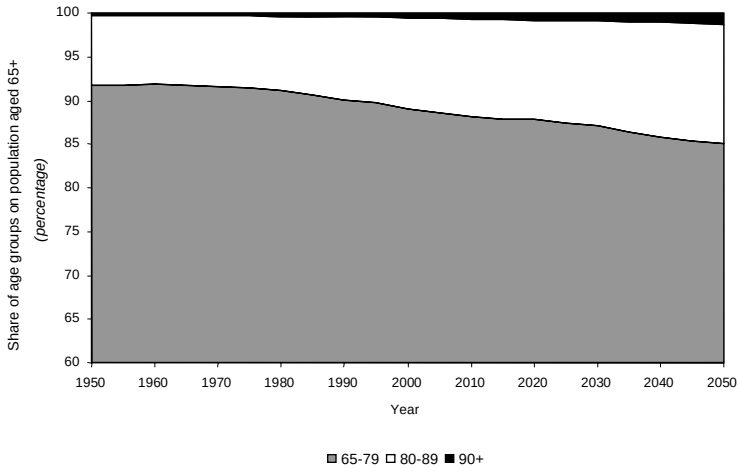
uted among three age sub-groups: 65–79, 80–89, and 90 and over (figure II.5). In many ways, the patterns seen in the age distribution of the senior populations across development groups closely resemble those seen in the age structures of populations as a whole.

Figure II.5. Age composition of people aged 65 and over, by development group, estimates and medium variant, 1950–2050

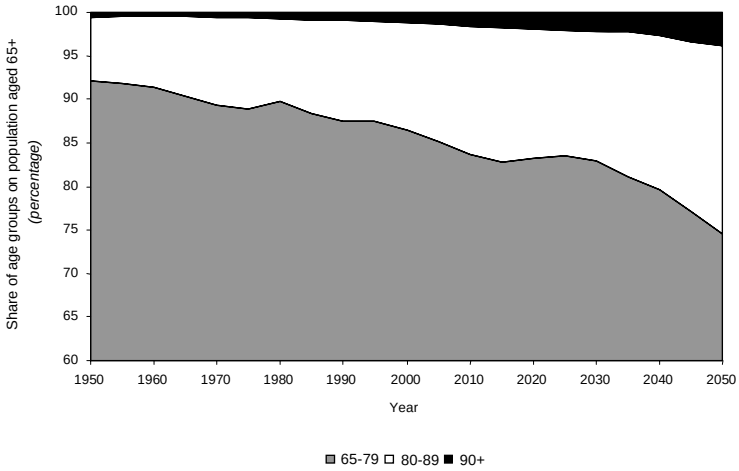
A. More developed regions



B. Least developed countries



C. Other less developed countries



In the more developed regions, for instance, the percentage of all persons aged 65 and over who are aged 90 and over is expected to increase by a factor of 2.5, rising from almost 4 per cent to over 9 per cent between 2005 and 2050, while the percentage of the youngest-old, aged 65 to 79, declines from 76 to 64 per cent and the percentage of those aged 80–89 is expected to increase from 20 to 27 per cent. Such changes in the age composition of the older population have profound implications for the distribution of health care expenditures, among other things.

Similar trends are expected to characterize the older populations of the least developed and other less developed countries, but for these regions the prospects for old-age survival are not expected to permit the percentage of those 90 and over to reach the levels anticipated for more developed regions. In the least developed countries, only slightly more than 1 per cent of all older persons are expected to be aged 90 and over by 2050, and among the other less developed countries, just under 4 per cent. Nevertheless, in the case of the other developed countries, which includes China, this would imply that the proportion of persons aged 90 and over would almost triple between 2005 and 2050 (China's proportion of persons aged 90 and over is expected to almost quadruple during that same period). Hence, although the trends stemming from improving old-age survivorship are similar across the three regions, important differences in the age composition of the older population are expected to persist.

This discussion may be summarized by reference to the median age of populations (table II.2). (The median age is the age at which 50 per cent of the population is older and 50 per cent is younger.) Increases in the median age capture, in a single number, the ageing process of a population. In 1950, the median age of the more developed regions was only 29.0 years, but is projected to rise to more than 45 years by 2050. In the least developed countries, where higher fertility rates generally prevail, the median age in 1950 was just under 20 years, and, although increases in the median age are expected over the coming years, even by the end of the projection period the median age is not likely to attain 30 years. The other less developed countries, by contrast, which in 1950 had a median age only slightly above that of the least developed countries, are expected to attain a median age of over 39 years by the end of the projection.

