

Course: Demography

**Program: Population and
Development**

**Higher School of Economics
Institute of Demography**

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Lecture 2

Population Structures and Population Aging

Population structure

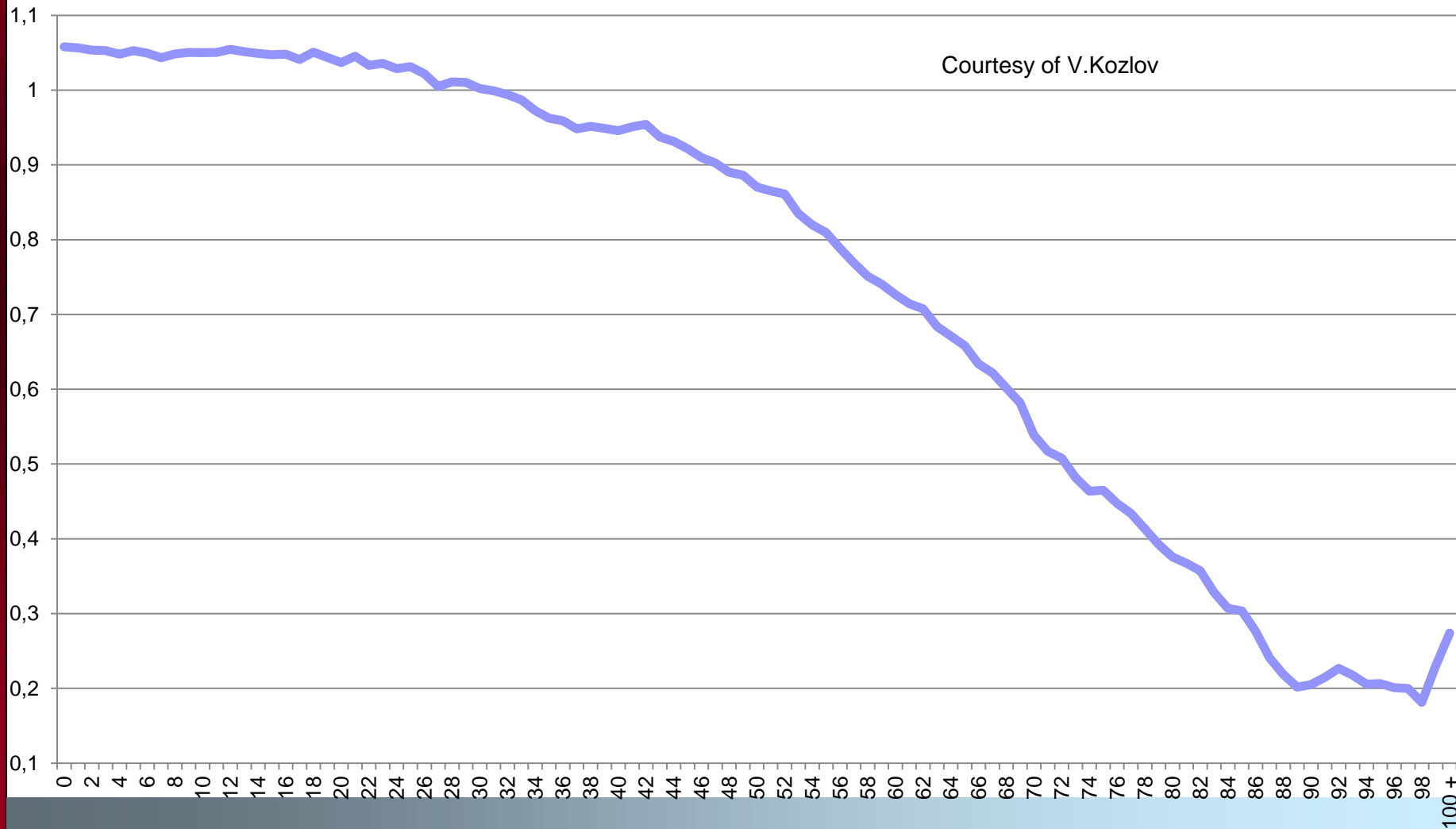
- **Age and sex are the main components of population structure**

Sex Ratio

- **Primary – at conception (about 130 males to 100 females)**
- **Secondary – at birth (105-106 boys to 100 girls). Accurate estimates are important for population forecasts.**
- **Tertiary – at other ages. At maturity, at reproductive ages, at older ages.**

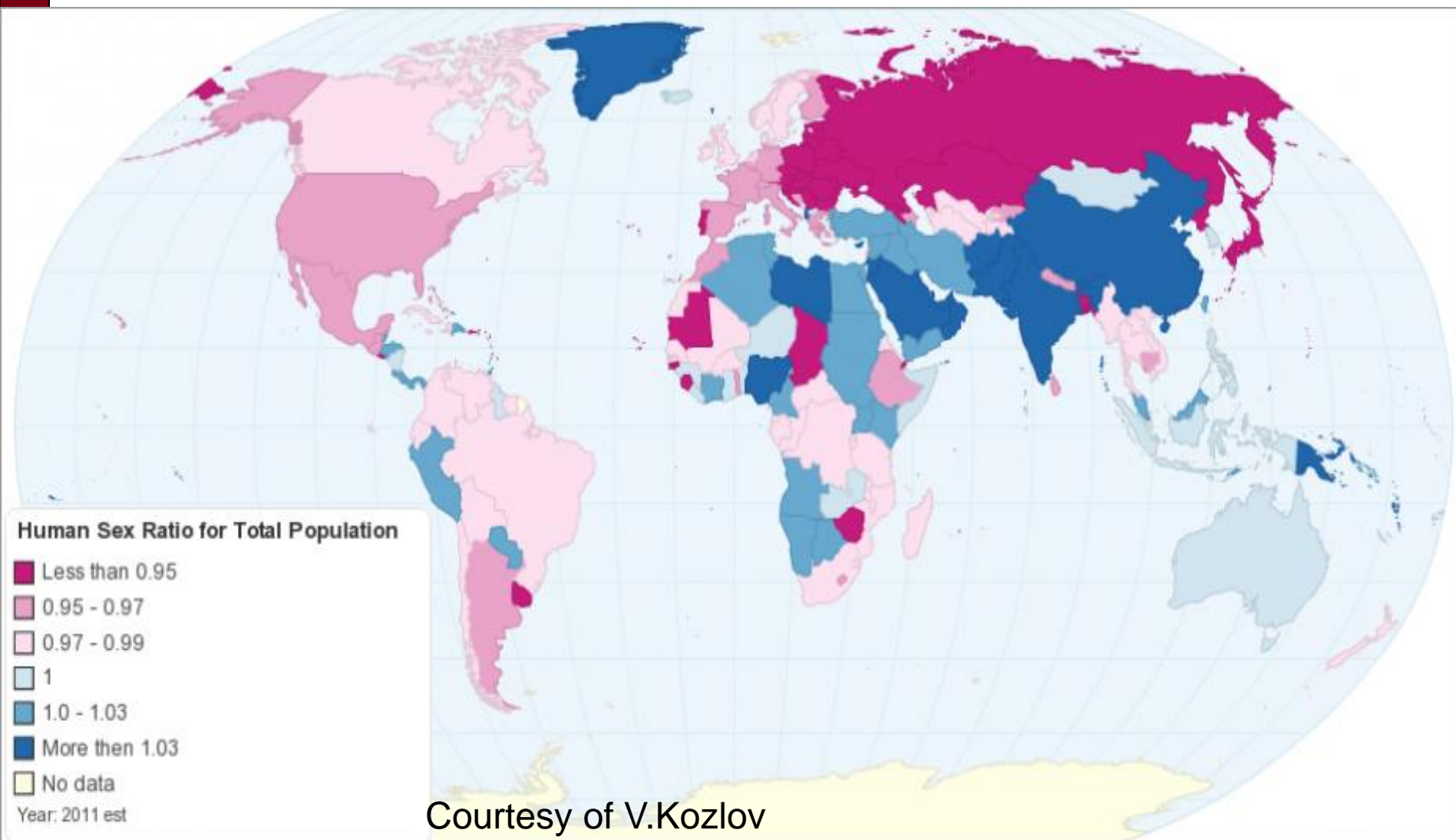
Russia is known for its shortage of men (1.1.2013)

Ratio of men to women - 862:1000



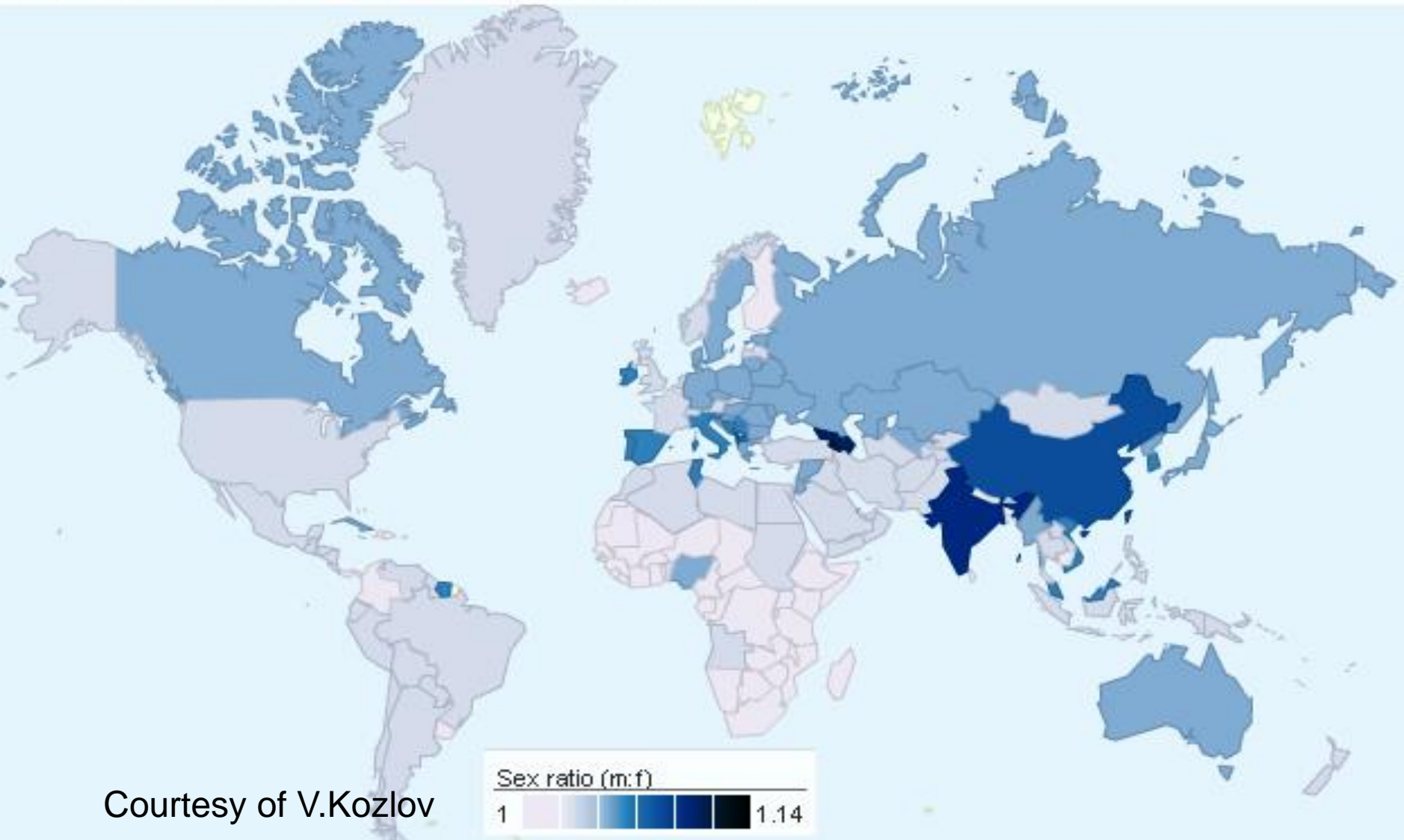
Sex ratio for the total population

More men in the world population (overall)



Distortion of typical sex ratio at birth (105:100) in China, India, Transcaucasia

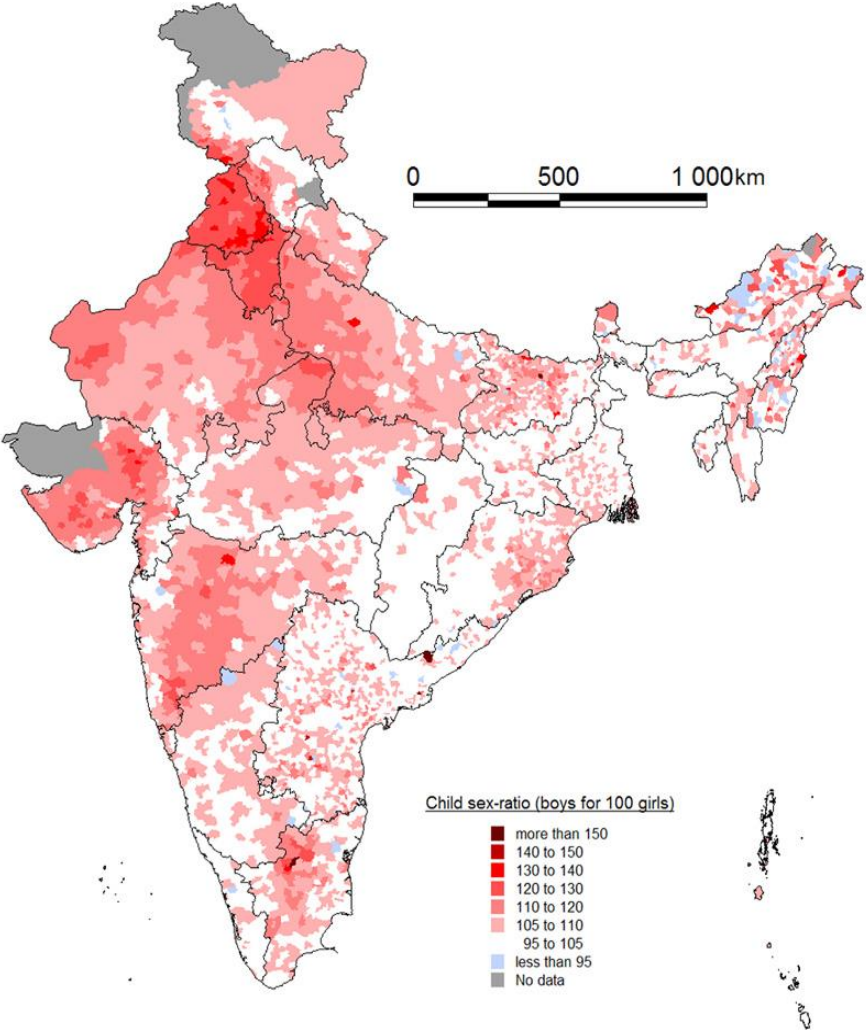
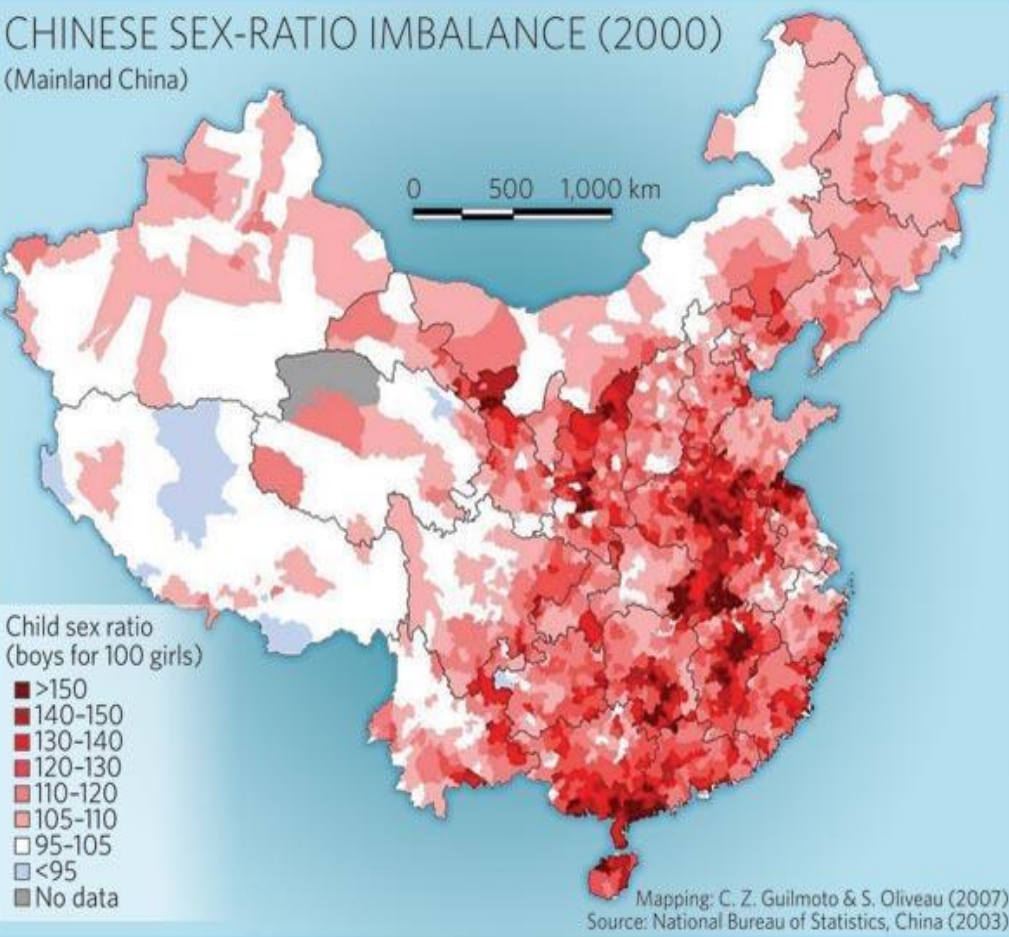
Worldwide Human Sex Ratio at Birth



Courtesy of V.Kozlov

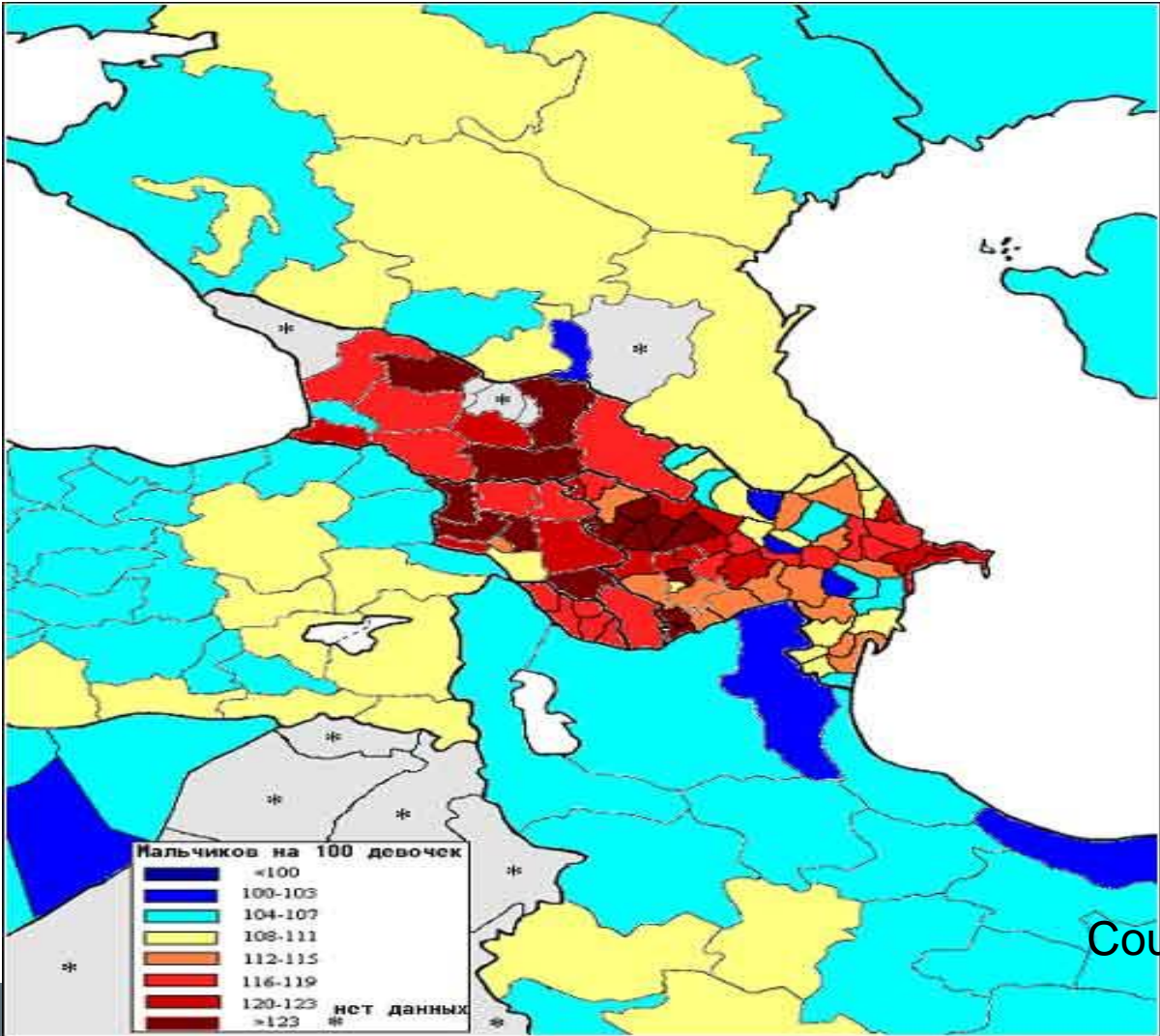
Child sex ratio imbalance in China and India

Culturally determined preferences of boys



Courtesy of V.Kozlov

Distortion of sex ratio at birth in Transcaucasia



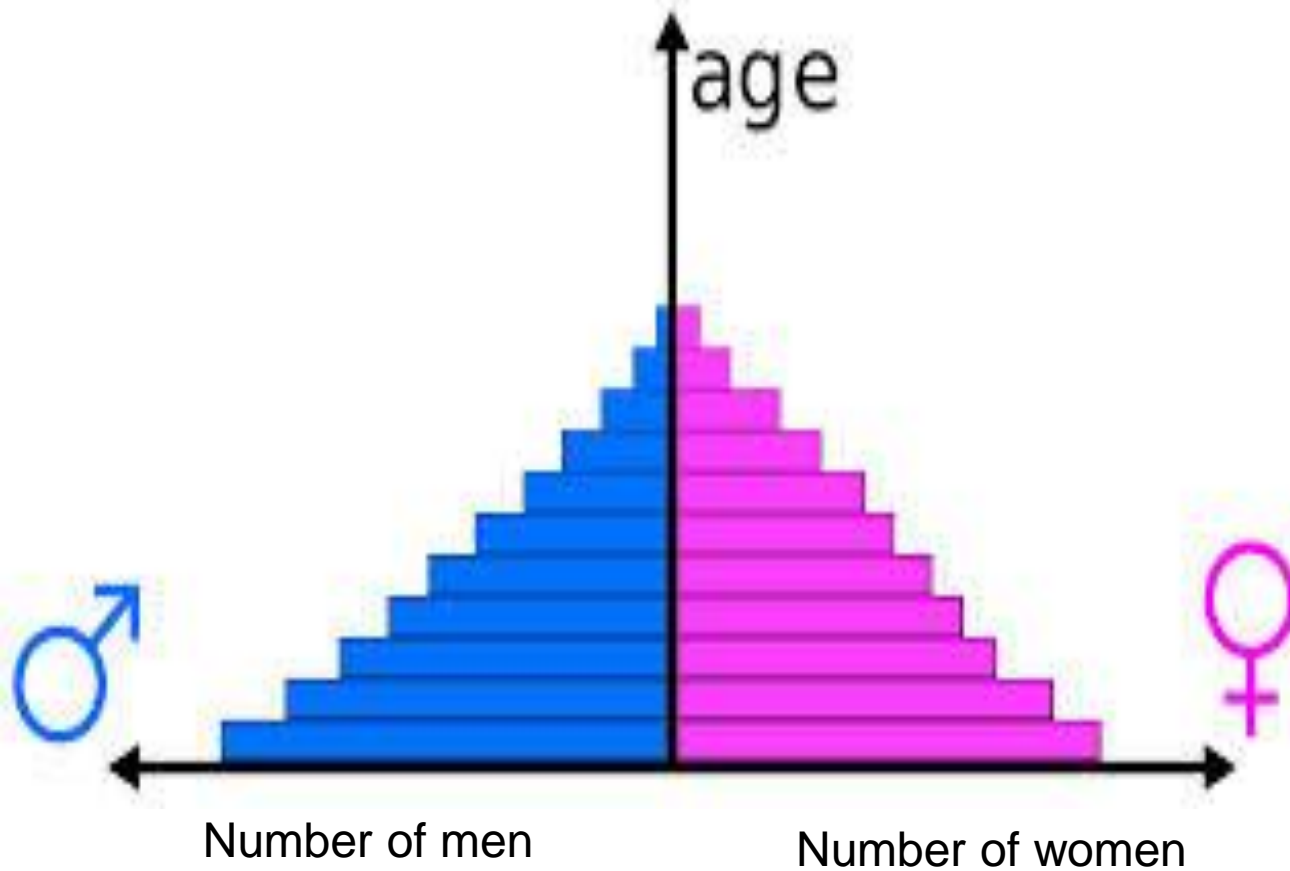
Courtesy of V.Kozlov

Population Age Structure

The concept of population pyramid

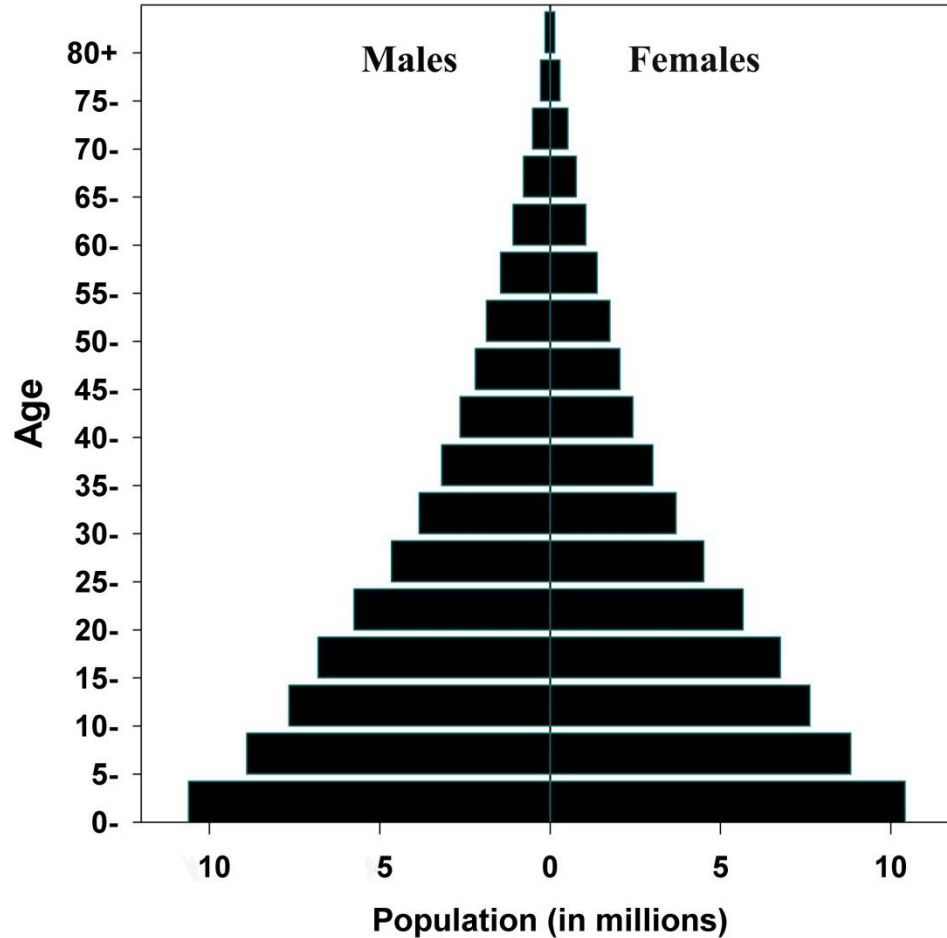
Demographers commonly use population pyramids to describe both age and sex distributions of populations. Youthful populations are represented by pyramids with a broad base of young children and a narrow apex of older people, and older populations are characterized by more uniform numbers of people in the age categories.

