

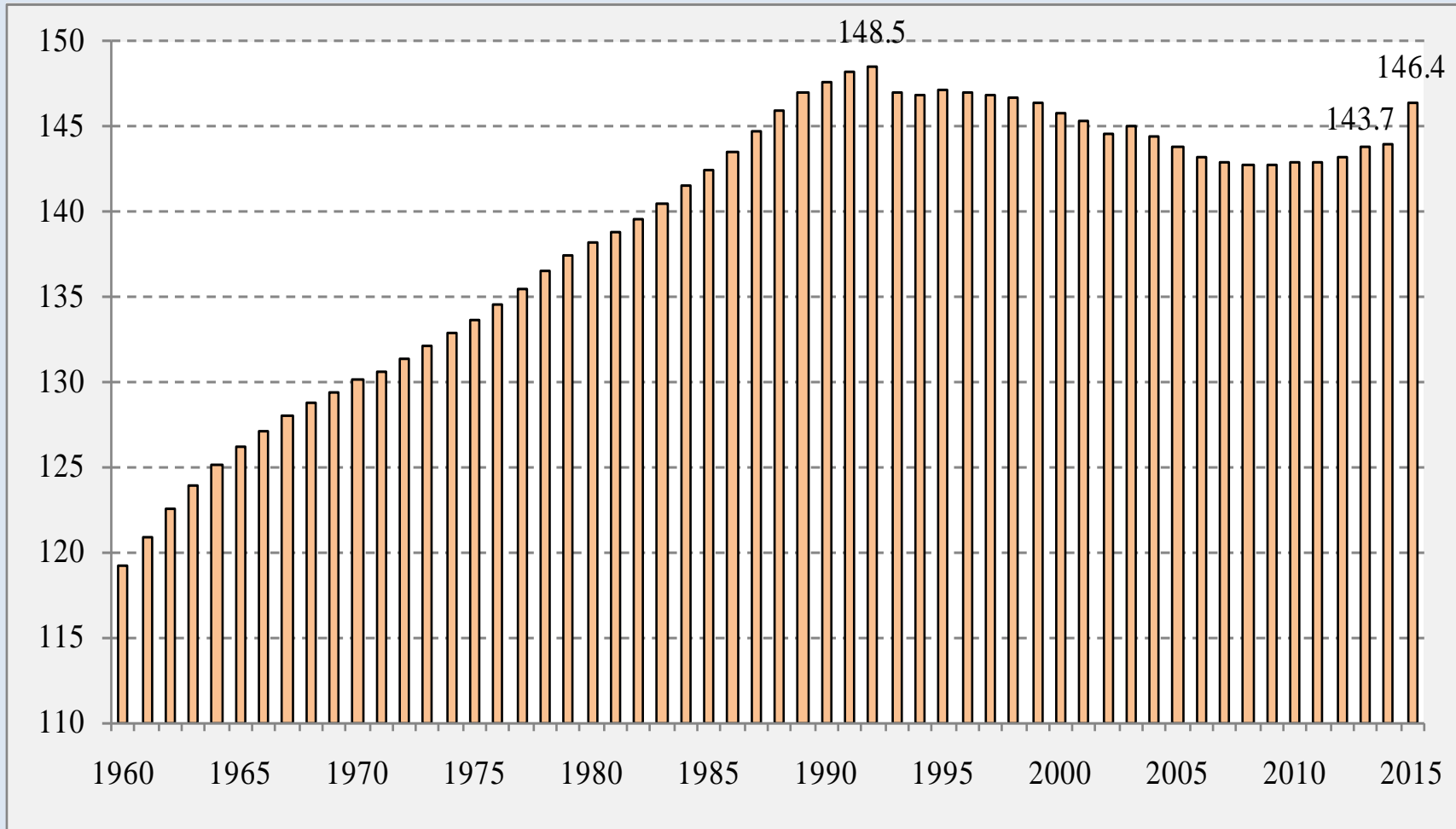


Demographic Projection in Russian Interindustrial Model

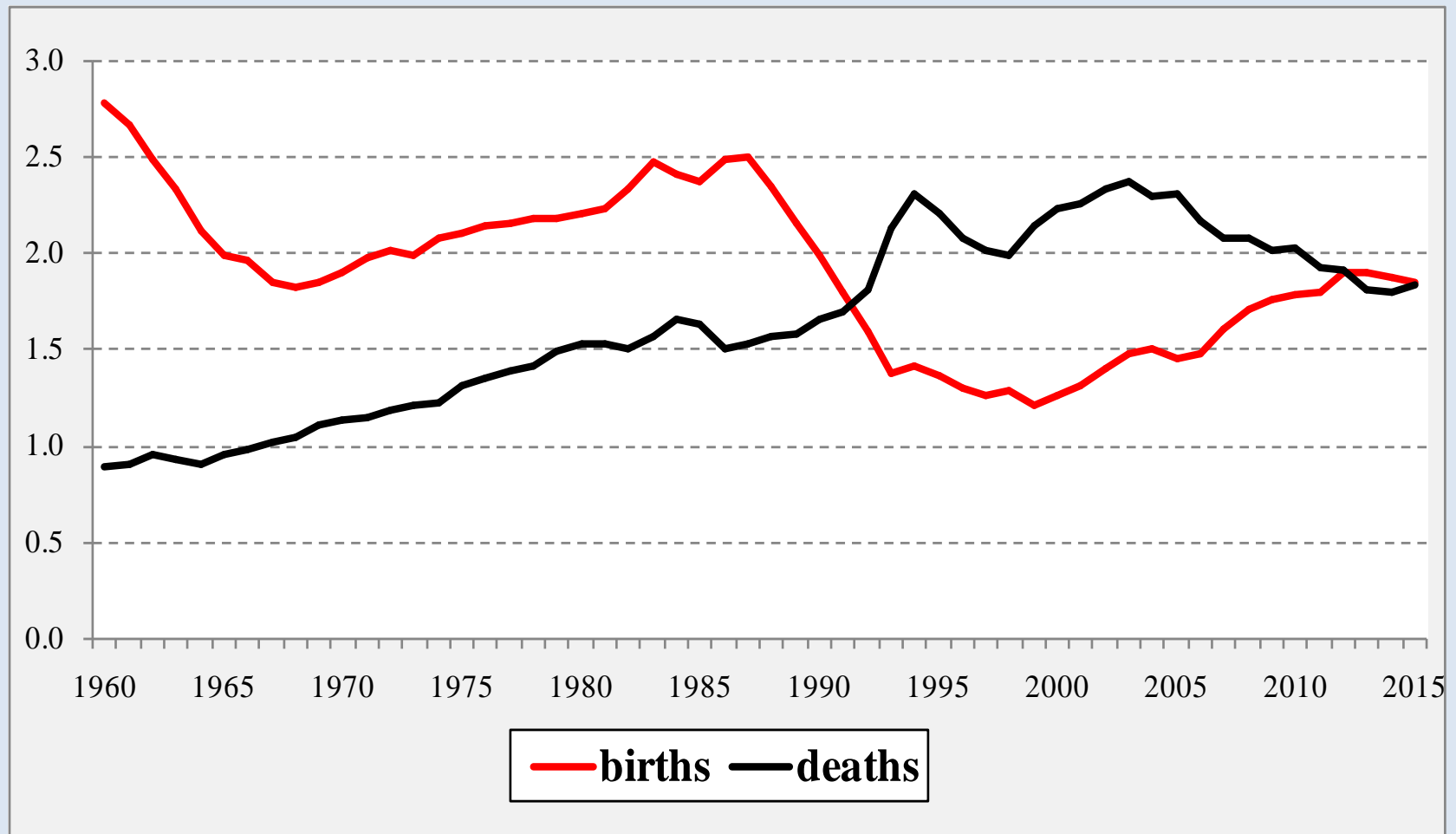
Vadim Potapenko
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Russian Academy of Sciences

