Public Lecture
by
Professor Wolfgang Lutz

Tuesday, 19 February 2013

Auditorium, Level 1

RELC International Hotel

Institute of Policy Studies 25 Years & Forward 1988-2013

Lee Kuan Yew School of Public Policy
National University of Singapore

Wittgenstein Centre

FOR DEMOGRAPHY AND GLOBAL HUMAN CAPITAL

Low Fertility, Human Capital Development and Economic Growth in an International Context

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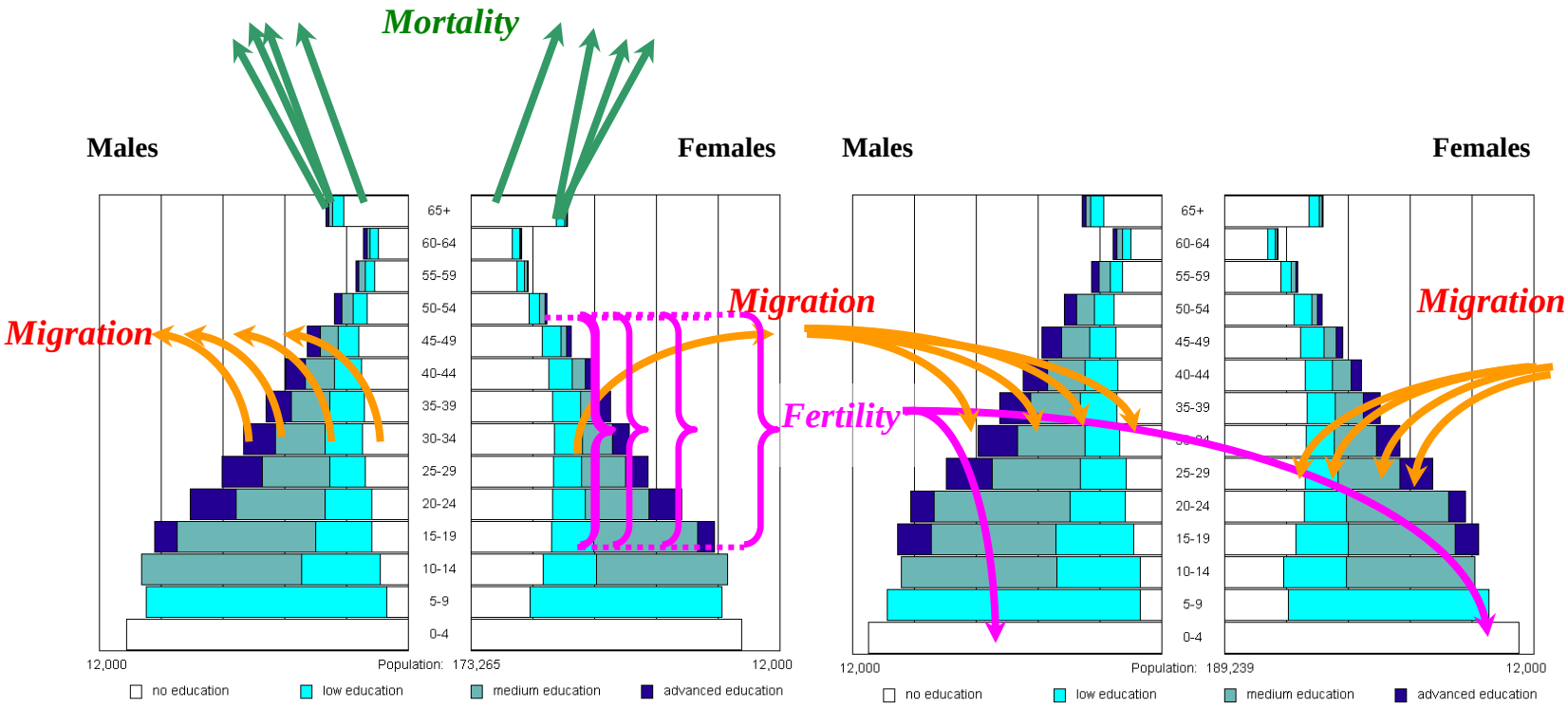
Outline

- Measuring and modeling changing population and human capital structures
- Reproduction and Fertility
- Is population ageing a problem?
- Education, health and economic performance: The long term global perspective
- The ASEAN Perspective

People produce economic growth

- The study of economic growth must start with the study of the people who produce it (with their own hands or through designing, building and operating the machines or institutions that make it possible).
- But people do not come as an amorphous mass. Not every member of a given population makes the same contribution to the economy.
- People differ by age, sex, educational attainment, health status, labor force participation and other dimensions.
- In the following global level analysis for reasons of data availability we only focus on the educational attainment dimension of human capital by age and sex.

The Demographic Multi-Sate Model: Principles of Population Dynamics by Age, Sex, and Education



Population by Age, Sex, and Education 2000

Population by Age, Sex, and Education 2005

IIASA

Human Capital = POP x Education x Health

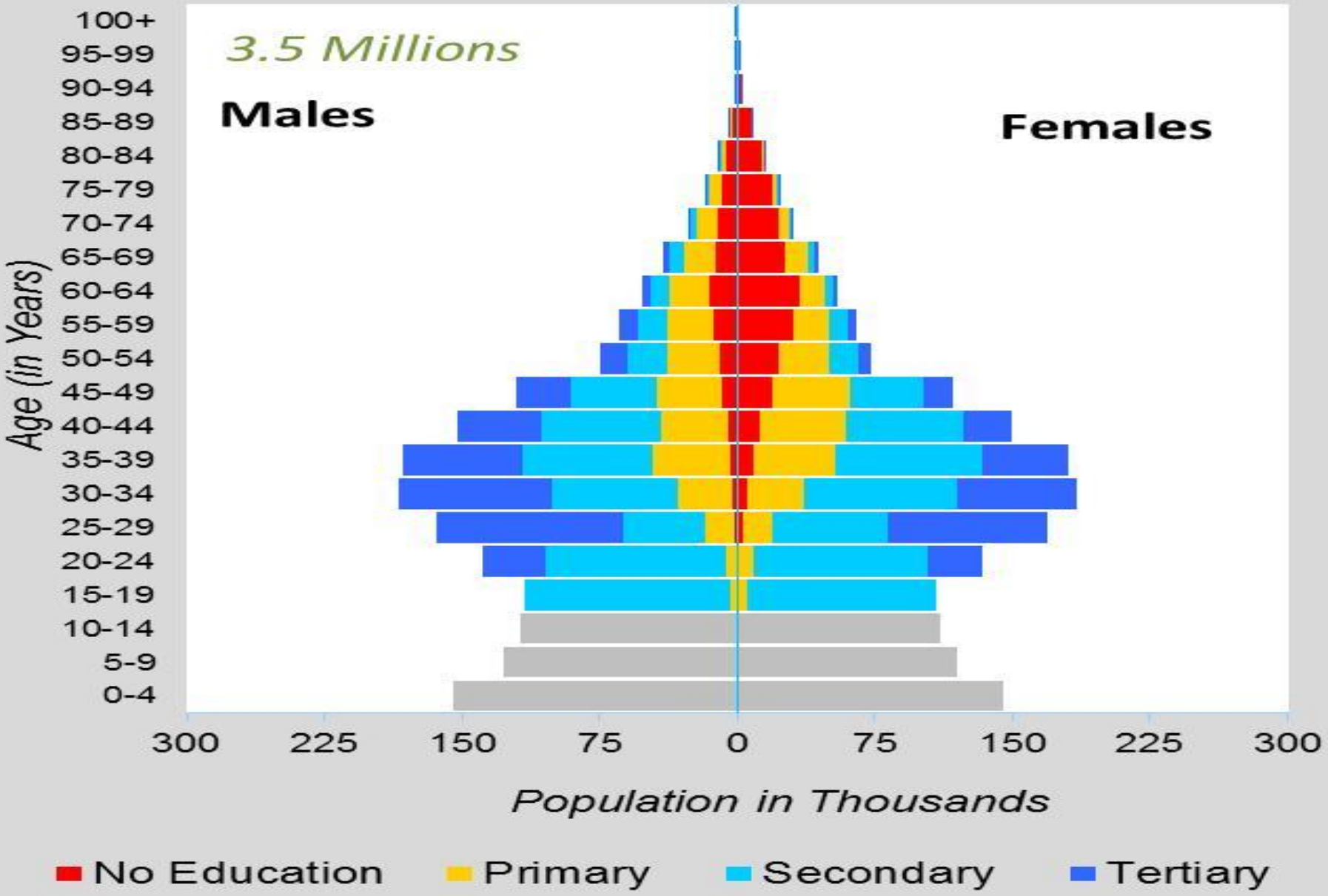
- **Education:** formal – informal
  quantity – quality – content

- Formal Education:
- **Education Flows** – Policy variable

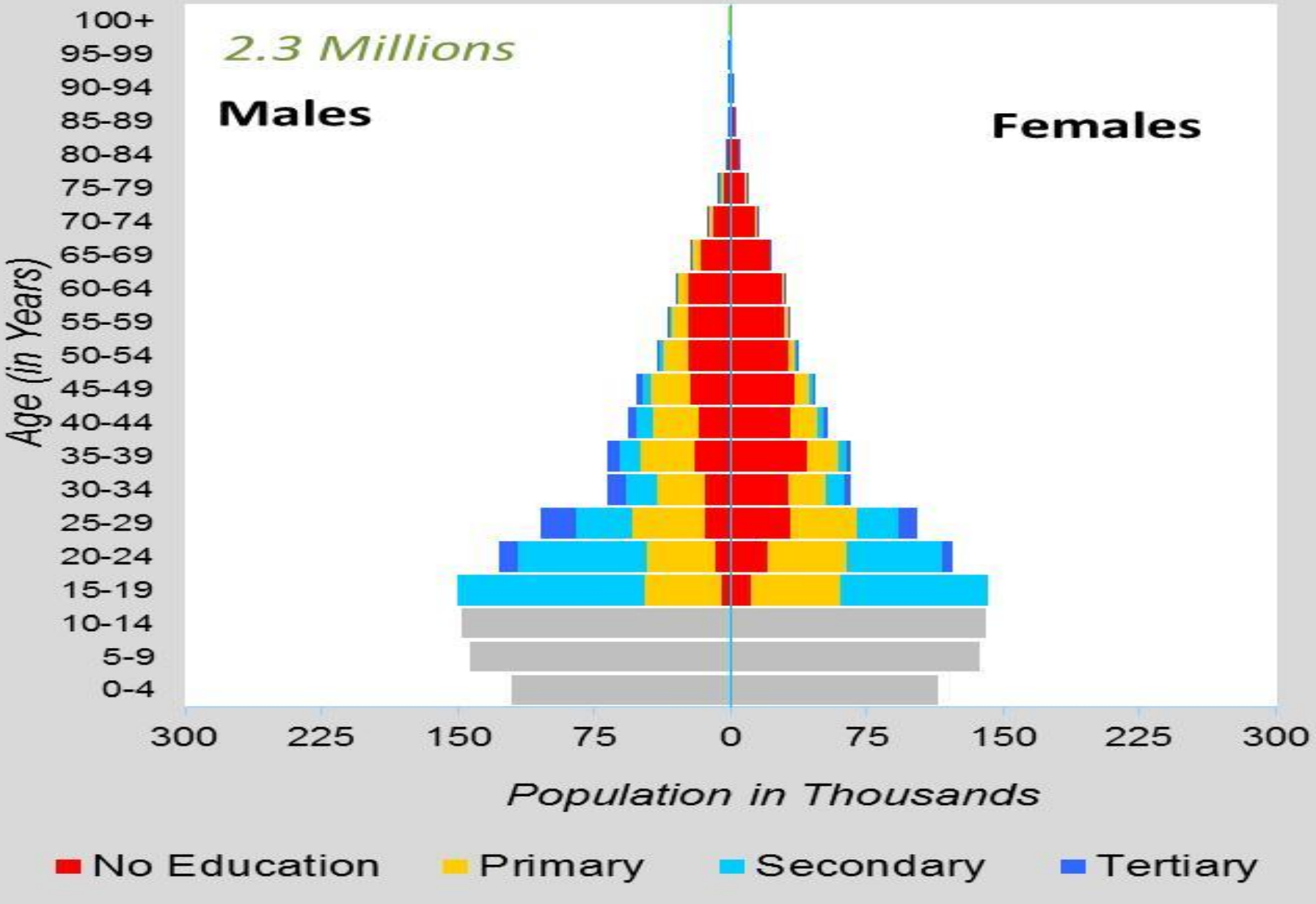
(Gross and Net Enrolment by Age, Repetition Rates)

- **Education Stocks** - Change very slowly due to great momentum
  - Mean years of schooling
  - Distribution by highest educational attainment
  - Functional literacy (IALS, LAMP)