Population pyramid - schema



Types of population pyramids

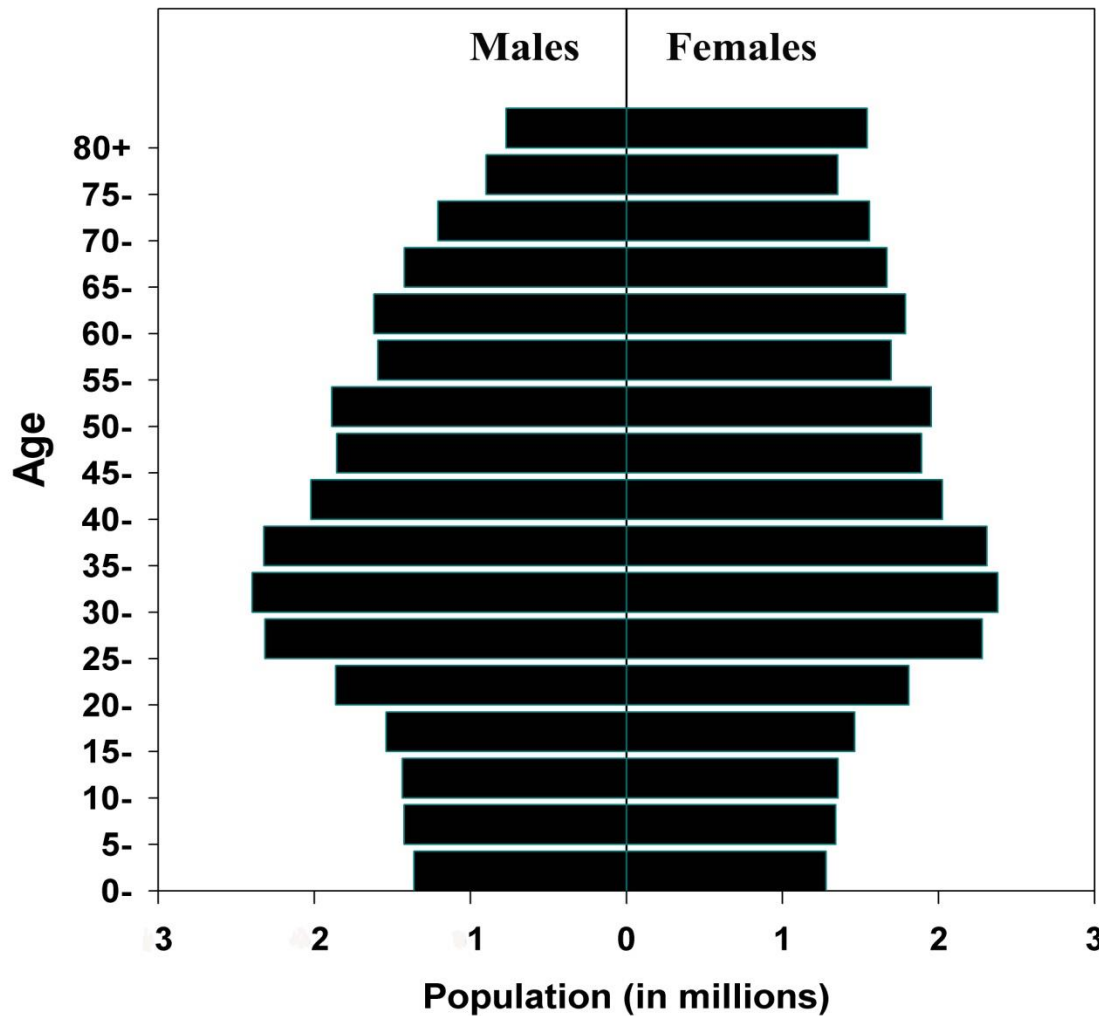
Nigeria: 2000



**Young
growing
population**

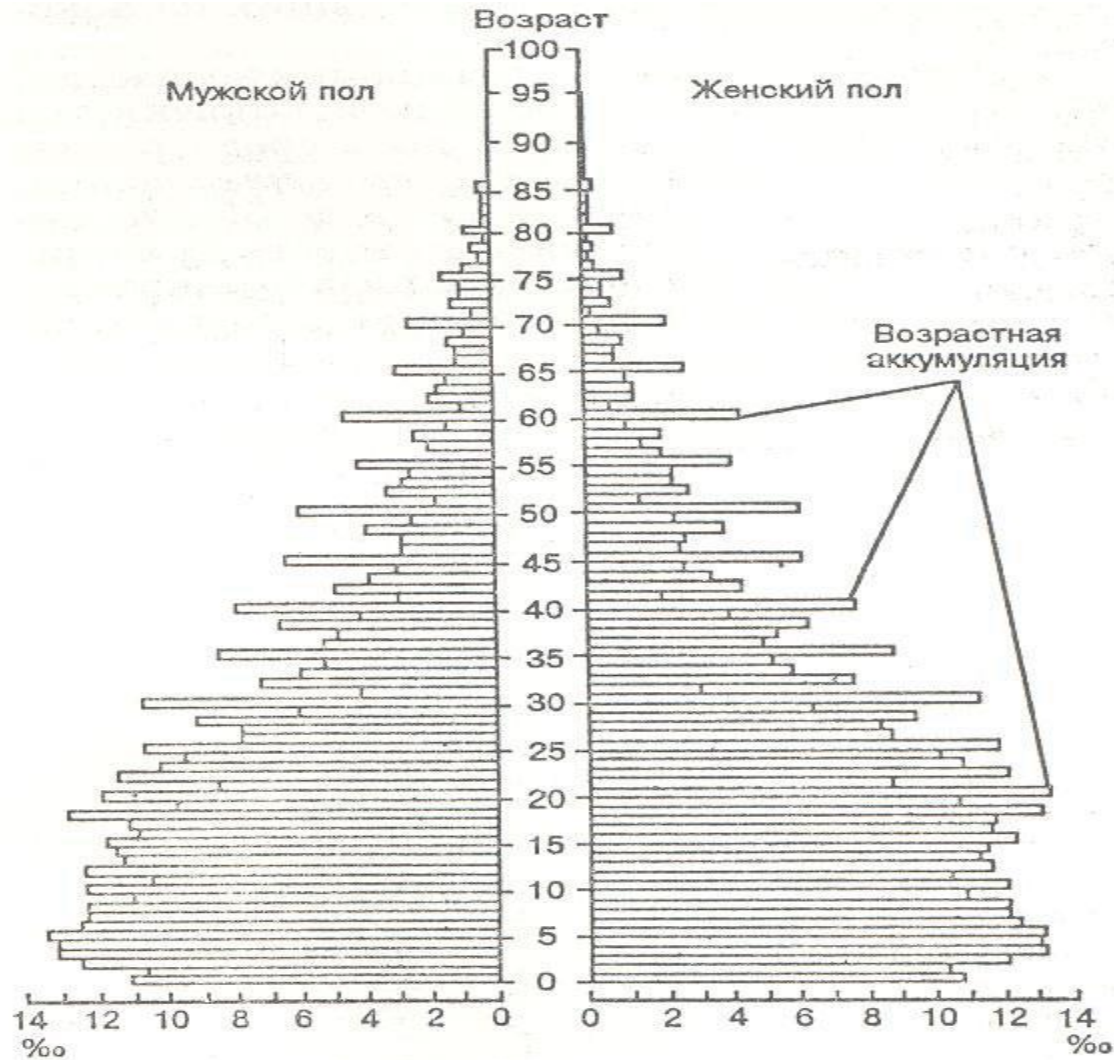
Types of population pyramids

Italy: 2000



**Aging
population
structure**

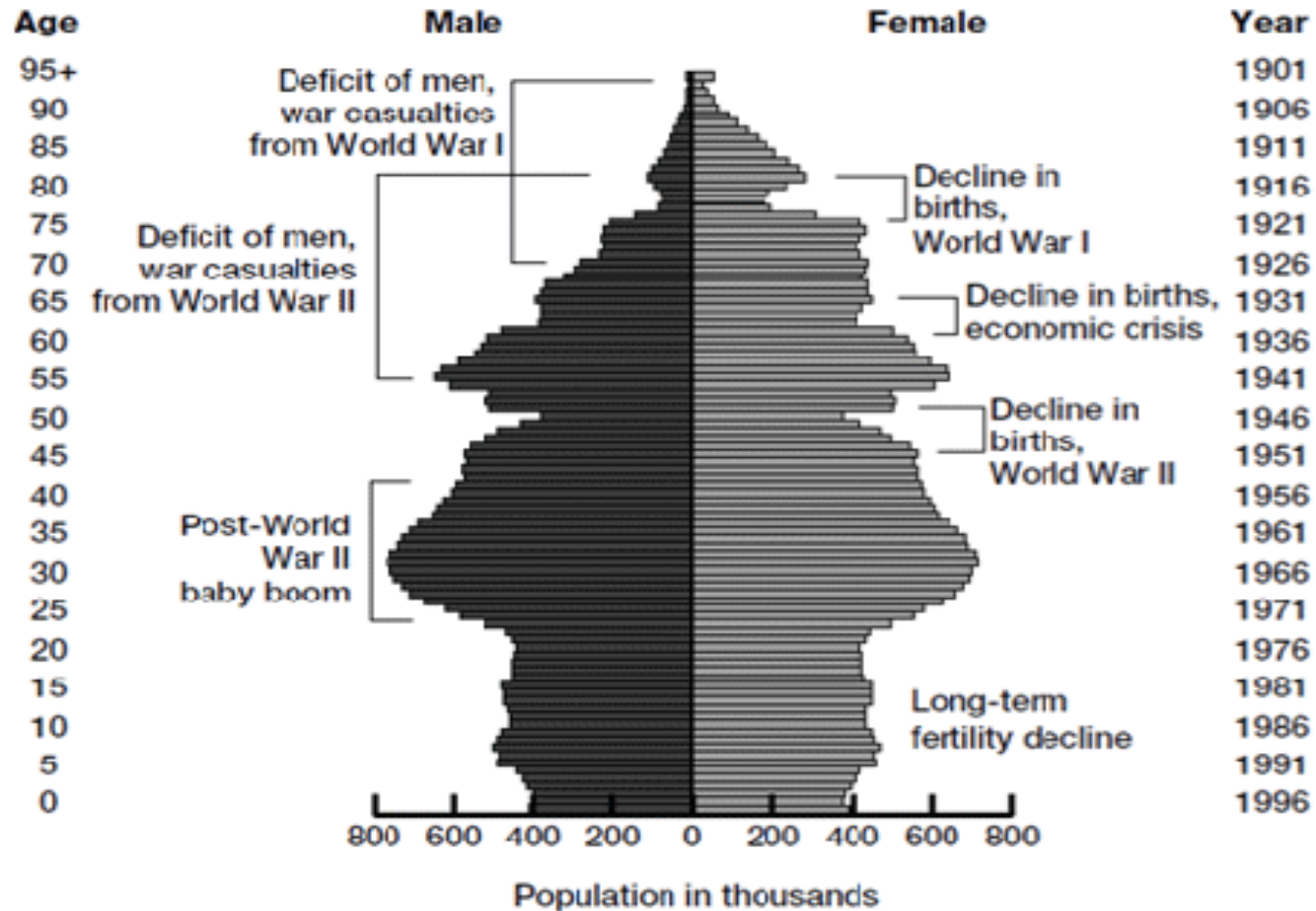
Example of age heaping



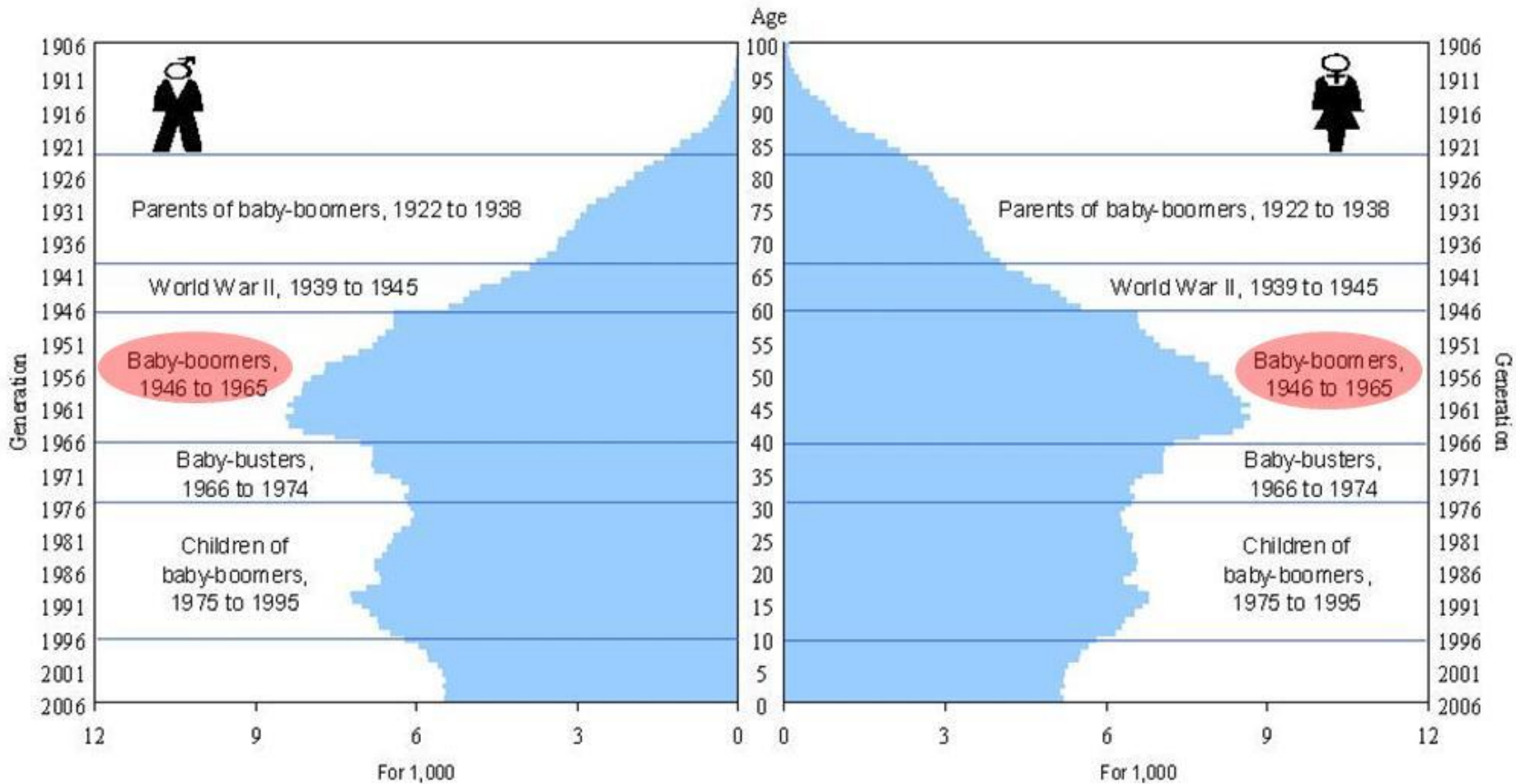
Courtesy of V.Kozlov

Shape of population pyramid reflects past events

Population pyramid of Germany in 1996

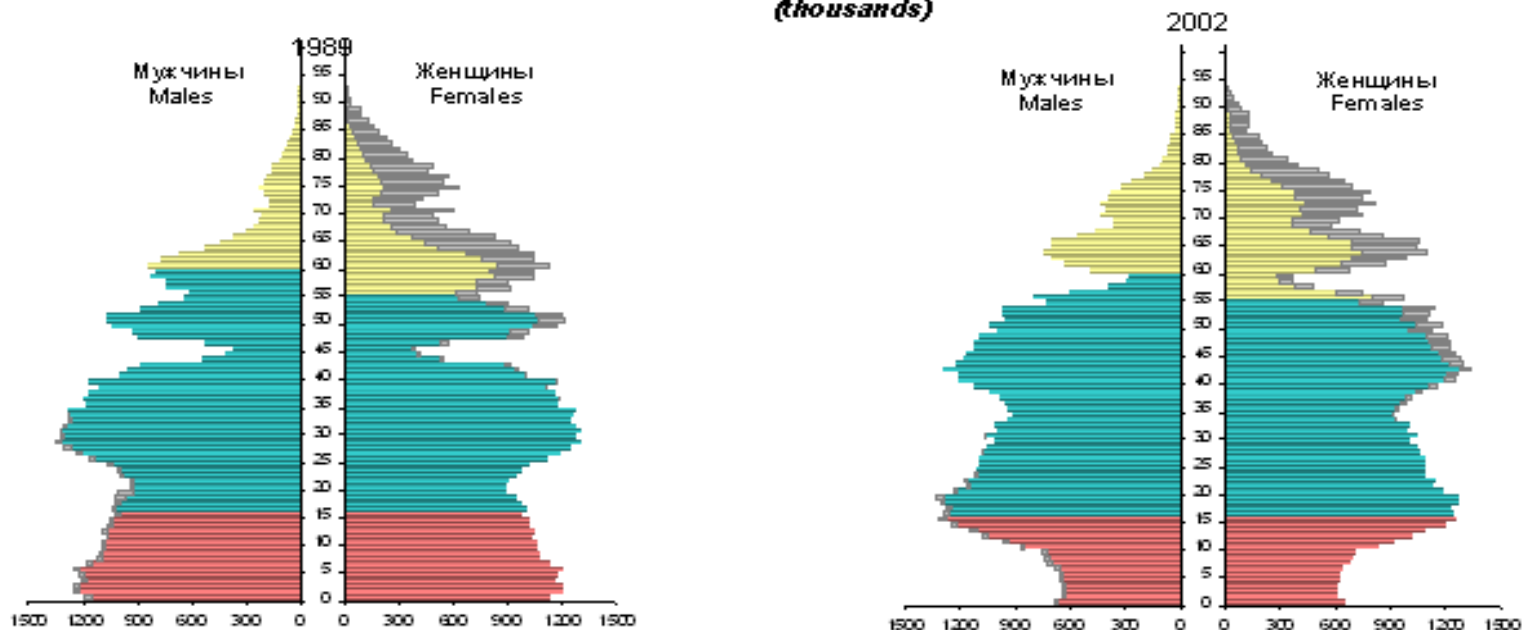


Population pyramid of Canada, 2006 reflecting different generations



Russia in 1989 and 2002

НАСЕЛЕНИЕ ПО ПОЛУ И ВОЗРАСТУ
(тысяч человек)
Population, by age and sex
(thousands)

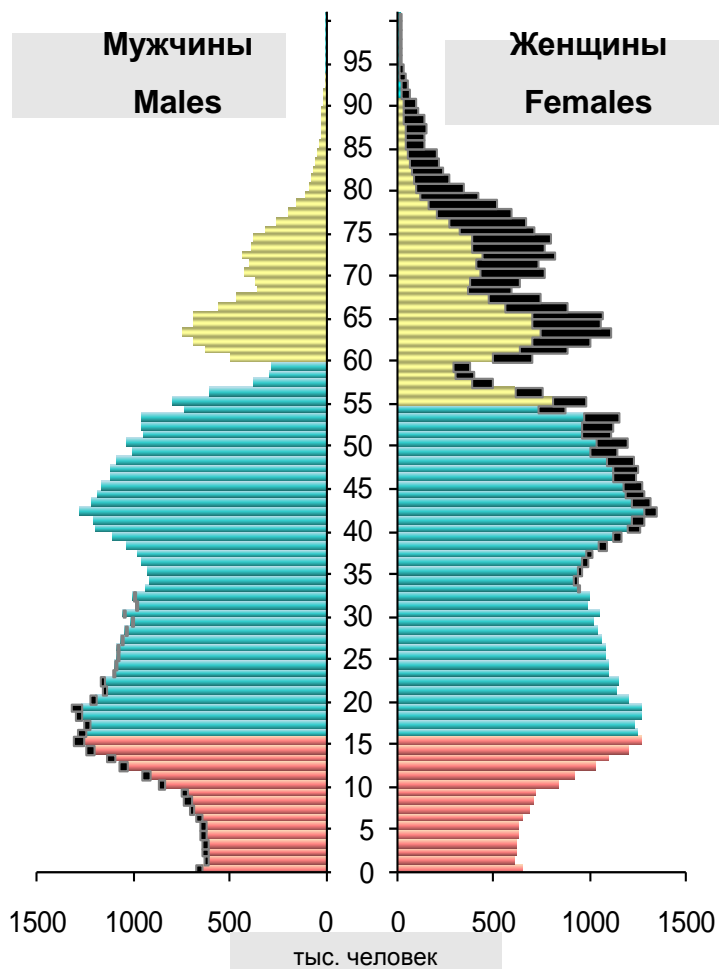


- мужчины и женщины 0-15 (males and females 0-15)
- мужчины 16-59, женщины 16-54 (males 16-59, females 16-54)
- мужчины 60 и более, женщины 55 и более (males 60 and over, females 55 and over)
- разница между численностью мужчин и женщин (difference in numbers between males and females)

Russian population by age and sex (in thousand)

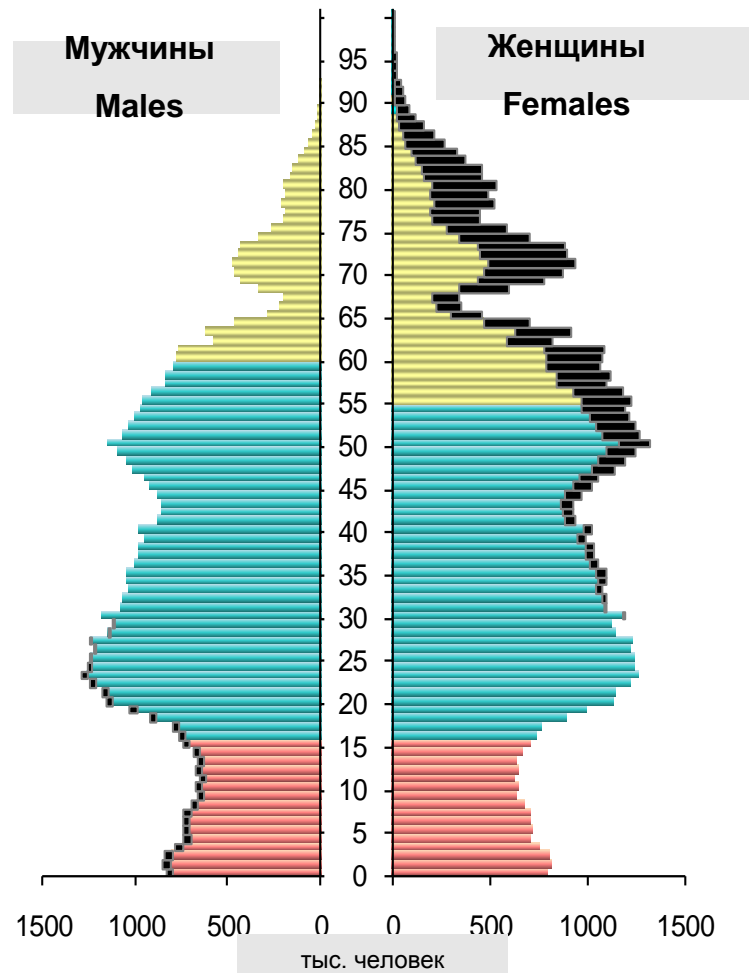
2002 г.

возраст, лет



2010 г.