Demographic situation in Russia

Russian population on 1st January, million people

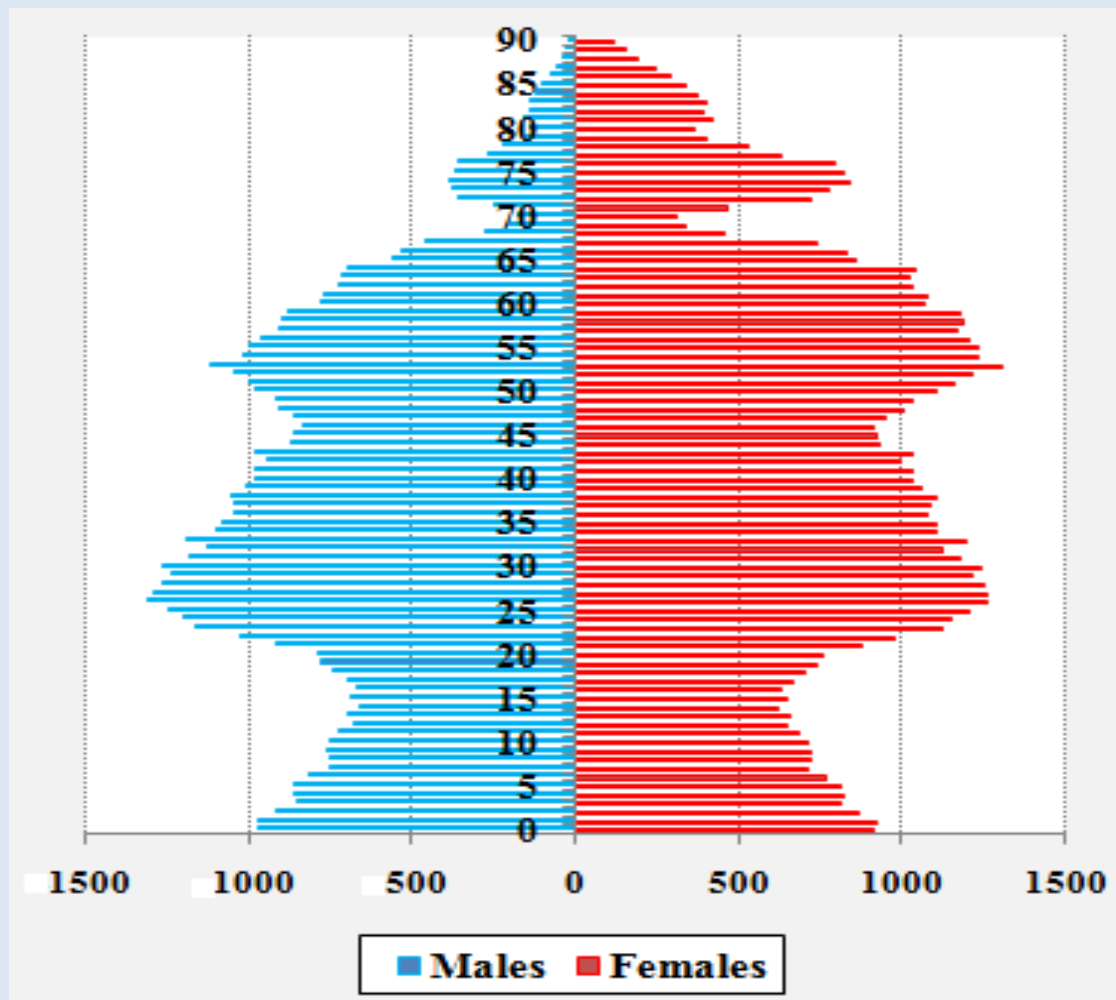


Components of natural increase of population, million people



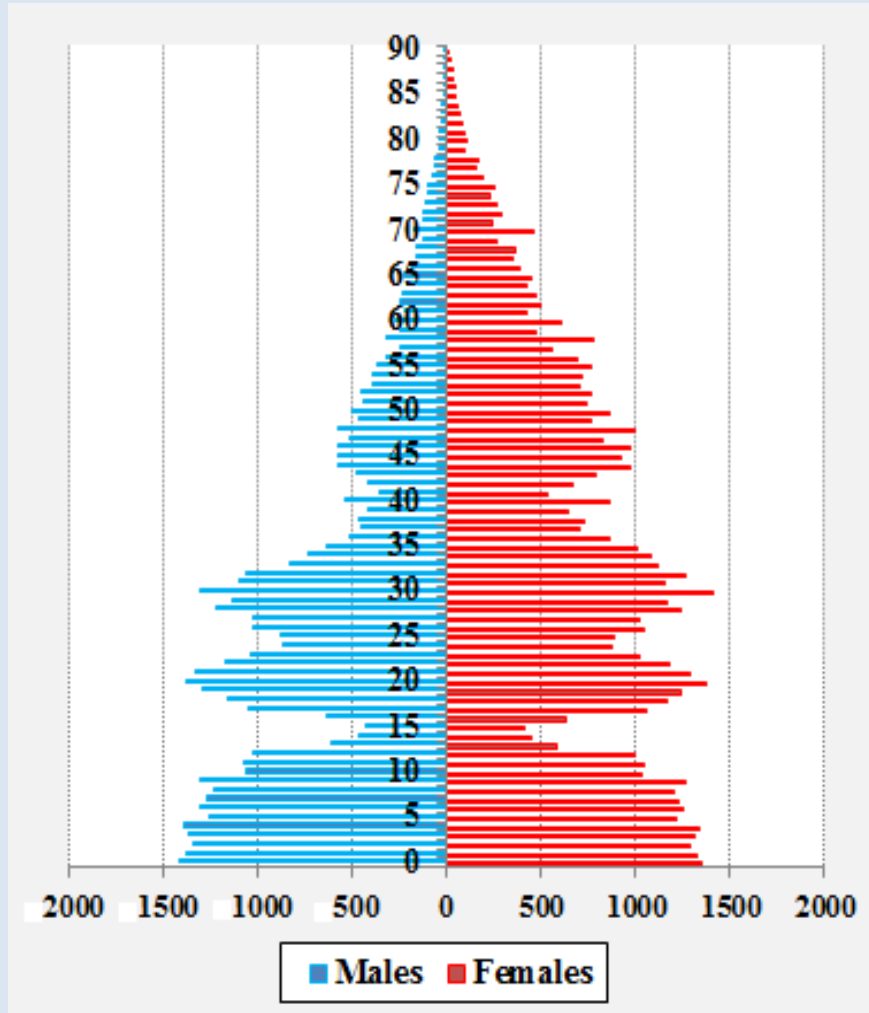
Russian Age Pyramid

Population by age in 2014, thousand people

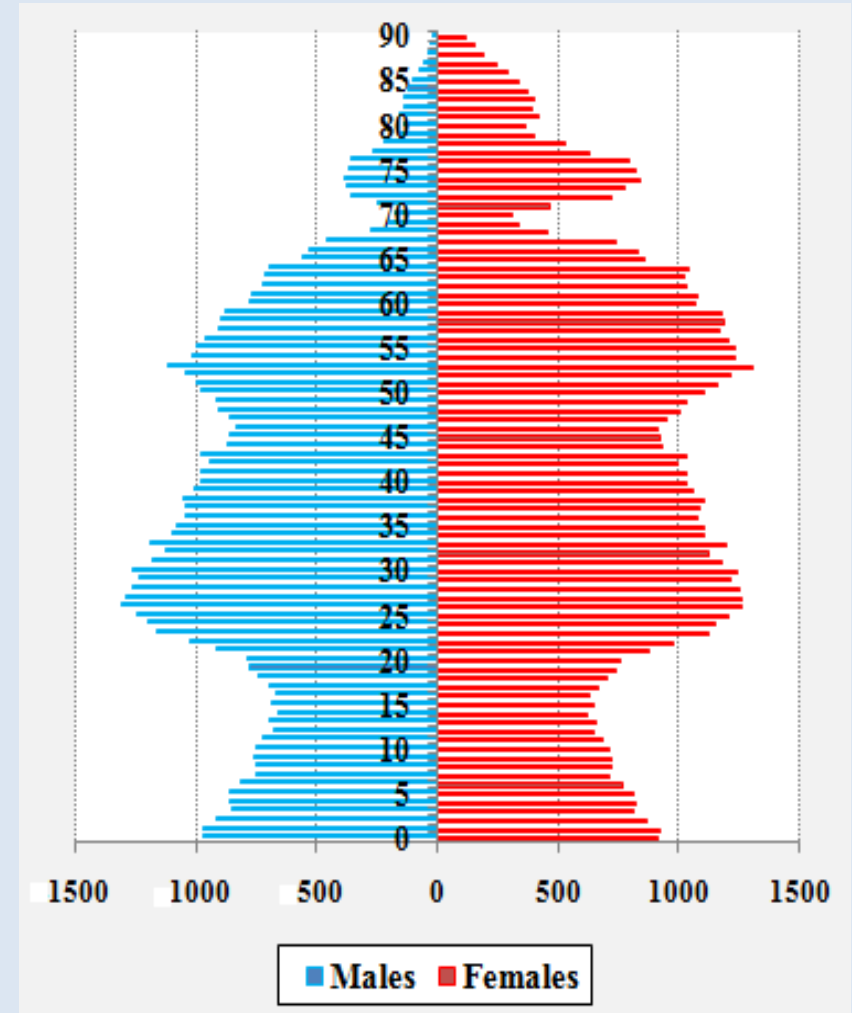


Features of Russian Age Pyramid: comparison with 1960

1960

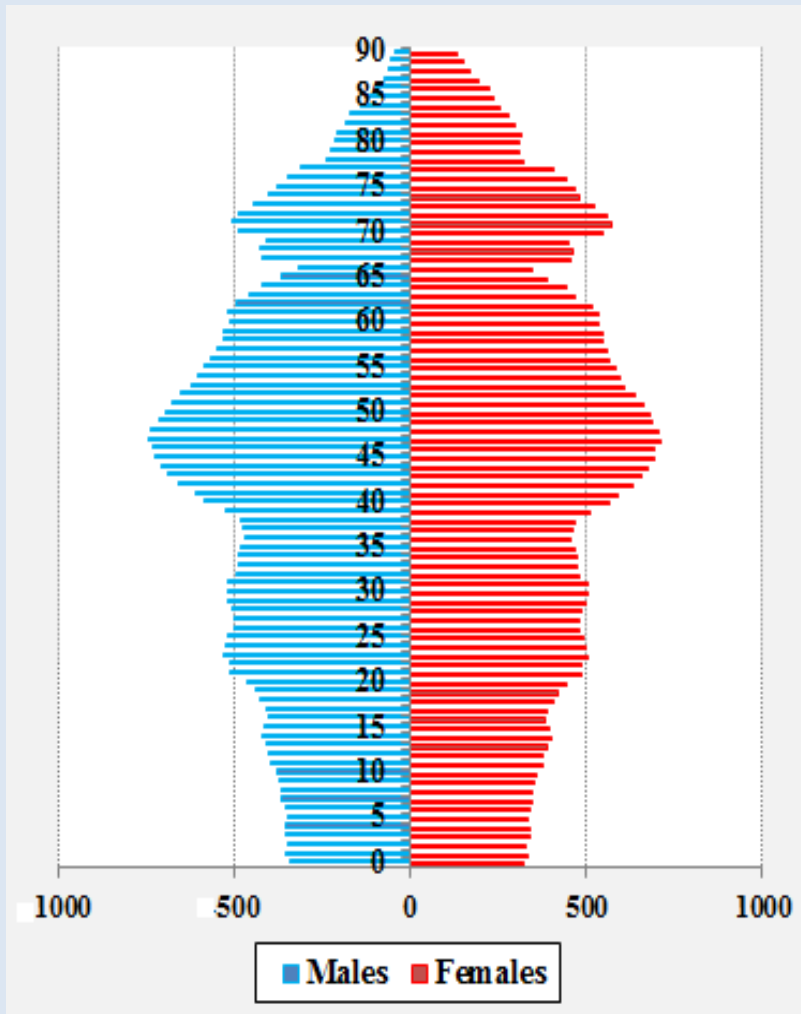


2014

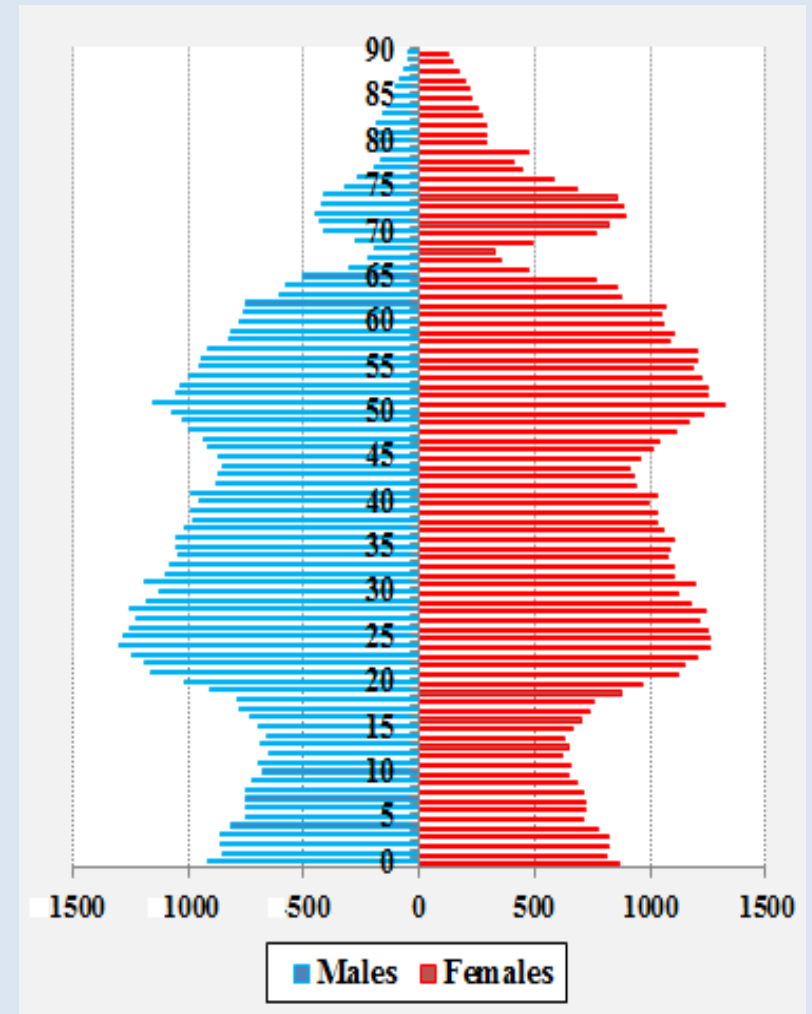


Features of Russian Age Pyramid: comparison with Germany

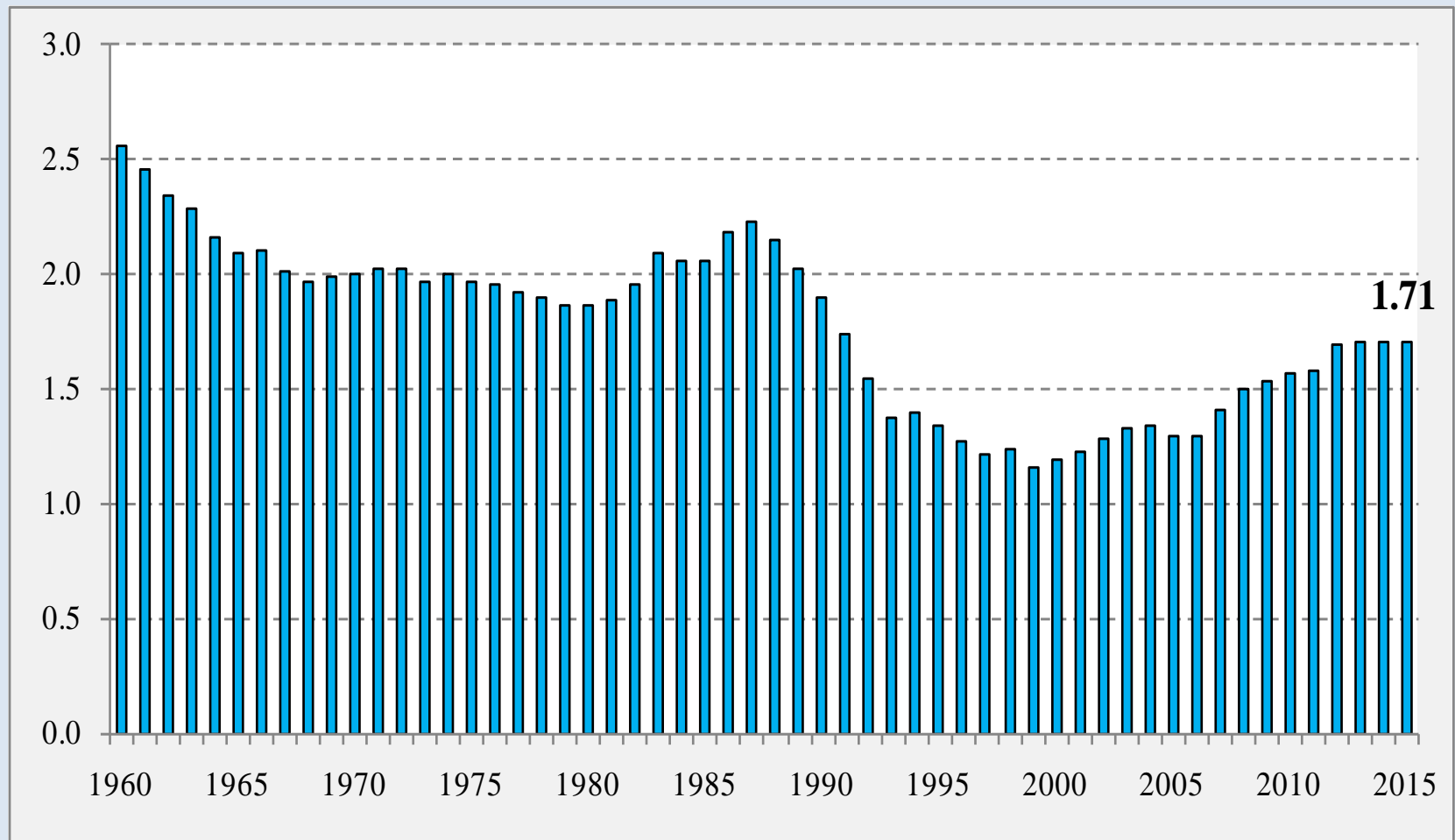
Germany 2012



Russia 2012

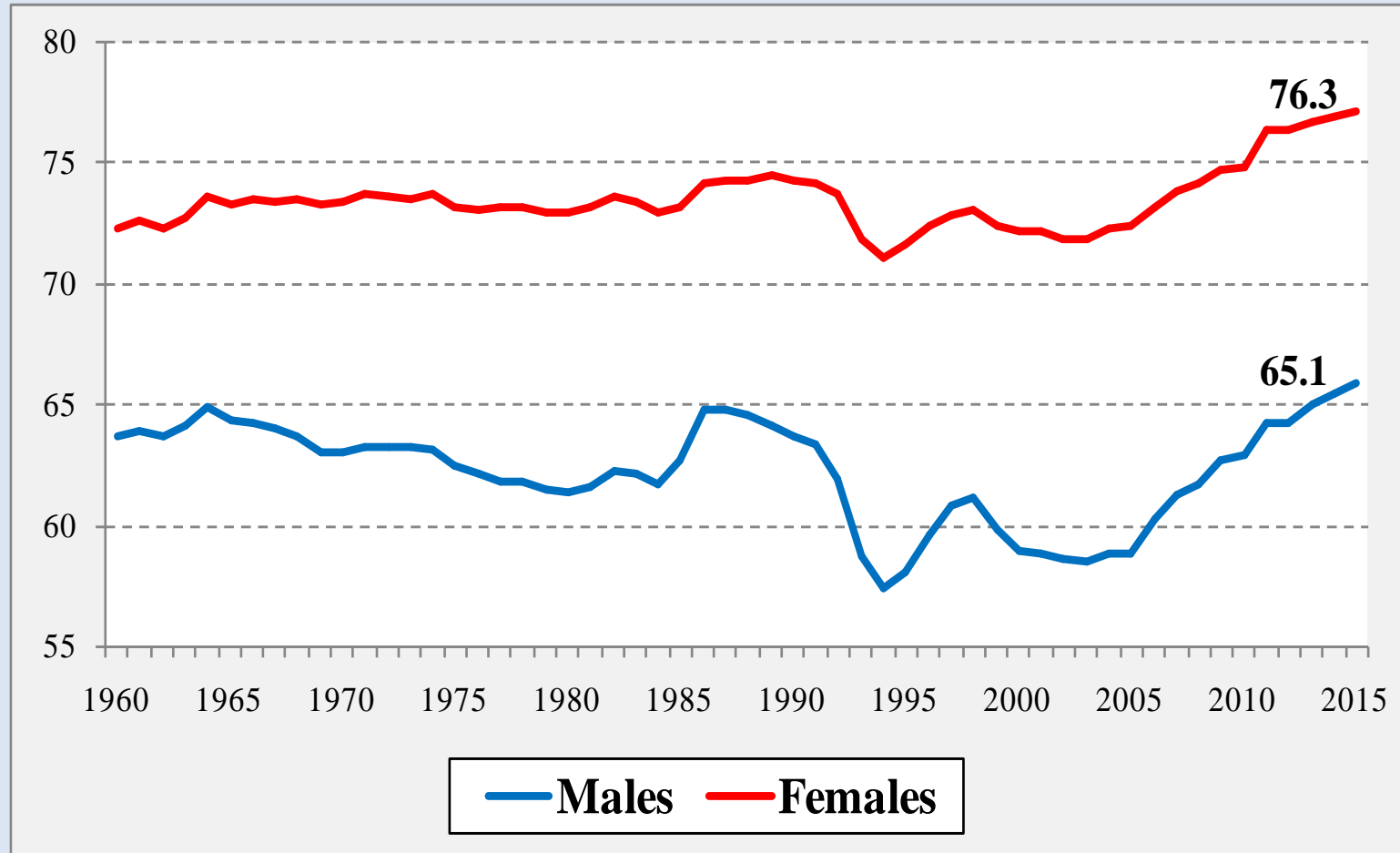


Total Fertility Rate



Mortality

Life Expectancy at Birth, years



Demographic situation is the most discussed subject of socio-economic agenda in Russia for many years