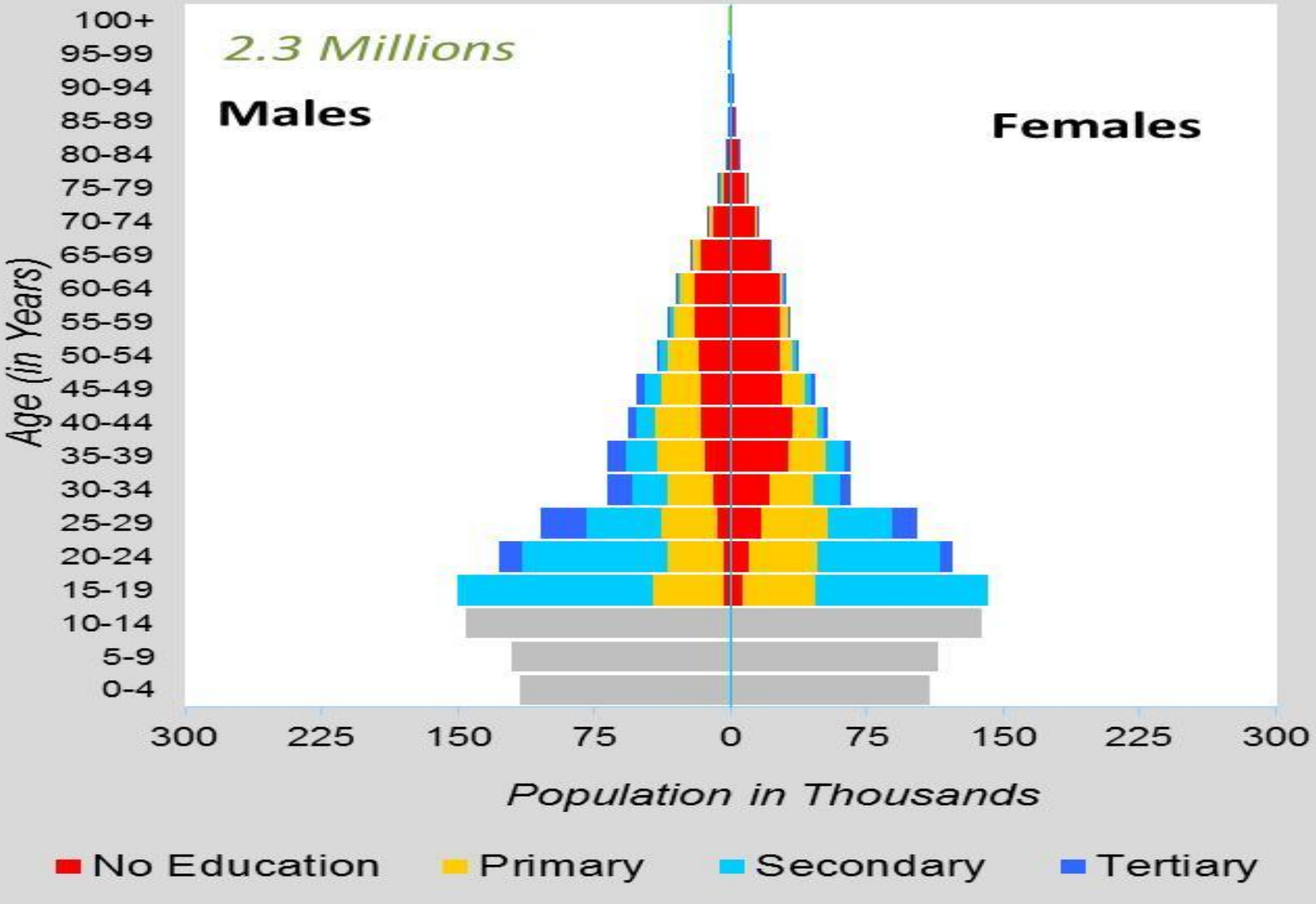
Singapore - 1995 BP



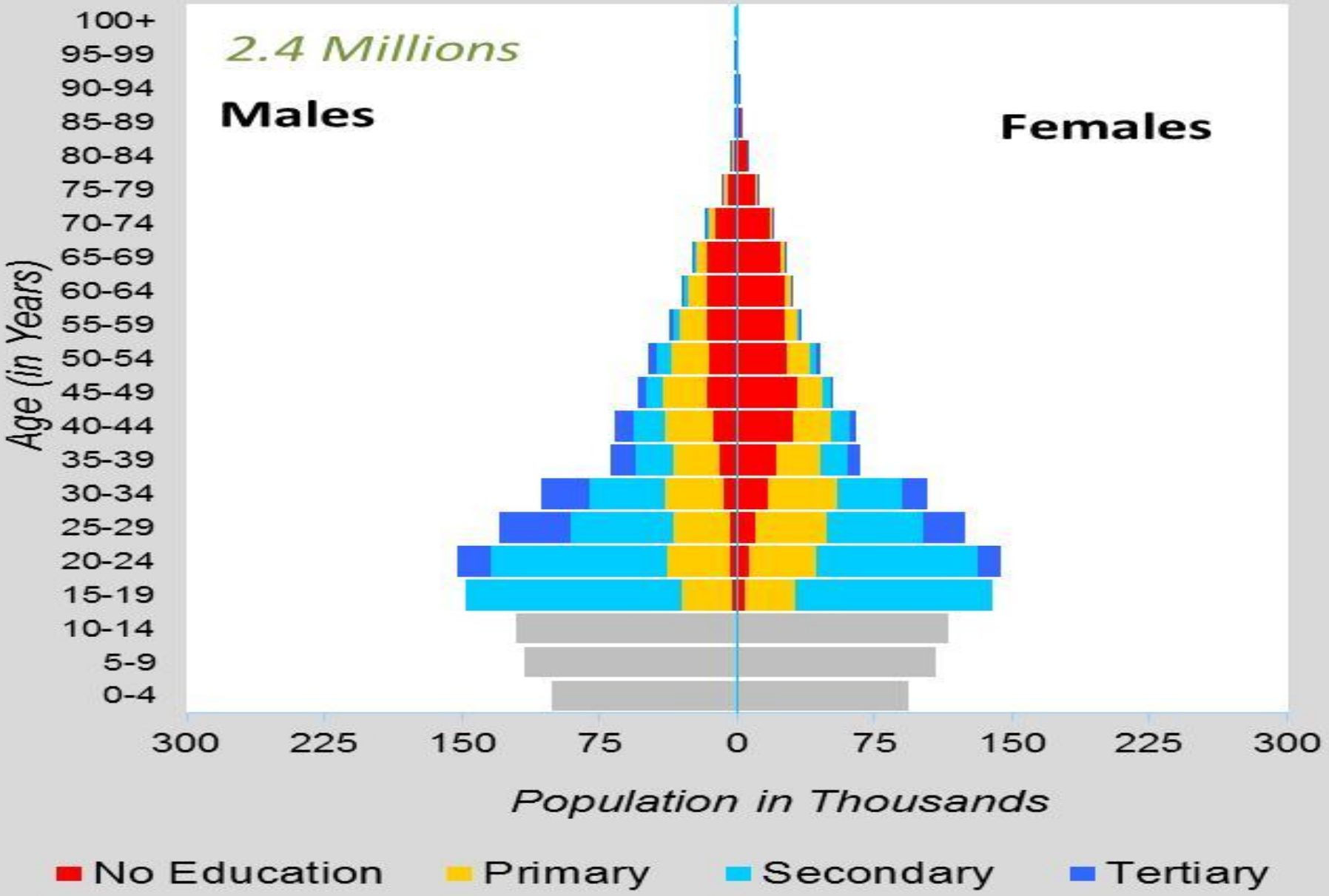
Singapore - 1970 BP



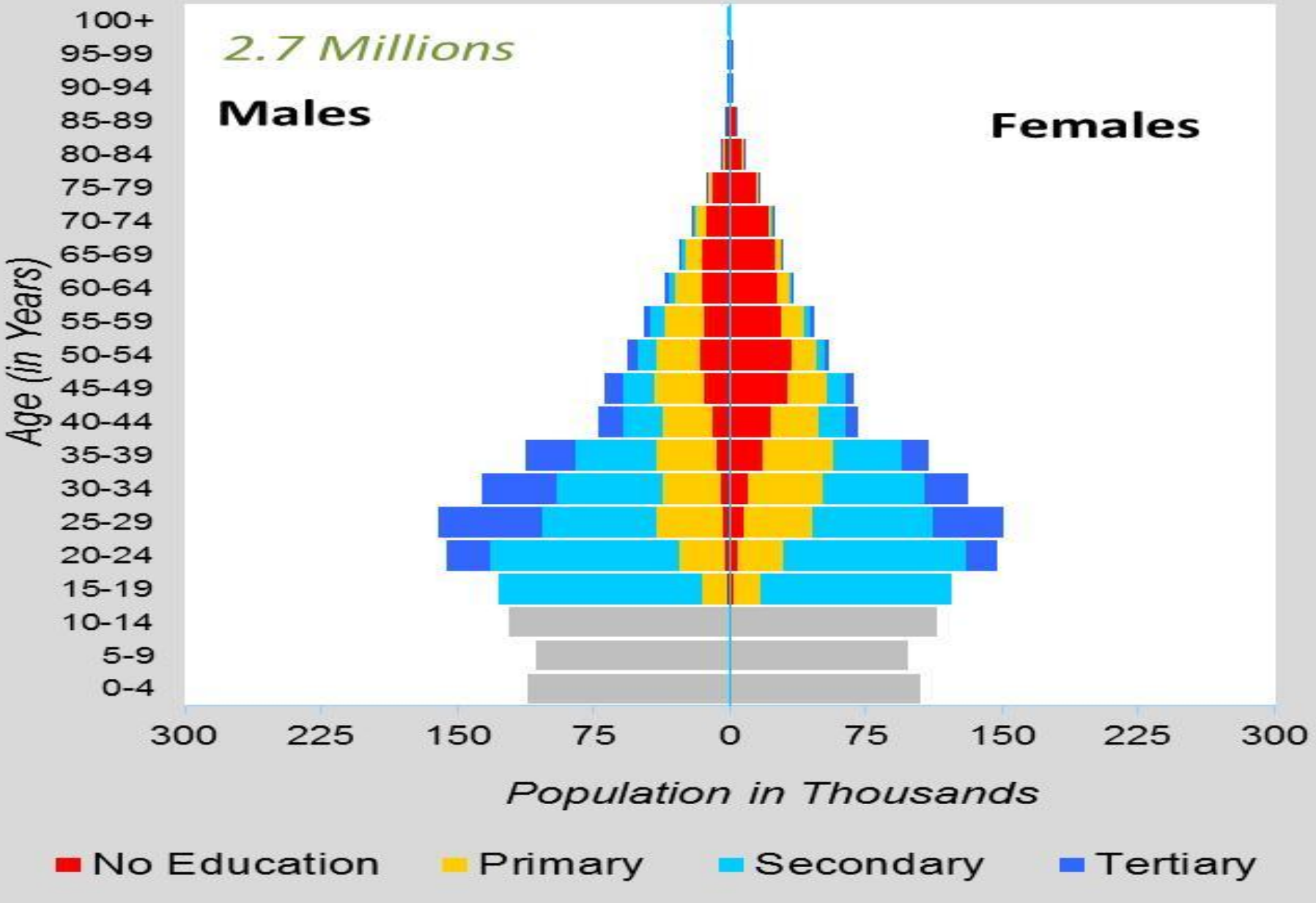
Singapore - 1975 BP



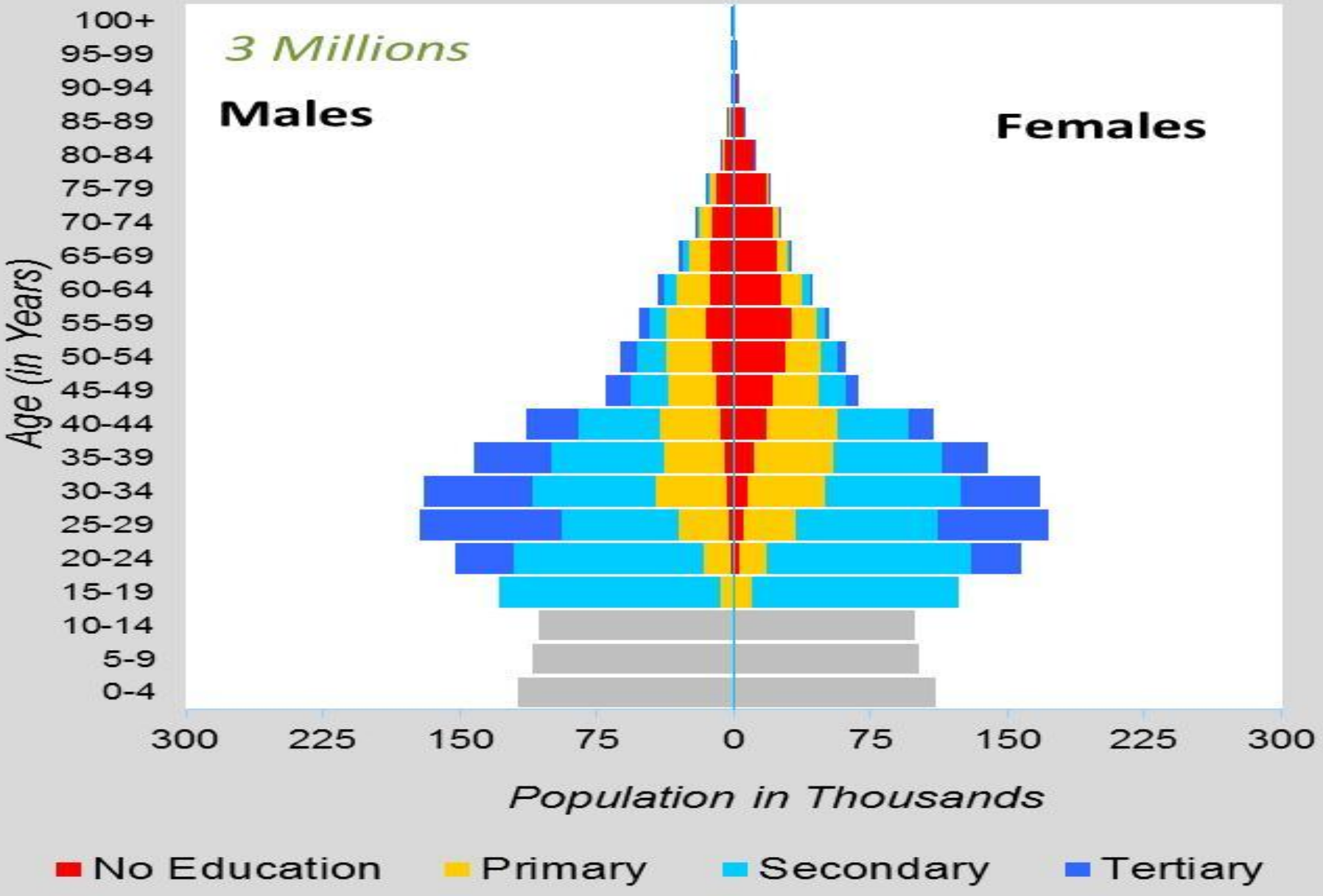
Singapore - 1980 BP



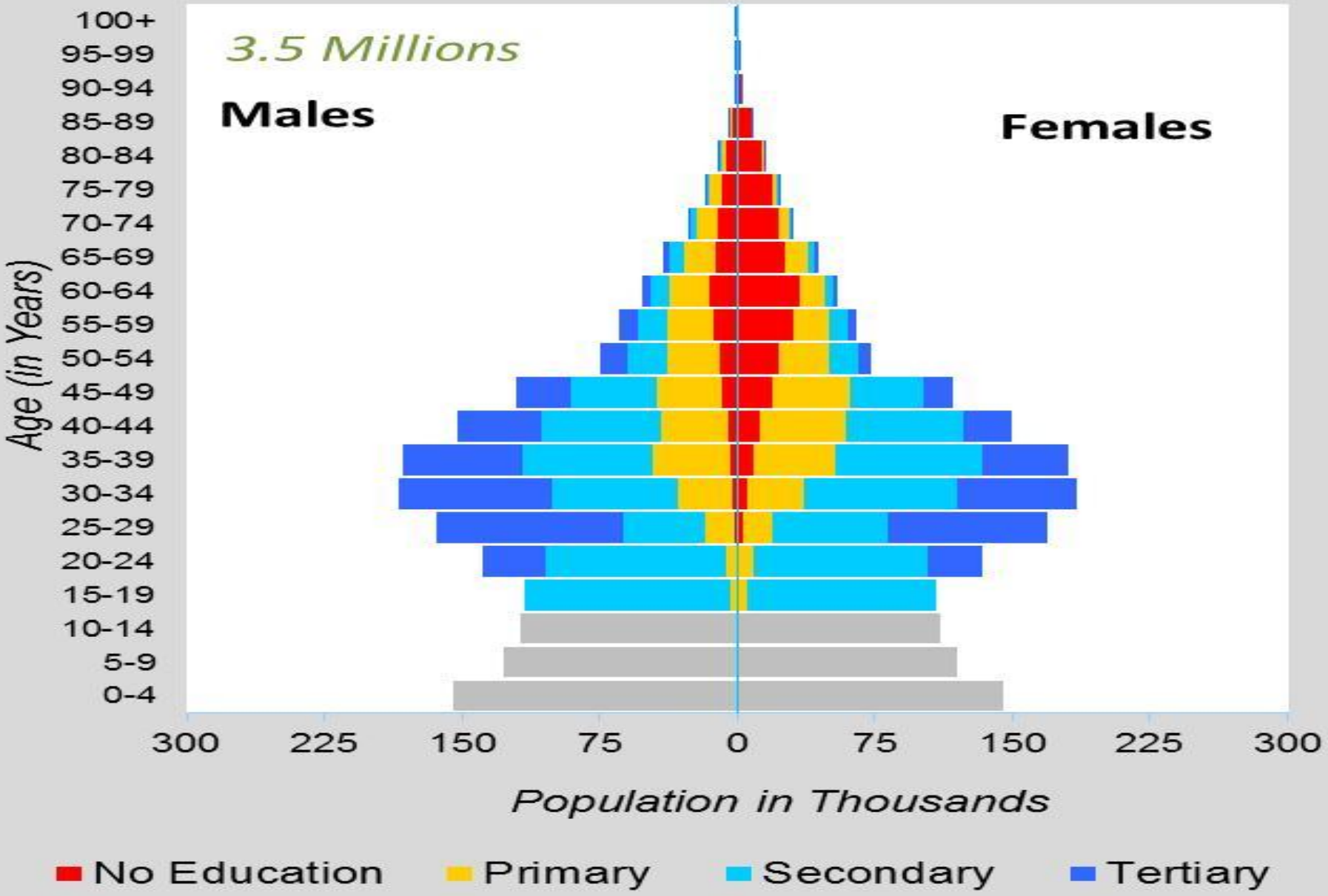
Singapore - 1985 BP



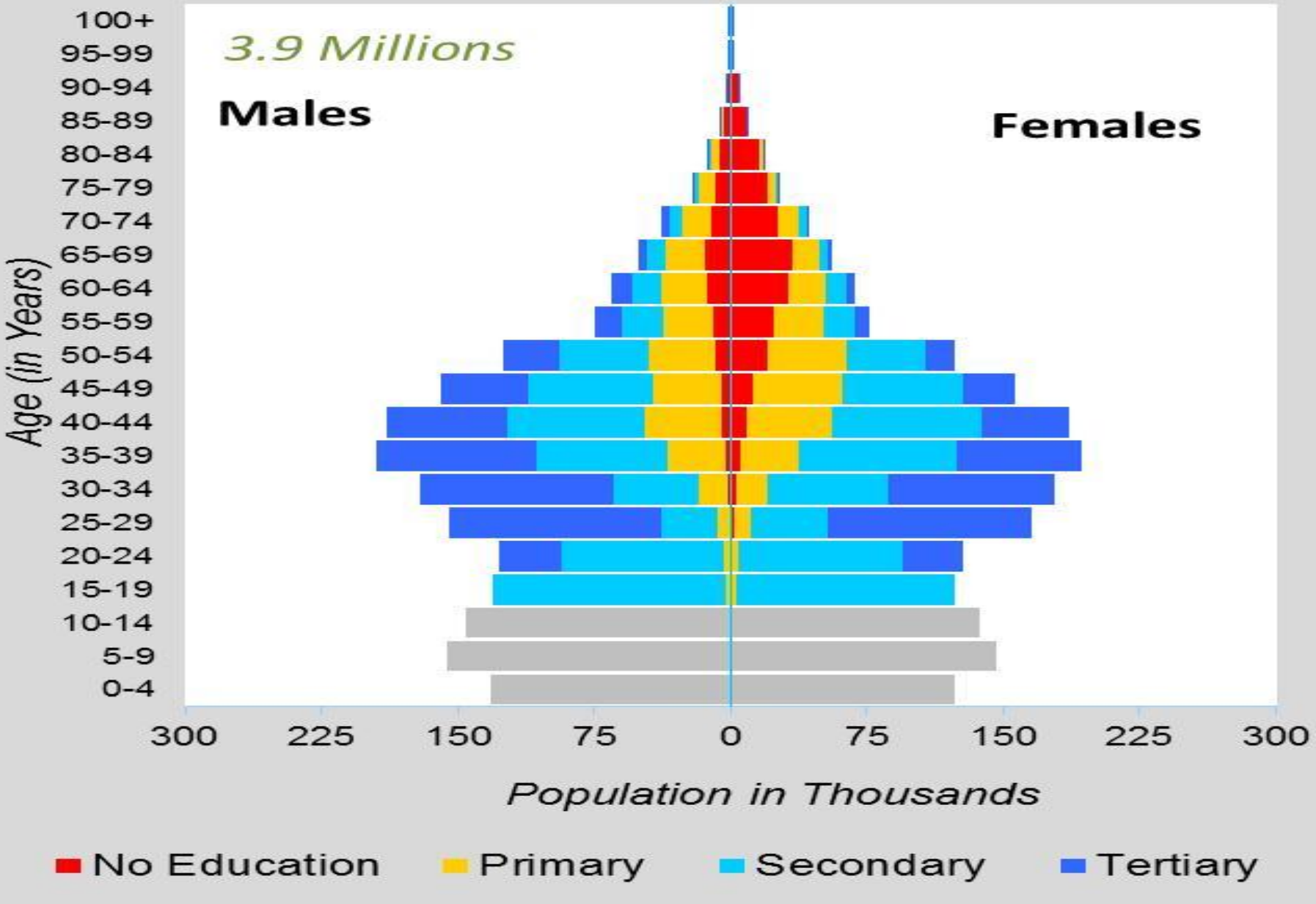
Singapore - 1990 BP



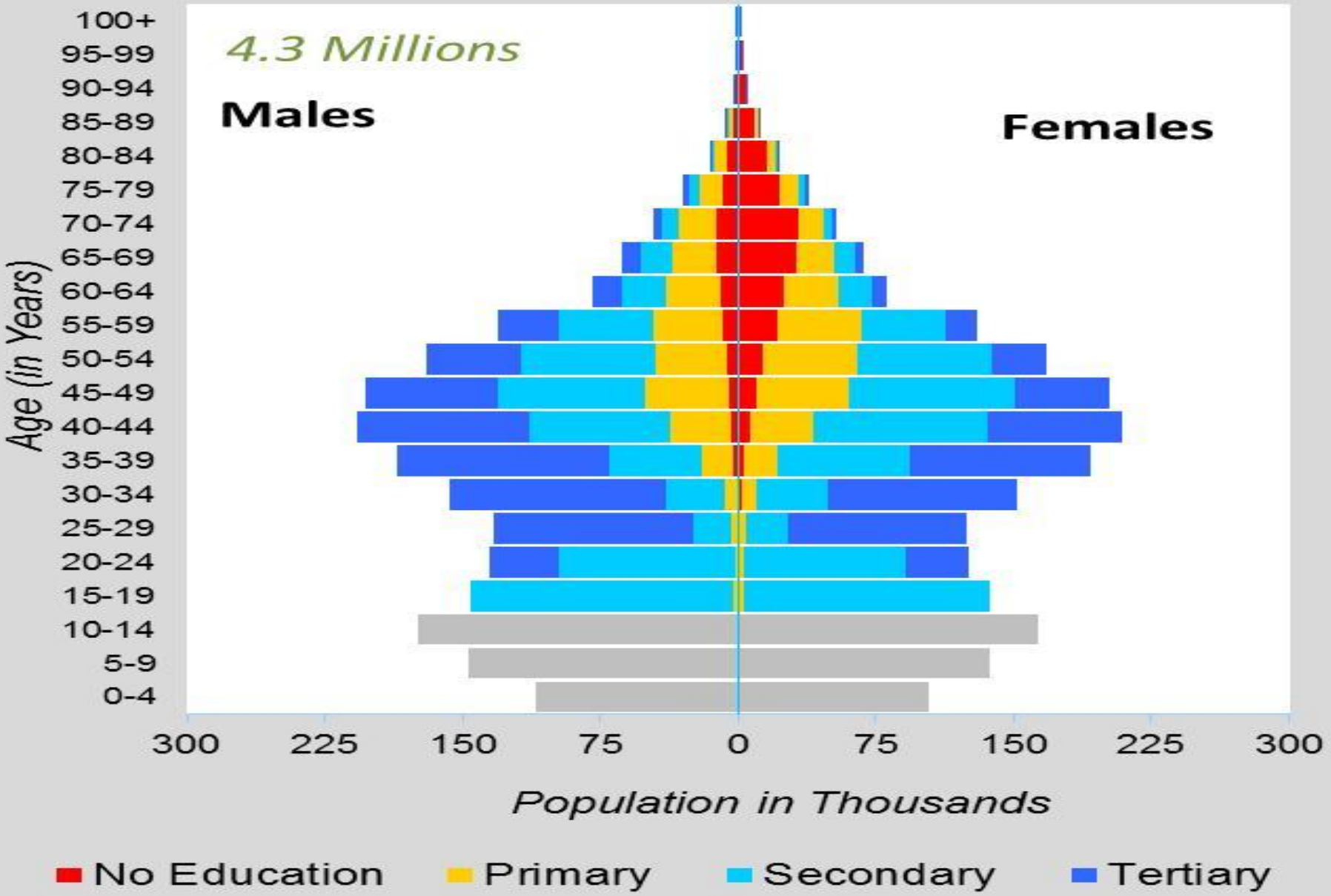
Singapore - 1995 BP



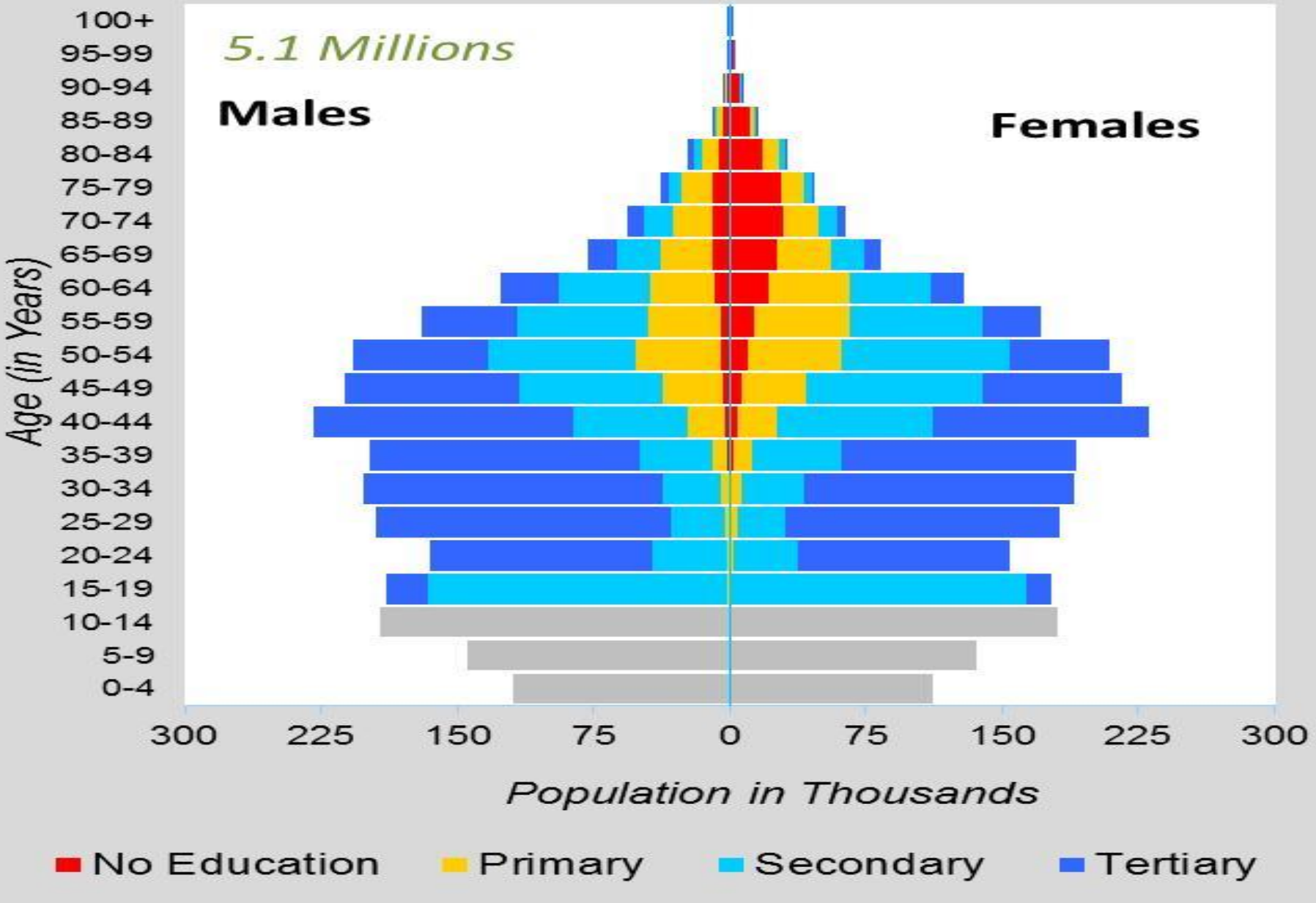
Singapore - 2000 BP



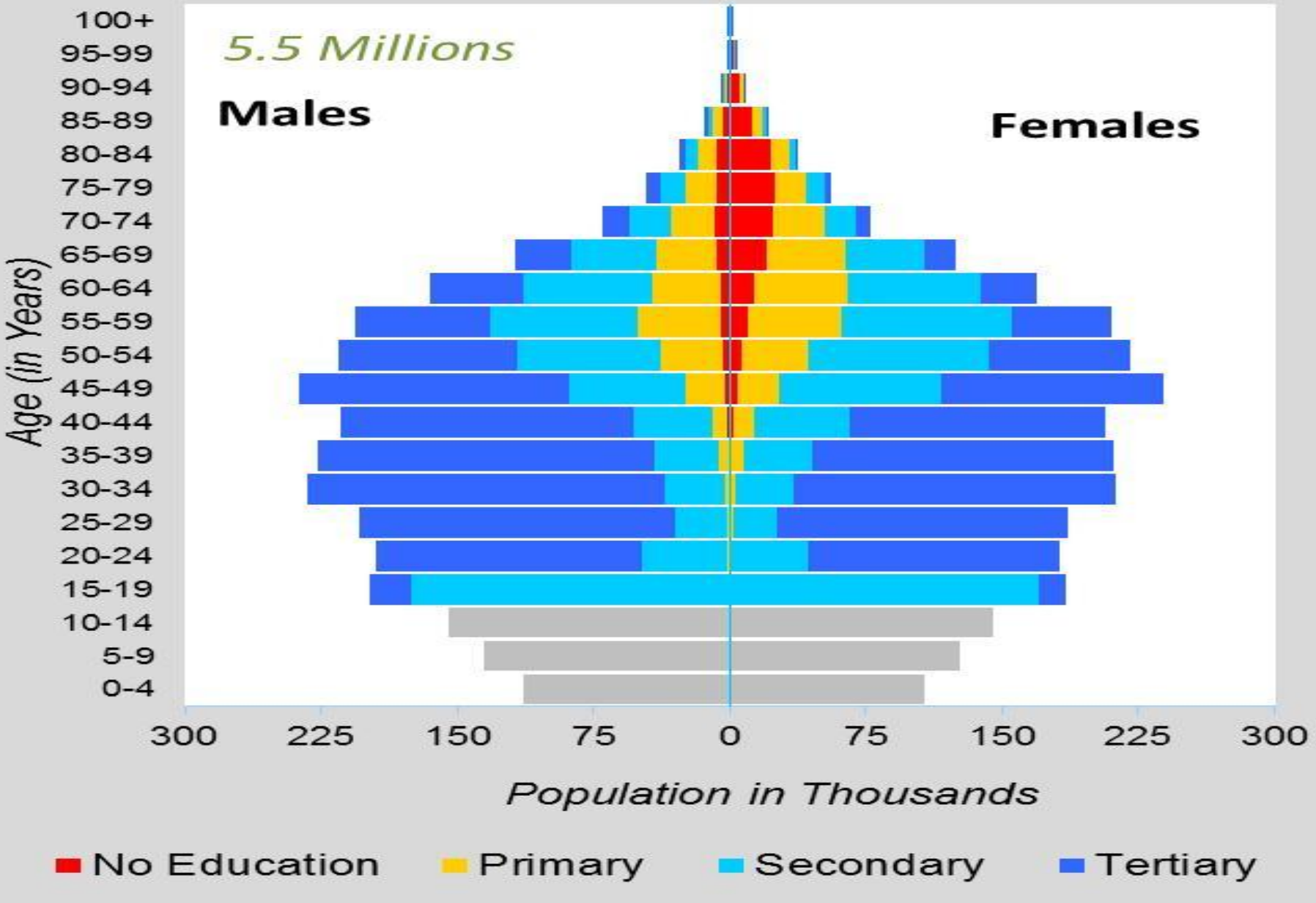
Singapore - 2005 BP