The differentials are even more pronounced across major areas, with Africa maintaining a median age below 20 years in both 1950 and 2005 and below 30 years in 2050, while Europe, which has already reached a median age of 39.0 years in 2005, is expected to increase to 47.1 years in 2050. At the intermediate level, Northern America and Oceania have followed similar patterns, with

TABLE II.2. MEDIAN AGE, BY DEVELOPMENT GROUP AND MAJOR AREA, ESTIMATES AND MEDIUM VARIANT, 1950–2050

	Median age (years)		
Development group or major area	*1950*	*2005*	*2050*
World	23.9	28.1	37.8
More developed regions	29.0	38.6	45.5
Less developed regions	21.4	25.6	36.6
Least developed countries	19.6	18.9	27.3
Other less developed countries	21.7	26.8	39.3
Africa	19.0	18.9	27.4
Asia	22.0	27.7	39.9
Europe	29.7	39.0	47.1
Latin America and the Caribbean	20.2	25.9	39.9
Northern America	29.8	36.3	41.5
Oceania	28.0	32.3	40.5

median ages rising from just under 30 years in 1950 to just above 40 years in 2050. The most extreme changes in median ages are seen in Latin America and the Caribbean and in Asia, where estimated median ages in 1950 (respectively 20.2 and 22.0 years) are expected to almost double by 2050, reaching about 40 years. The median age in these two major areas is thus expected to increase from levels similar to that of Africa in 1950 to levels close to those of Northern America and Oceania in 2050.

In 2005, 11 countries were estimated to have a median age above 40 years, all of them belonging to the more developed regions. In 2050, 89 countries are projected to have a median age above 40 years, and about half of them will be from the less developed regions. Seventeen countries are expected to have a median age above 50 years in 2050. That is, population ageing, which is a pervasive reality in developed countries, is expected to become common in the developing world as well, and it will occur over a shorter time span than in developed countries.

Among the ten countries with the oldest populations in the world in 2005, all are in Europe except for Japan, which has the highest estimated median age (42.9 years; table II.3). By 2050, five of the top six countries with the oldest populations are expected to be non-European (Macao, China SAR; the Republic of Korea; Martinique; Japan and Singapore). The median age is expected to be above 50 years in all top ten oldest countries. All of the countries with very high median ages have low fertility and mortality levels.

TABLE II.3. TEN COUNTRIES AND AREAS WITH THE OLDEST AND TEN COUNTRIES AND AREAS WITH THE YOUNGEST POPULATIONS, ESTIMATES AND MEDIUM VARIANT, 2005 AND 2050

	2005			*2050*	
	Country or area[a]	*Median age (years)*		*Country or area*[a]	*Median age (years)*
		A. Oldest population			
1	Japan	42.9	1	Macao, China SAR	54.4
2	Italy	42.3	2	Republic of Korea	53.9
3	Germany	42.1	3	Martinique	53.0
4	Finland	40.9	4	Italy	52.5
5	Switzerland	40.8	5	Japan	52.3
6	Belgium	40.6	6	Singapore	52.1
7	Croatia	40.6	7	Slovenia	51.9
8	Austria	40.6	8	Ukraine	51.9
9	Bulgaria	40.6	9	Slovakia	51.8
10	Slovenia	40.2	10	Lithuania	51.7
		B. Youngest population			
1	Uganda	14.8	1	Burundi	20.3
2	Niger	15.5	2	Uganda	20.5
3	Mali	15.8	3	Liberia	20.9
4	Guinea-Bissau	16.2	4	Chad	21.0
5	Burkina Faso	16.2	5	Niger	21.5
6	Dem. Republic of the Congo	16.3	6	Guinea-Bissau	21.5
7	Malawi	16.3	7	Equatorial Guinea	21.8
8	Chad	16.3	8	Congo	21.9
9	Congo	16.3	9	Dem. Republic of the Congo	22.1
10	Liberia	16.3	10	Angola	22.9
	WORLD	28.1		WORLD	37.8

[a] Countries or areas with 100,000 persons or more in 2000.

As for the 10 countries with the youngest populations, all are in Africa in 2050 as well as in 2005. Among these countries, the median age varies slightly, from 14.8 to 16.3 years in 2005 and from 20.3 to 22.9 years in 2050. The total fertility rates in the countries included in the lists were estimated or projected at above 6 children per woman in 2000-2005 and at about 2.75 children per woman in 2045-2050.

NOTES

[1]If very finely-disaggregated age data were available, such that the proportion of newborns could be graphed at the bottom of the age pyramid, the width of the base would be interpretable as a crude birth rate. This interpretation of the bottom-most age group is not strictly correct when broader 5-year age categories are employed, because the width of the base is also affected by mortality risks in infancy and childhood. Nevertheless, in most cases, the width of the base provides a good visual indicator of fertility levels.

[2]This assumes that changes in age structure leave income per person of working age unaffected. See National Research Council (1986) for an account of the early literature on age structure, population growth, and the implications for income per worker. Birdsall, Kelley and Sinding (2003) provide a recent reassessment. There remains much controversy about the existence, direction, and strength of such effects.