There are main concerns about possible future demographic situation:

- **Depopulation** (great territory with decreasing population have political and social risks in a long-time period)
- **Change of population structure** (that can affect labour market conditions and decelerate economic growth)
- **Increase of expenditures on pension system**

Cohort component method is used for population forecasting

To use the method we need to have:

- ❖ Population by sex and age (1-year groups) in basic year**
- ❖ Age-specific survival ratios for males and females for every year of forecast period**
- ❖ Age-specific fertility rates for every year of forecast period**
- ❖ Number of migrants by sex and age for every year of forecast period**

Example of the method's using:

$$N_{f25}(2014) = (N_{f24}(2013) + 0.5 * I_{f24}(2013, 2014)) * S_{f25} + 0.5 * I_{f25}(2013, 2014),$$

where $N_{f25}(2014)$ – number of females at age 25 on 1st January of 2014,

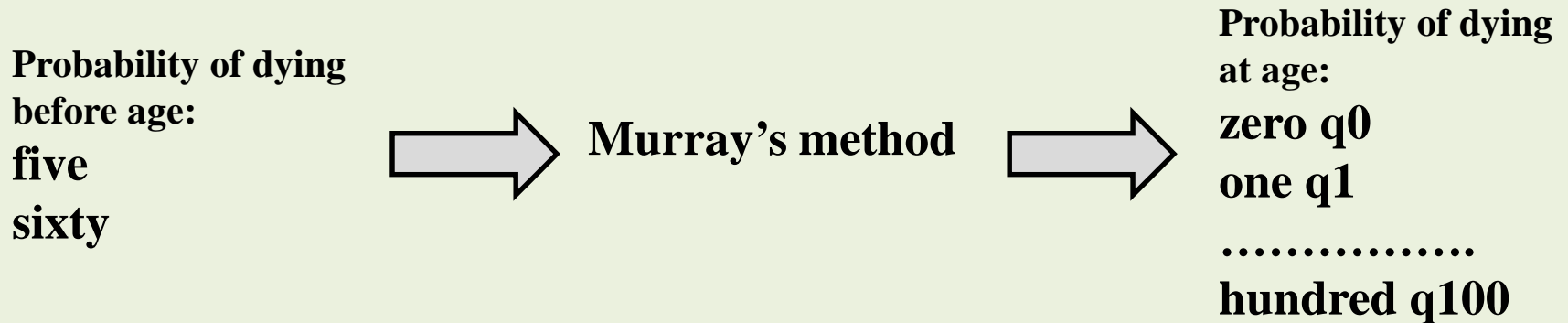
S_{f25} – survival ratio for females from age 24 to 25,

$I_{f25}(2013, 2014)$ - number of net female migrants at age 25 in 2013

To apply cohort component method we need to develop fertility, mortality and migration scenarios by sex and age for every year of forecast period

Mortality Scenario

For developing mortality scenario Murray's method* is used. By the method only two parameters – probability of dying before age 5 and 60 – let approximately calculate all elements of life table



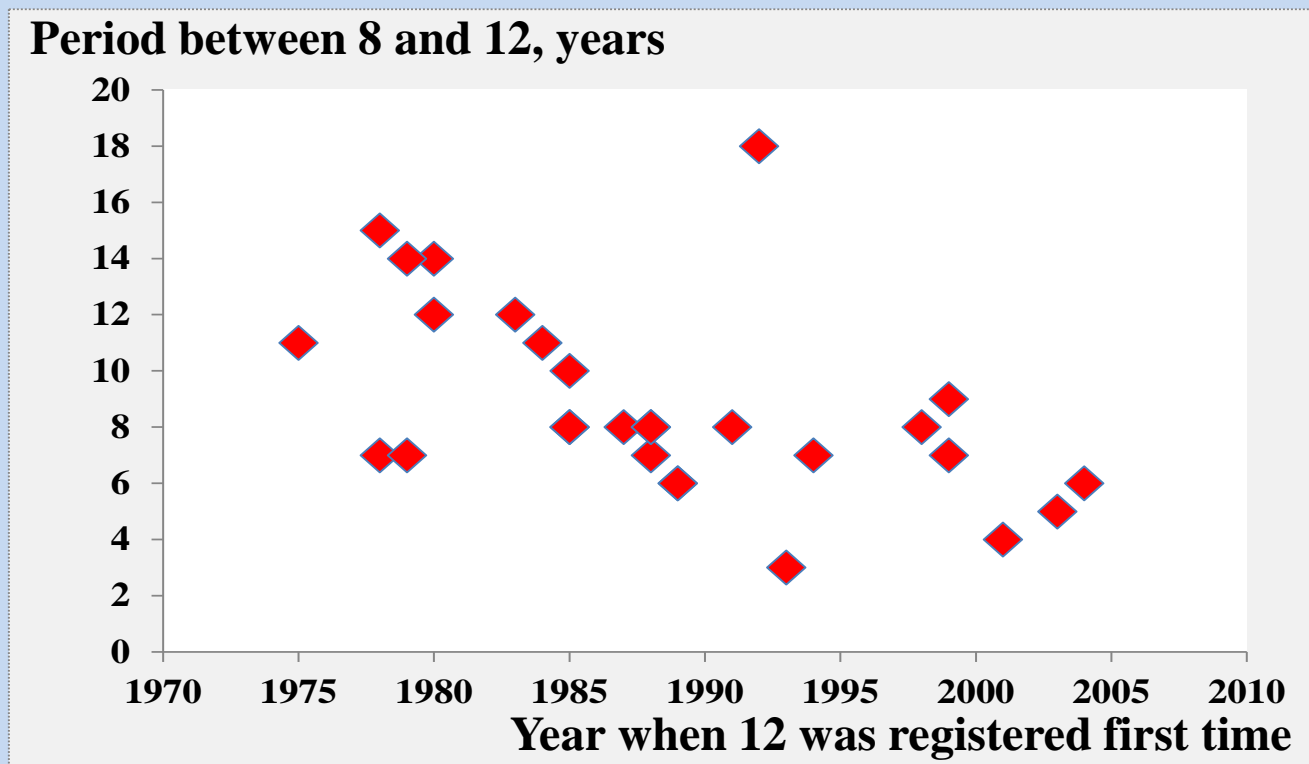
In this way, to develop whole mortality scenario for Russia only four values for every year has to be set: probability of dying before age 5 and 60 for males and for females.