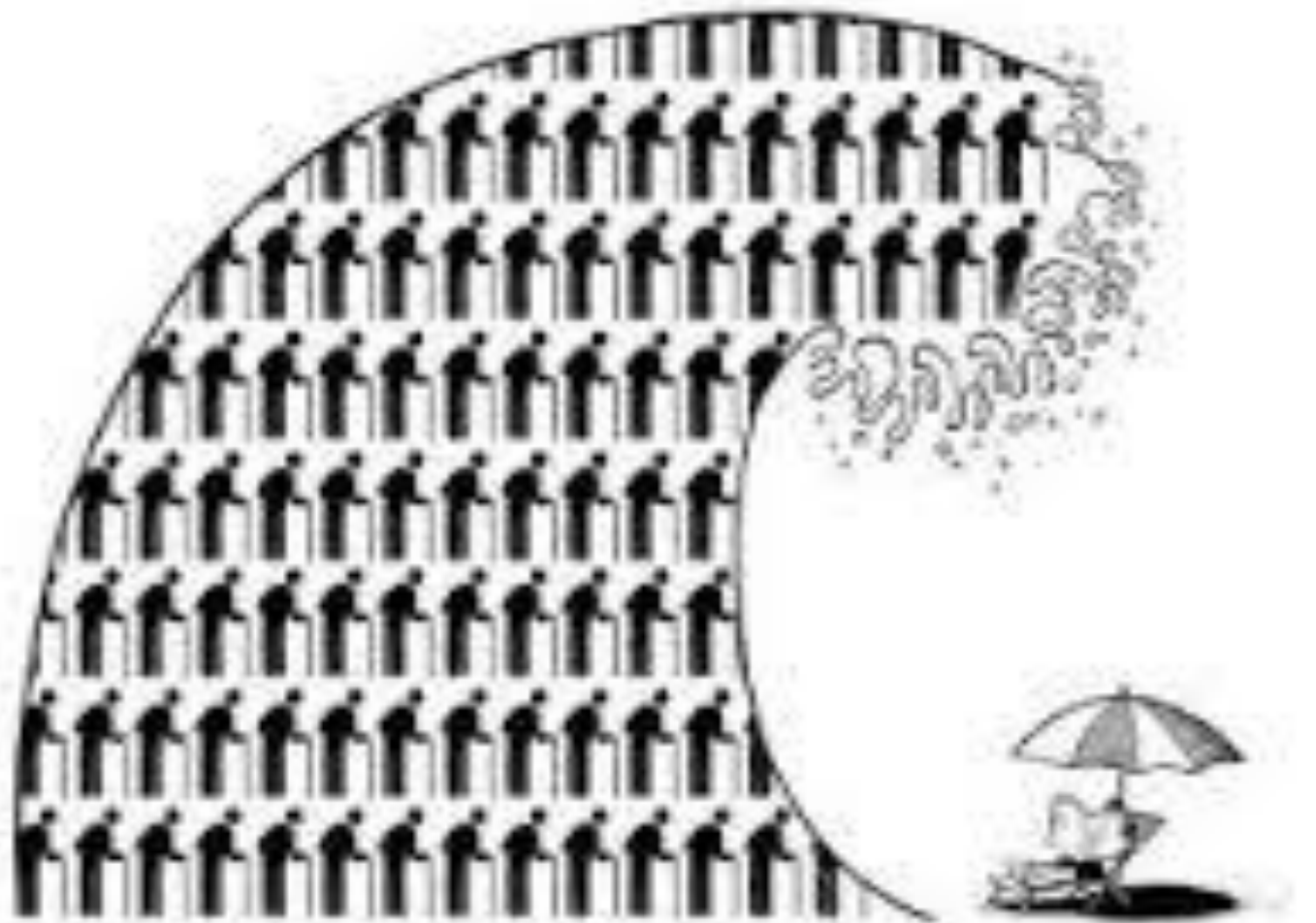
возраст, лет



■ моложе трудоспособного возраста
■ старше трудоспособного возраста

■ в трудоспособном возрасте
■ разница между численностью мужчин и женщин

Population Aging

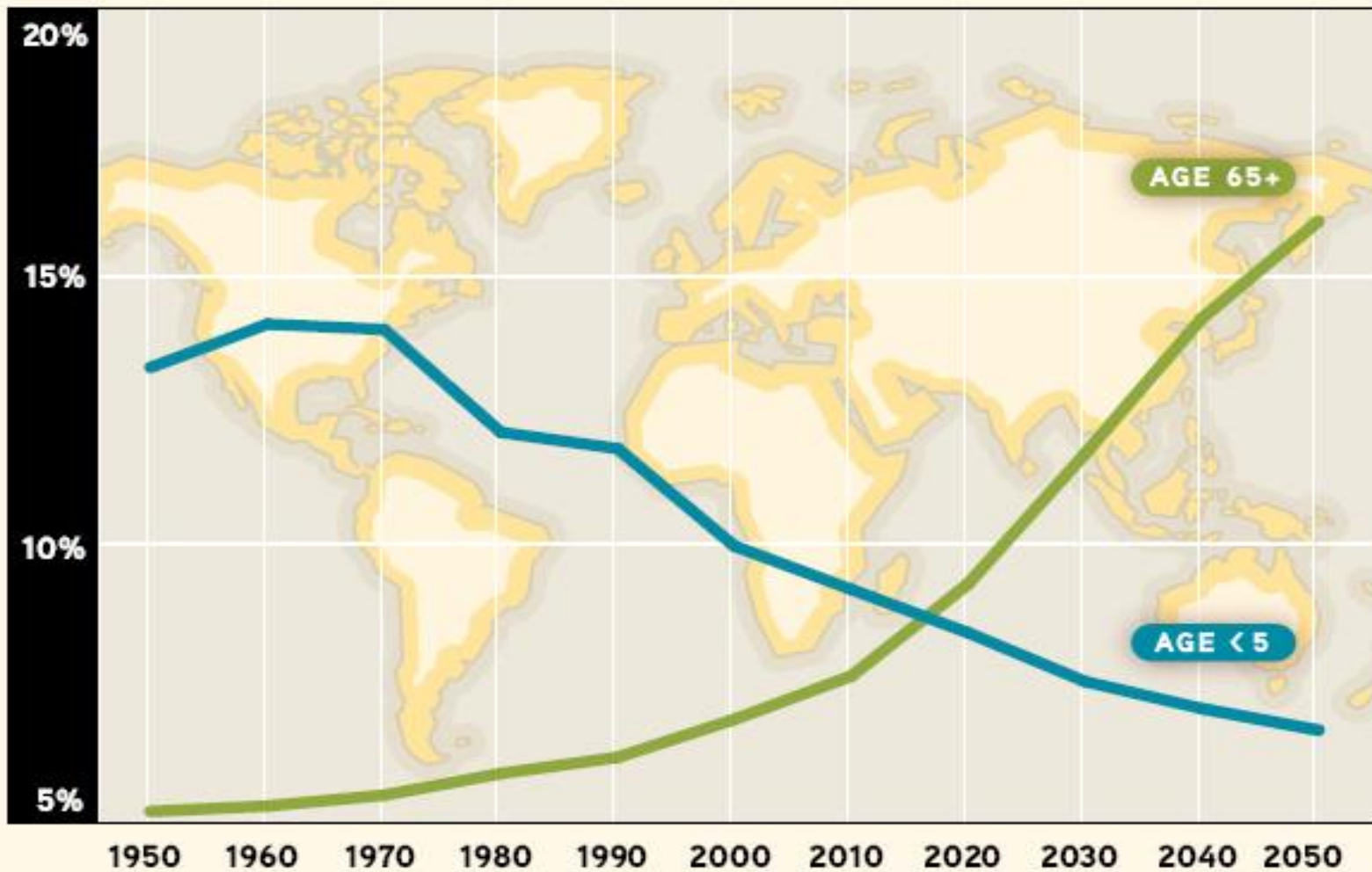


'Silver tsunami'

Population Aging

- **Population aging (also known as demographic aging) is a summary term that is used to describe for shifts in the age structure of a population toward people of older ages.**
- **Population aging is expected to be among the most prominent global demographic trends of the twenty-first century.**

YOUNG CHILDREN AND OLDER PEOPLE AS A PERCENTAGE OF GLOBAL POPULATION



Source: United Nations Department of Economic and Social Affairs, Population Division. *World Population Prospects. The 2004 Revision*. New York: United Nations, 2005.

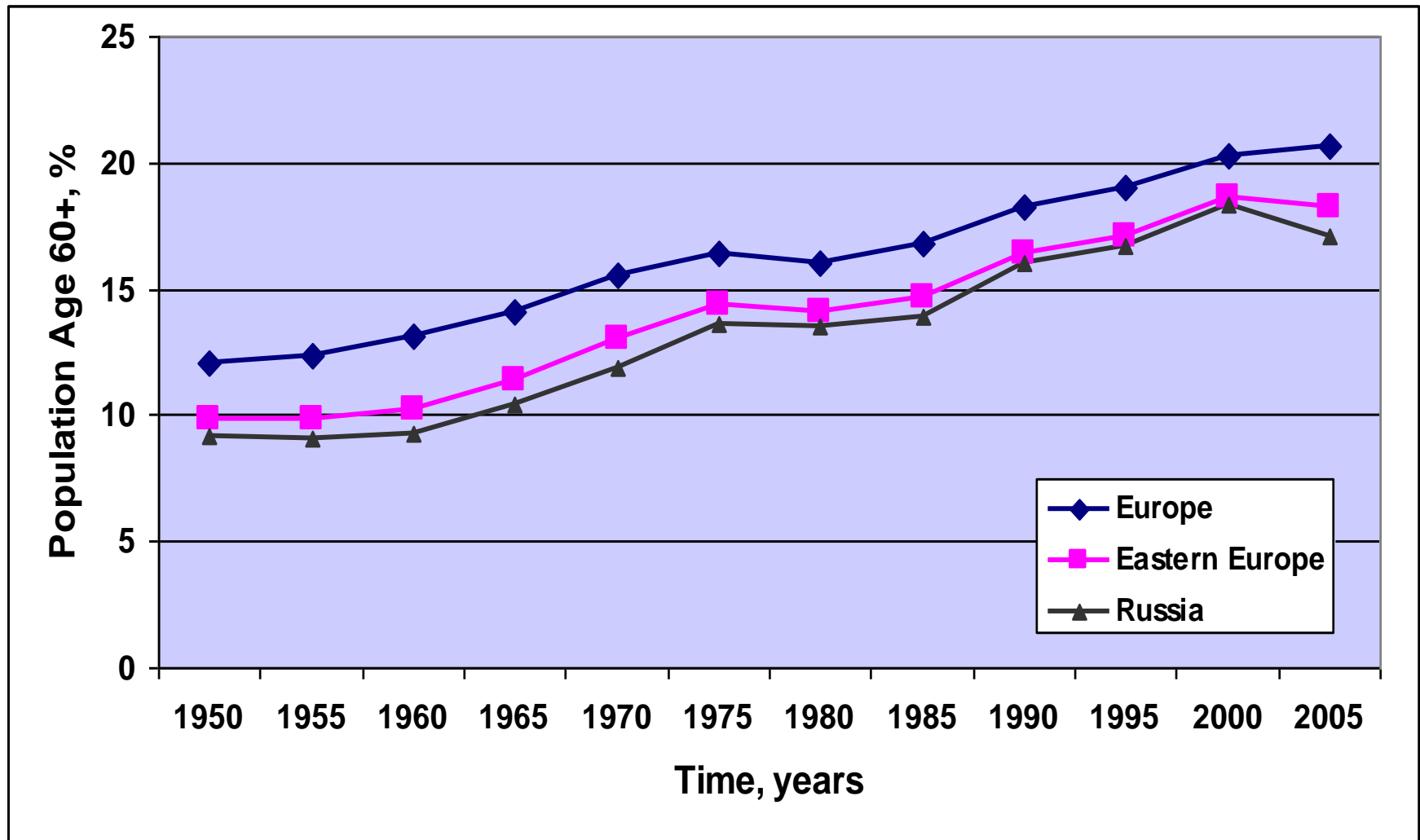
Measures of Population Aging

- **Percentage of elderly people of retirement ages in population is the most common measure of population aging**
- **A society is considered to be relatively old when the fraction of the population aged 65+ years exceeds 8-10%**
- **According to this definition, the populations of the Eastern Europe and Russia are becoming very old, because the percentage of elderly people reached the levels of 14.2% and 13.8% respectively in 2005**

Proportion of older people in population

- **The choice of the boundary for old age (65 years and over) is rather arbitrary**
- **Many demographers who study FSU and Eastern European countries also use 60 years cut-off (retirement age for many countries of FSU and the Eastern Europe).**
- **In this case a population is considered to be old, when the proportion aged 60+ years exceeds 10-12%**

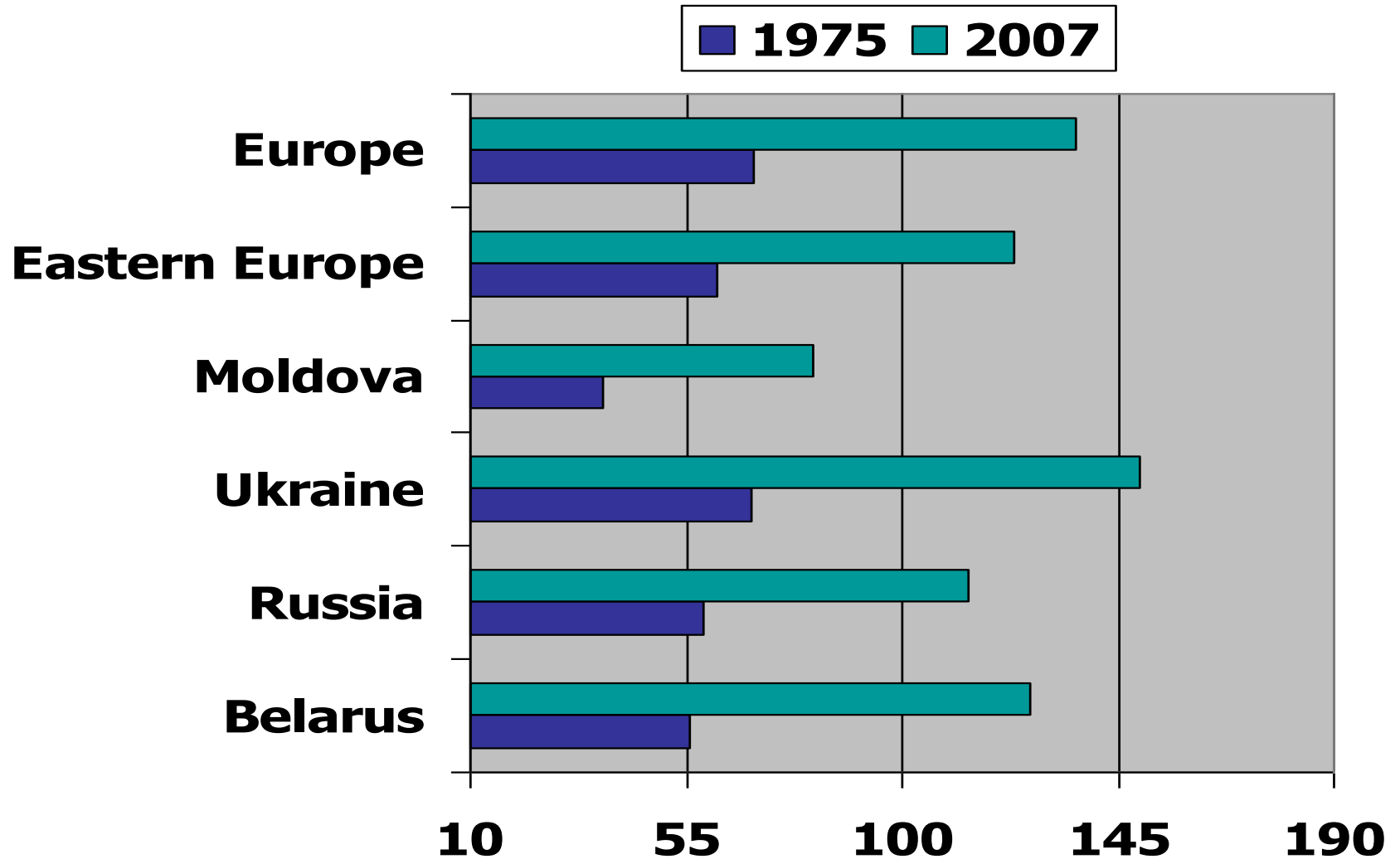
Time trends in the proportion of the elderly (age 60+)



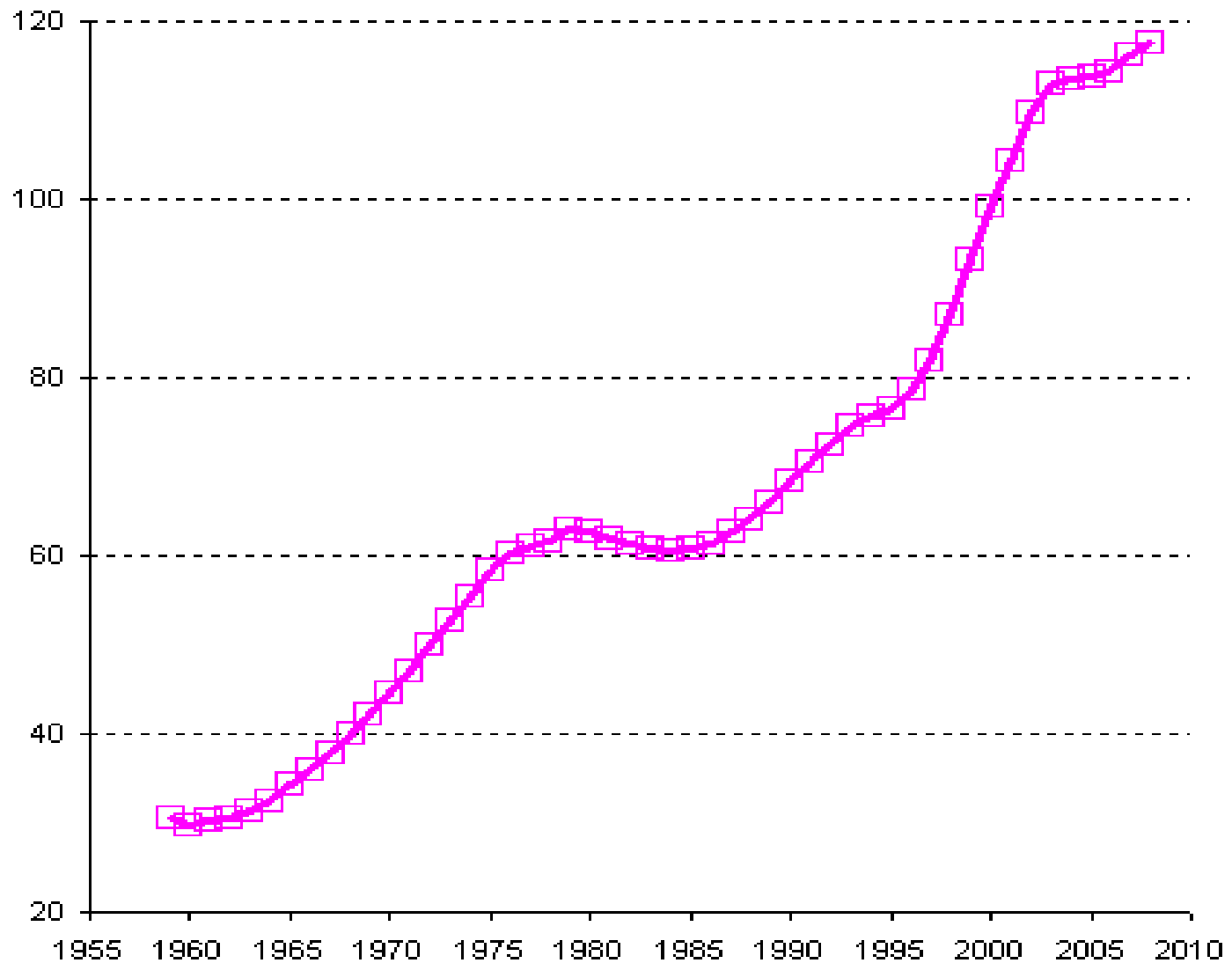
Aging Index (elder-child ratio)

- **The number of people aged 65 and over per 100 youths under age 15**
- **Sometimes referred to as the elder-child ratio**
- **In 1975 all countries of the Eastern Europe had more youth than elderly (aging index below 100). Now all of them except Moldova have more elderly than youth.**

Aging Index in European FSU countries



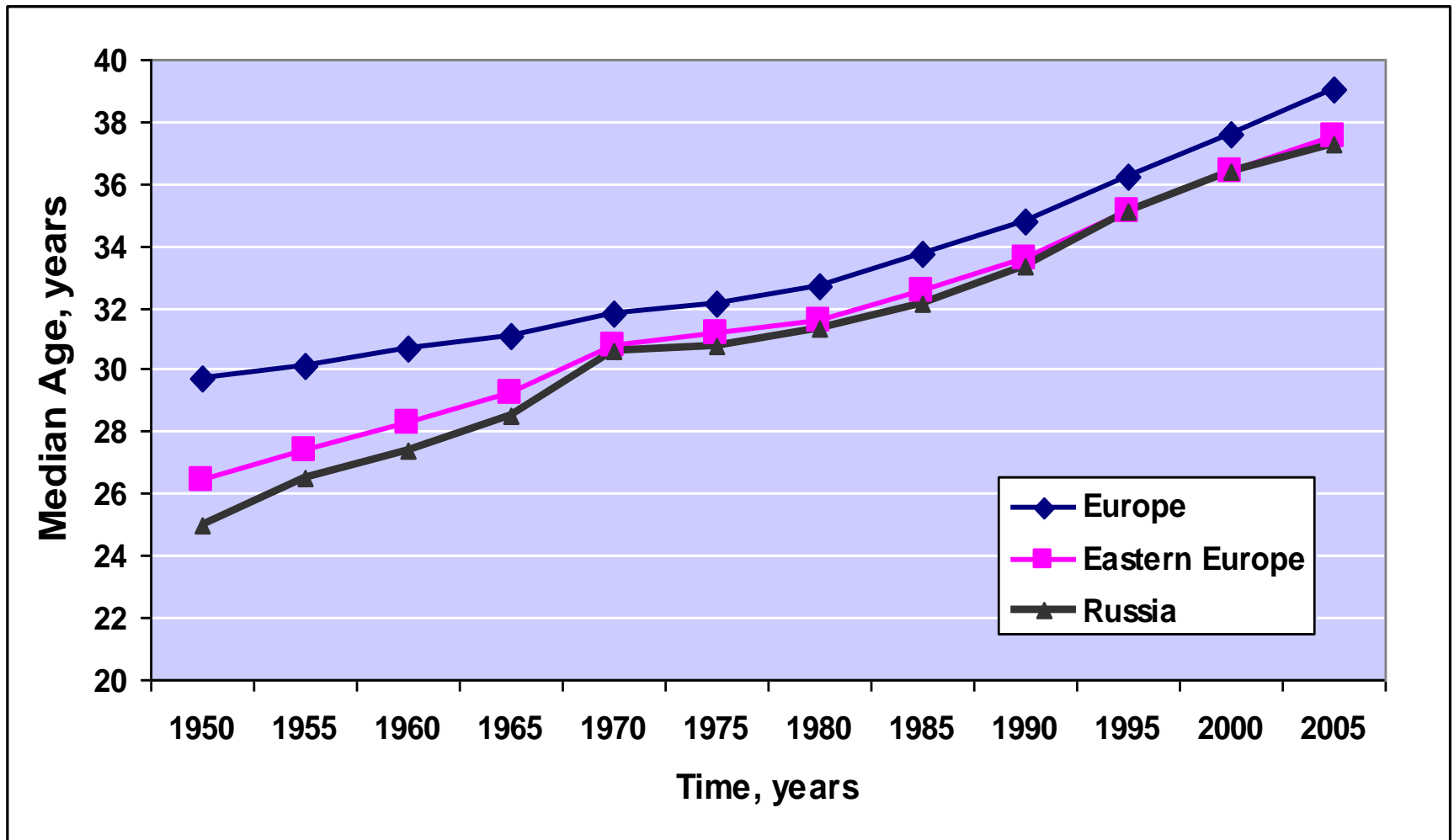
Dynamics of Aging Index in Russia



Median age of population

- **Median age of population is the age at which exactly half the population is older and another half is younger.**
- **Median age is an indicator based on statistical measure of location (sometimes mean and modal ages of population are also used)**