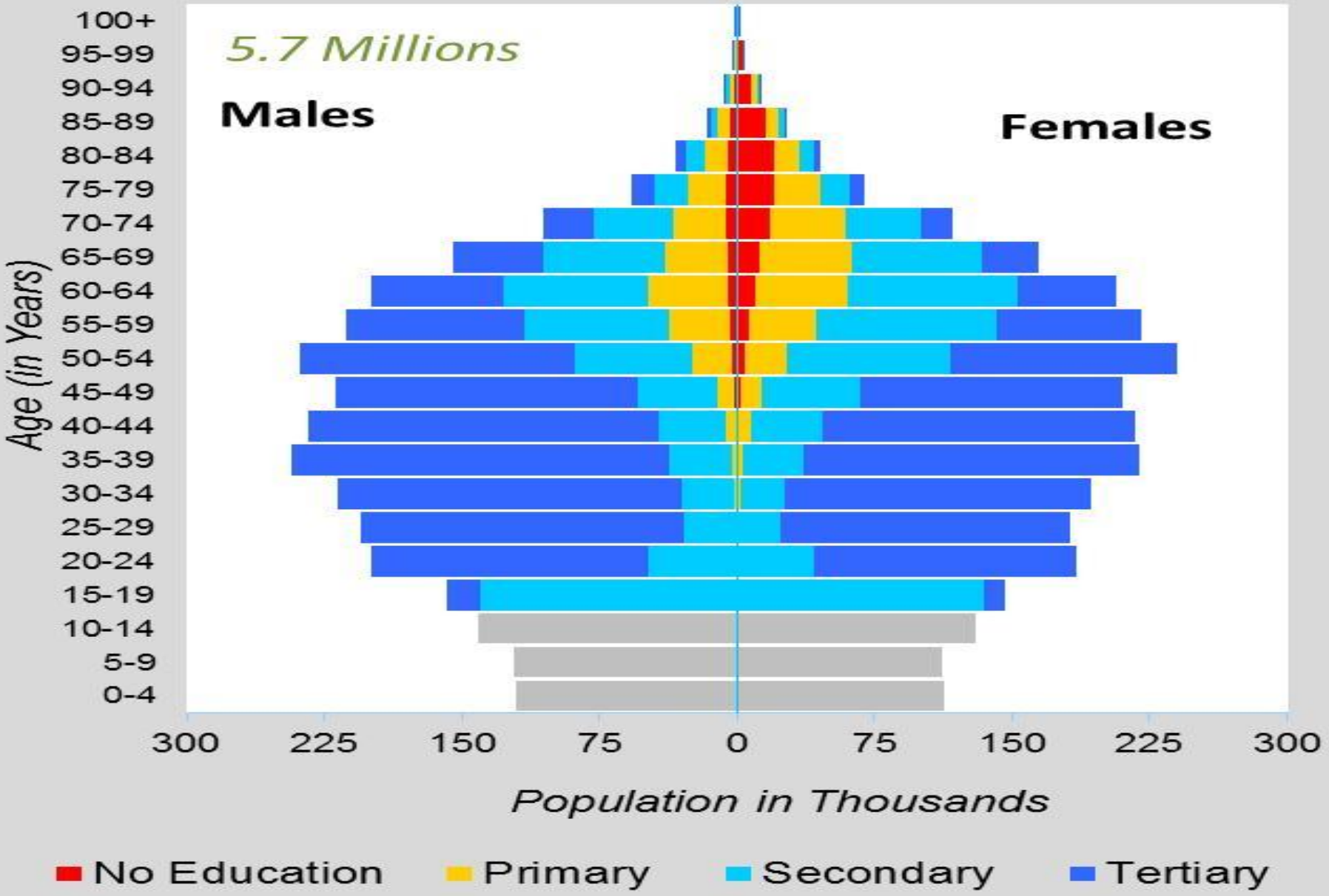
Singapore - 2010



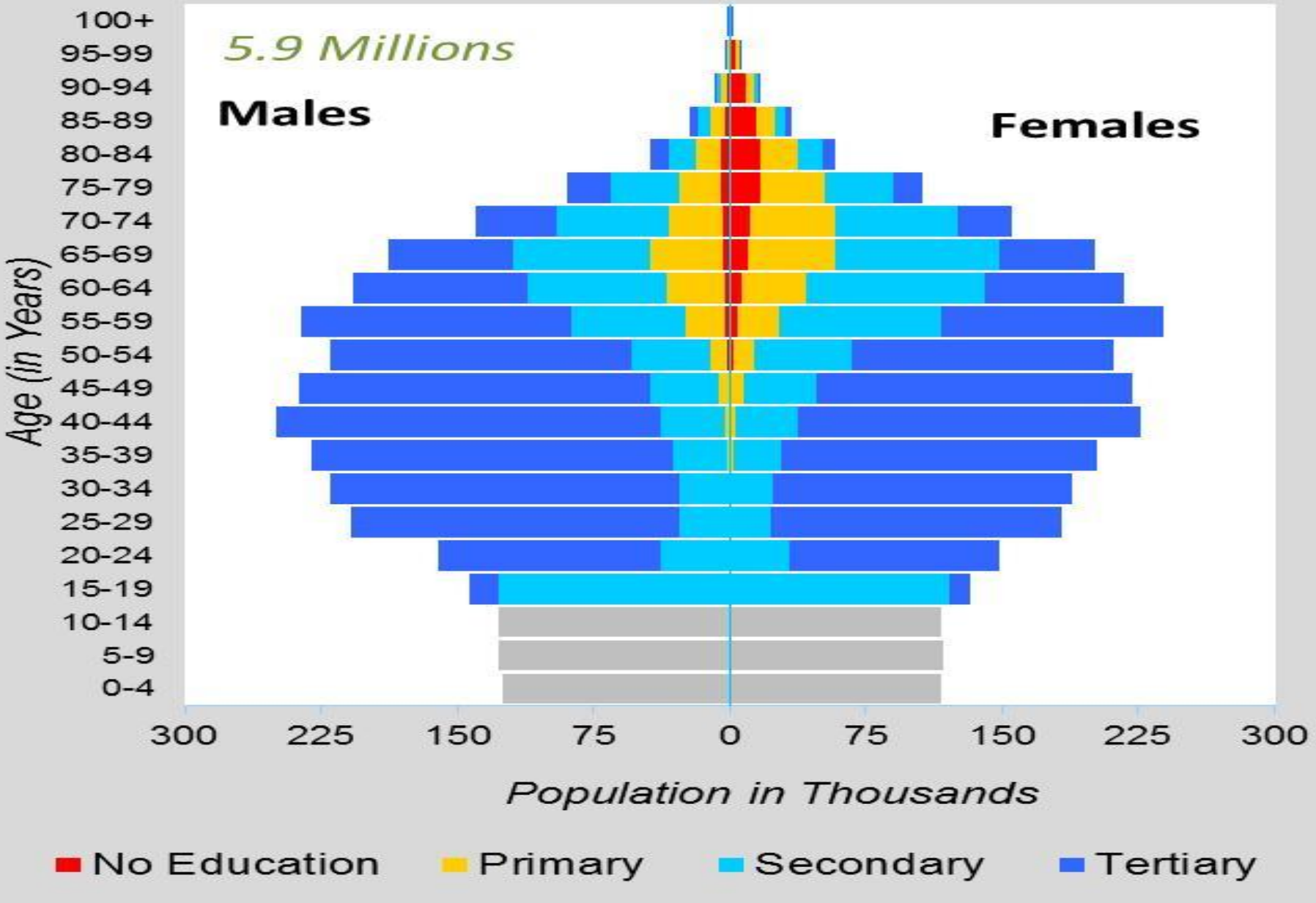
Singapore - 2015 SSP2



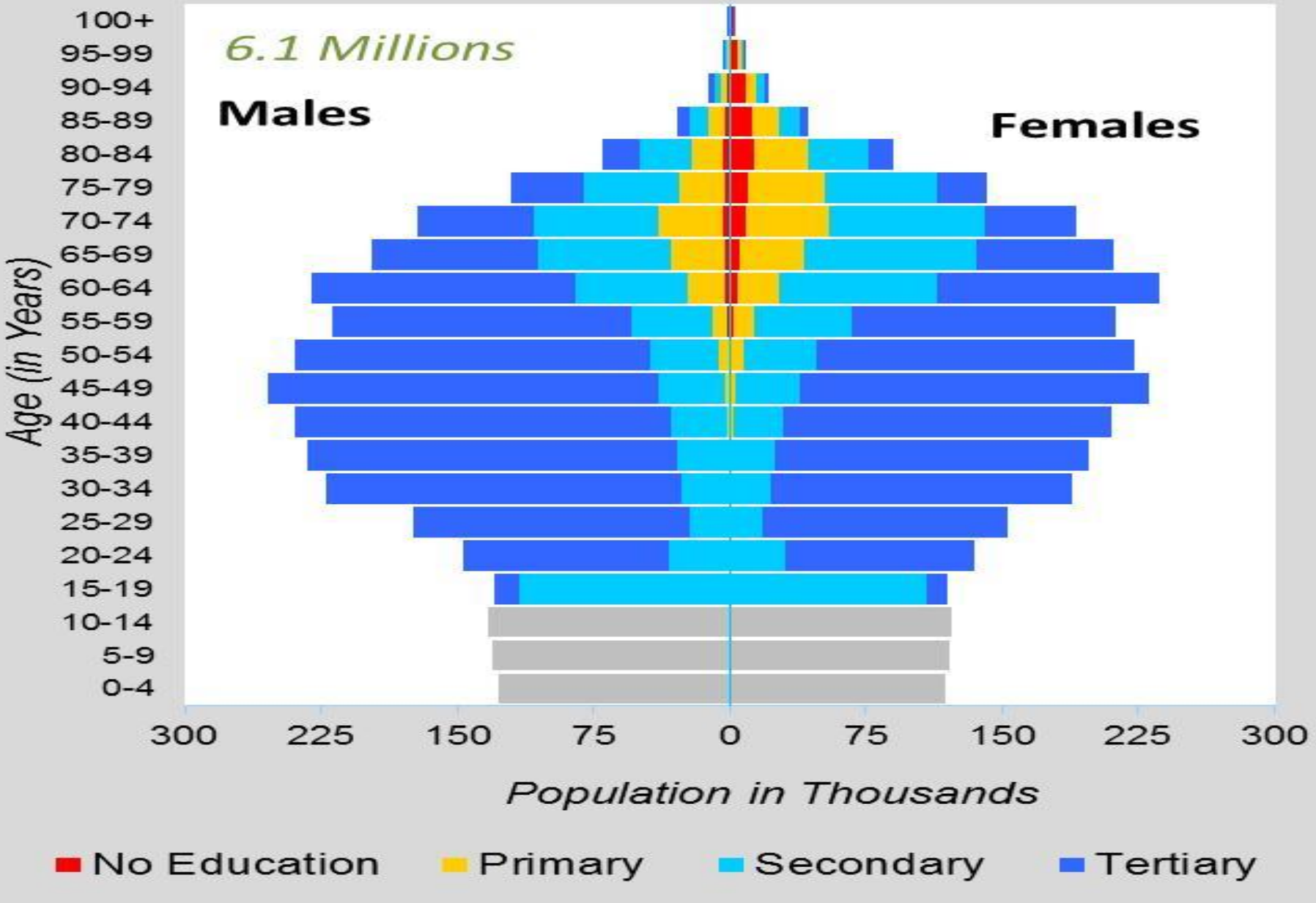
Singapore - 2020 SSP2



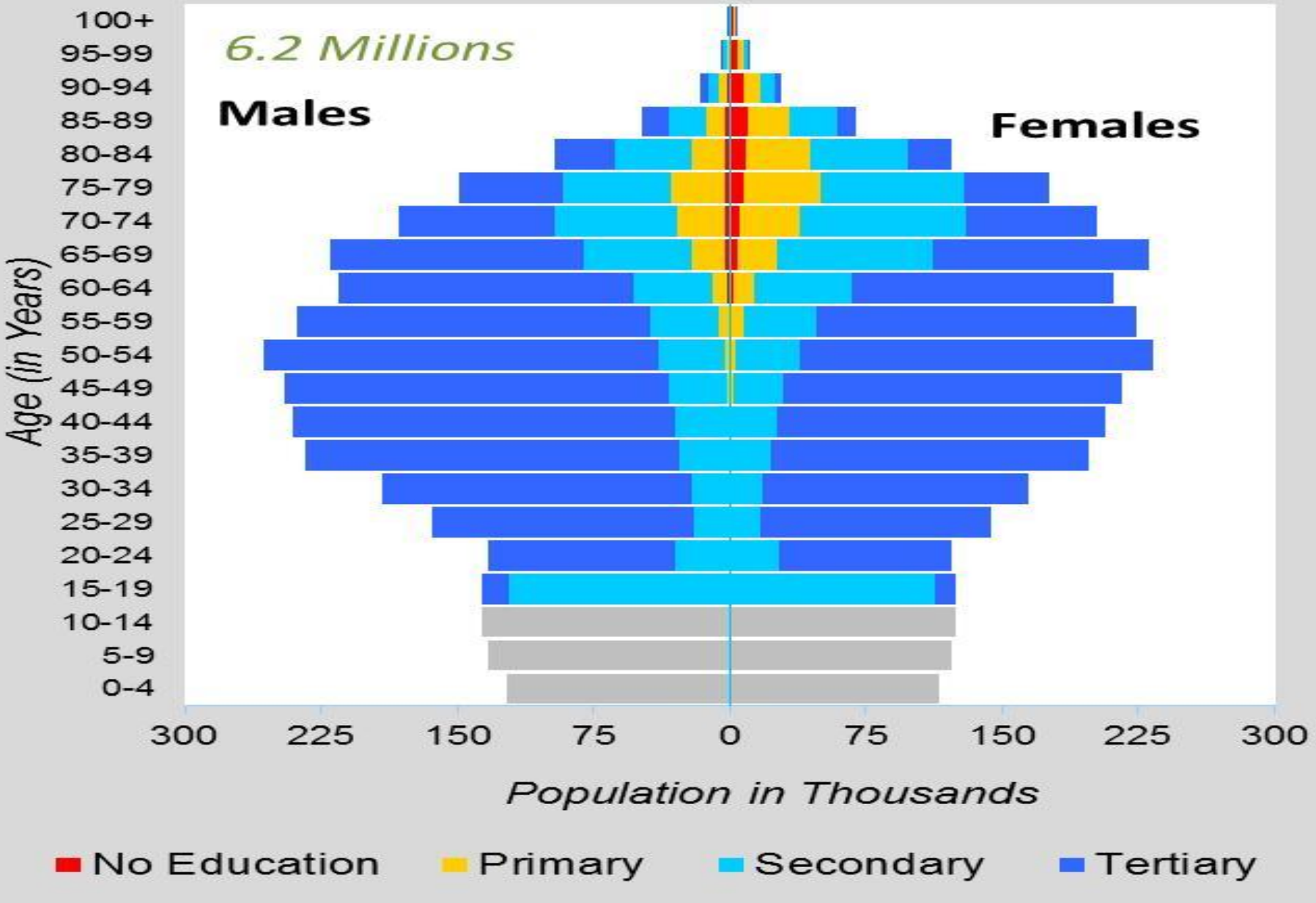
Singapore - 2025 SSP2



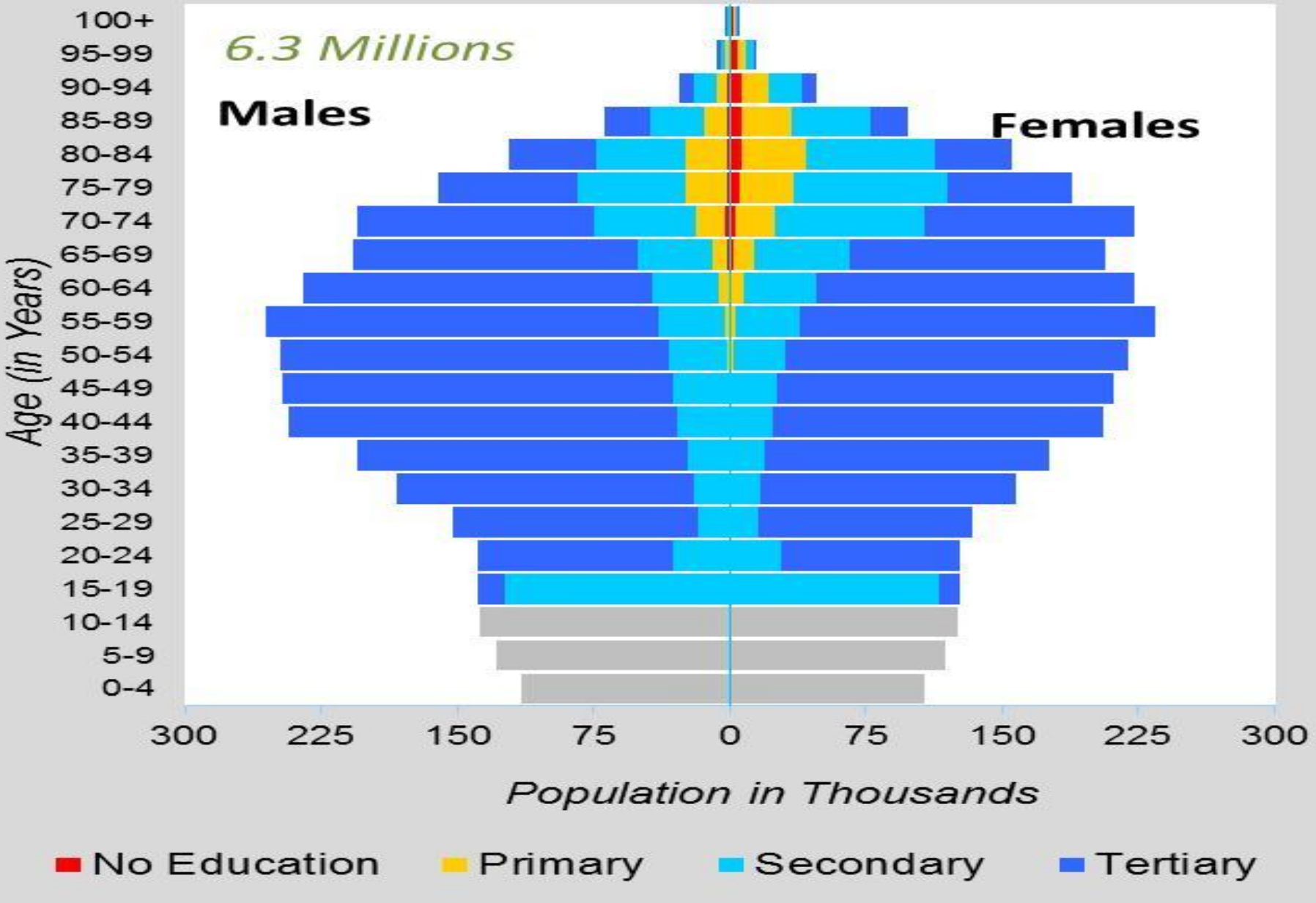
Singapore - 2030 SSP2



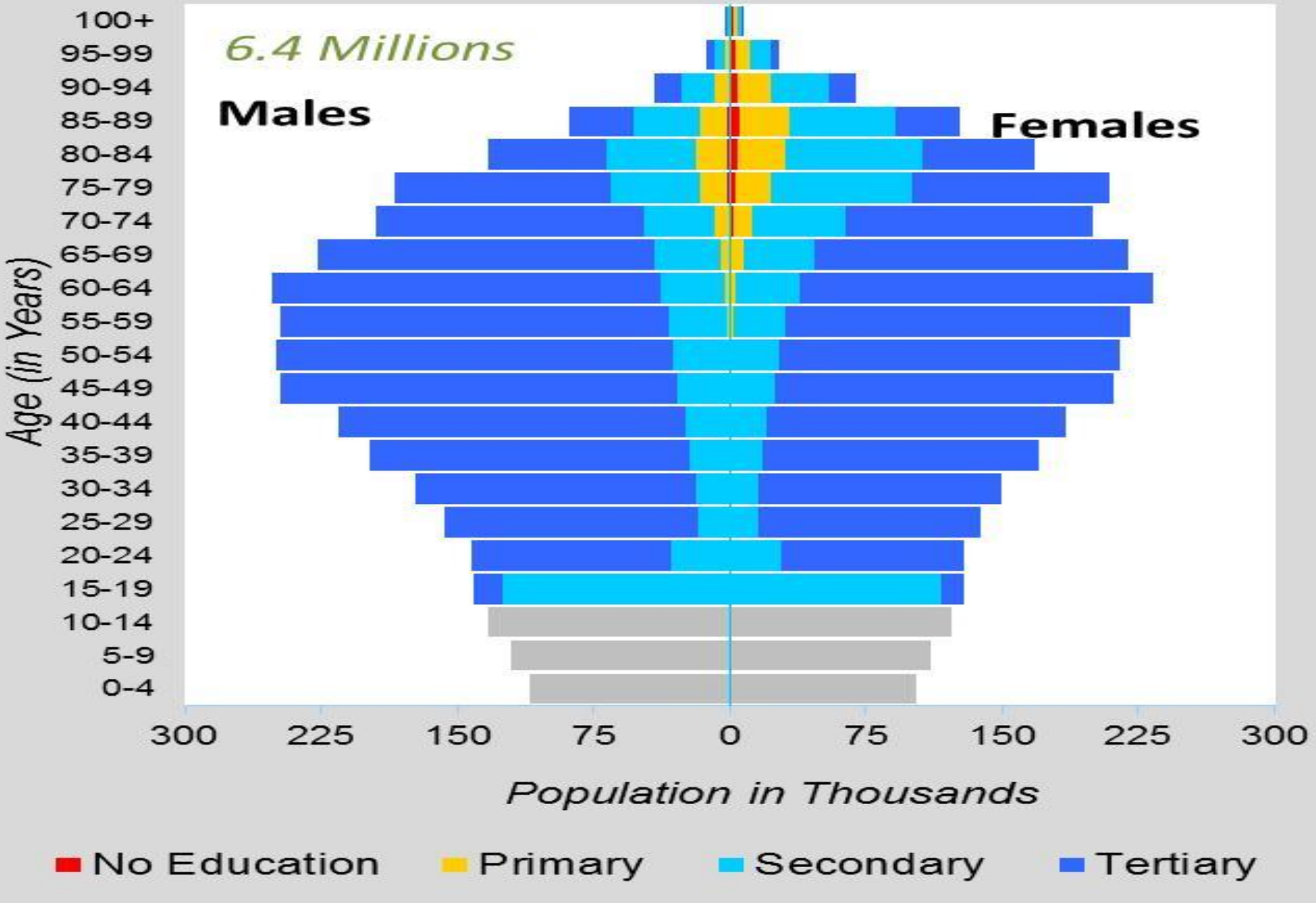
Singapore - 2035 SSP2



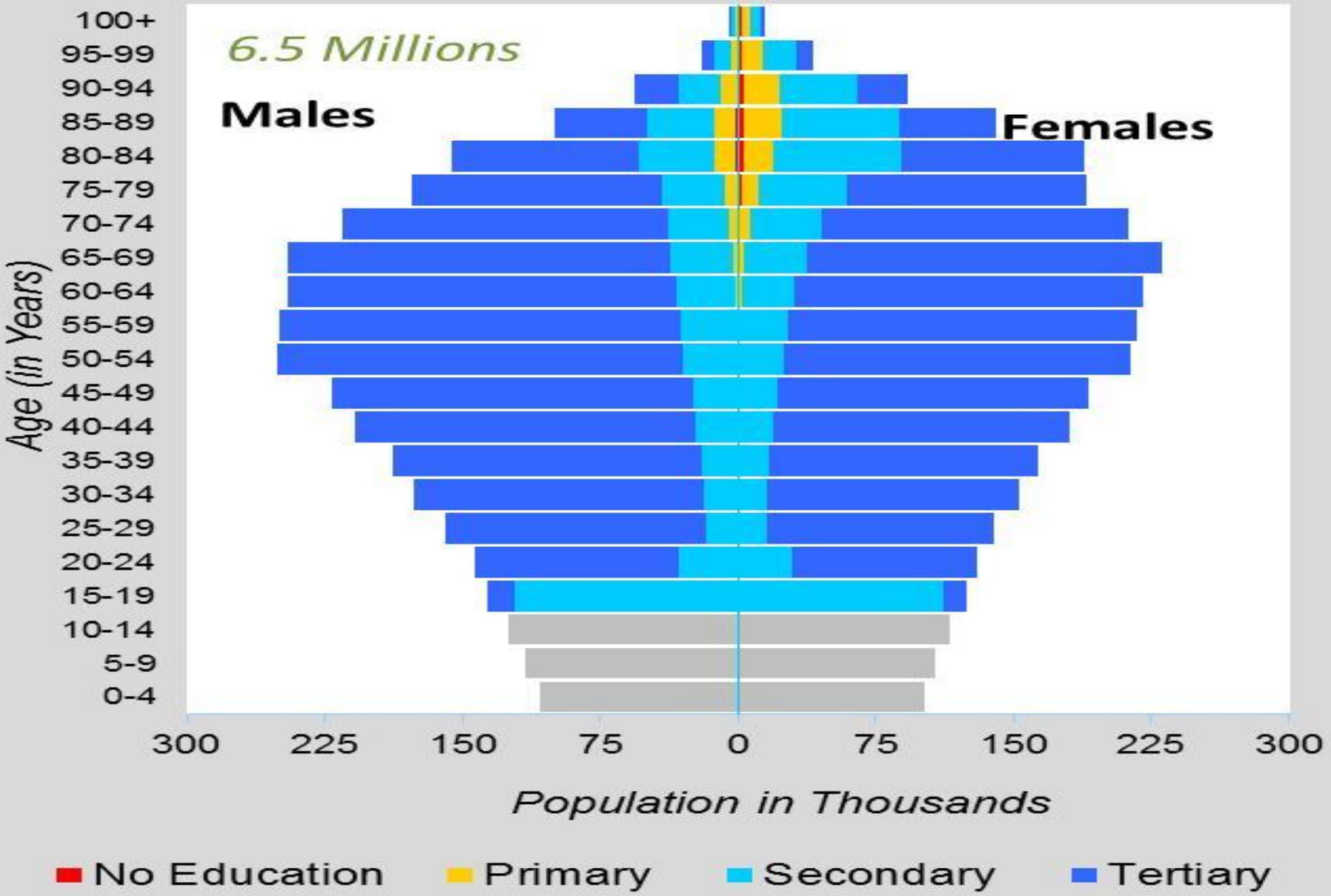
Singapore - 2040 SSP2

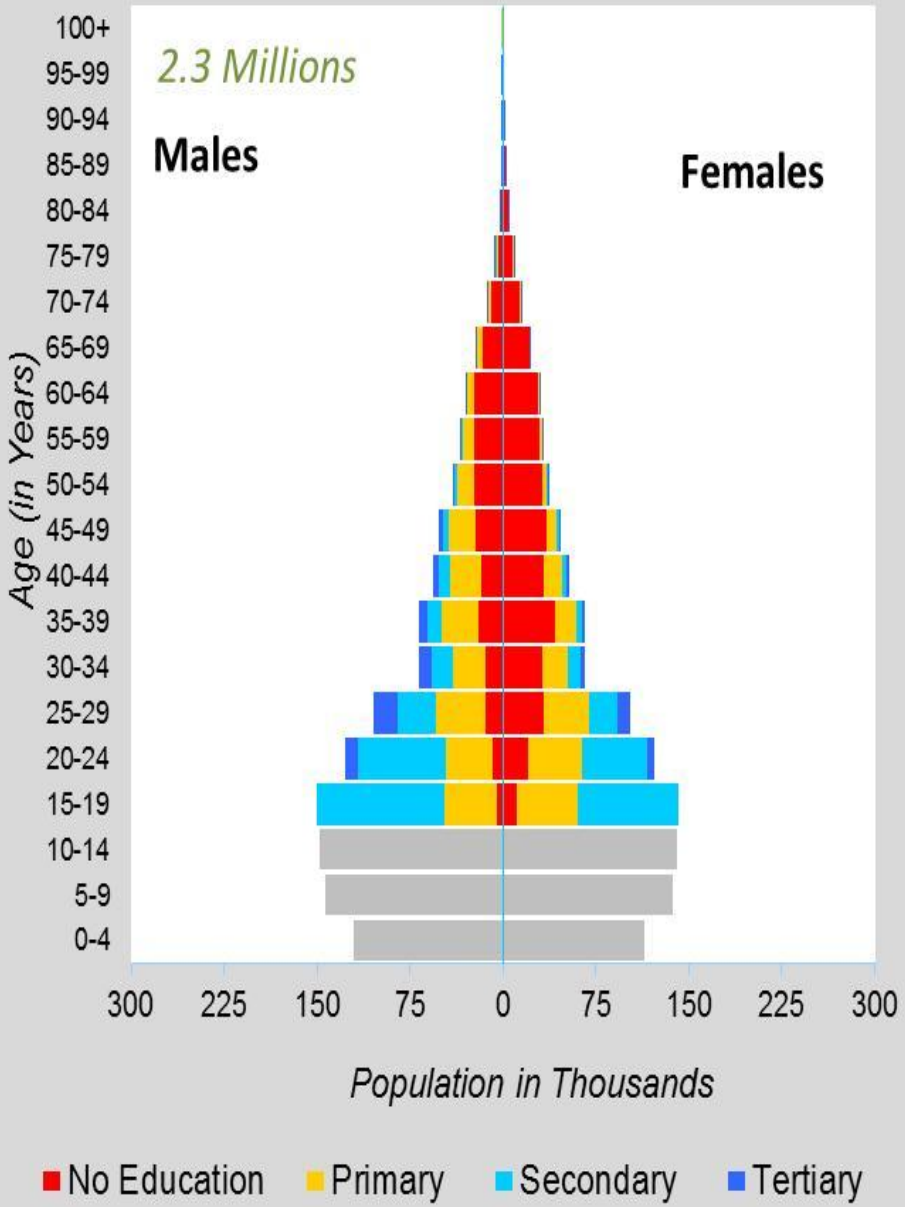


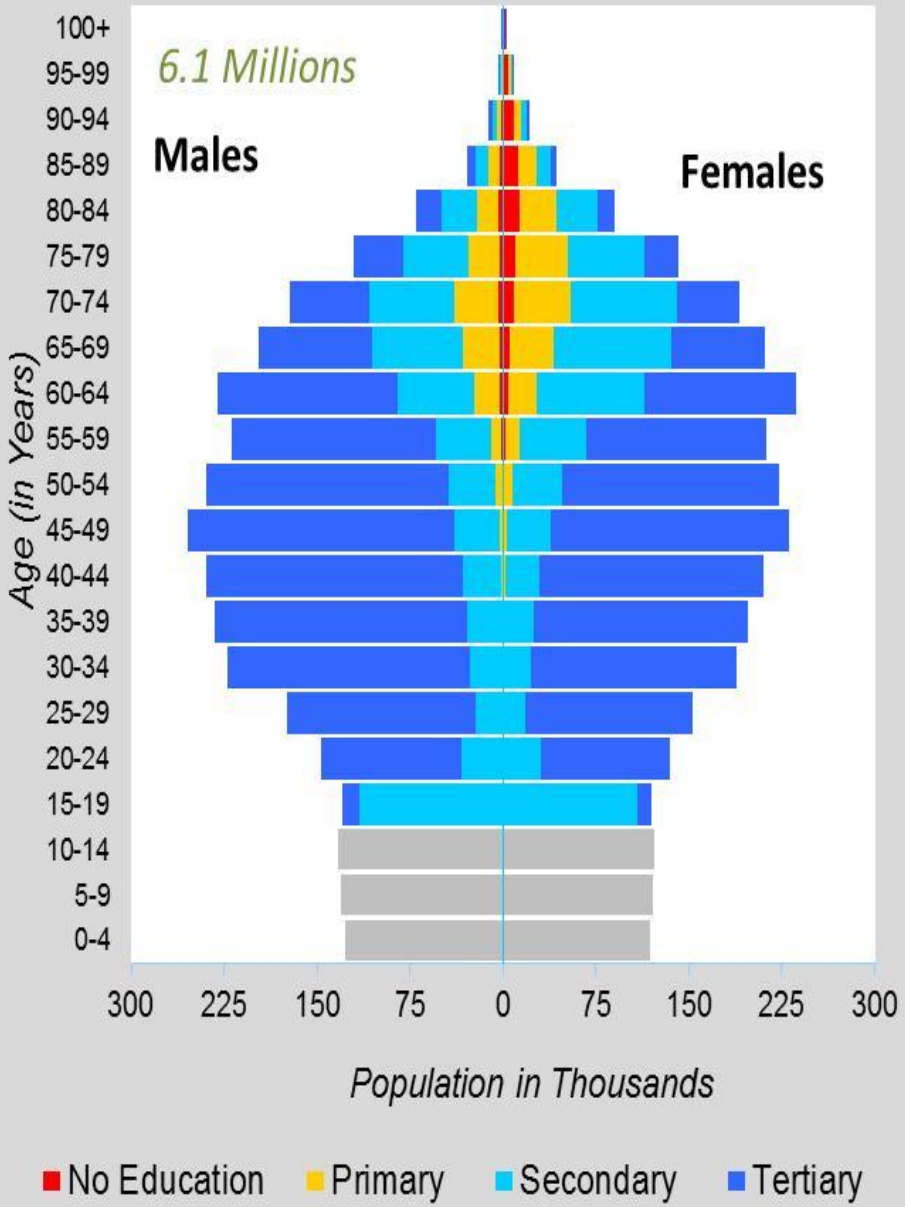
Singapore - 2045 SSP2

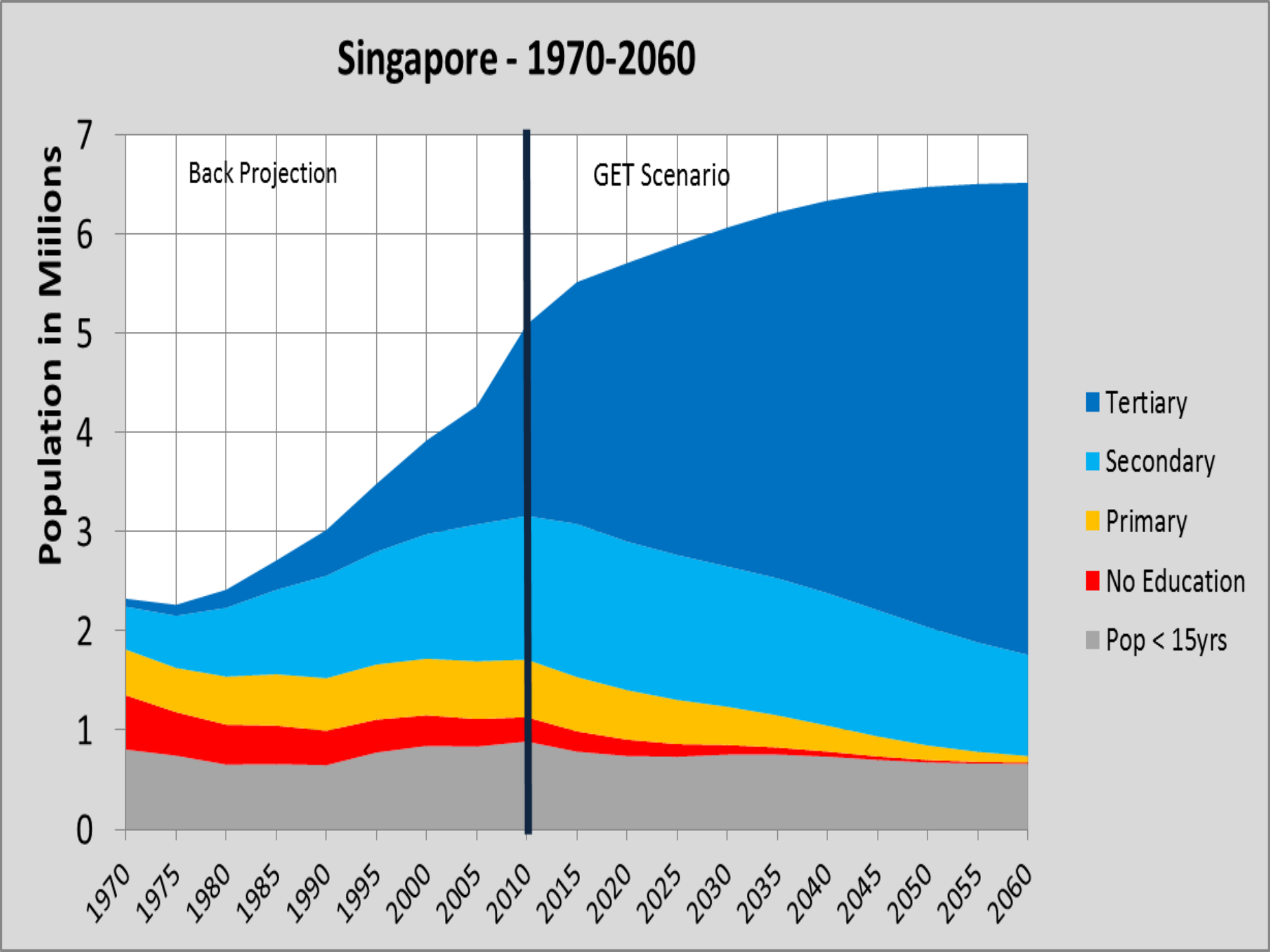