These forecast values were set through analysis of the retrospective data for Russia and a wide range of other countries

*Murray C.J.L. (2003). Modified logit life table system: principles, empirical validation and application. *Population Studies* 57(2)

Example of using mortality's historical patterns

Current Russian level of probability of dying before 5 years (for males) is 12



Points on the figure are 28 countries (Europe, USA, Japan, Canada)

Source: Human Mortality Database

Mortality scenario assumes that falling of probability of dying before 5 years (for males) from 12 to 8 (per thousand people) will take 6 years in Russia, as it is ordinary for countries that achieved 12 after 1990

Fertility Scenario

For developing fertility scenario the next formula is used*

$$f(x) = T * e^{-\left(\frac{x-M}{N(x)}\right)^2}$$

where $f(x)$ – age-specific fertility rate at mother's age x ,

T – a parameter that describes level of fertility linked with total fertility rate,

M – a modal mother's age

$N(x)$ – an additional parameter that reflects spread of fertility curve before and after modal mother's age (it splits by two values – the first one is for ages before modal mother's age, the second one is for ages after it)

To develop whole fertility scenario only four values should be set: total fertility rate, modal mother's age and two additional parameters of spread

*Peristera P., Kostaki A. (2007). Modeling fertility in modern populations. *Demographic Research, Volume 16*

General description of demographic scenario

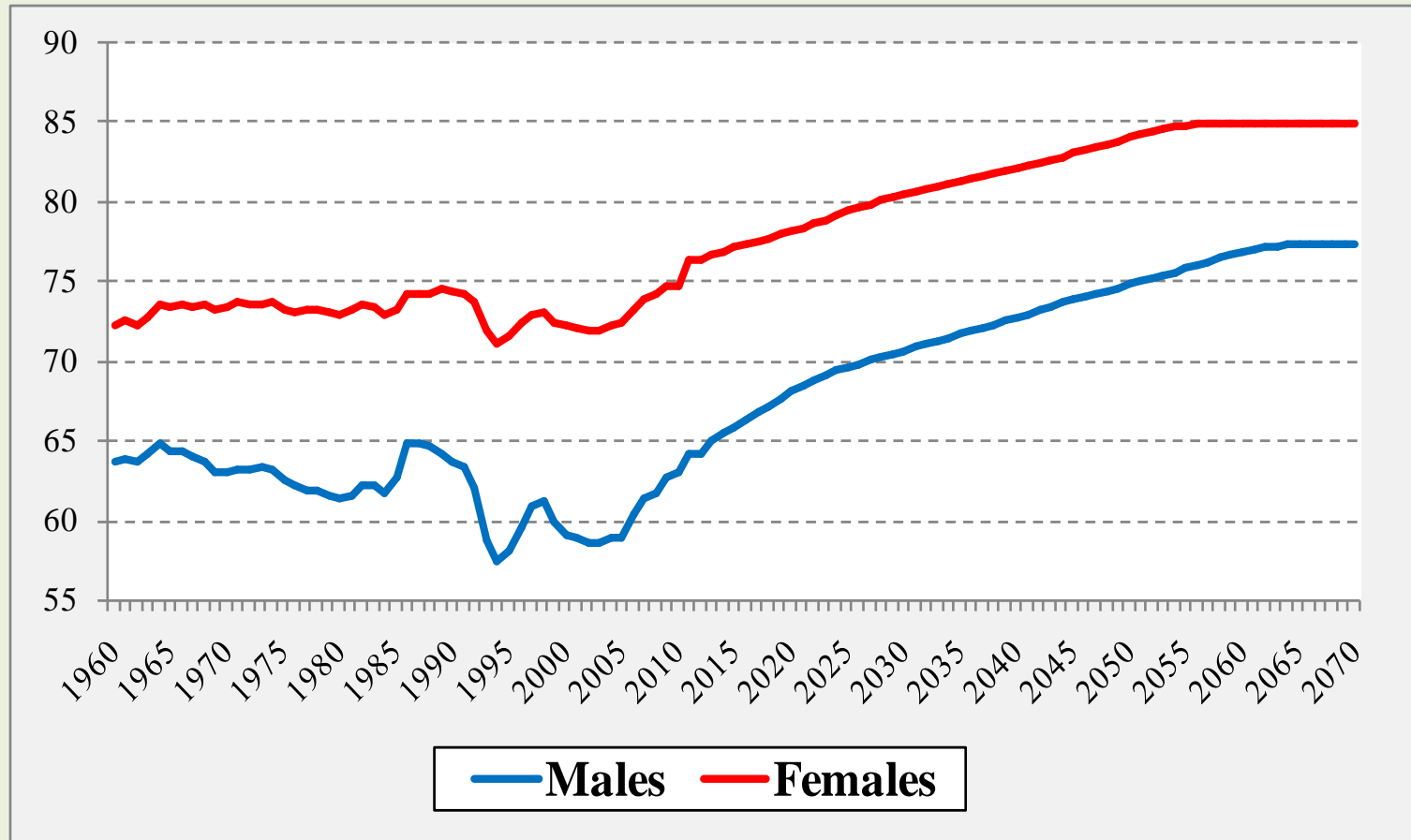
Main exogenous variables' values that are set for demographic forecast

| | | | 2013 | 2030 | 2050 | 2070 | Bases |
|---|----|---------|------|------|------|------|---|
| Probability of dying before age (per thousand people) | 5 | males | 12 | 5 | 4 | 4 | Analysis of retrospective data for Russia and other countries |
| | | females | 9 | 3 | 3 | 3 | |
| | 60 | males | 332 | 210 | 135 | 99 | |
| | | females | 132 | 98 | 58 | 50 | |
| Modal mother's age | | | 25 | 28 | 30 | 30 | |
| Total fertility rate | | | 1.71 | 1.74 | 1.83 | 1.87 | |
| Net migration, million people | | | 0.30 | 0.11 | 0.08 | 0.05 | |