Time trends in median age of population

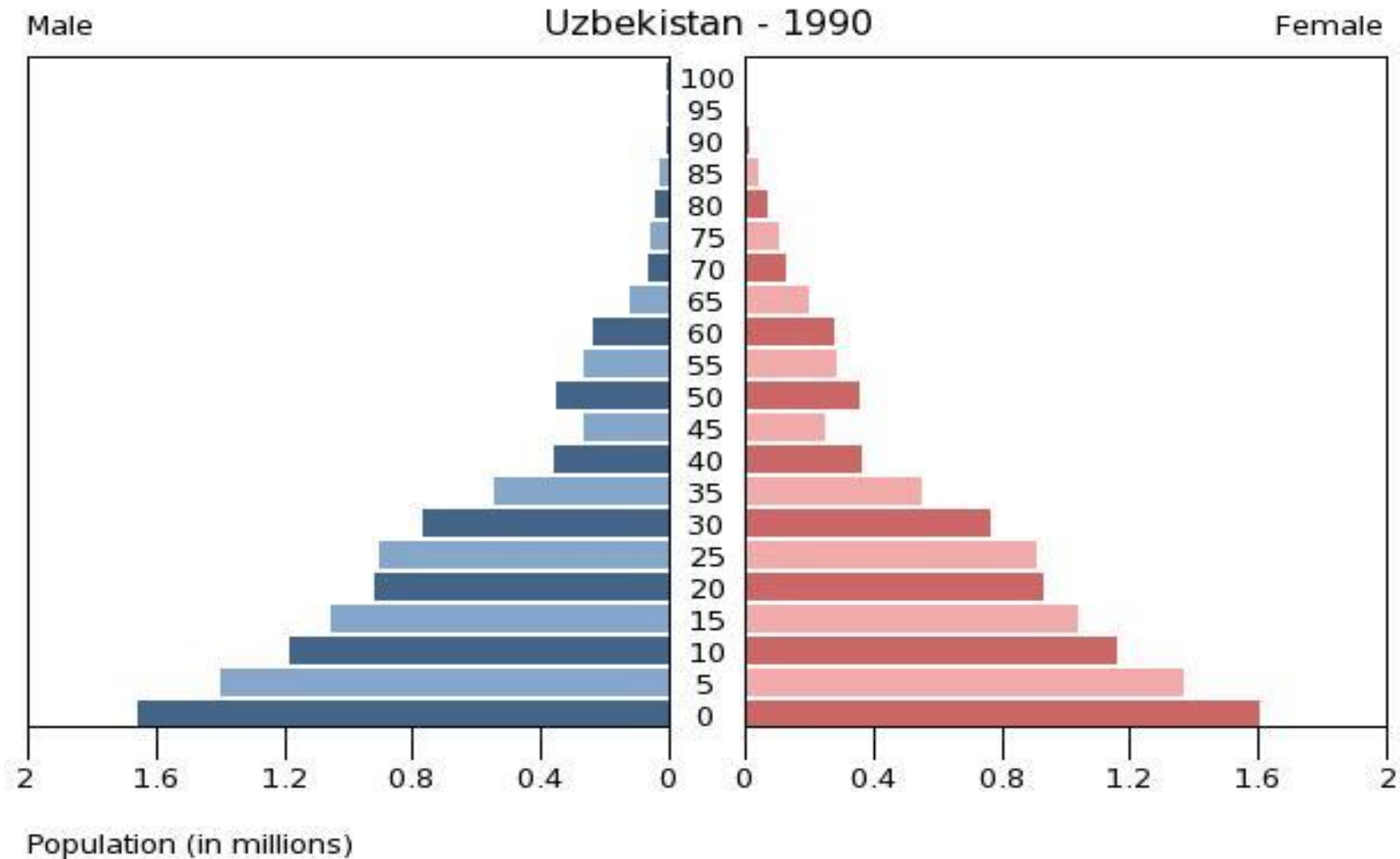


Median age in some countries

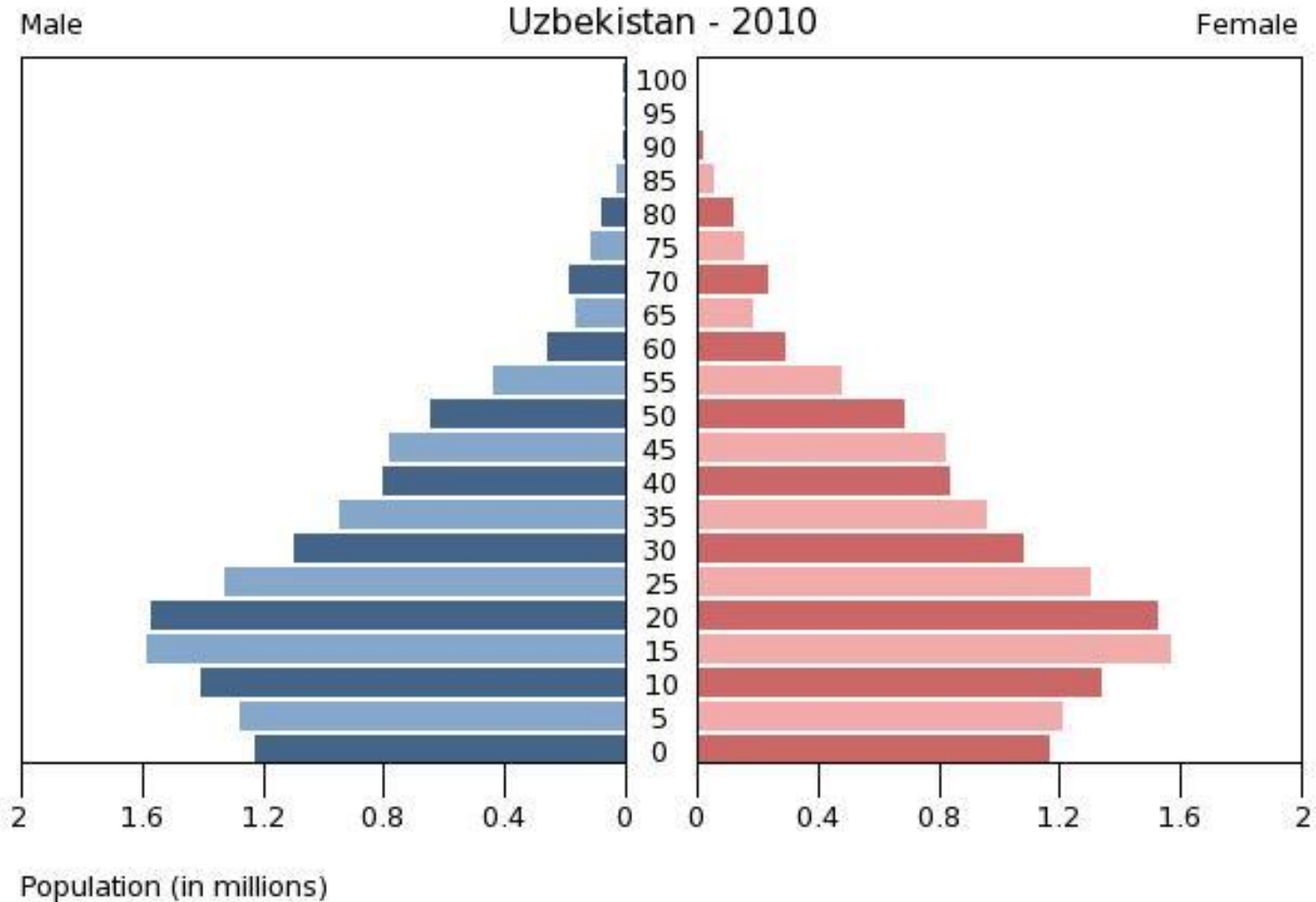
Countries/Regions	1975	1995	2005
Europe	32.1	36.2	39.0
Eastern Europe	31.2	35.1	37.5
Belarus	30.5	34.8	37.8
Republic of Moldova	26.2	30.8	33.0
Russian Federation	30.8	35.1	37.3
Ukraine	33.6	35.9	39.0

Any single indicator of population aging may be misleading, because the age distribution of population is often very irregular, reflecting the scars of the past events (wars, economic crises etc.), and it cannot be described just by one number without significant loss of information.

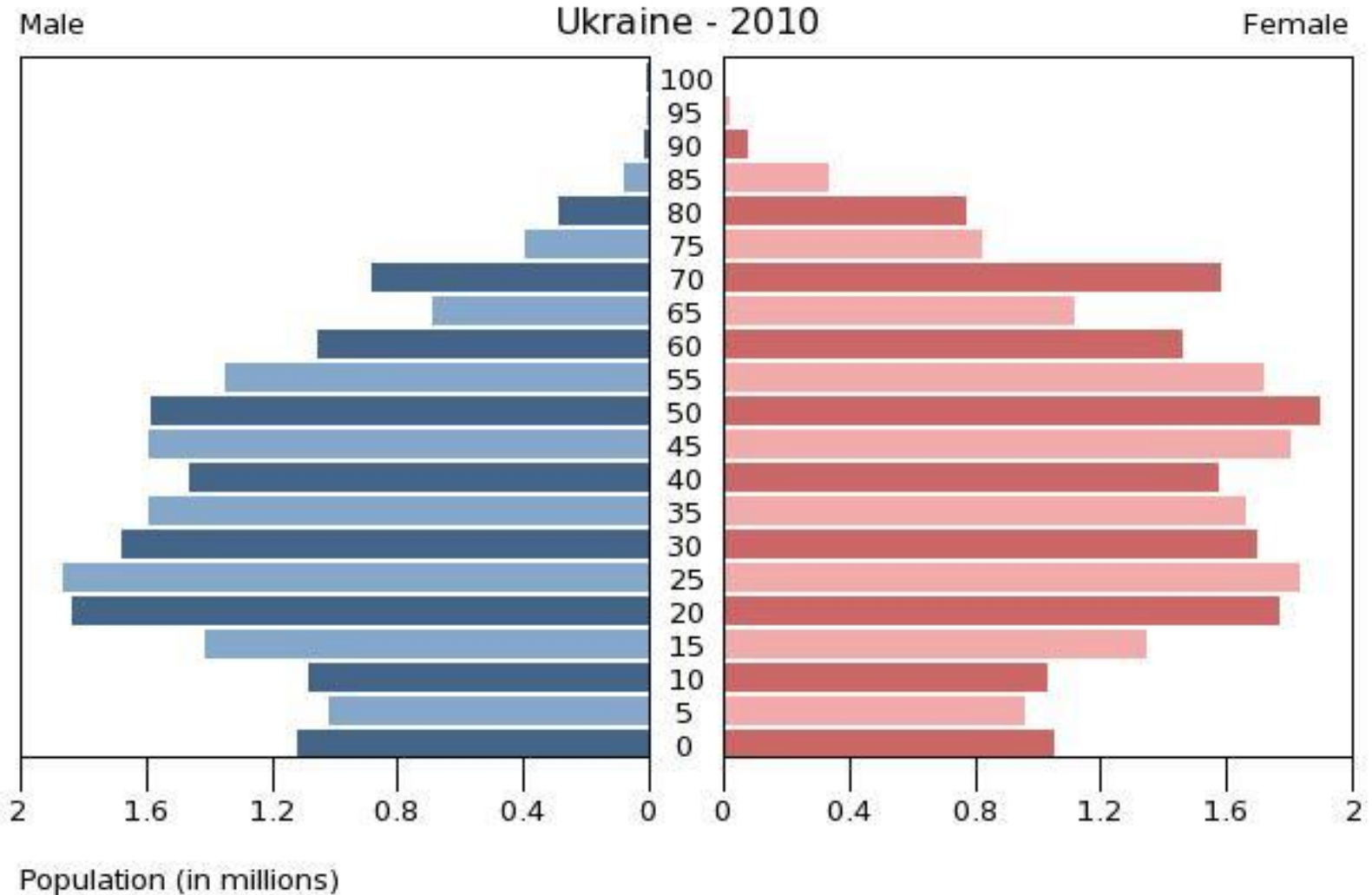
Population with young age structure. Uzbekistan in 1990



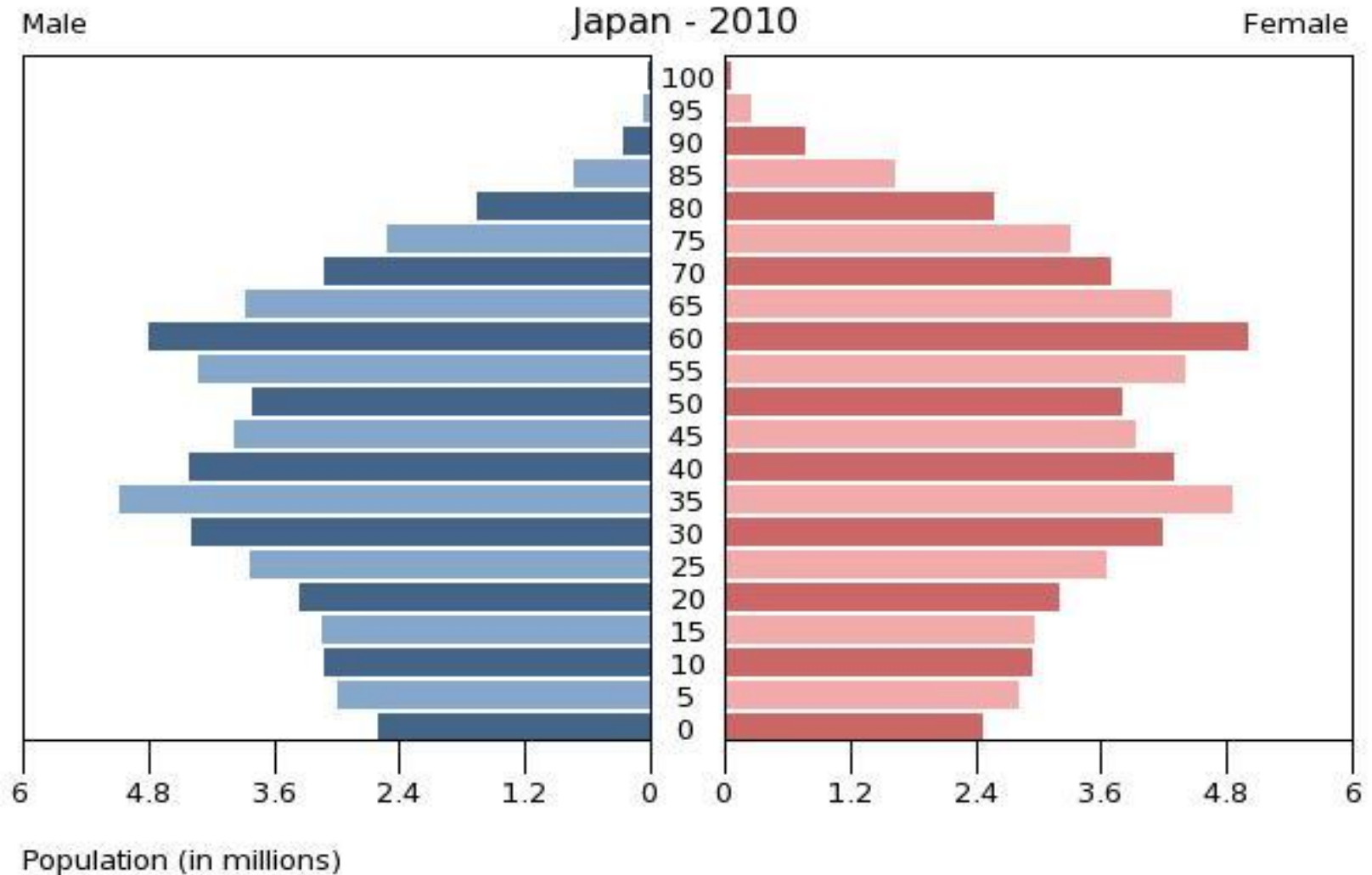
Uzbekistan in 2010. Population started to age



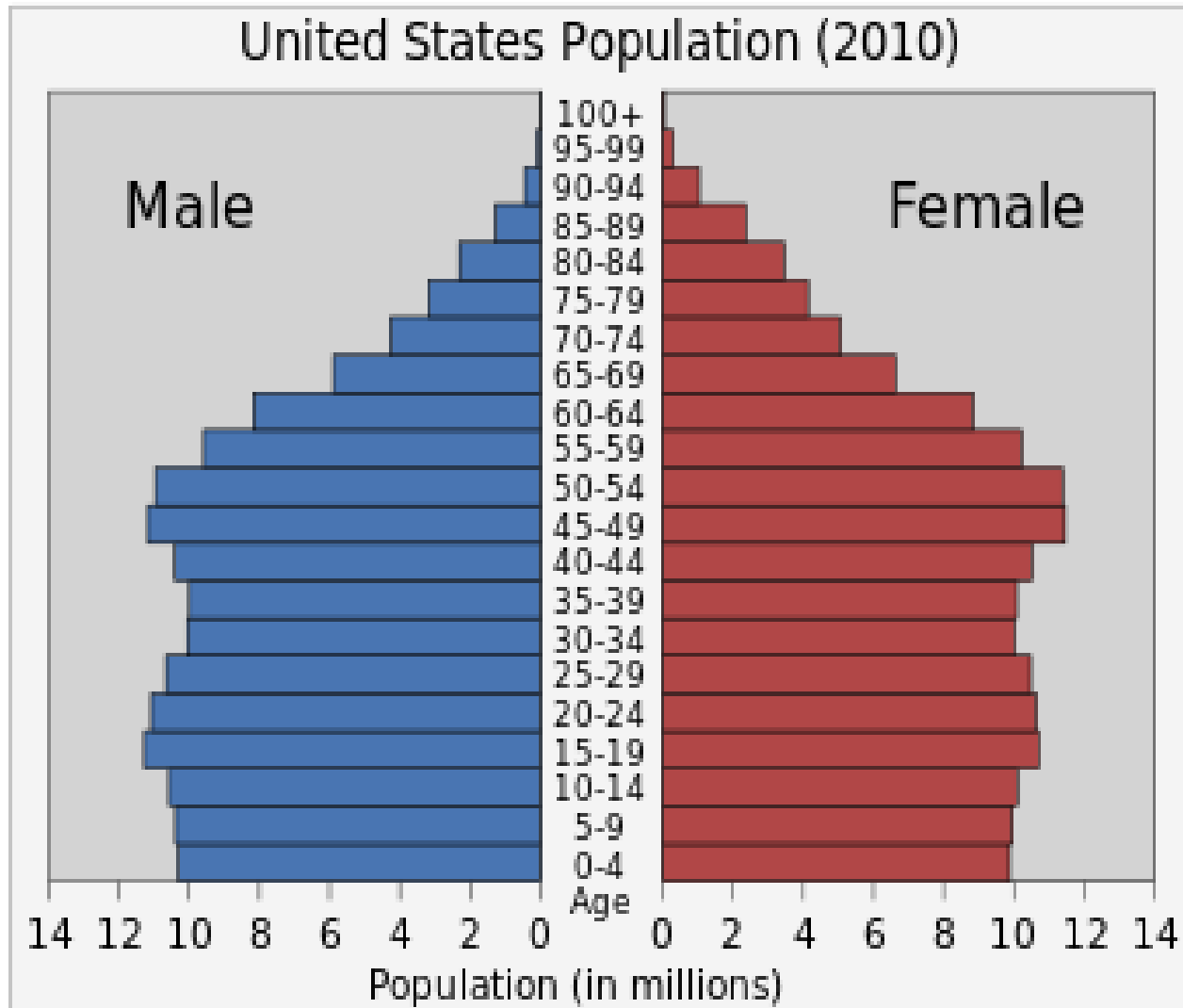
Ukraine in 2010. An example of population with advanced population aging



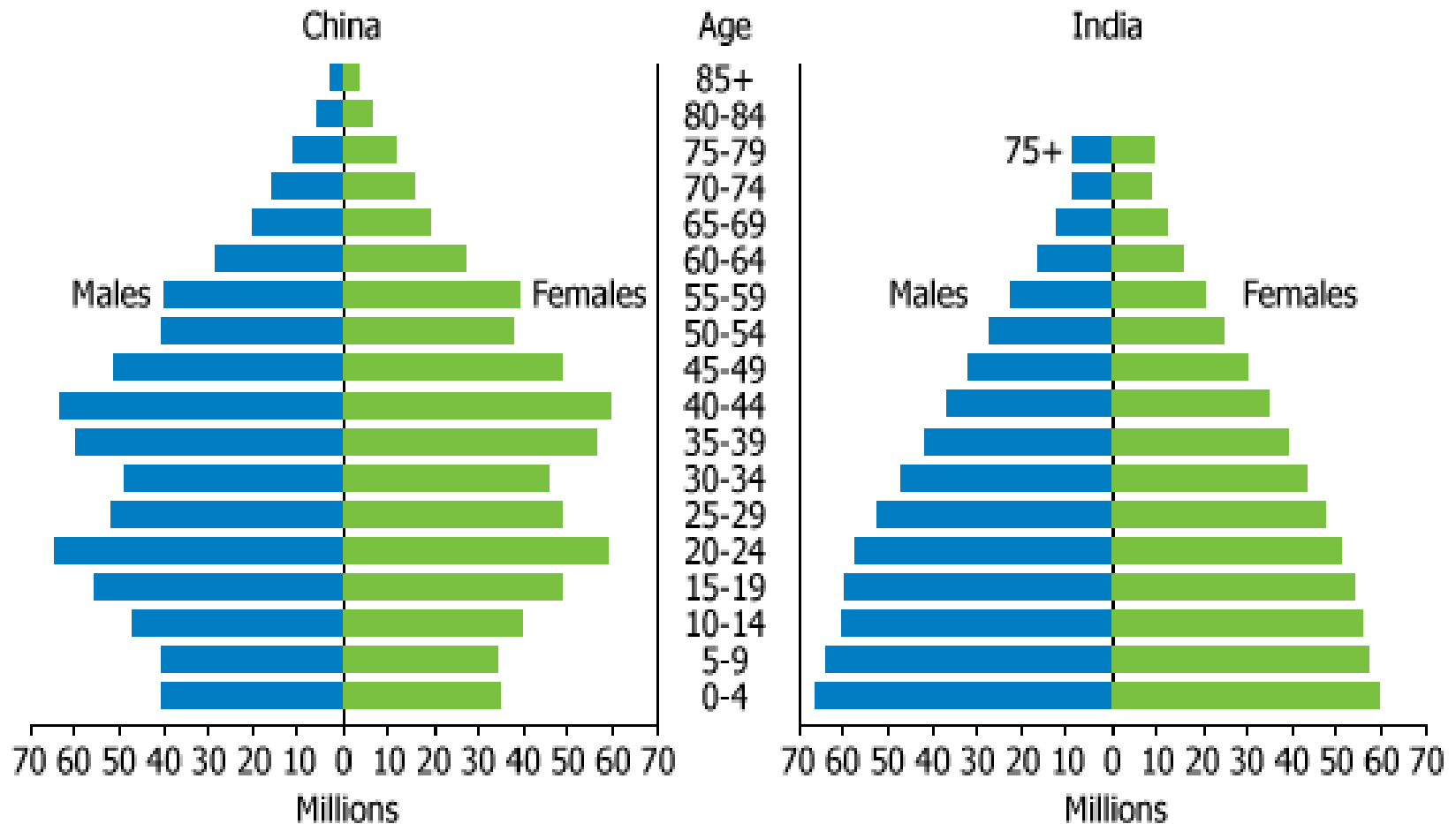
An example of population with very advanced population aging. Japan in 2010



Intermediate variant with irregularity (baby-boomers)



Population pyramids in two most populous countries



Demographic Determinants of Population Aging

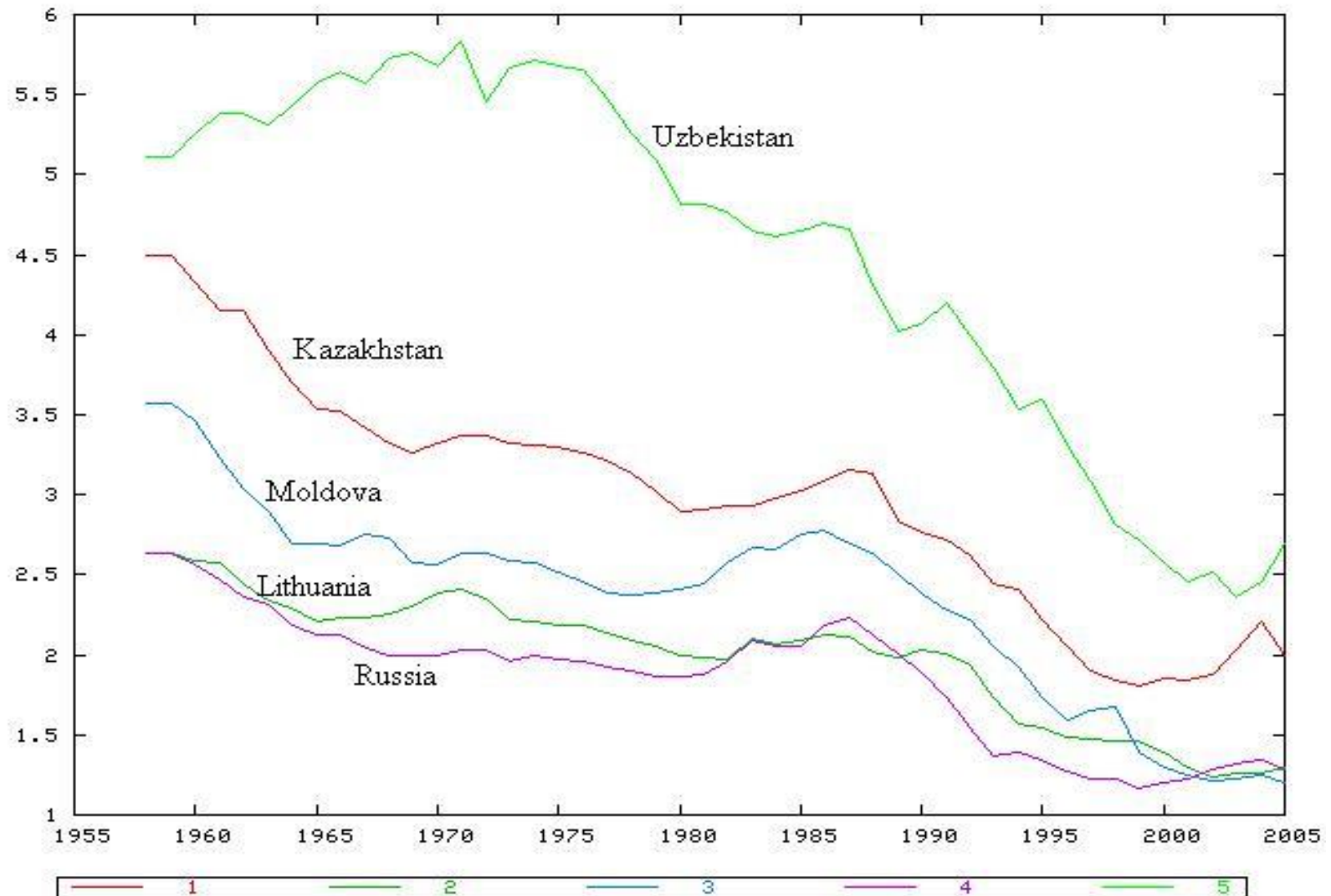
- Declining fertility
- Increasing longevity
- Out-migration of youth



Declining fertility

- **Demographic studies demonstrated that the declining fertility (birth) rates has the greatest role in causing population aging**
- **Population aging happens because the declining fertility (birth) rates make recent cohorts smaller than the preceding ones, thus tilting the age distribution towards older ages.**