Singapore - 2050 SSP2




Singapore - 1970 BP
2.3 Millions
Males
Females
100+
95-99
90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
Age (in Years)
300
225
150
75
0
75
150
225
300
Population in Thousands
No Education
Primary
Secondary
Tertiary

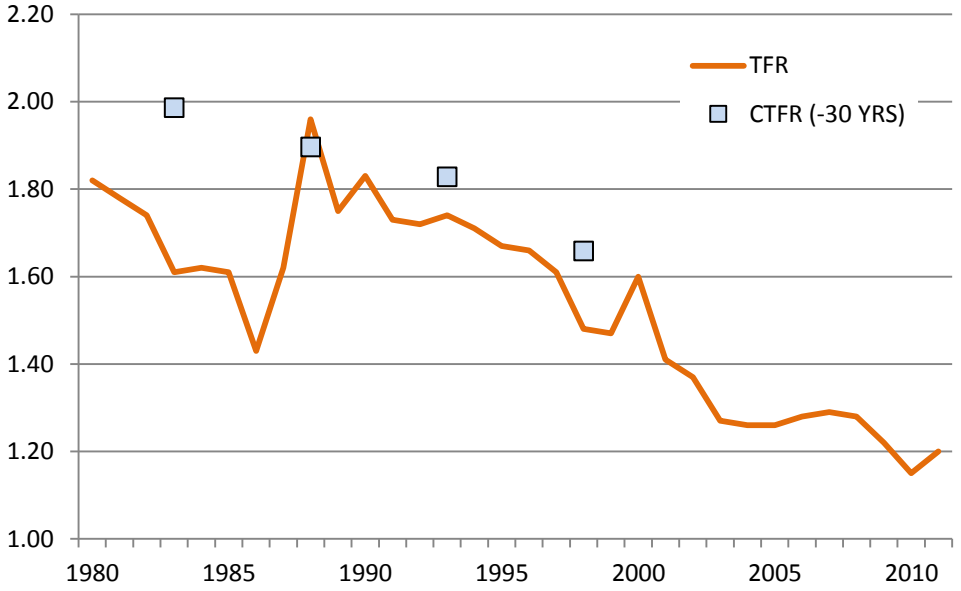

Singapore - 2030 SSP2
6.1 Millions
Males
Females
100+
95-99
90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
Age (in Years)
300
225
150
75
0
75
150
225
300
Population in Thousands
No Education
Primary
Secondary
Tertiary


Singapore - 1970-2060
Population in Miilions
0
1
2
3
4
5
6
7
Back Projection