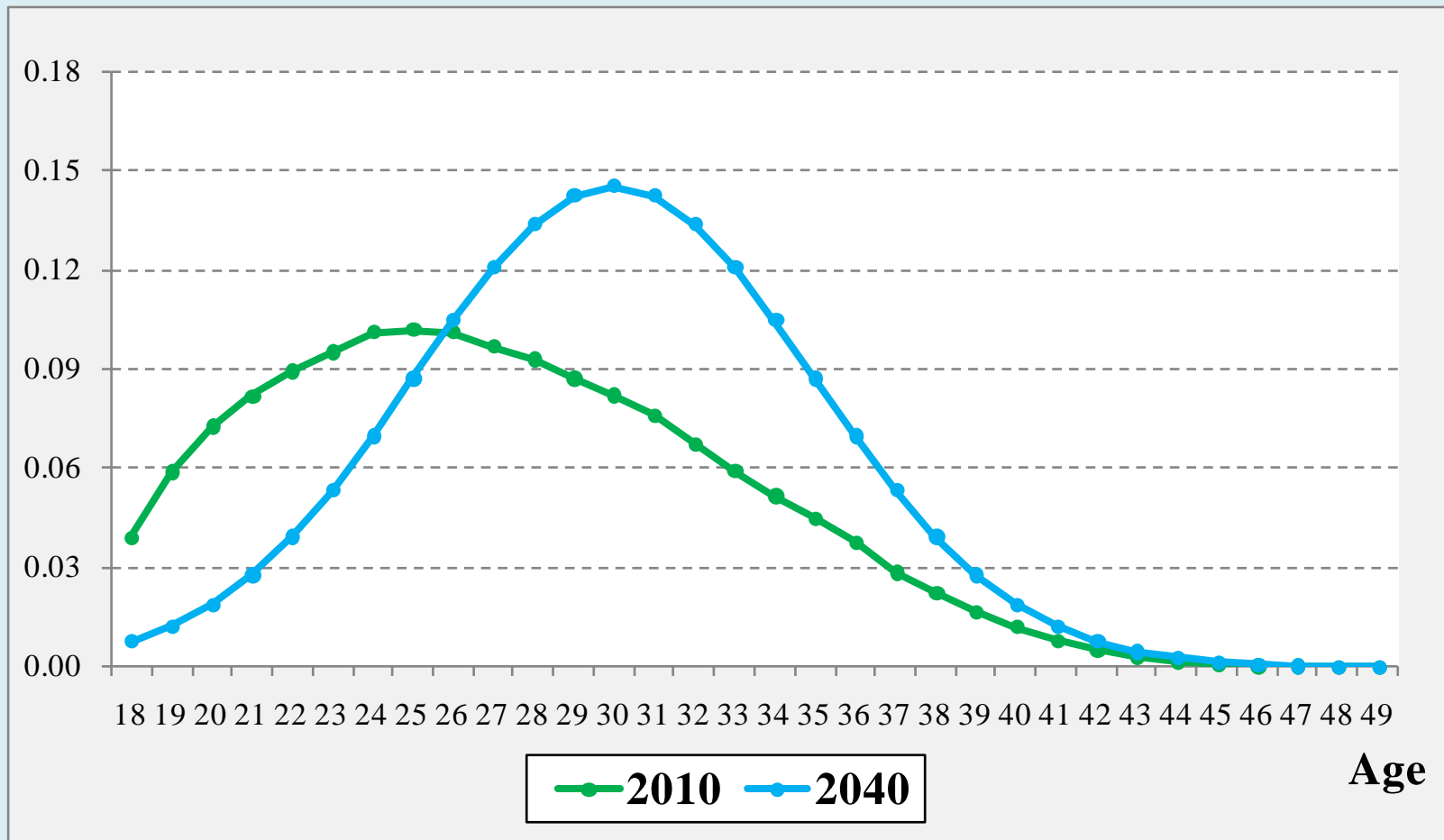
The scenario is quite **MEDIUM**. Firstly, it supposes that Russian mortality will decrease by current level of Western Europe in 50 years only.