Total fertility rates in some FSU countries

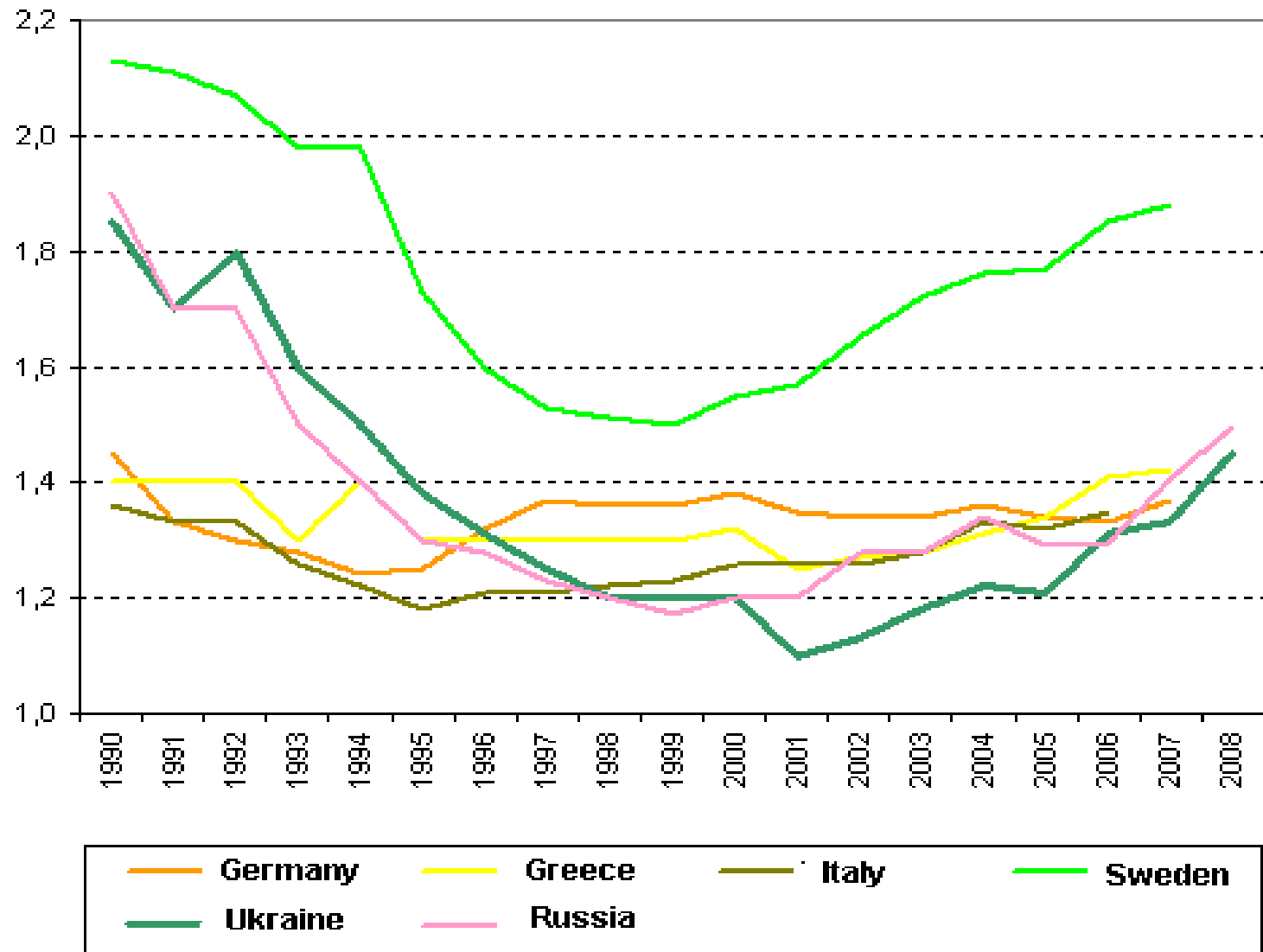


Declining fertility in the 1990s

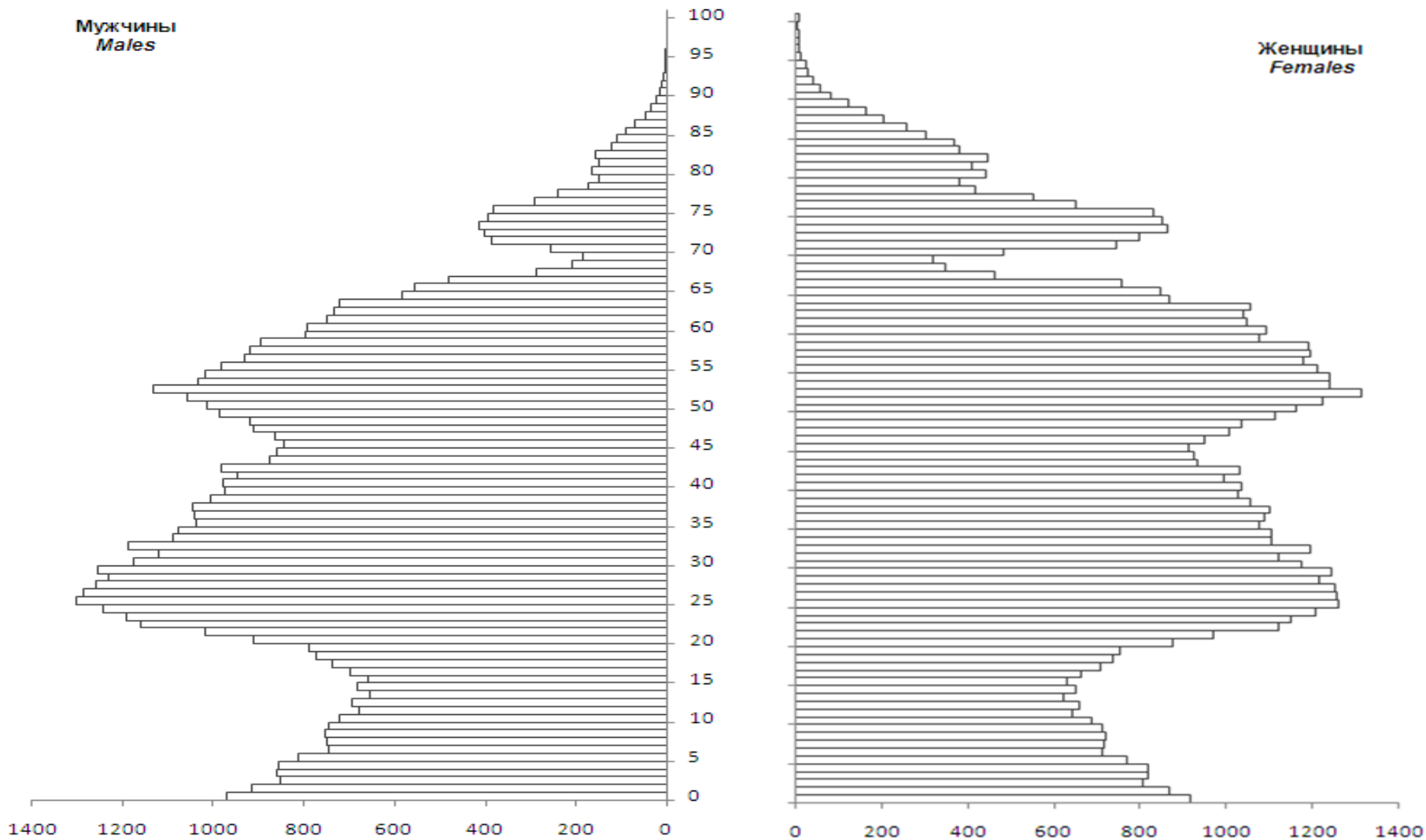
**Result: Population aging “from the bottom”
(of the population pyramid)**

- **Rapid decline of fertility in FSU countries during the transition period**
- **Currently all countries of the Eastern Europe demonstrate fertility below the average European level**

Total fertility rates in European countries



Age and sex distribution of Russia on 1.1.2013



Courtesy of V.Kozlov

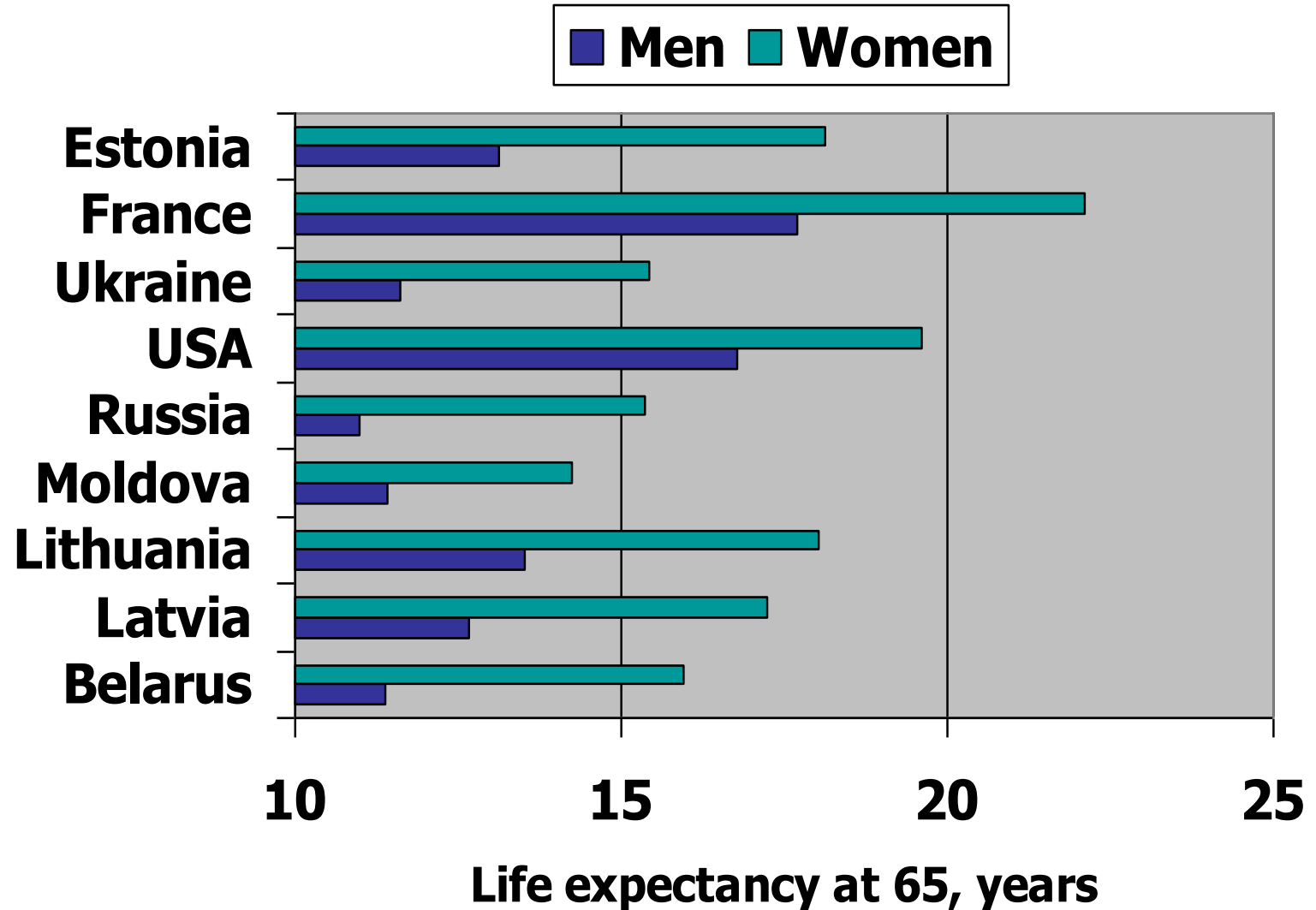
Increasing longevity

- **The increase in life expectancy has two components, acting on population aging in the opposite directions.**
- **The first component is the mortality decline among infants, children and relatively young persons, having age below the population mean. This component of mortality decline is acting against population aging, because its effects (saving young lives) are similar to effects of increased fertility**

Increasing longevity (2)

- The second component of the increase in life expectancy is related to a new trend of mortality decline, which had emerged after the 1950s in the developed countries -- an accelerating decrease in mortality rates among the oldest-old (85+ years), and the oldest-old women in particular
- This second component of mortality decline, which is concentrated in older age groups, is becoming an important determinant of population aging (women in particular) in industrialized countries (population **aging "from the top"** of the population pyramid).

Life expectancy at age 65, 2003-2005



Increasing longevity (3)

- **The second component did not play a significant role in the aging of FSU populations so far. These countries demonstrated a decrease rather than increase in life expectancy during the 1990s.**
- **The uncertainty in the future of mortality changes in FSU countries affects the quality of demographic forecasts of population aging in the countries of the Former Soviet Union.**

The role of immigration

- **Immigration usually slows down population aging, because immigrants tend to be younger.**
- **In Russia immigration during the 1990s partially alleviated the effects of population aging**

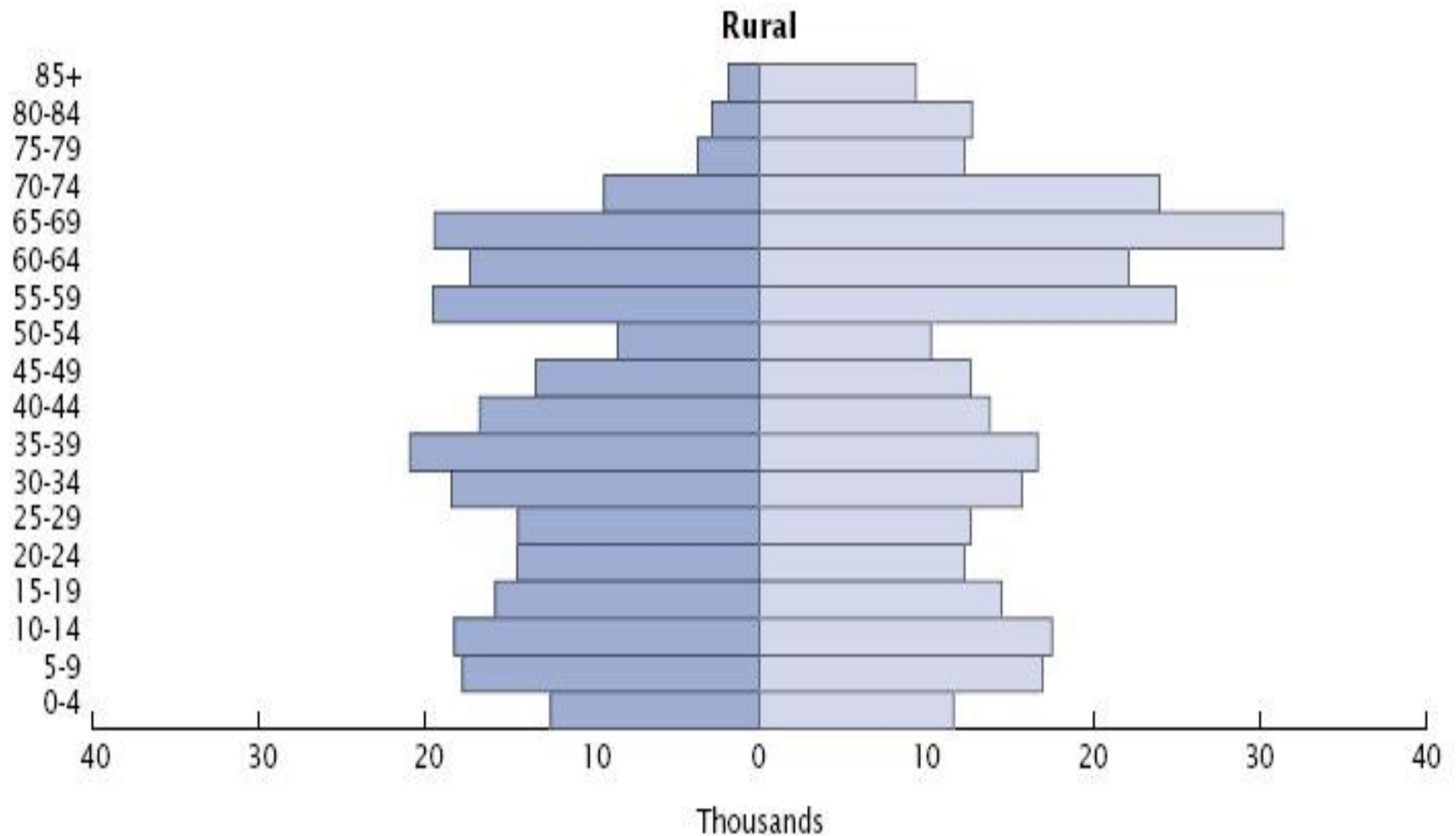
The role of emigration

- **Emigration of working-age adults accelerates population aging, as it is observed now in many FSU countries nations (like Moldova).**
- **Many FSU countries (with exception of Russia, Belarus and recently Kazakhstan) lose young population due to migration**

Role of migration within Russia

- **Within Russia the migration processes accelerate population aging in rural regions of European North and Center (due to out-migration of youth) and slow down it in big cities like Moscow.**
- **Rural population in Russia is older than urban population despite higher fertility.**
- **Population aging is particularly prominent among rural women in Russia.**
- **While the proportion of women aged 65+ in Russia is 16 percent, some regions of Central and North-Western Russia have population of older women that exceeds 30 percent**

Pyramid of rural population of Kursk oblast, Russia



Source: U.S. Census Bureau, 2000a.

Population aging in Russia during the 1990s

- **Declining fertility and increasing young adult mortality accelerated population aging**
- **On the other hand, immigration and declining child and infant mortality helped to alleviate the effects of population aging**

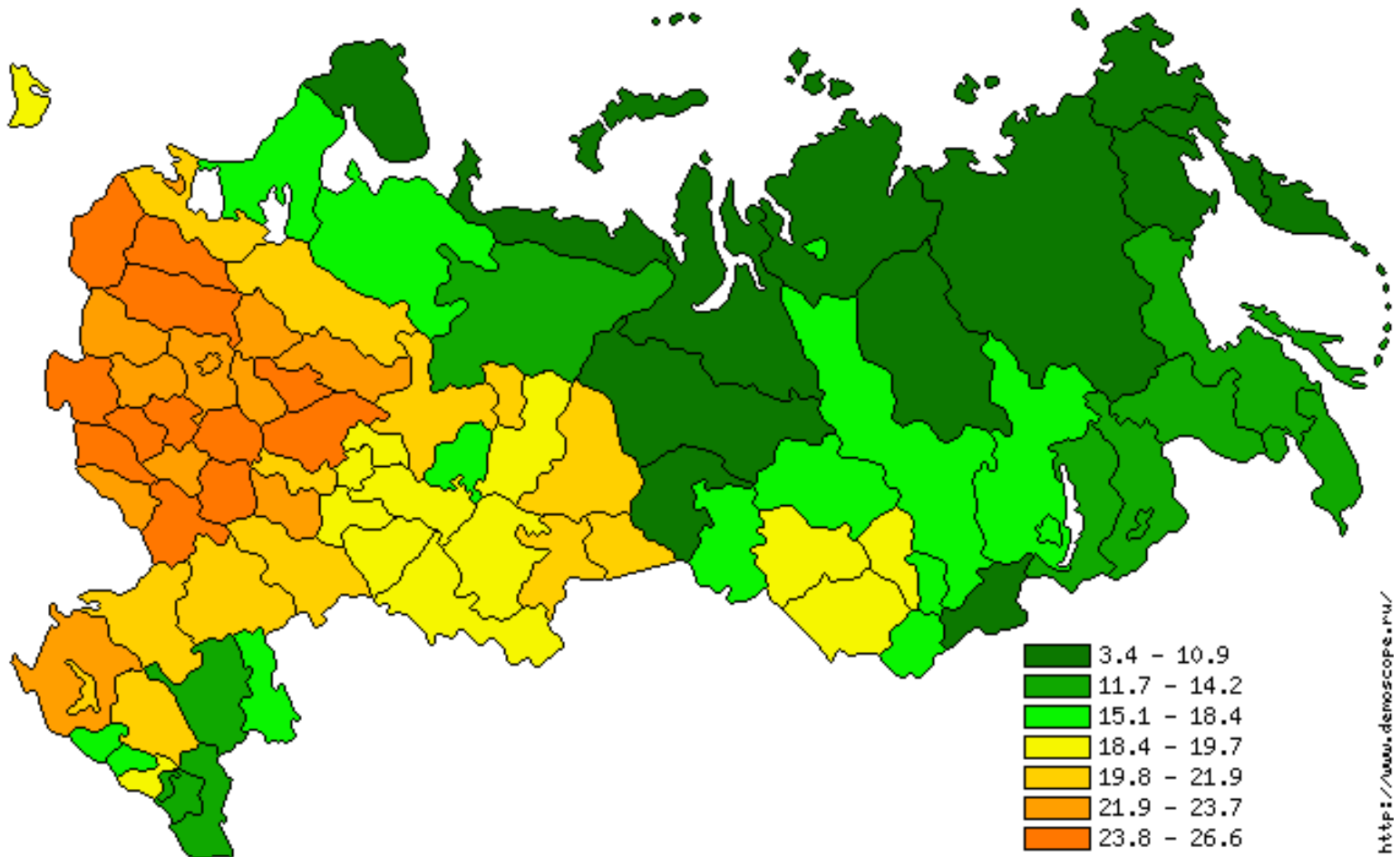
Components of population aging in Russia between two censuses (1989 and 2002), estimates by E. Andreev et al. (2005)

- **It was estimated that population enumerated by 1989 census should age by 13.7 years by 2002.**
- **Part of this population did not survive to older age decreasing the actual mean population by 5.5 years**
- **Children born during this period decreased this mean by 5 years**
- **Young immigrants decreased the mean by 0.2 years**
- **Mean age of population would increase by only one year (instead of actual 3 years) if mortality and fertility would remain at 1989 levels**

Population aging in Russia

- **Russian population still remains relatively young compared to other European countries including countries of the Eastern Europe.**

Percent of population at retirement ages, 1995

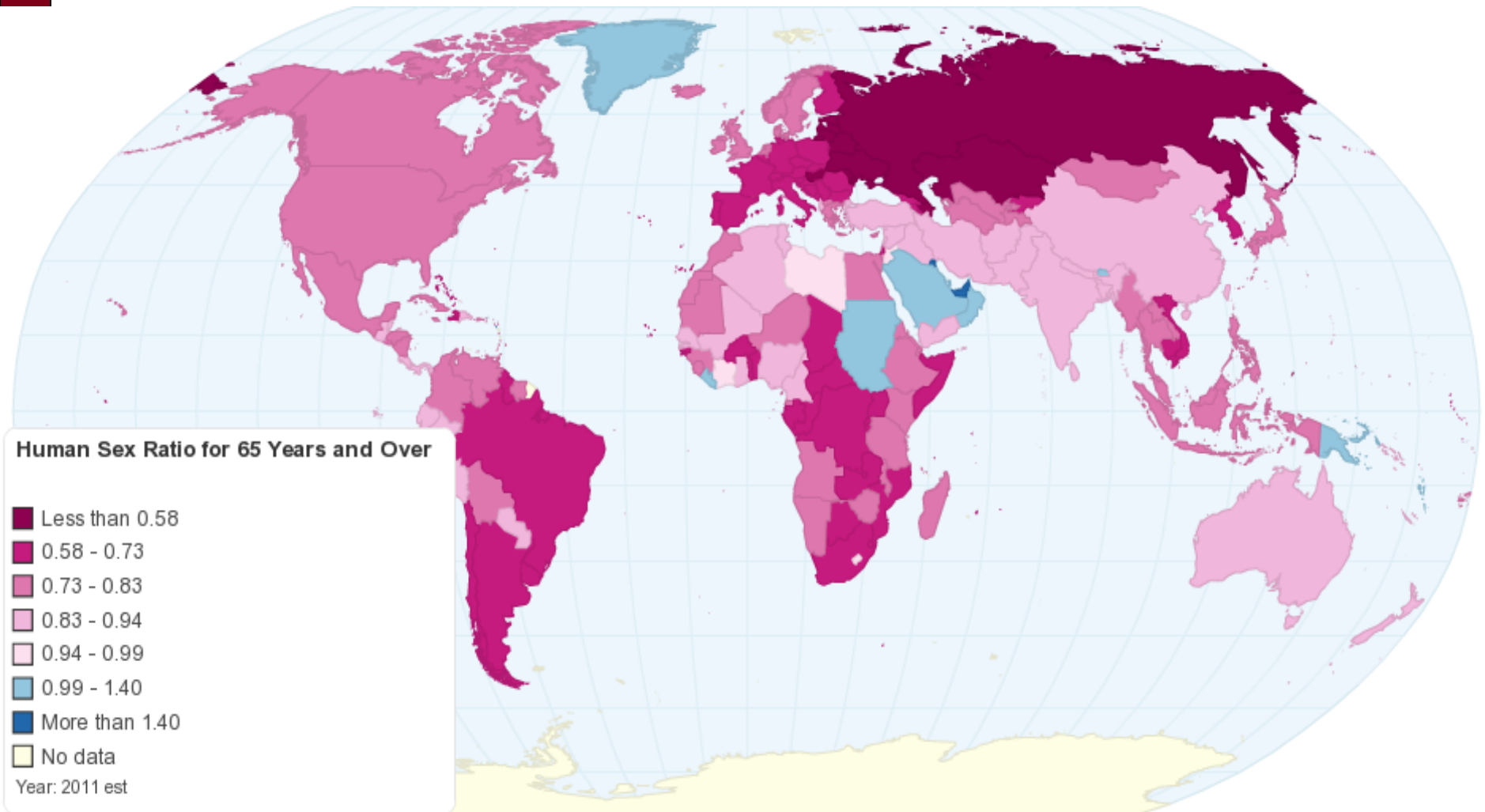


Socio-demographic processes that accompany population aging

Feminization of population aging

- **The fact that in most nations females have lower mortality than males in every age group results in “feminization” of population aging.**
- **In 2005 in Russia, there were 16.8 million older women and 8.4 million older men aged 60 and over, or a sex ratio of 50 men for every 100 women.**
- **In 2007 in the Eastern Europe this ratio was equal to 57 men to 100 women and 69 men per 100 women in Europe.**

Sex ratio at older ages (65+)