GET Scenario
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
Tertiary
Secondary
Primary
No Education
Pop < 15yrs

Fertility in Singapore

Period Total Fertility Rates

1950-1955	6.61
1955-1960	6.34
1960-1965	5.12
1965-1970	3.65
1970-1975	2.82
1975-1980	1.84
1980-1985	1.59
1985-1990	1.70
1990-1995	1.84
1995-2000	1.58
2000-2005	1.33
2005-2010	1.25



AVG TFR 1981-2000 1.67

AVG CTFR, cohorts 1951-70 1.84

estimated tempo effect in the 1980s-1990s = **0.18**

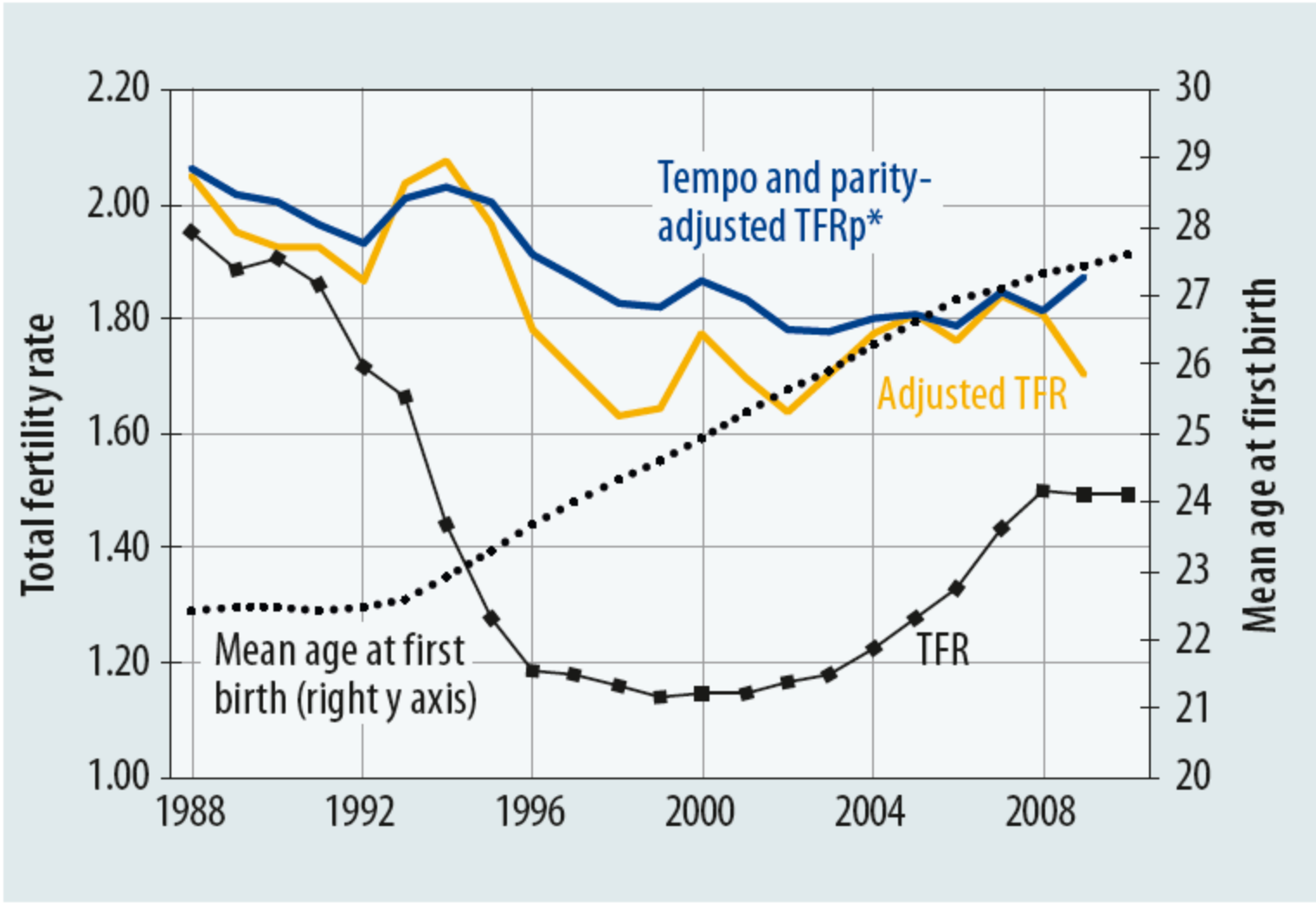


Figure1: Fertility trends in the Czech Republic, 1988-2010