Secondly, the scenario supposes very fast decrease of migration flows

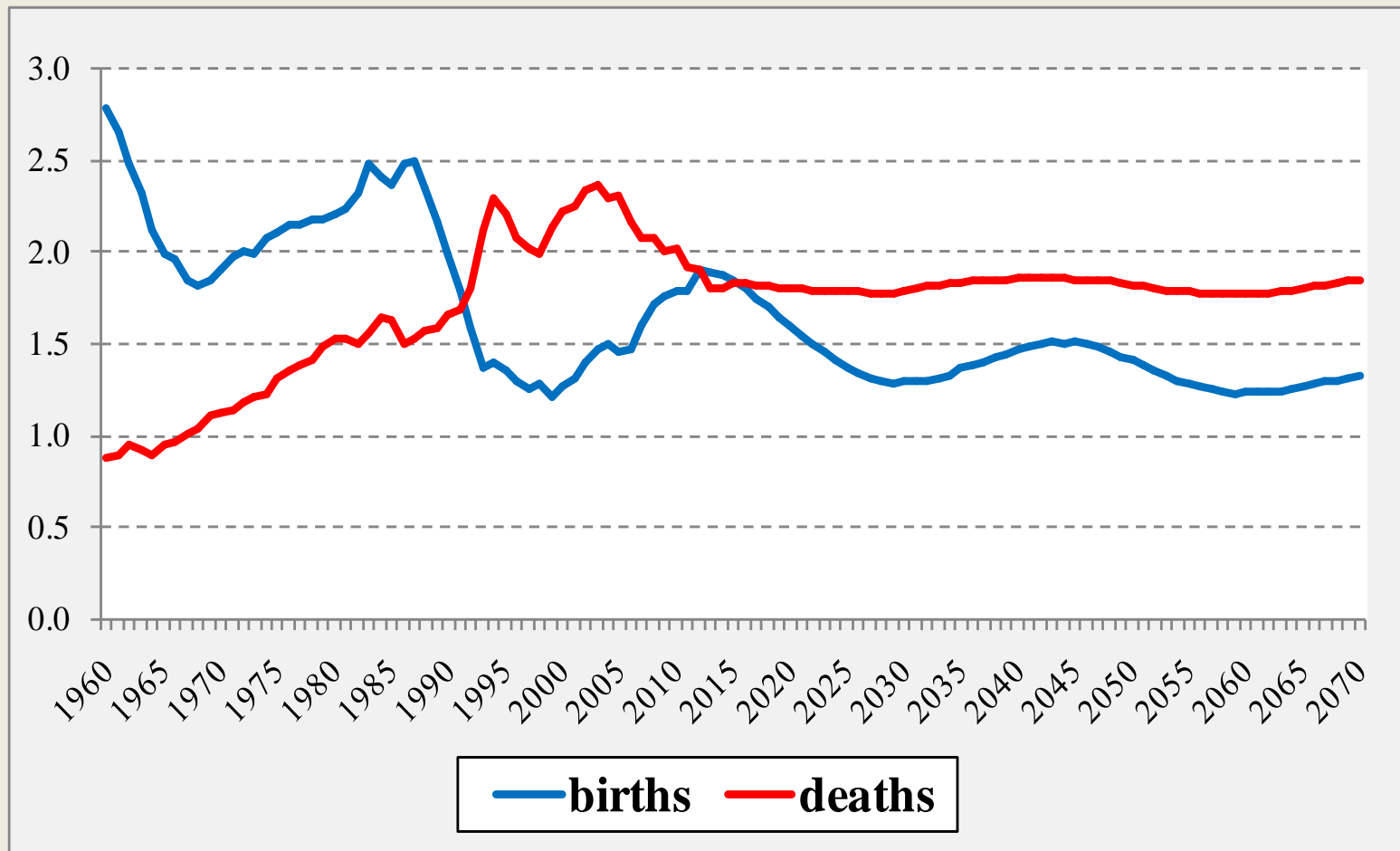
Life Expectancy at Birth, years



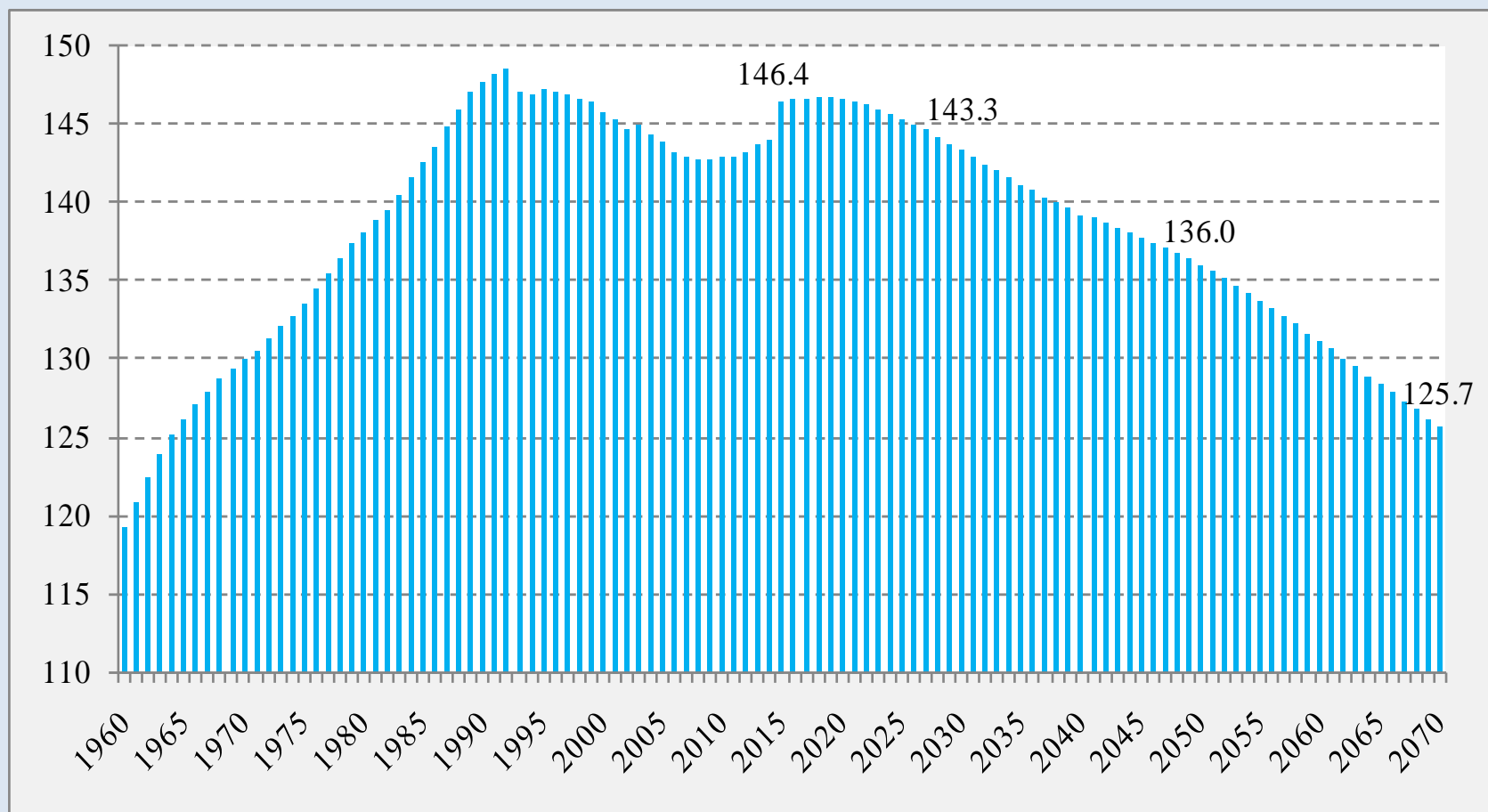
Age-specific fertility rates



Components of natural increase of population, million people

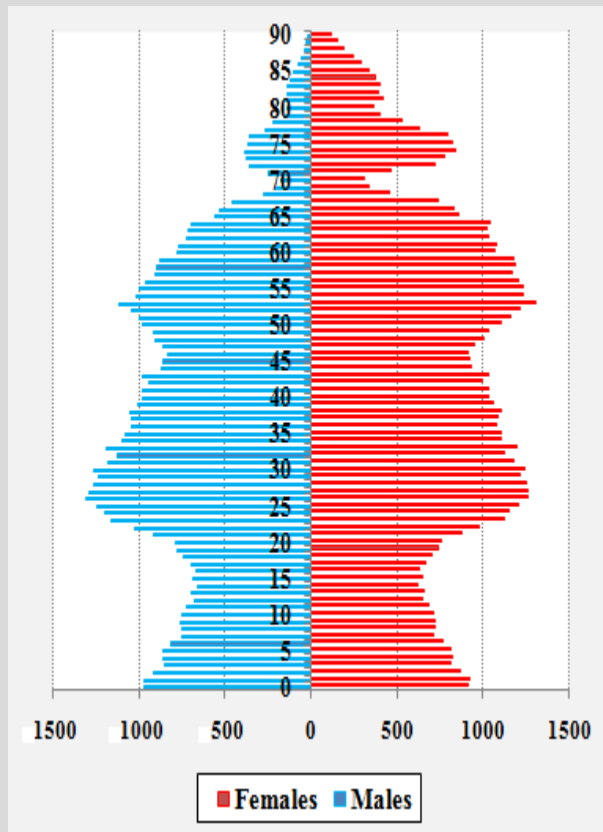


Russian population on 1st January, million people

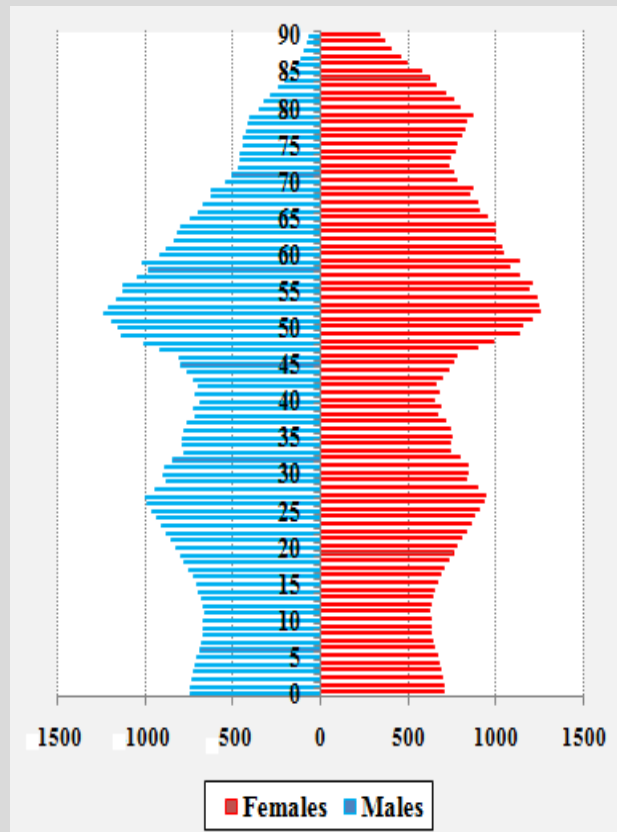


Forecast: age pyramids

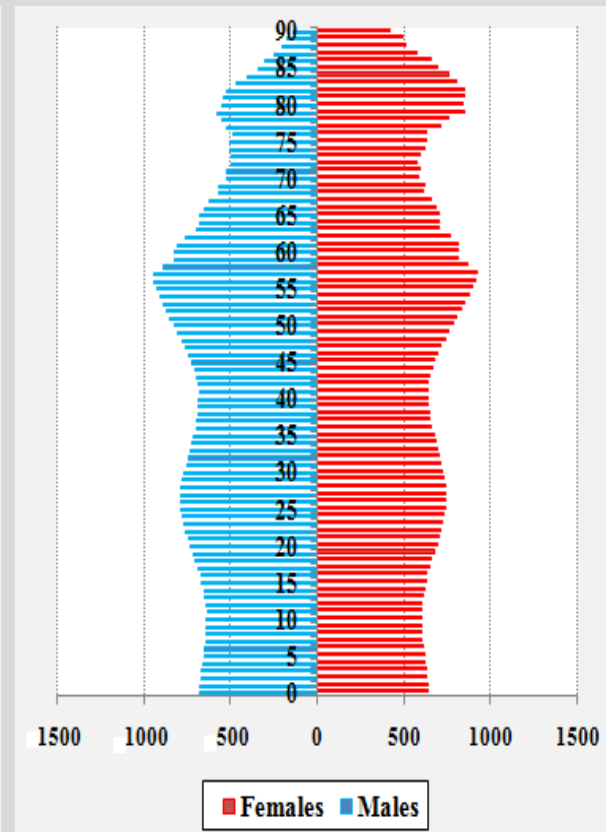
2014



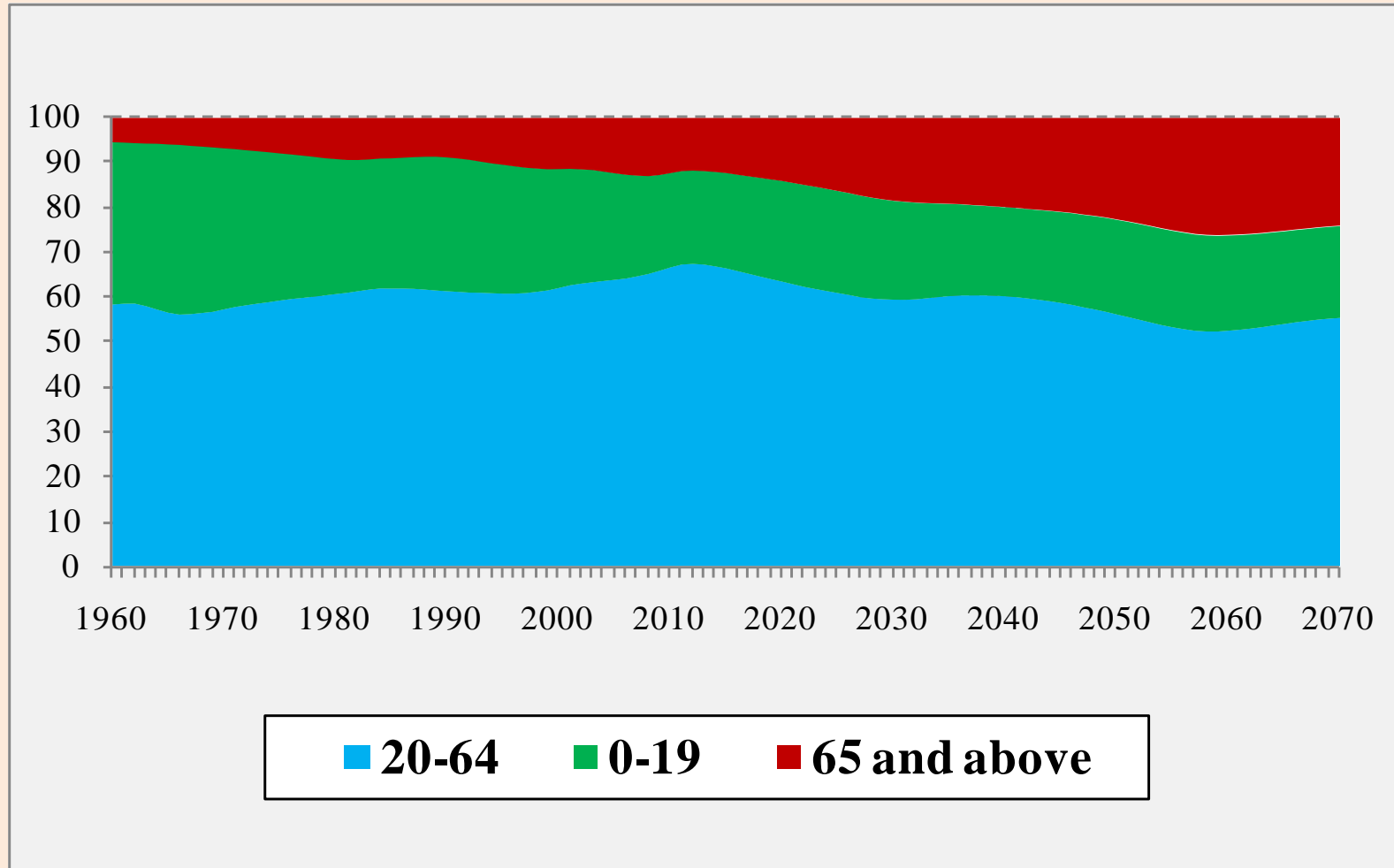
2040



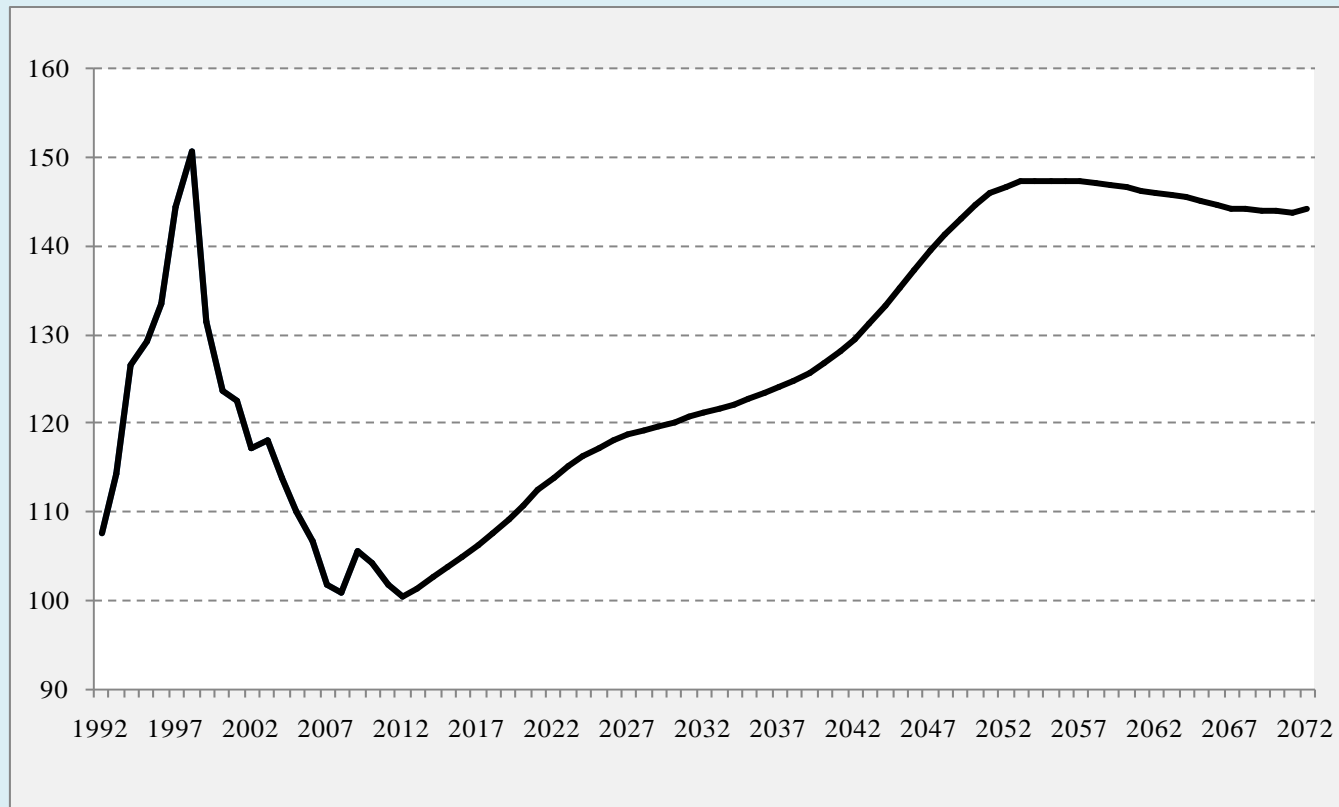