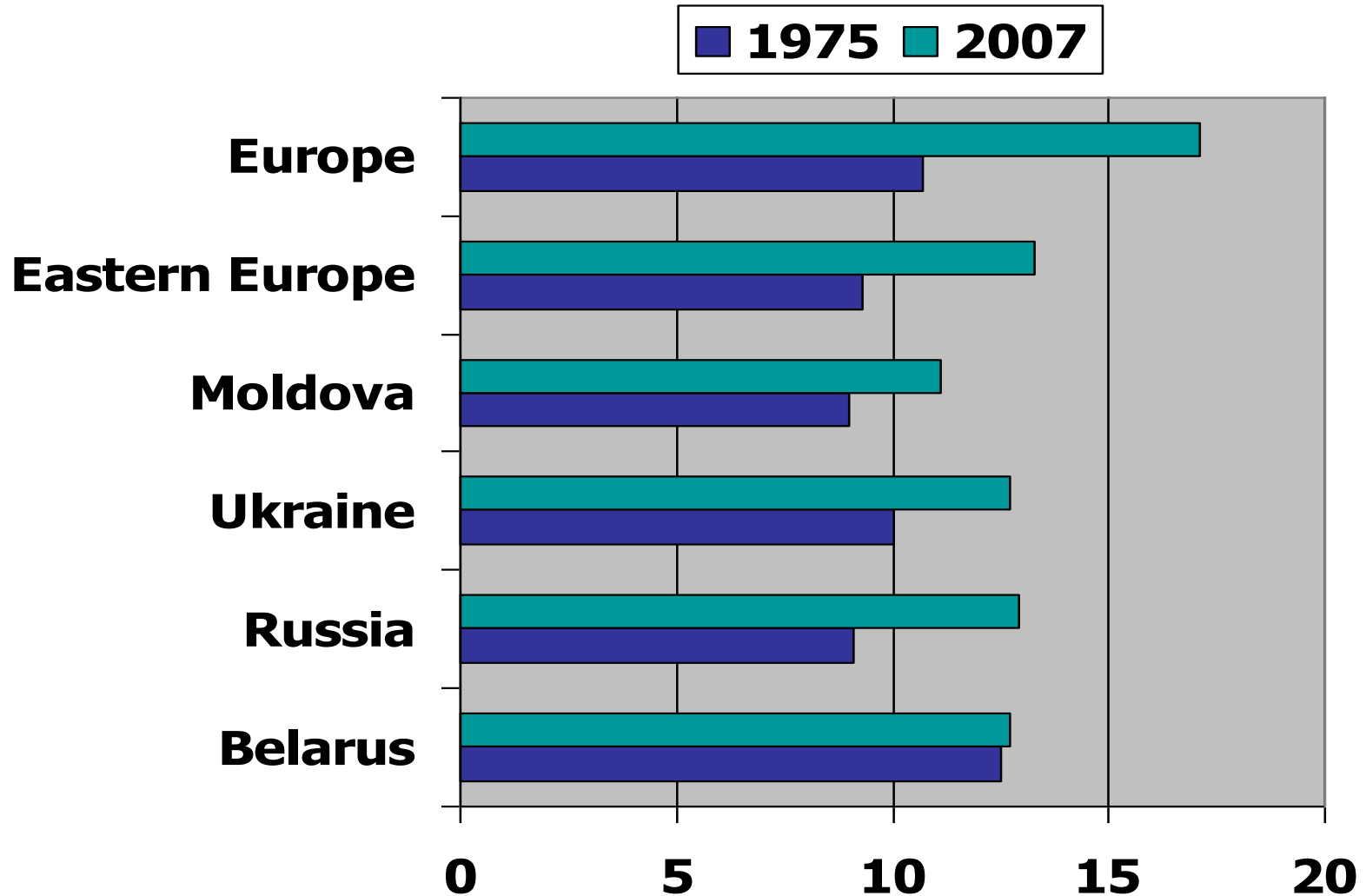


Courtesy of V.Kozlov

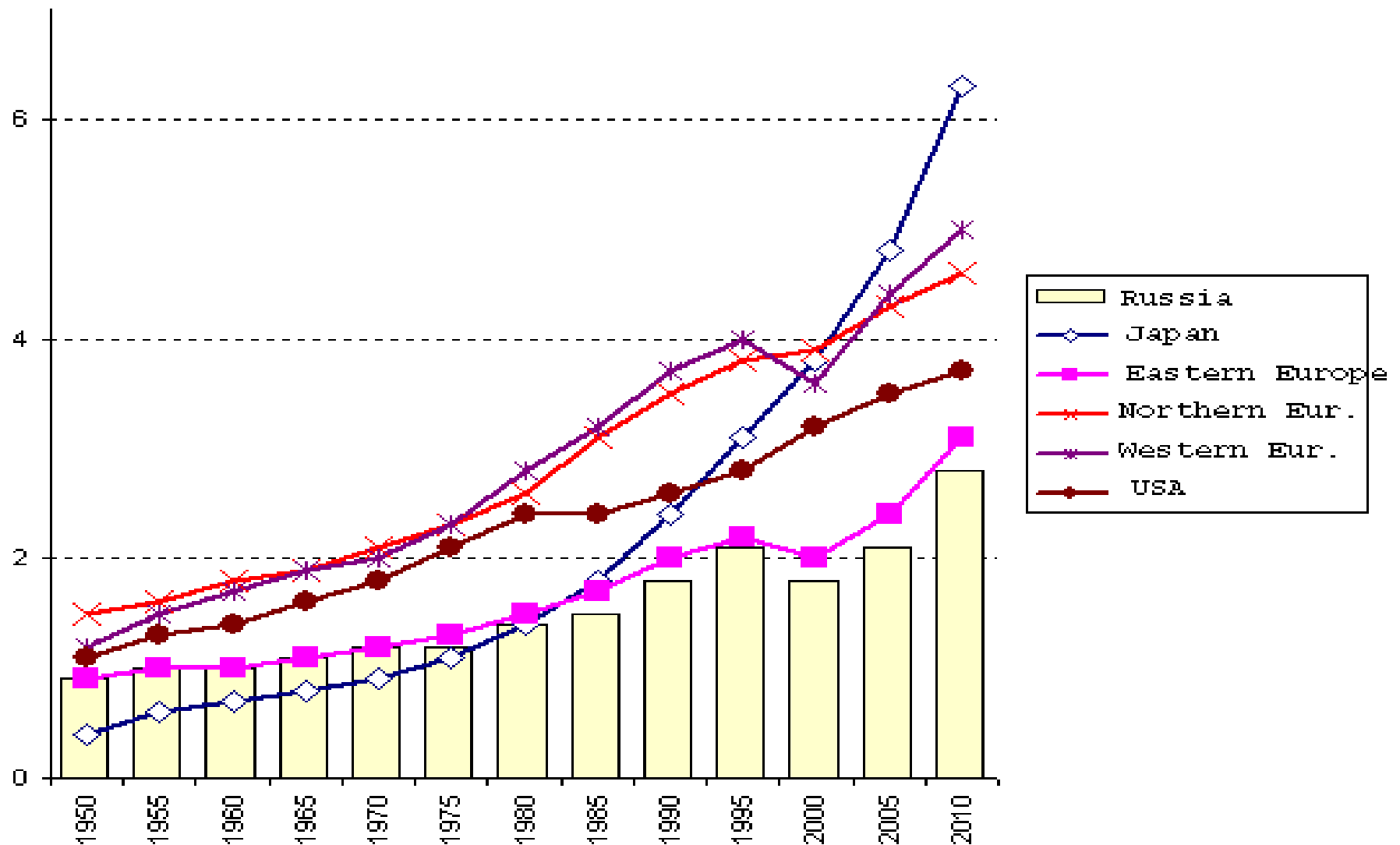
Aging of the older population

- **“Deeper” population aging: the “oldest old” (people aged 80 and over) are now the fastest growing portion of the total population in many countries including Europe**
- **In FSU countries this process did not reach significant proportions**

Percentage of the oldest old (80+) in older population (60+)

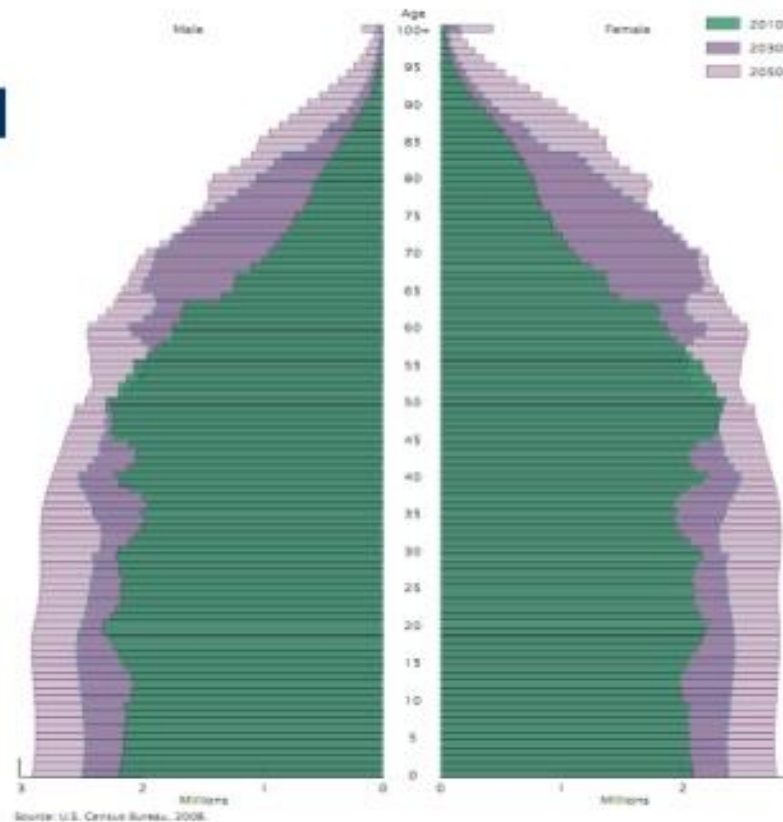


Proportion of 80-years old in population

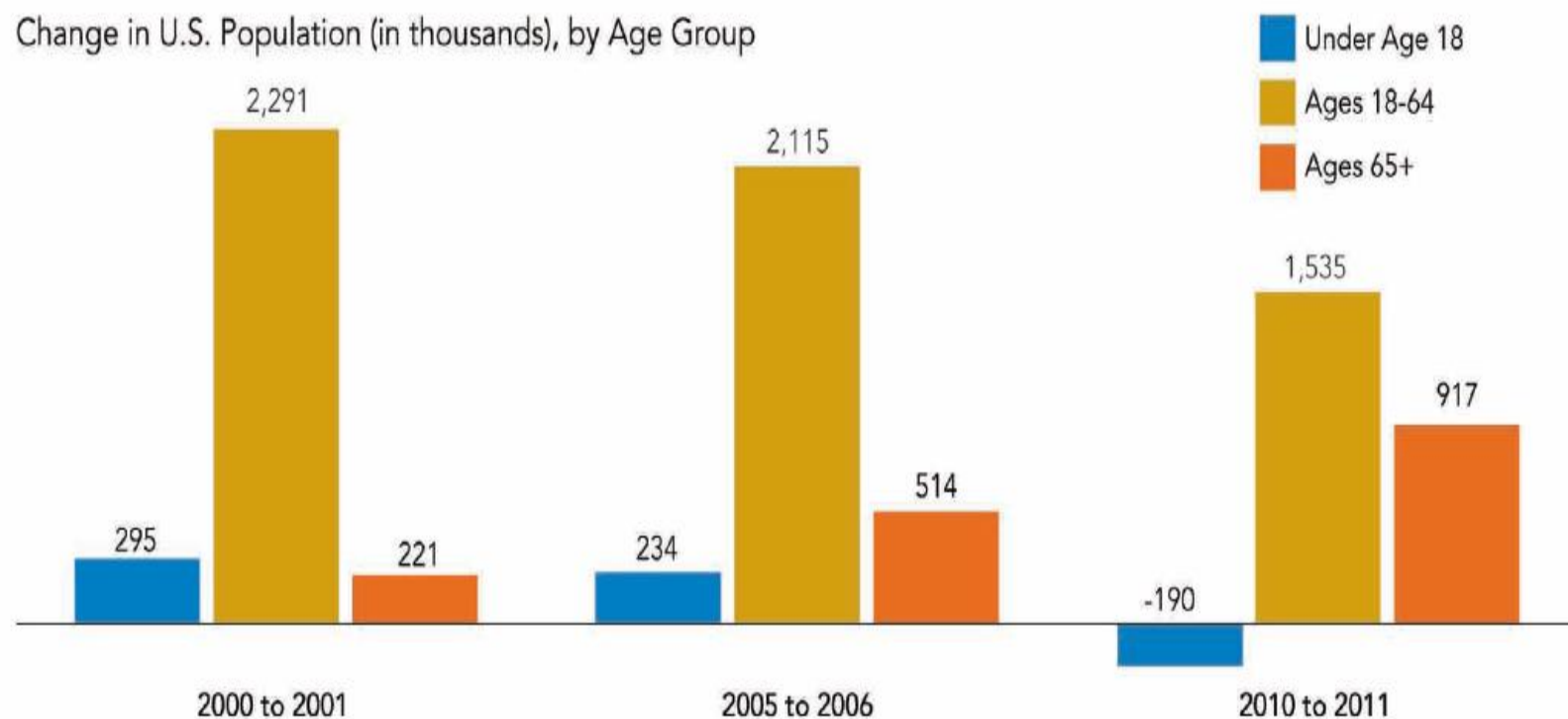


Population aging in the US

Age & Sex Structure of the US Population: 2010, 2030, & 2050



The U.S. Population Is Growing More Slowly and Beginning to Age Rapidly.



SOURCE: U.S. Census Bureau, Population Estimates Program.

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2012 WORLD POPULATION DATA SHEET

Increasing load on social welfare system

- The potential support that elderly may receive from the working population can be measured by the **potential support ratio**: the ratio of population aged 15-64 years to that aged 65 years and over
- The ratio is measured as an inverse of **age-old dependency ratio**

Shrinking support base for the elderly

Potential Support Ratio (population 15-64/population 65+)

Country/Region	1975	2007	2025
Europe	5.7	4.3	3.1
Eastern Europe	6.9	5.0	3.5
Belarus	6.6	4.9	3.9
Moldova	9.5	7.2	4.4
Russia	7.7	5.3	3.8
Ukraine	6.4	4.3	3.3

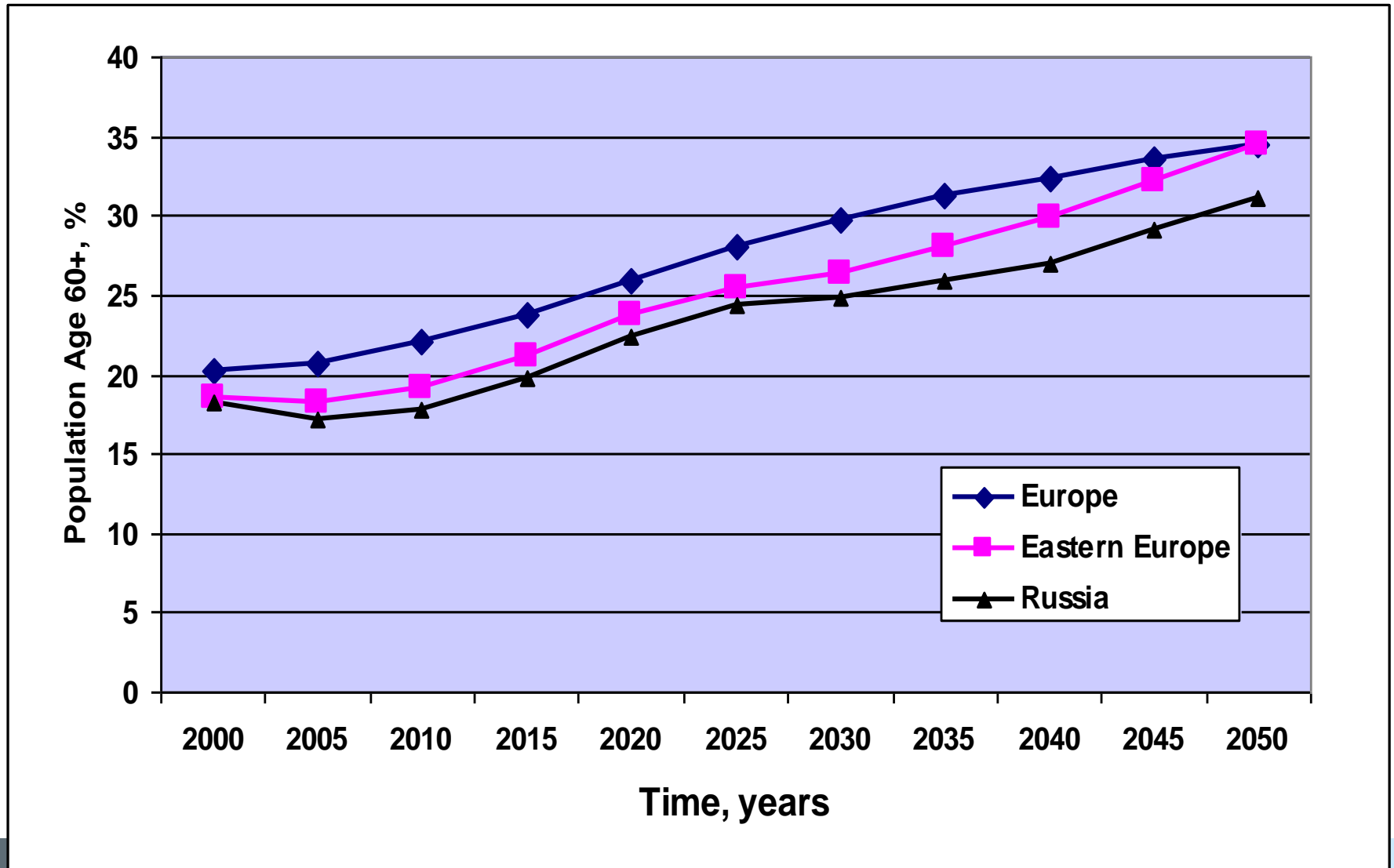
Elderly in Russia often support their children

- **Studies of inter-household transfers during the transition period in Russia found that net inter-household transfers flow predominantly from elderly and “empty-nest” households to younger households.**
- **Transfers allowed older Russians to subsidize working-age families adjusting to post-Soviet labor market and help them to raise children**

Population Aged 60 and Over by Marital Status and Living Arrangements. 2006

Country/Region	Percentage currently married	Percentage living alone	Statutory retirement age
	Men / Women	Men / Women	Men / Women
Europe	80 / 47	13 / 35	-
Eastern Europe	83 / 47	11 / 31	-
Belarus	81 / 39	..	60 / 55
Republic of Moldova	81 / 40	..	62 / 57
Russian Federation	77 / 36	10 / 31	60 / 55
Ukraine	83 / 35	..	60 / 55

Projected proportions of people aged 60+ (medium variant)



Demographic load and the concept of demographic dividend

Dependency ratio

- **A measure of the portion of a population which is composed of dependents (people who are too young or too old to work).**
- **The dependency ratio is equal to the number of individuals aged below 15 or above 64 divided by the number of individuals aged 15 to 64, expressed as a percentage.**

Child and Elderly Dependency Ratios

- The **child dependency ratio** is equal to the number of individuals aged below 15 divided by the number of individuals aged 15 to 64, expressed as a percentage.
- The **elderly dependency ratio** is equal to the number of individuals aged 65 and above divided by the number of individuals aged 15 to 64, expressed as a percentage.

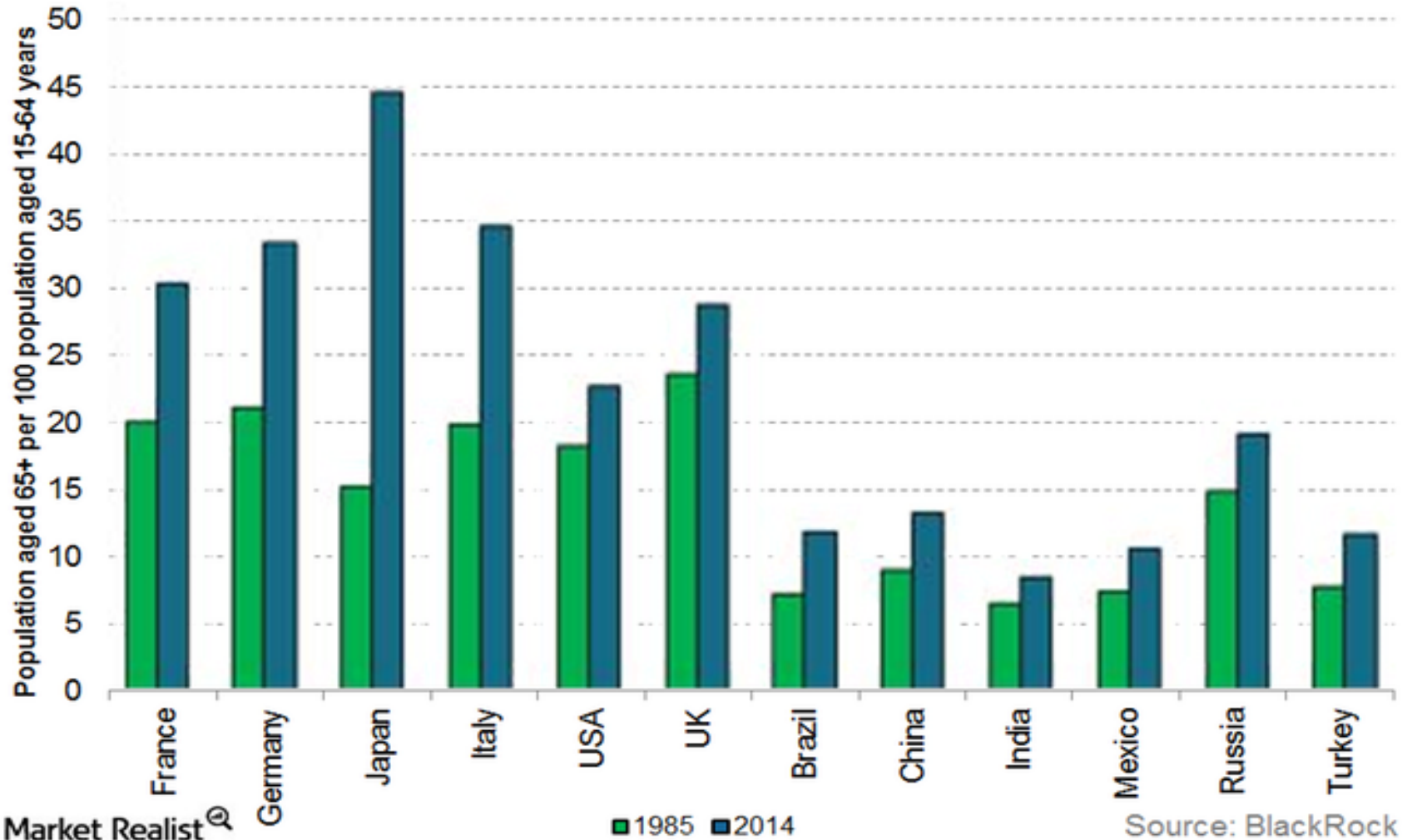
Demographic load

- **Dependency ratio is called sometimes “demographic load”**
- **Demographic load is often calculated per 1000 population (rather than percent)**

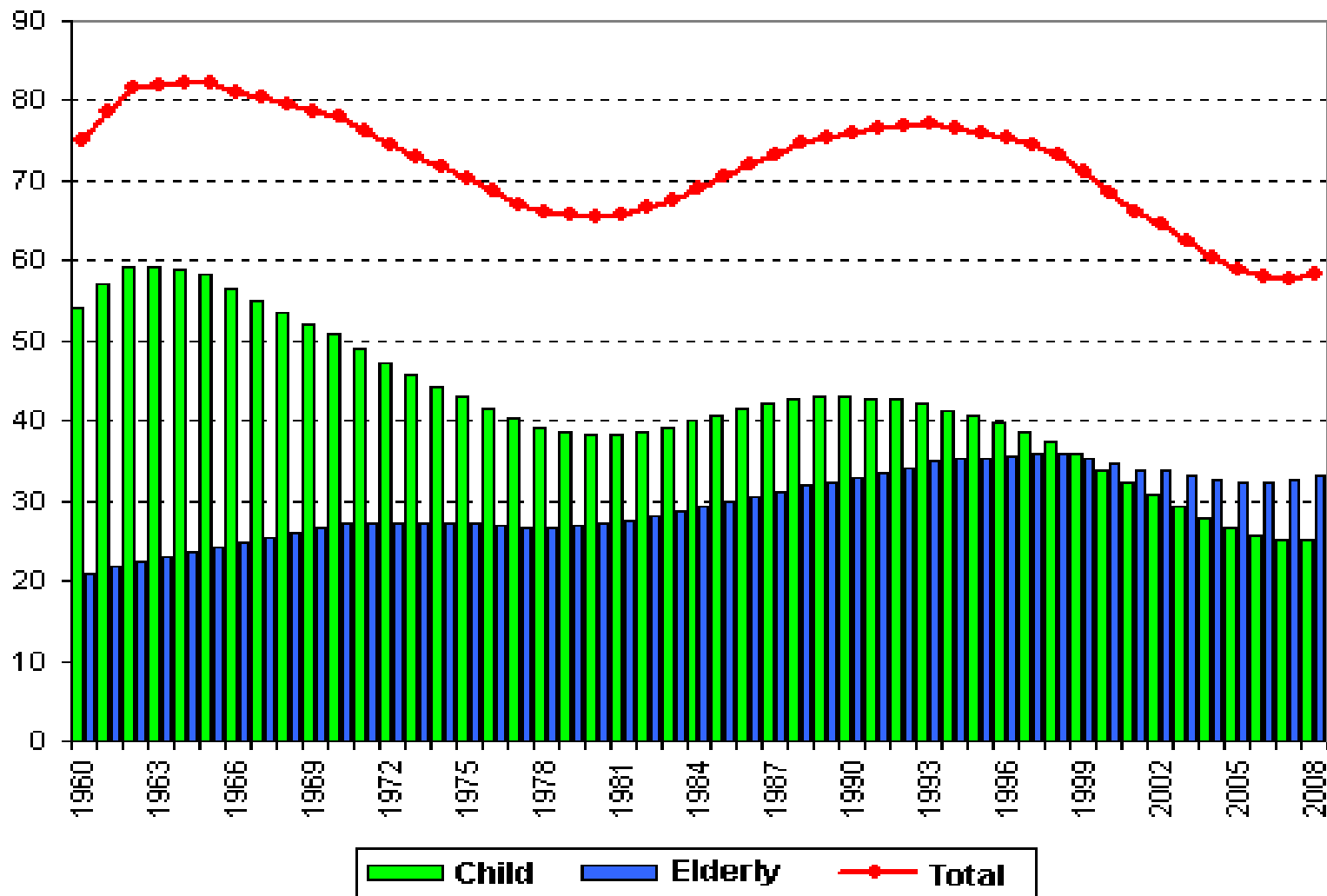
**Total Dependency Ratio =
Child Dependency Ratio +
Elderly Dependency Ratio**