One Criterion of Optimality: Education-weighted Dependency Ratio

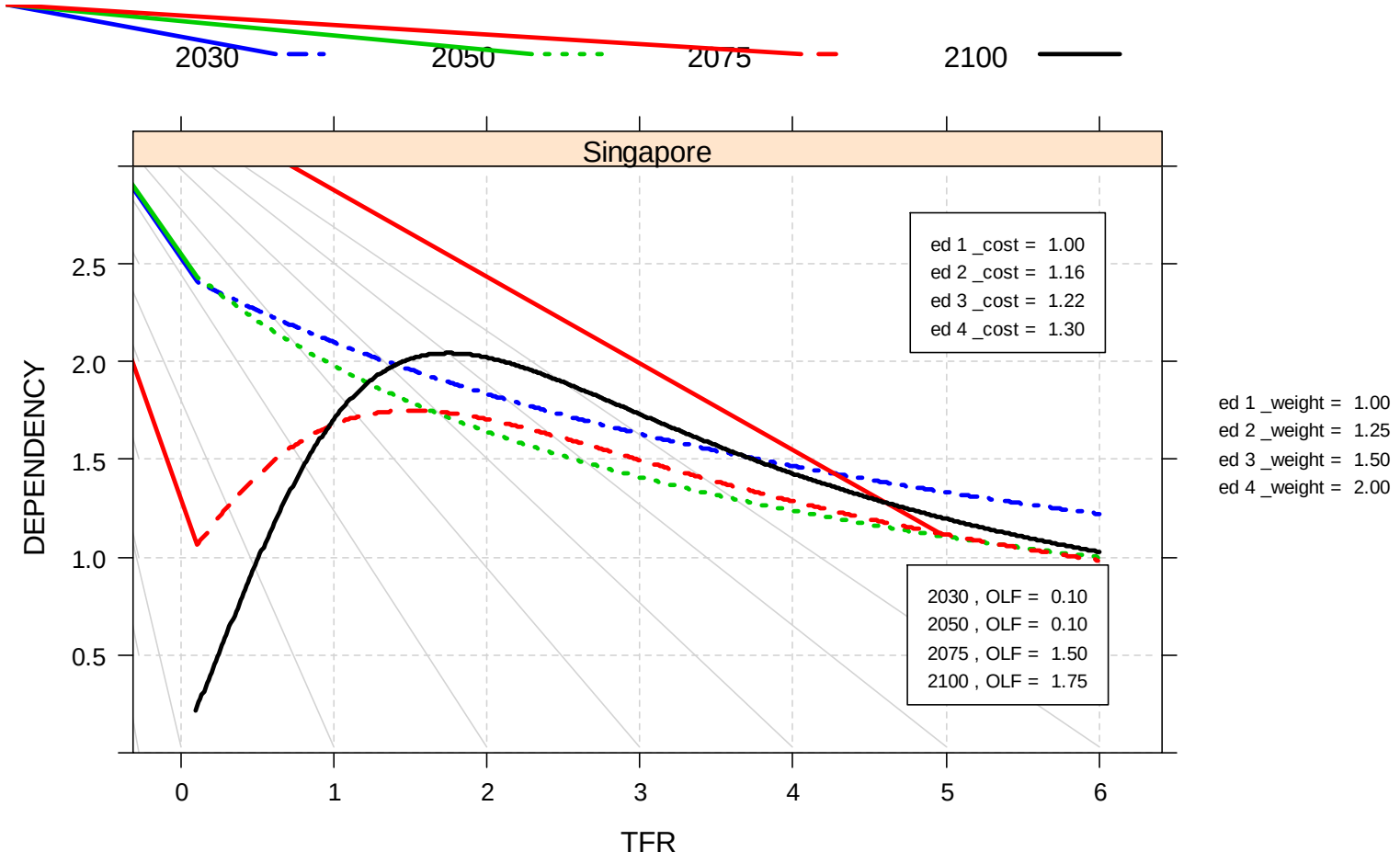
$$Dependency\ Ratio = \frac{Children + Retired}{Working}$$

$$Working = pop_{prim}^{16-57} * ed1weight + pop_{sec}^{19-61} * ed2weight + pop_{tert}^{26-65} * ed3weight$$

$$Children = pop_{preschool}^{0-5} * ed0cost + pop_{prim}^{6-10} * ed1cost + pop_{sec}^{11-18} * ed2cost + pop_{tert}^{19-25} * ed3cost$$

$$Retired = pop_{prim}^{58+} * pencost + pop_{sec}^{62+} * pencost + pop_{tert}^{66+} * pencost$$

Support ratio for global education trend (GET) scenario. Baseline for Singapore with lines at 2030 to 2100.