2070



Structure of Russian population by age, %



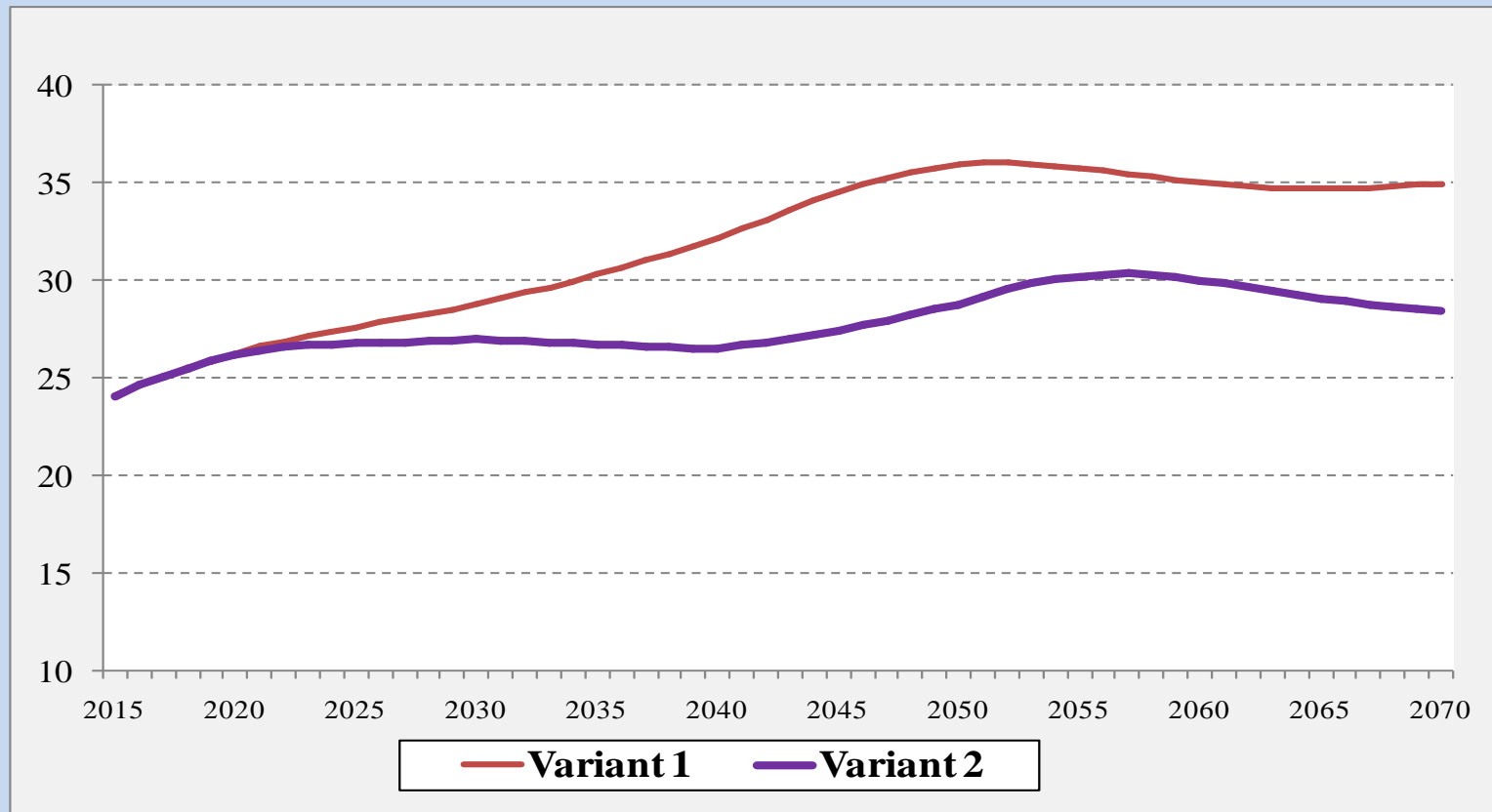
Ratio of dependants and employed, %



This calculation supposes that age-specific rates of economic activities and age-specific rates of unemployment will be the same as in 2013 for every year of forecast period

Forecast: pension system

Number of people at pension age, % of population



Variant 1 – current pension age (males – 60, females – 55)

Variant 2 – increasing pension age (males – by 65 from 2030 to 2050, females – by 60 from 2020 to 2040)

**THANK YOU
FOR
ATTENTION!**