Old Age Dependency Ratio

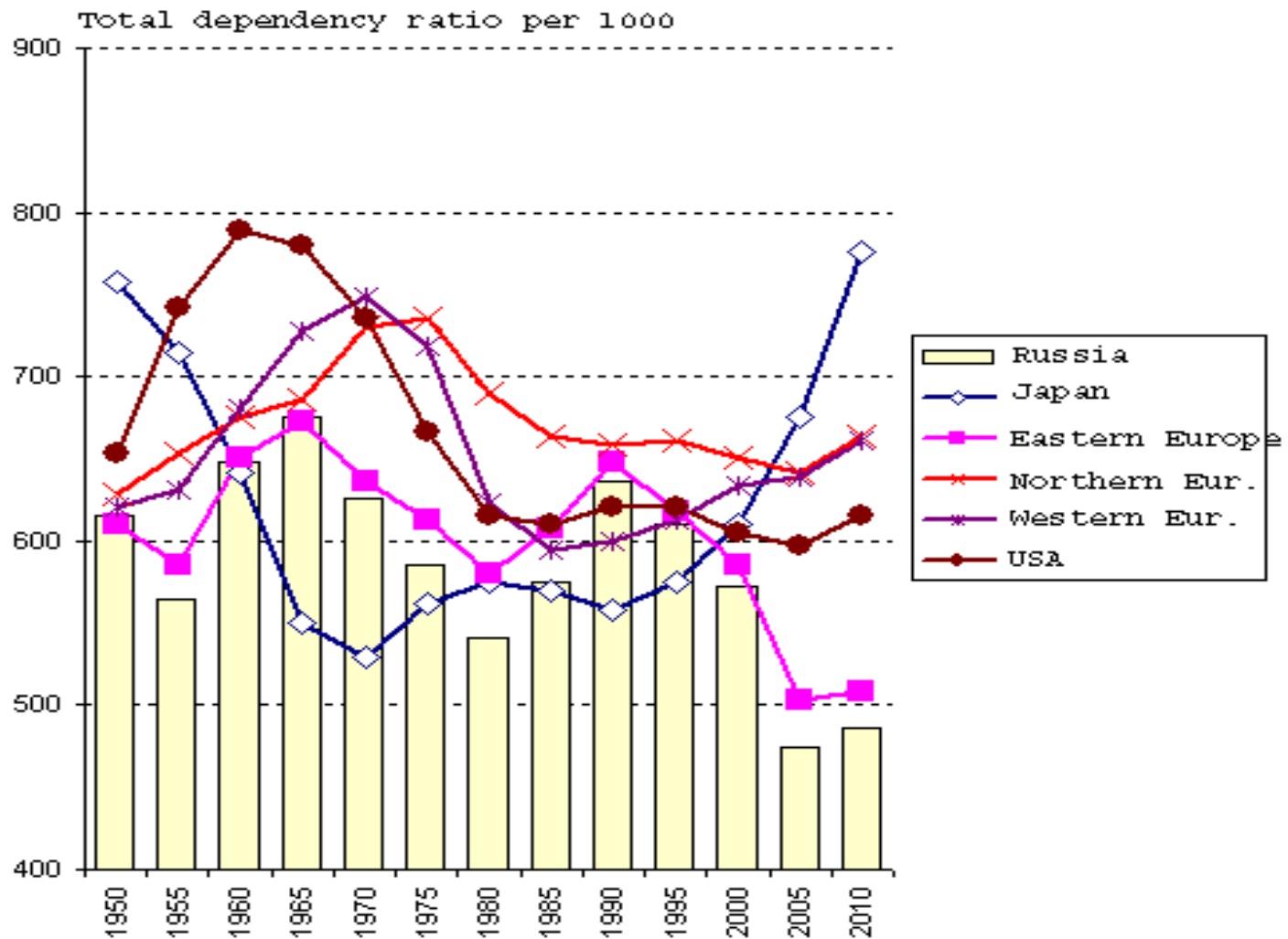
Populations Aging Rapidly in Developed Nations



Components of dependency ratio (per 100) in Russia



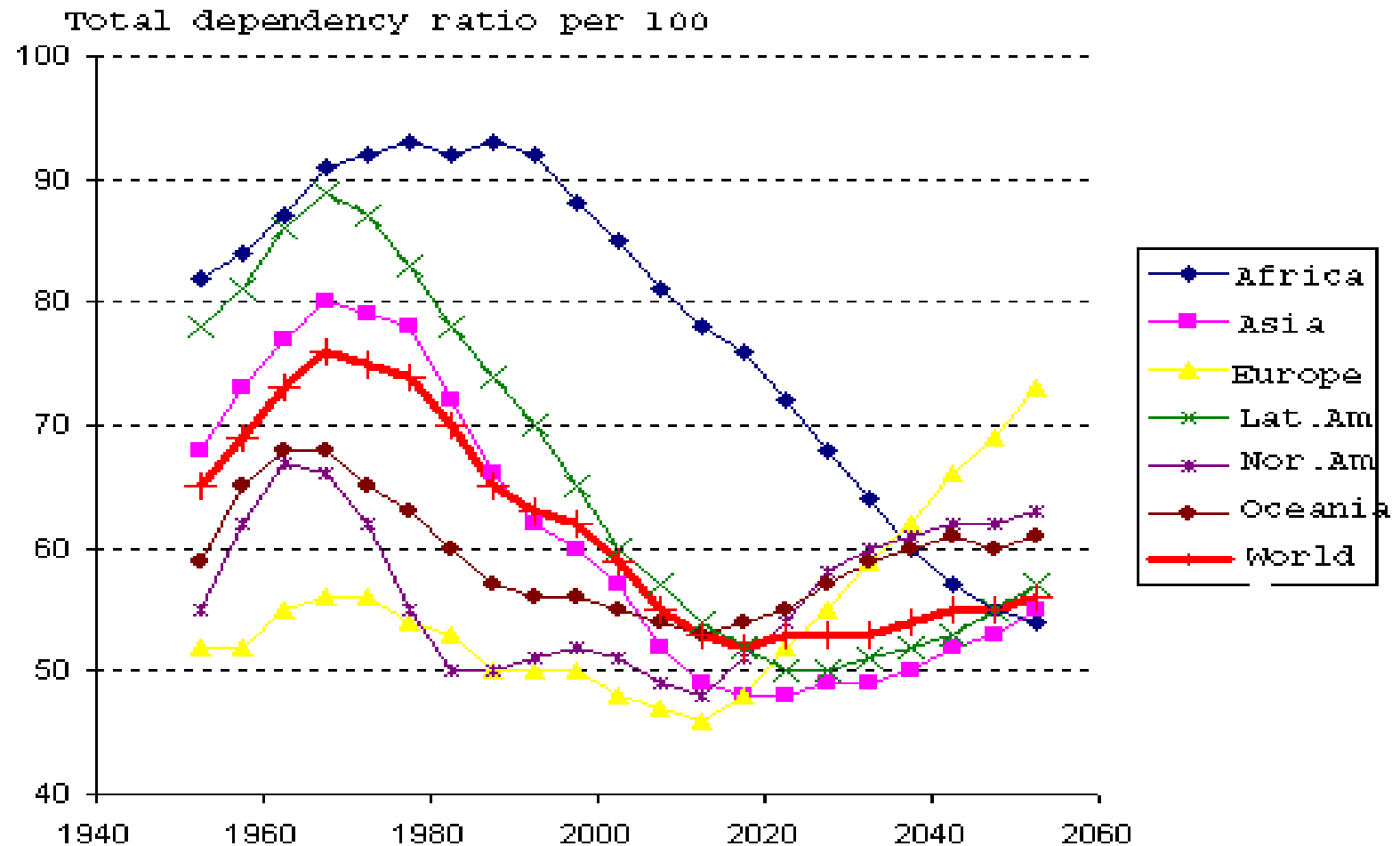
Total dependency ratio: Europe, Russia, USA, and Japan



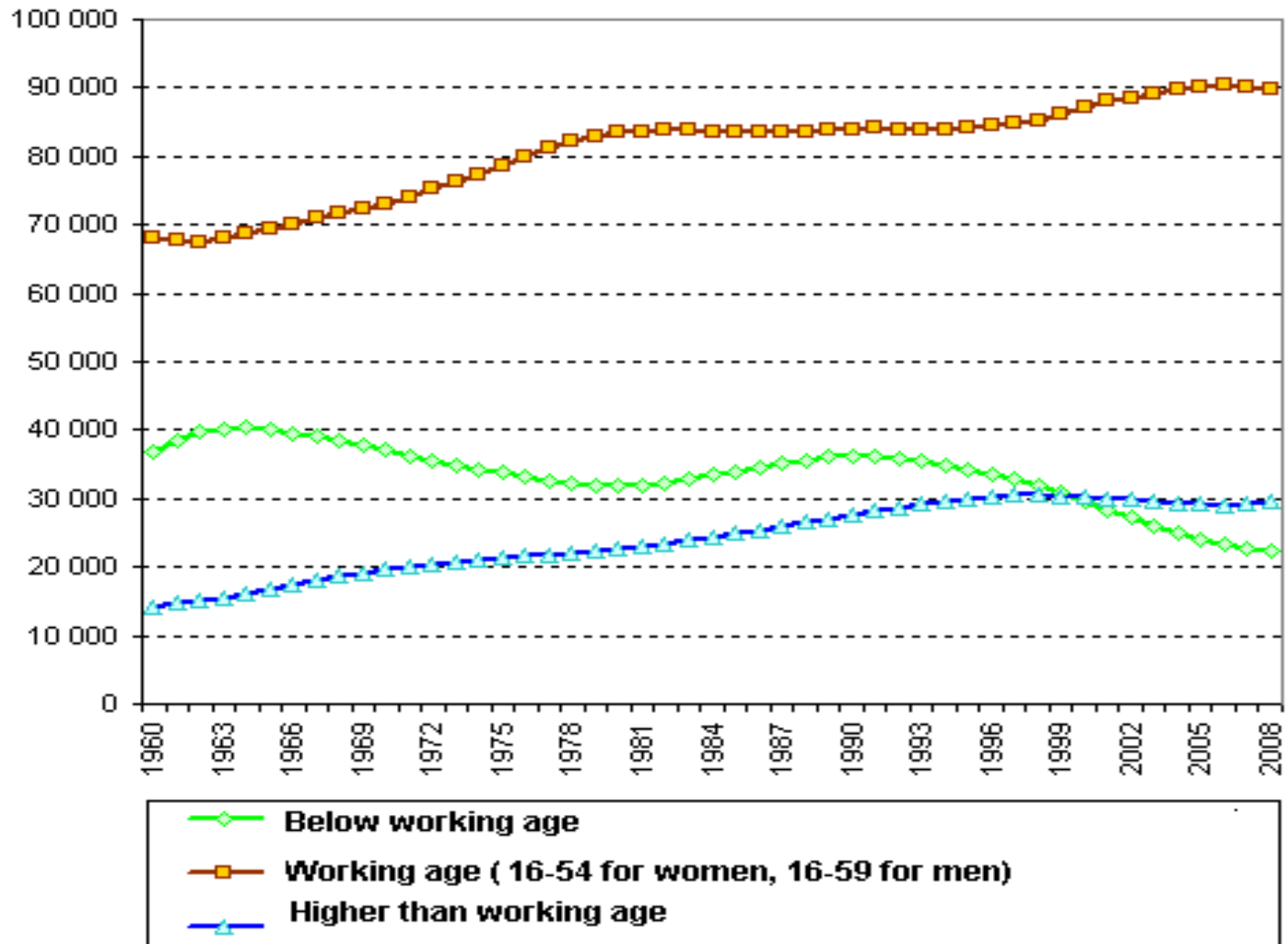
Demographic dividend

- **The demographic dividend is a demographic stimulus to economic growth due to a rising share of working age people in a population.**
- **This usually occurs late in the demographic transition when the fertility rate falls and the youth dependency ratio declines.**
- **During this demographic window of opportunity, output per capita may rise.**

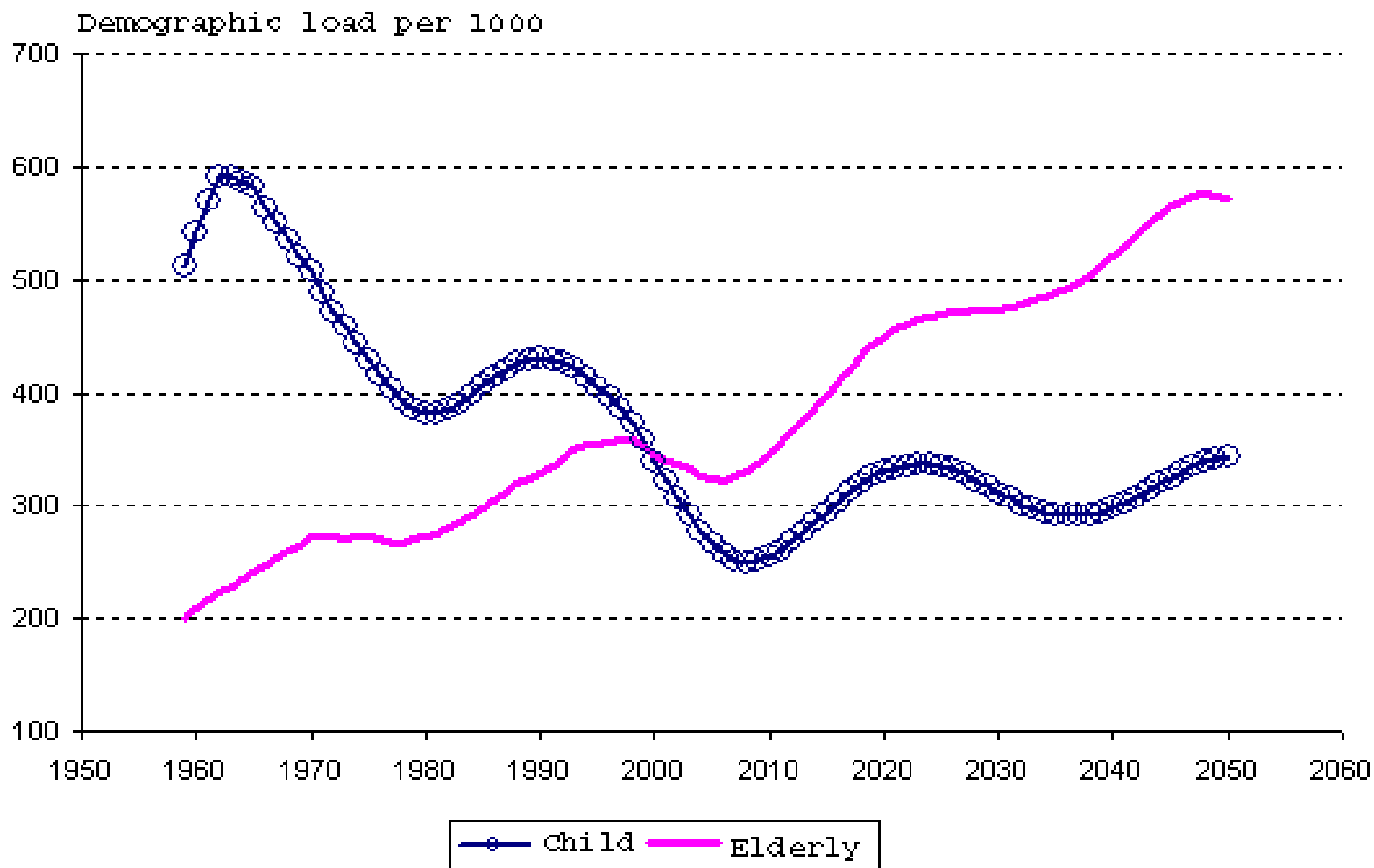
Demographic dividend in the world due to decline of total dependency ratio



Population changes in Russia

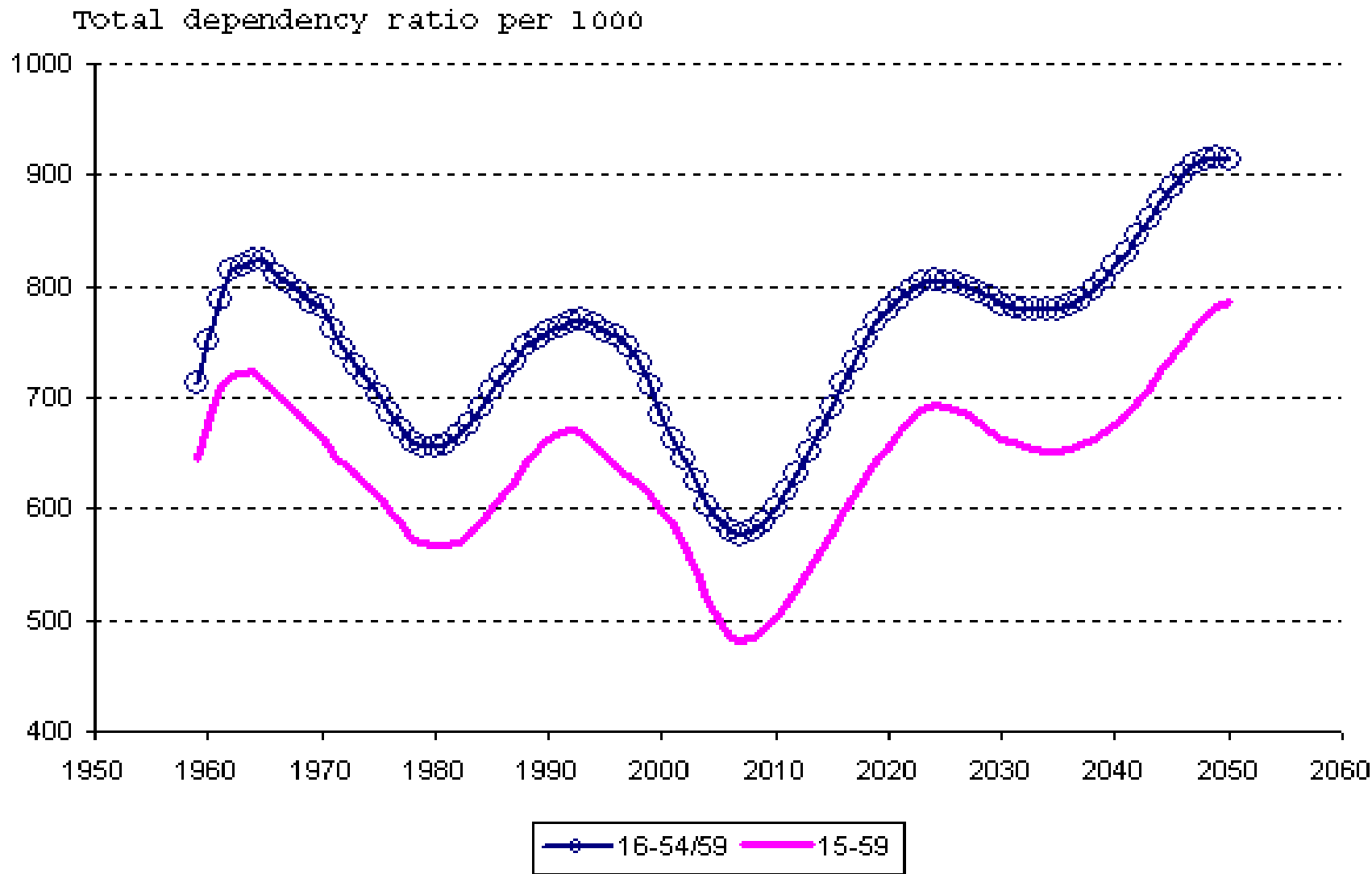


Child and elderly dependency ratios (demographic loads) in Russia



Farewell to demographic dividend in Russia

Total dependency ratios calculated for different working age (below)



Peter Uhlenberg
Editor

International
Handbook of
Population Aging

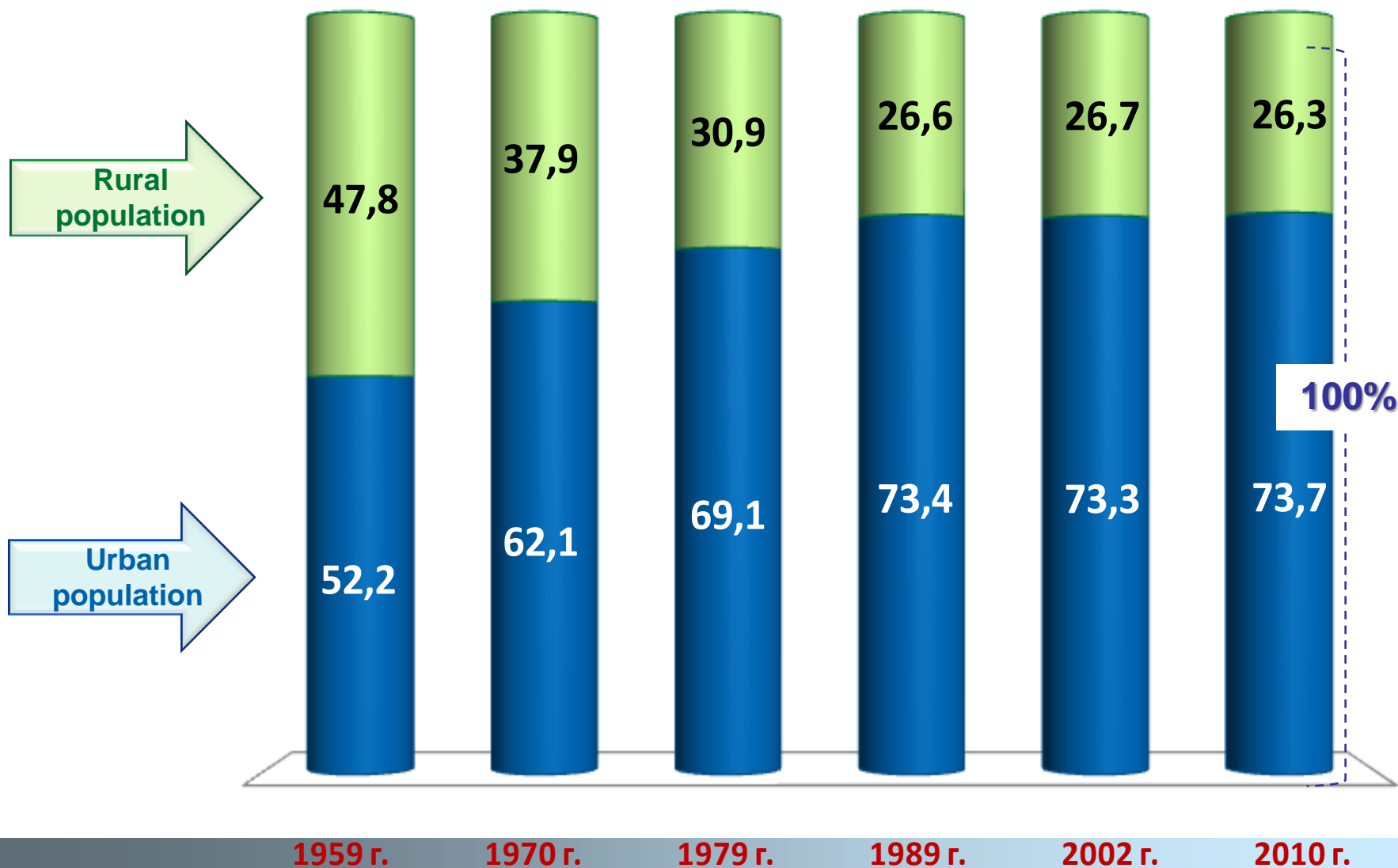
Springer

Gavrilova N.S., Gavrilov L.A. **Aging Populations: Russia/Eastern Europe**. In: P. Uhlenberg (Editor), International Handbook of Population Aging, New York: Springer-Verlag, 2009, pp.113-131.

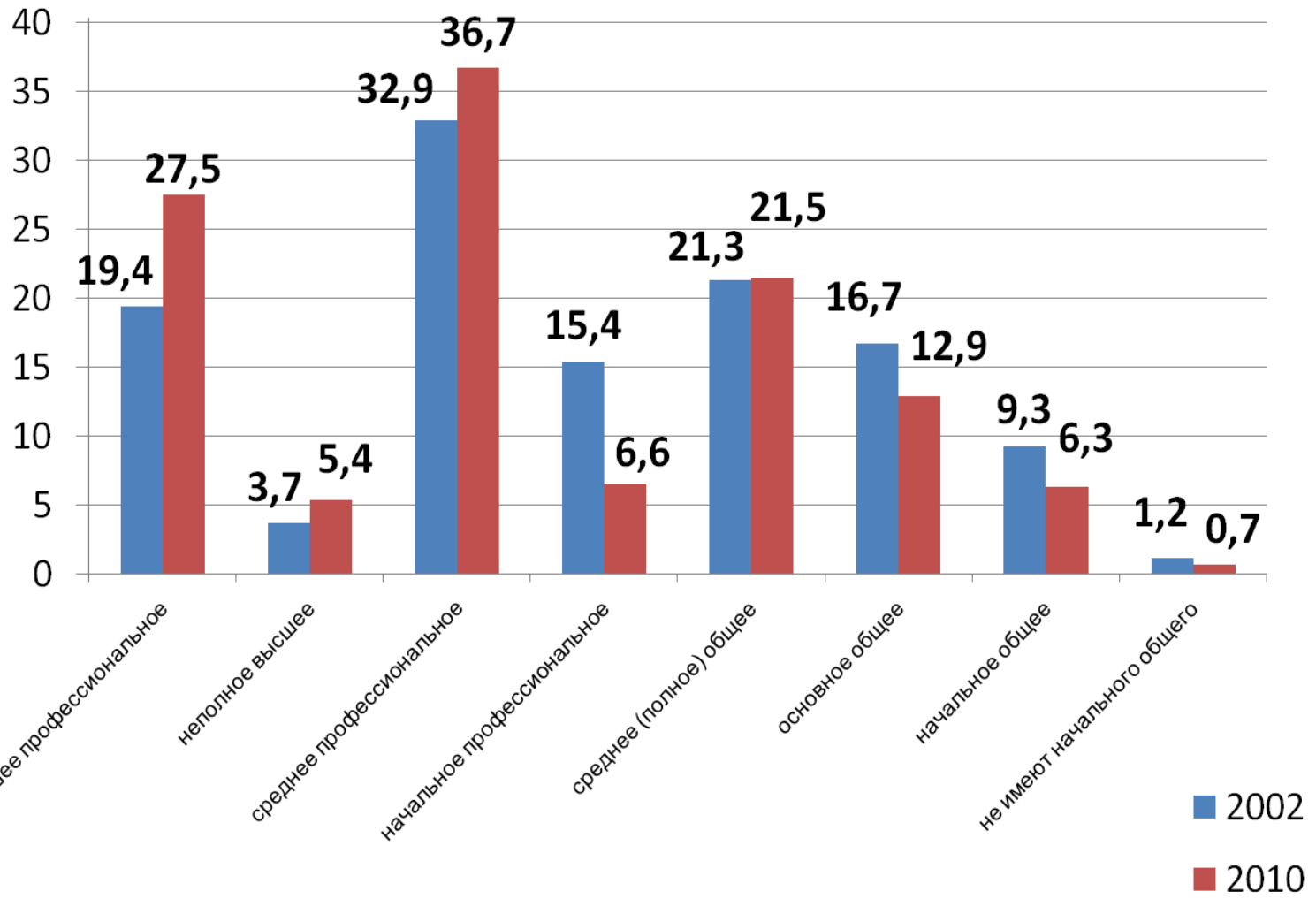
Other commonly used characteristics of population

- **Residence (urban or rural)**
- **Education**
- **Marital status (never married, married, widowed, divorced)**
- **Race or ethnicity**
- **Citizenship**