Striessnig, E, Lutz, W, (forthcoming), "*Can Below-Replacement Fertility be Desirable?*"

Is Population Ageing bad for Productivity Growth ?

At the Individual Level:

- Physical strength starts to decline around age 25
- Speed of mental perception declines after age 30
- Experience increases with age - up to high ages

At the Firm Level:

- ICT industries are most productive and have youngest workforce
- When controlling for industry then a good age mix is most productive.

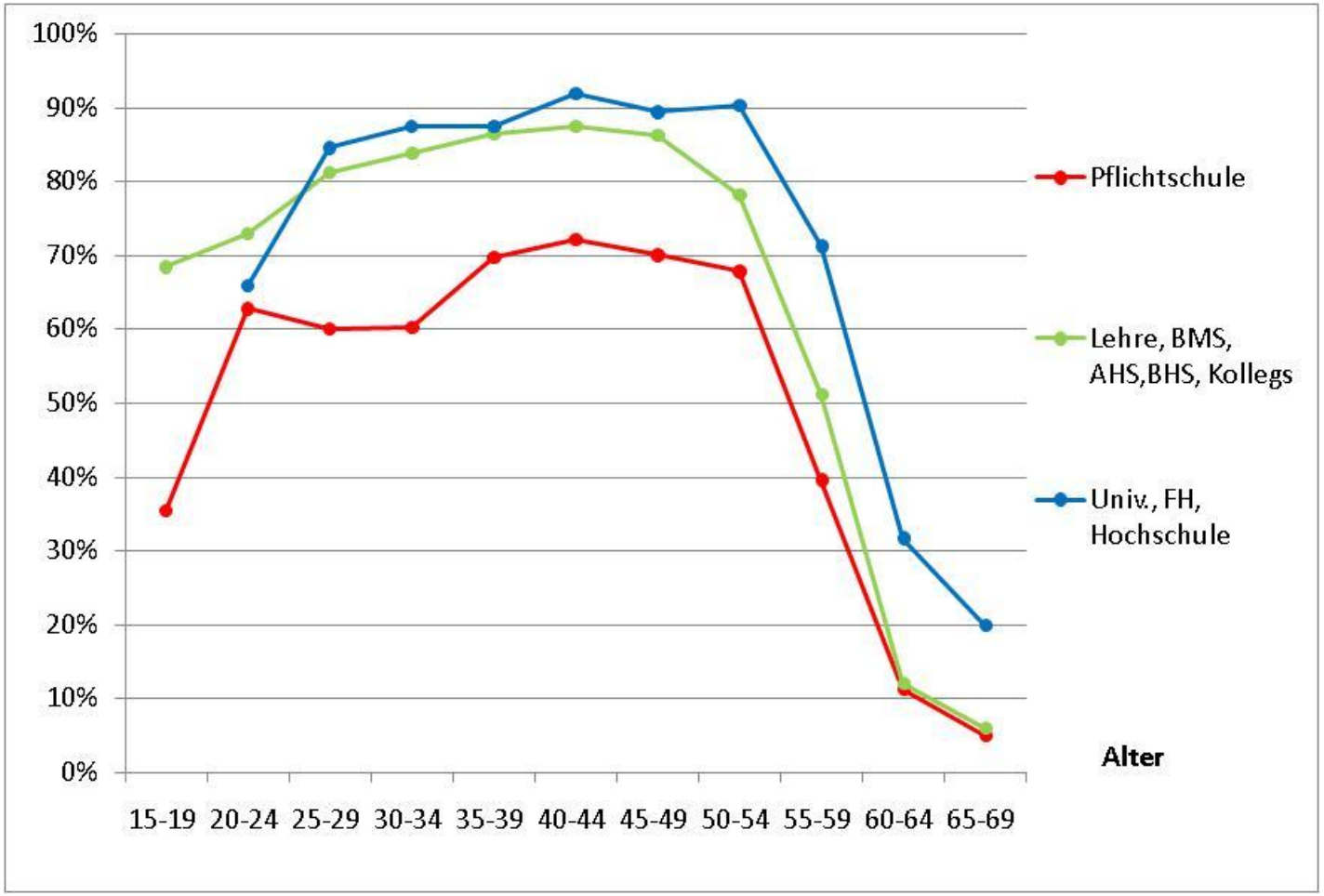
At the National Level:

- High proportion of 50-60 year olds is best
- Example of Germany

What are the key policy parameters to increase national level productivity?

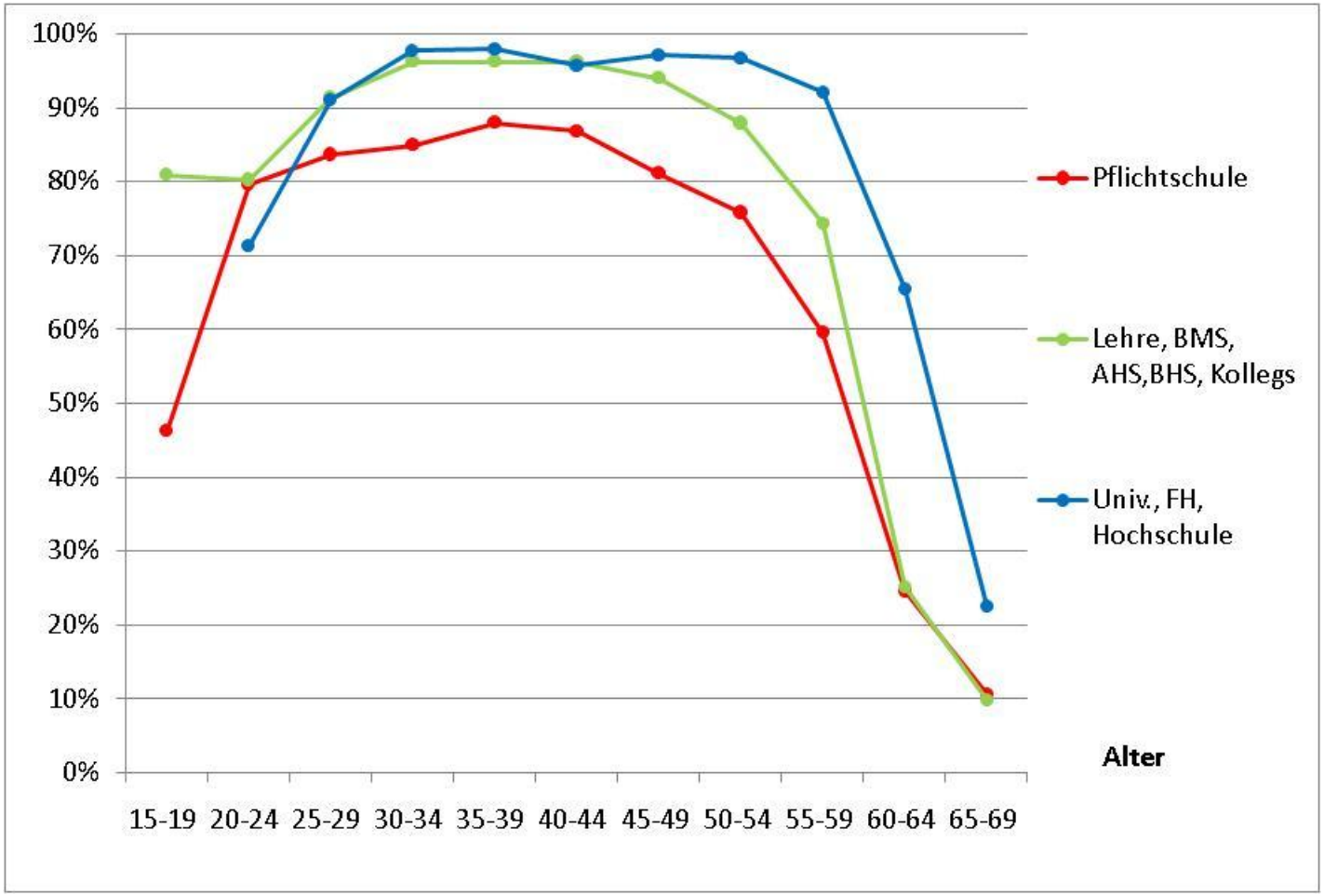
- **Higher education levels** are important for maintaining economic growth in ageing societies – take account of the delay between investments and benefits.
- **Higher labor force participation** of women and men of all ages. – Possibly combined with less hours of work per week.
- **Conclusion:** The negative effects of ageing have been exaggerated. The can be largely ameliorated by these two policies:

Female Labor Force Participation by Education Austria 2008



Quelle: European Labor Force Survey, 2008.

Male Labor Force Participation by Education Austria 2008



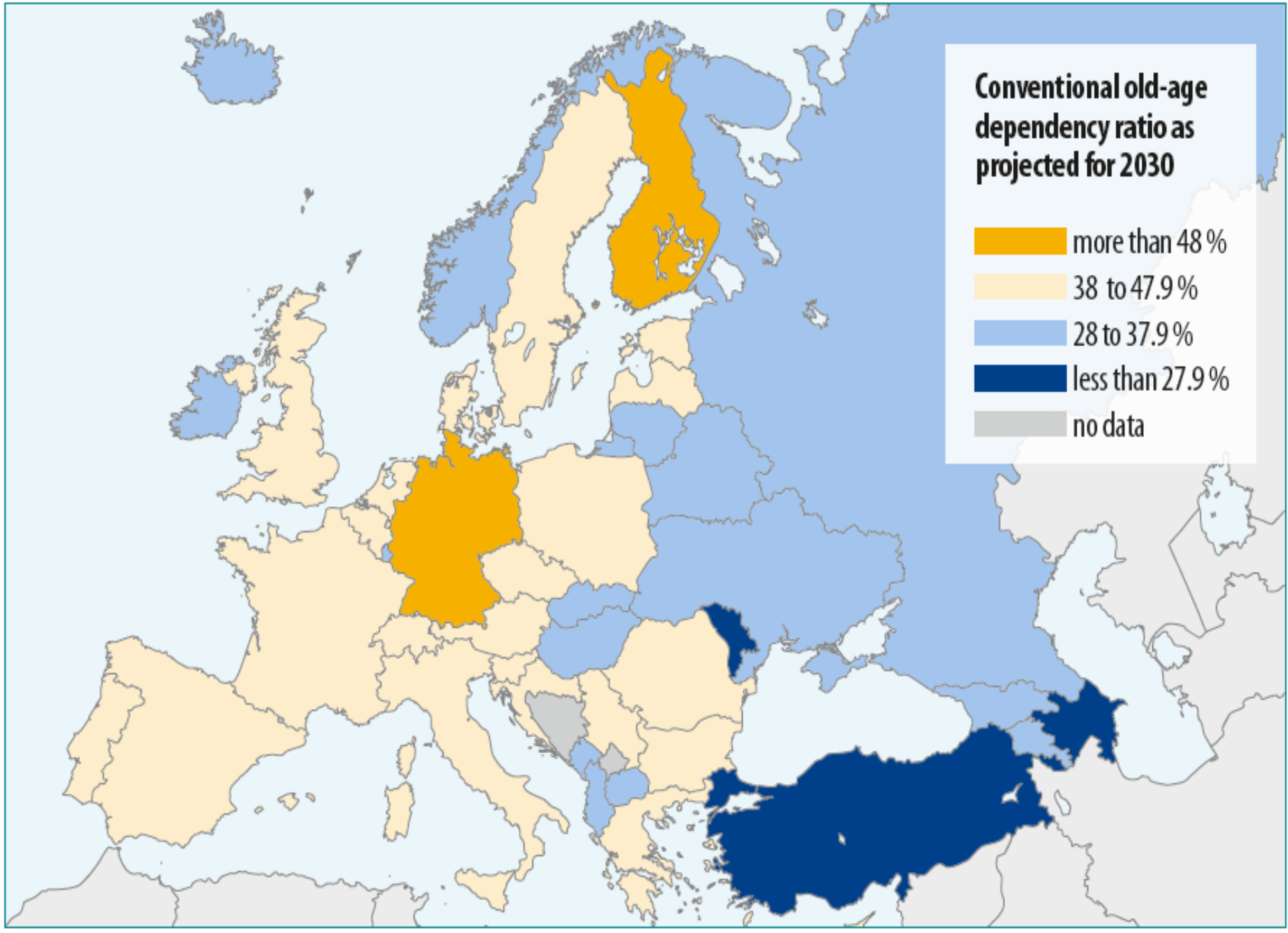
Quelle: European Labor Force Survey, 2008.

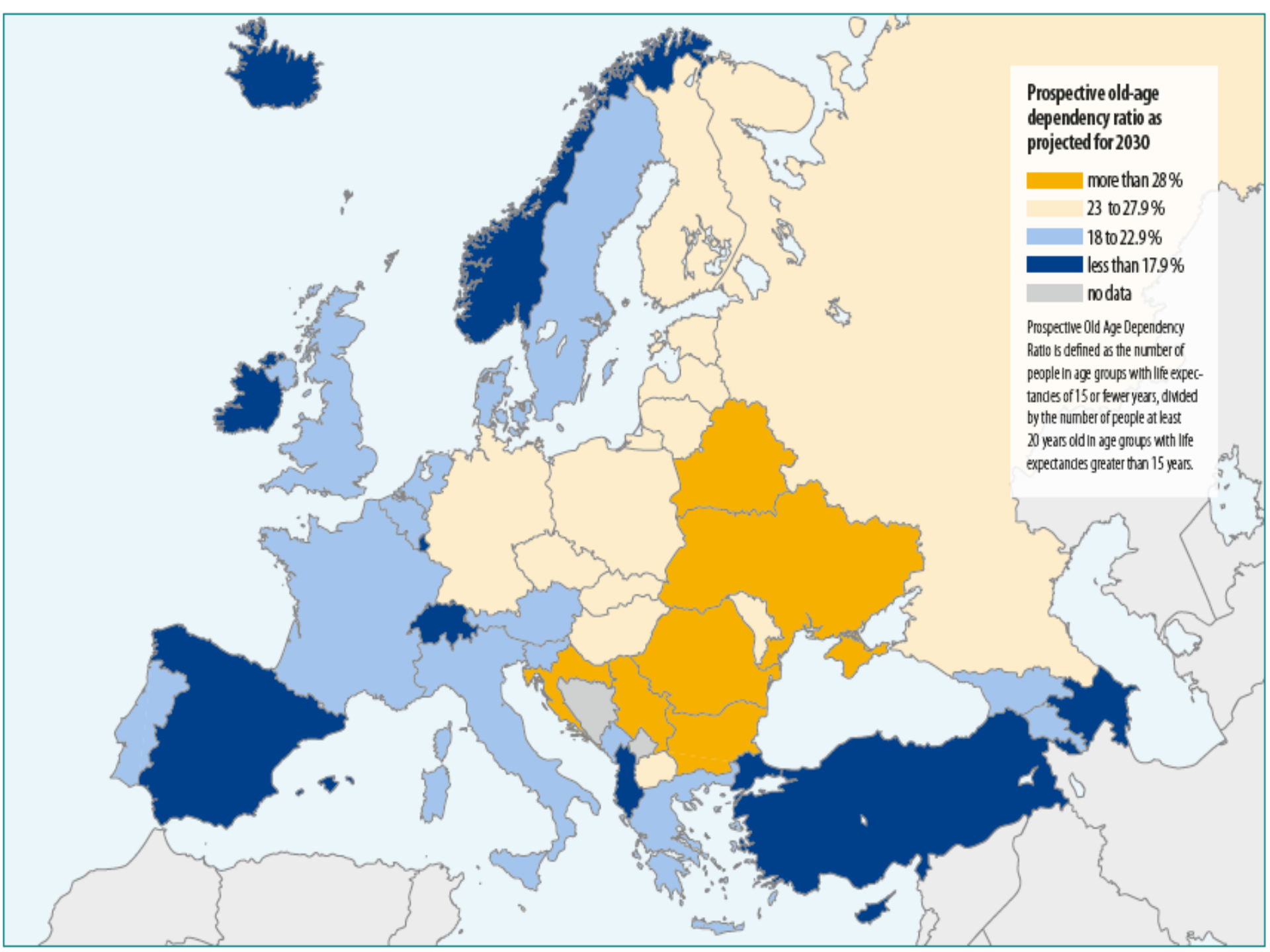
Redefining old age dependency

$$\text{OADR} = \frac{\text{Number of people aged 65 years or older}}{\text{Number of people aged 20 to 64}}$$

the VID and IIASA: the prospective old-age dependency ratio. In the POADR, the threshold of being old is not fixed but linked to life expectancy. People are considered old when the average remaining life expectancy in their age group is less than 15 years.

$$\text{POADR} = \frac{\text{Number of people older than the old-age threshold}}{\text{Number of people aged 20 to the old-age threshold}}$$


Conventional old-age dependency ratio as projected for 2030
more than 48 %
38 to 47.9 %
28 to 37.9 %
less than 27.9 %
no data


Prospective old-age dependency ratio as projected for 2030
more than 28 %
23 to 27.9 %
18 to 22.9 %
less than 17.9 %
no data
Prospective Old Age Dependency Ratio is defined as the number of people in age groups with life expectancies of 15 or fewer years, divided by the number of people at least 20 years old in age groups with life expectancies greater than 15 years.