Proportion of rural and urban population in Russia, %



Population educational level at age 15+, in million Russia, 2010

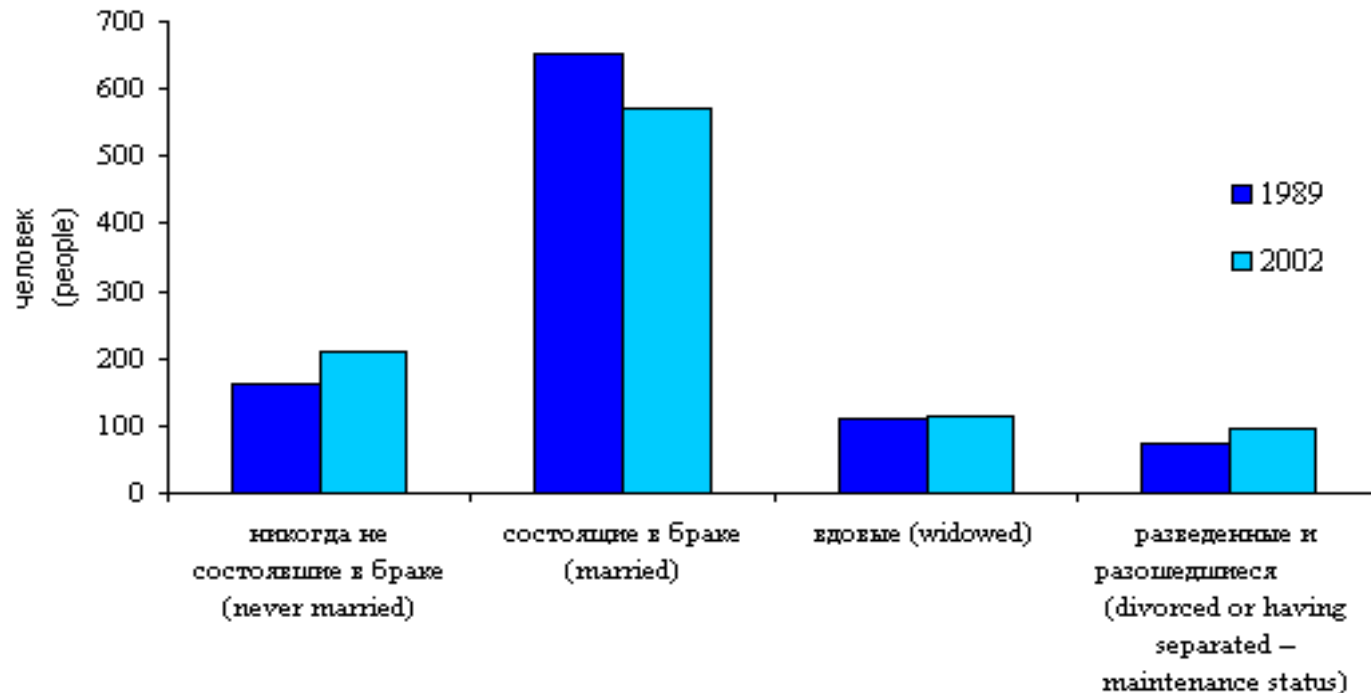


The highest

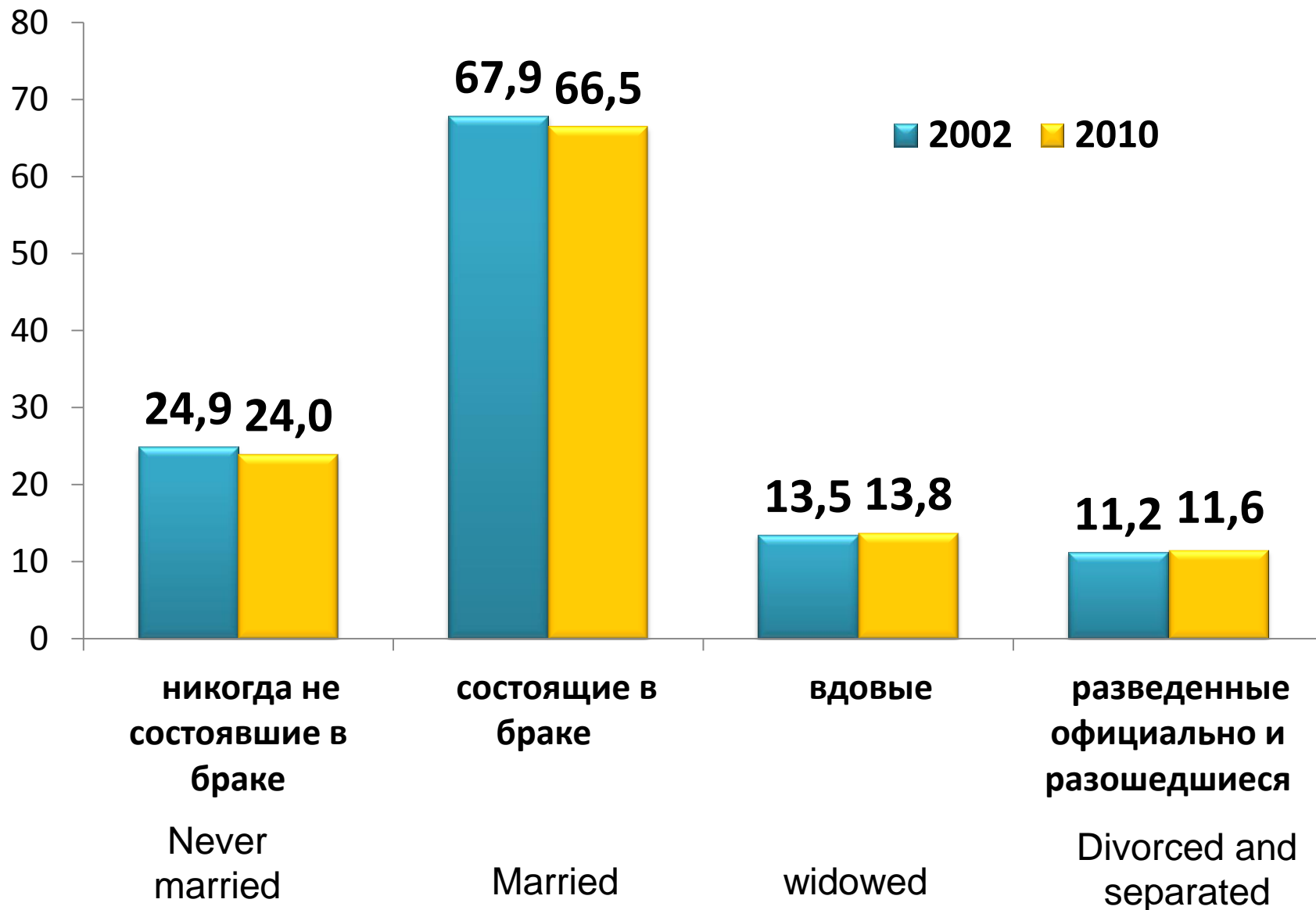
The lowest

Distribution by marital status per 1000 population 16+ years Russia from 1989 to 2002

БРАЧНОЕ СОСТОЯНИЕ НАСЕЛЕНИЯ
(НА 1000 ЧЕЛОВЕК В ВОЗРАСТЕ 16 ЛЕТ И БОЛЕЕ)
*Population marital status
(per thous. at age 16 and over)*

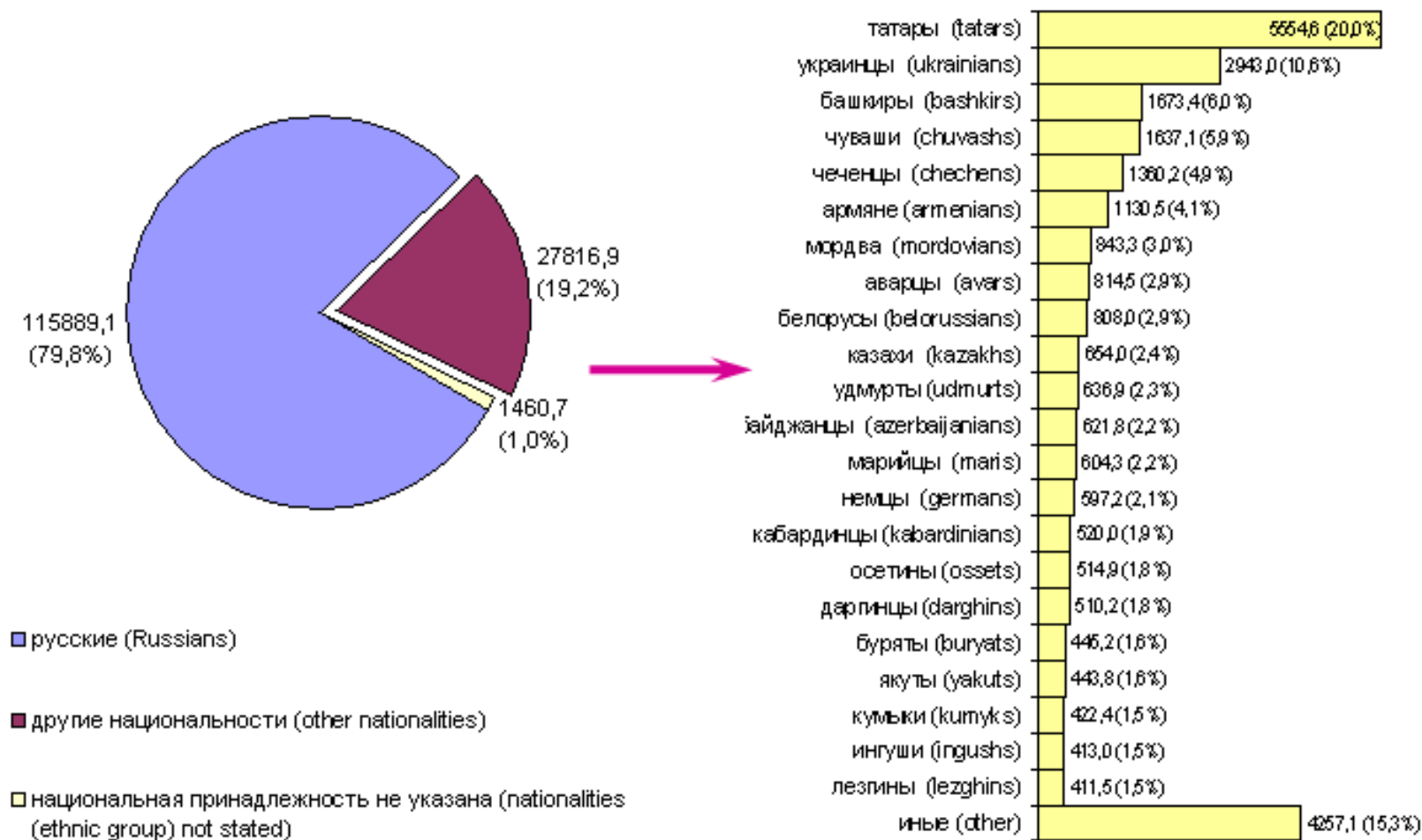


Distribution by marital status, age 16+, in million Russia from 2001 to 2010

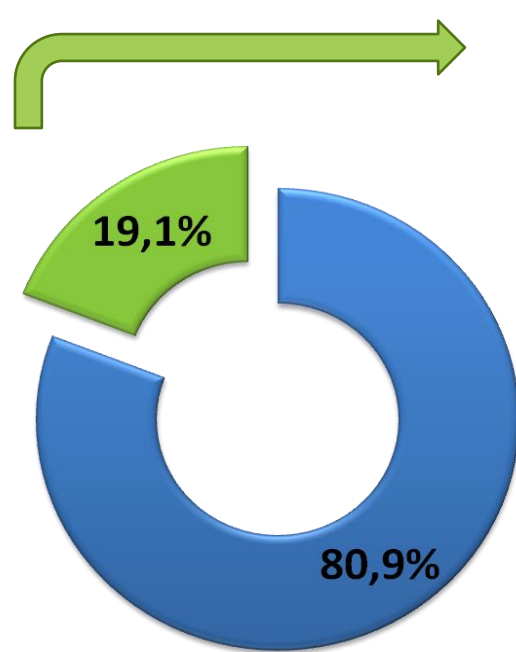


Distribution by ethnicity, Russia 2002

НАЦИОНАЛЬНЫЙ СОСТАВ
(тысяч человек)
*Nationalities and ethnic groups
(thousands)*



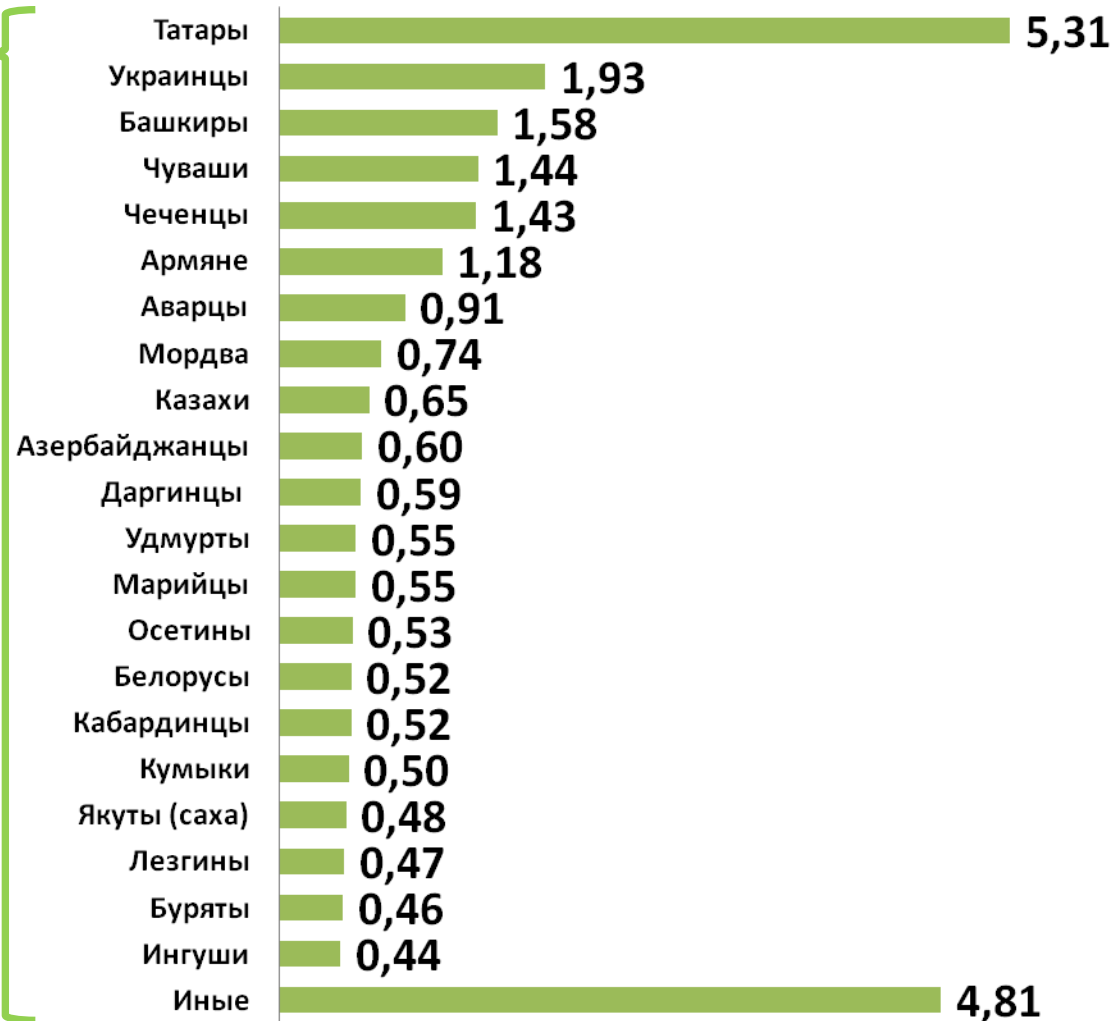
Distribution by ethnicity, in millions Russia 2010



■ Русские

■ Другие национальности

Blue color – Russian
Green color – other ethnicities



0 1 2 3 4 5 6

Nationalities of the Soviet Union: Police leaflet



Русский



Украинец



Татарин



Еврей



Цыган



Киргиз



Белорус



Литовец



Грузин



Армянин



Казак



Узбек



Латыш



Эстонец



Азербайджанец



Молдаванин

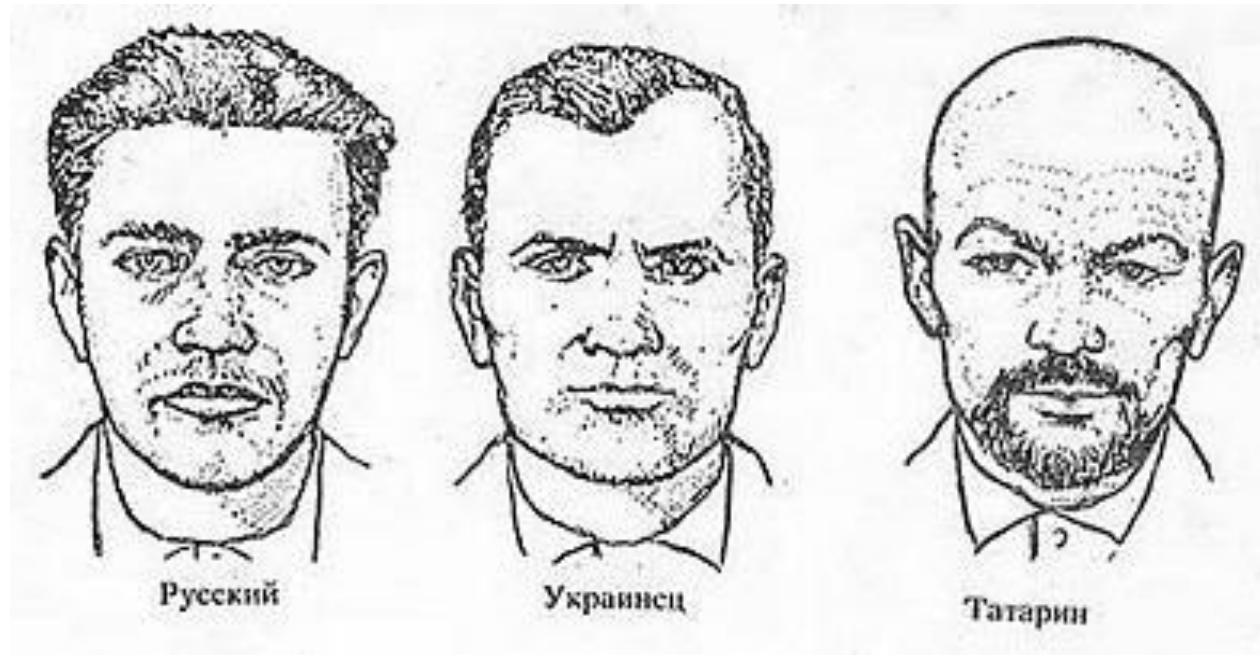


Таджик



Туркмен

The most common ethnicities in Russia



Russian

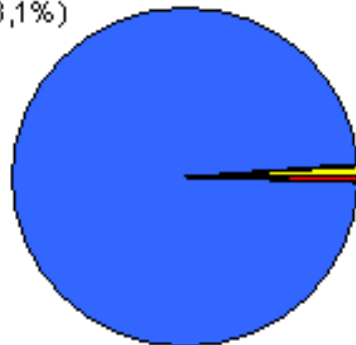
Ukrainian

Tatar

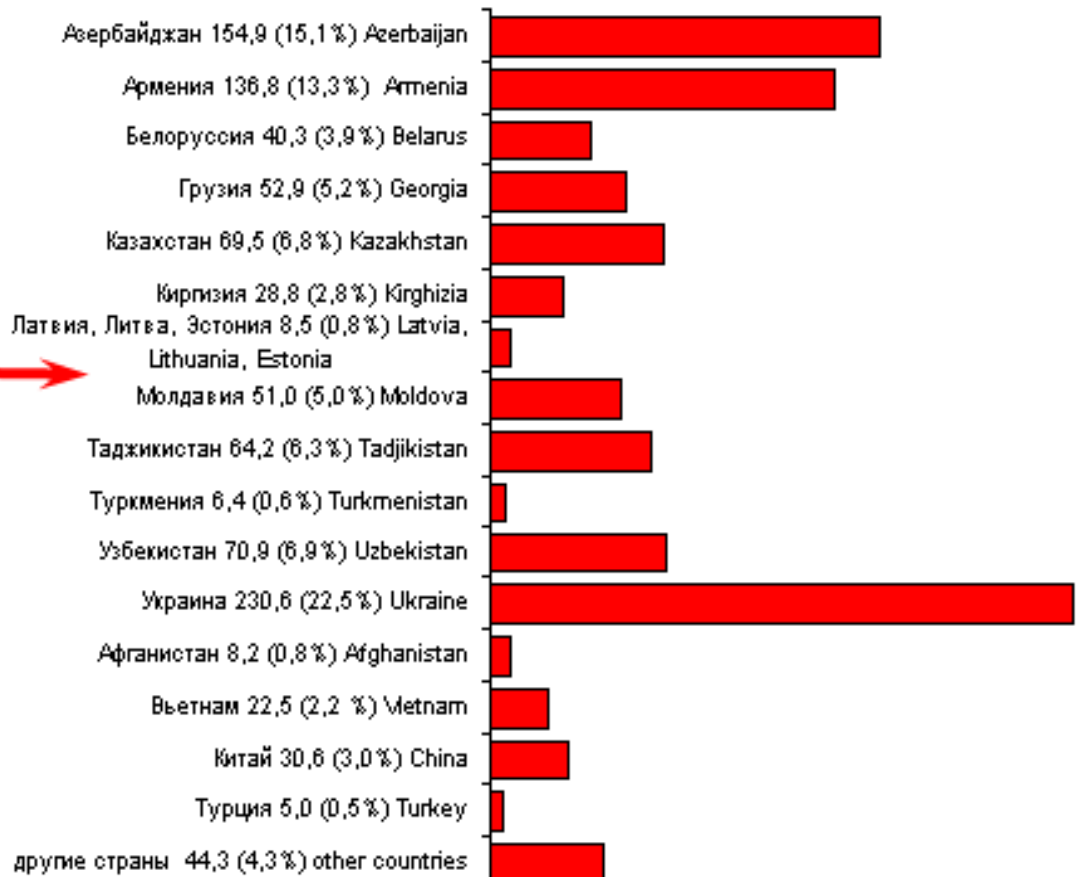
Distribution by citizenship Russia 2002

ГРАЖДАНСТВО
(тысяч человек)
Citizenship
(thousands)

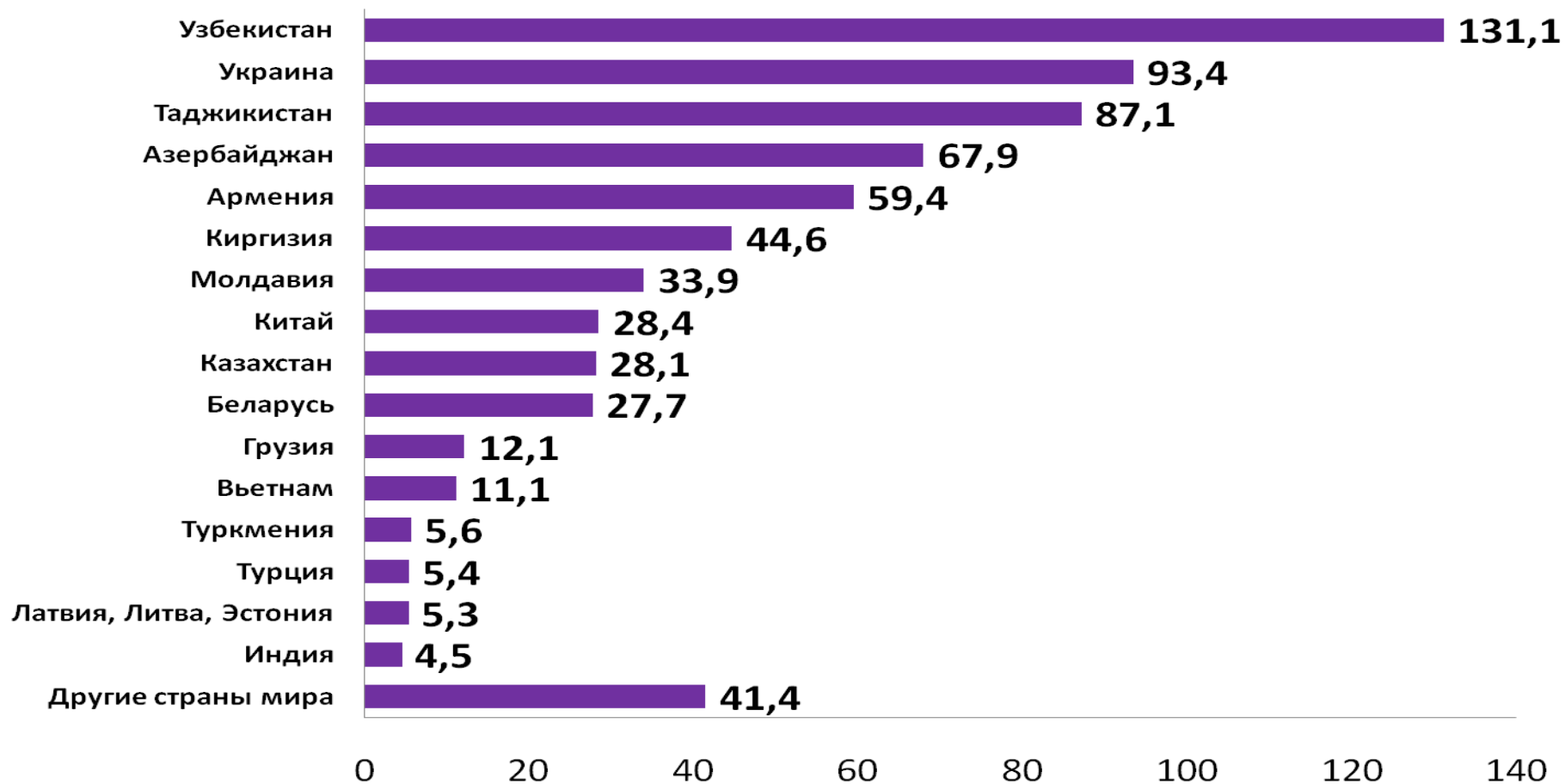
142442,4
(98,1%)



- граждане России (citizens of Russia)
- без гражданства (persons without any citizenship)
- гражданство не указано (citizenship not stated)
- иностранные граждане (foreign citizens)



Population distribution by citizenship of foreign countries, thousands Russia, 2010



The most common groups: Uzbekistan, Ukraine, Tajikistan