Female Education is Key to reducing World Population Growth
(*Lutz and KC, Science 2011*)

Different education scenarios assuming identical education-specific fertility rates

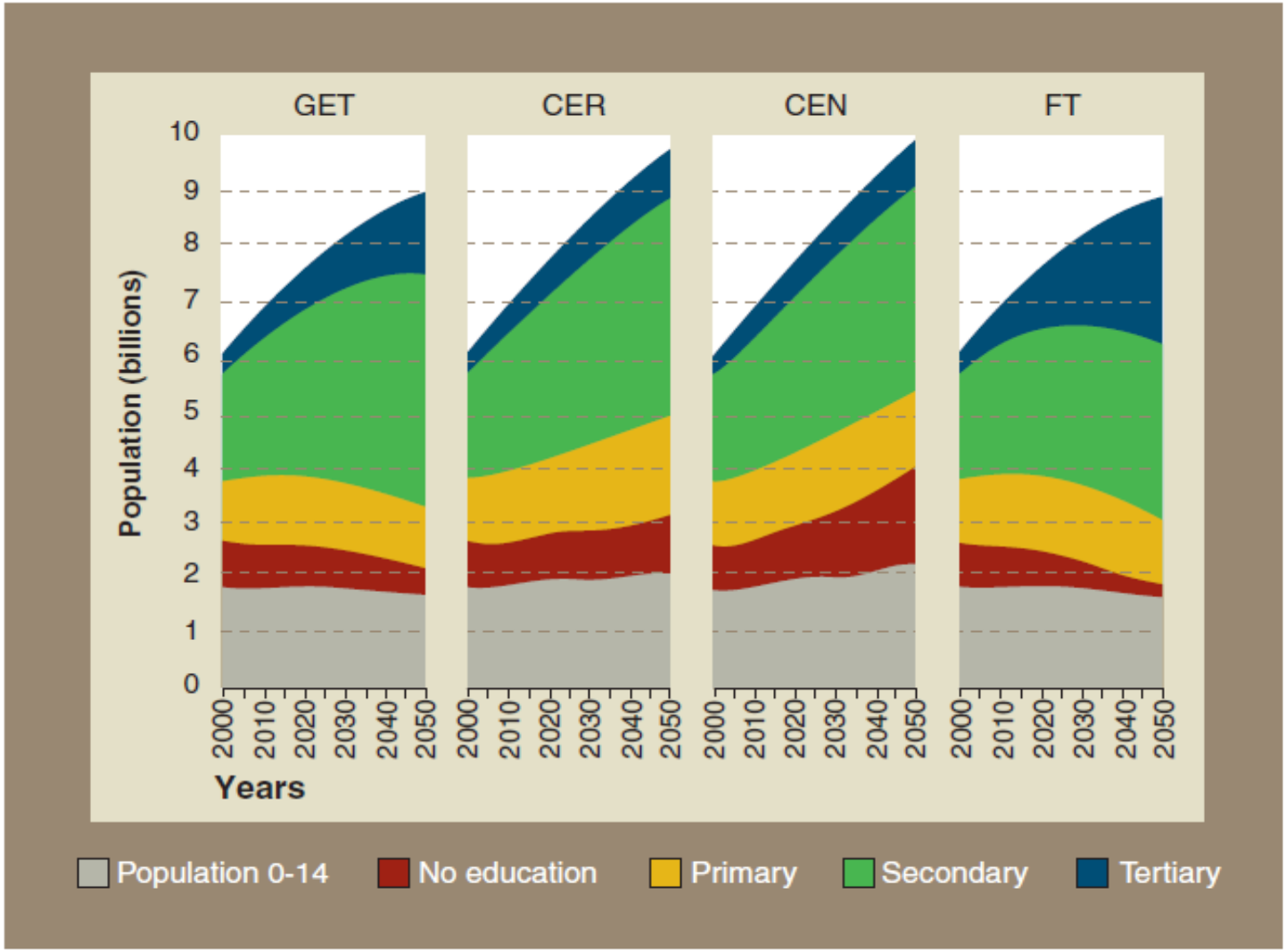


Fig. 2. World population by level of educational attainment projected to 2050 on the basis of four different education scenarios. Source for base year is (*39*) and for the scenarios is (*18*).

www.sciencemag.org SCIENCE VOL 319 22 FEBRUARY 2008 POLICY FORUM

ECONOMICS

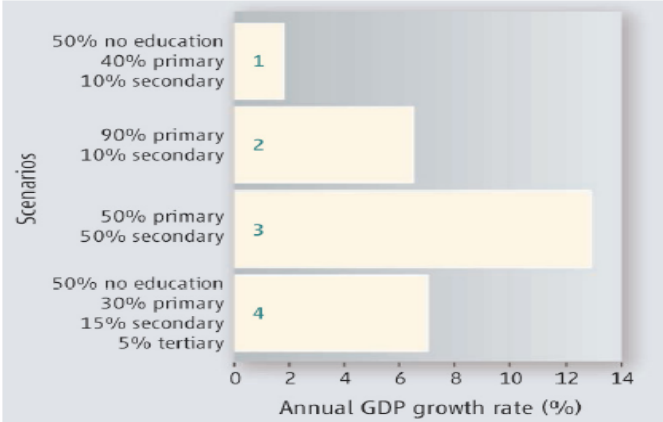
The Demography of Educational Attainment and Economic Growth

Complementing primary education with secondary education in broad segments of the population is likely to give a strong boost to economic growth.

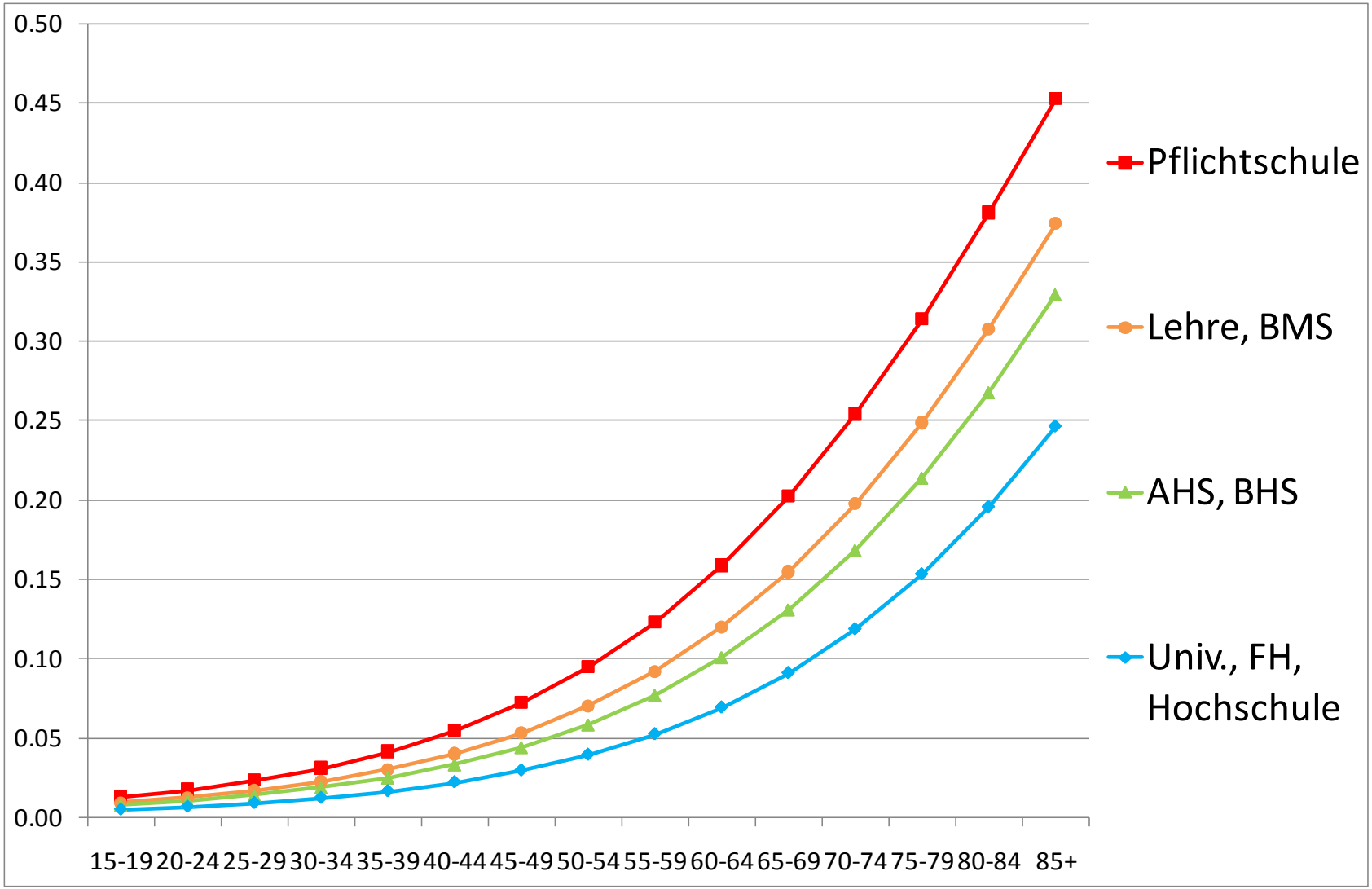
Wolfgang Lutz,[1]* Jesus Crespo Cuaresma,[2] Warren Sanderson[3]

Human capital, age structure and economic growth

- The age distribution of educational attainment plays a key role on the effects of human capital on growth.
- Strong effects of secondary education.
- A small simulation exercise for a stereotype African developing country:

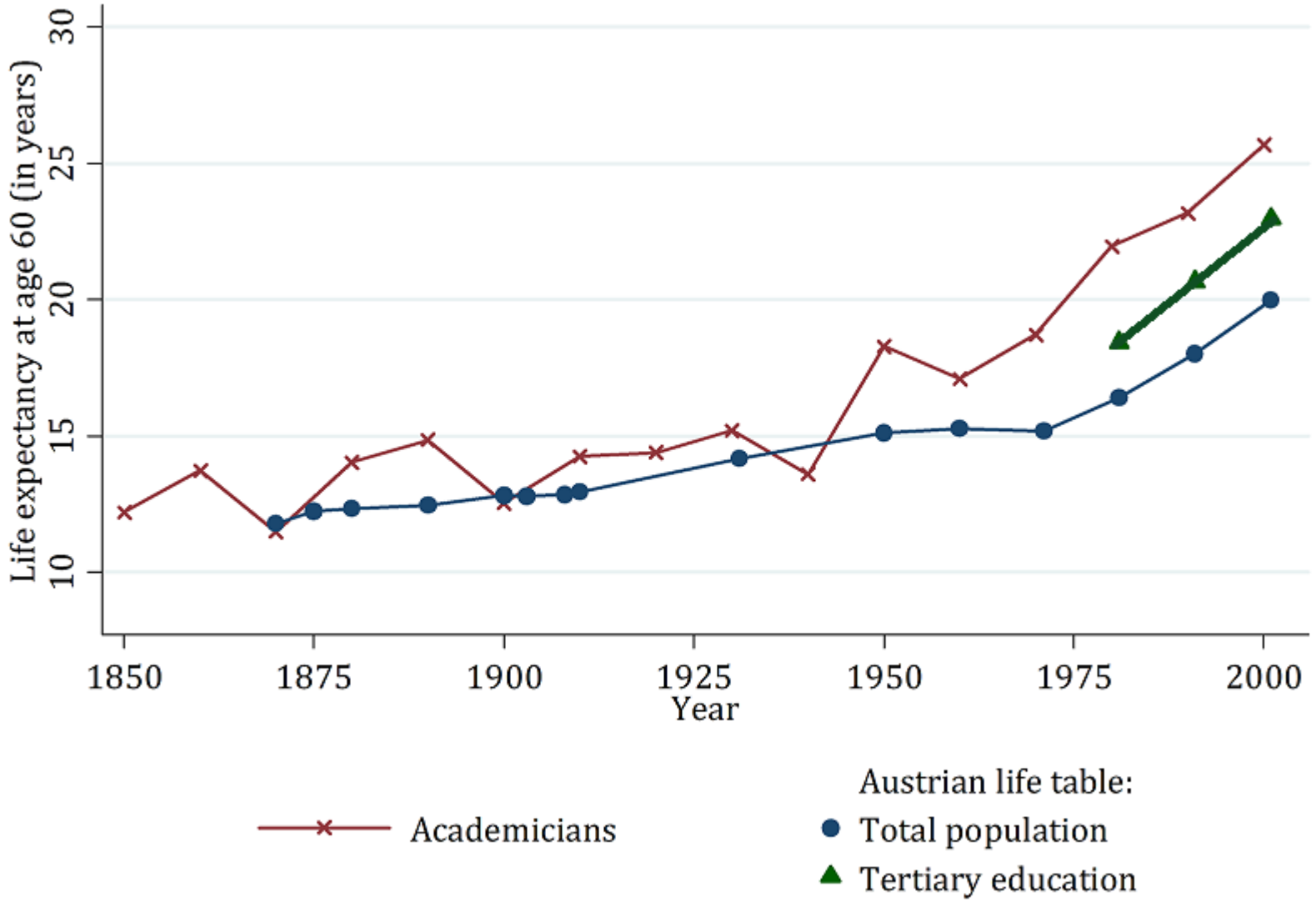


Austria 2007: Proportion of women with severe disabilities in activities of daily life



Quelle: Österreichische Gesundheitsbefragung 2006/2007.

Remaining Life Expectancy at Age 60
Austria 1850-2010



Source: Winkler-Dworak, VID

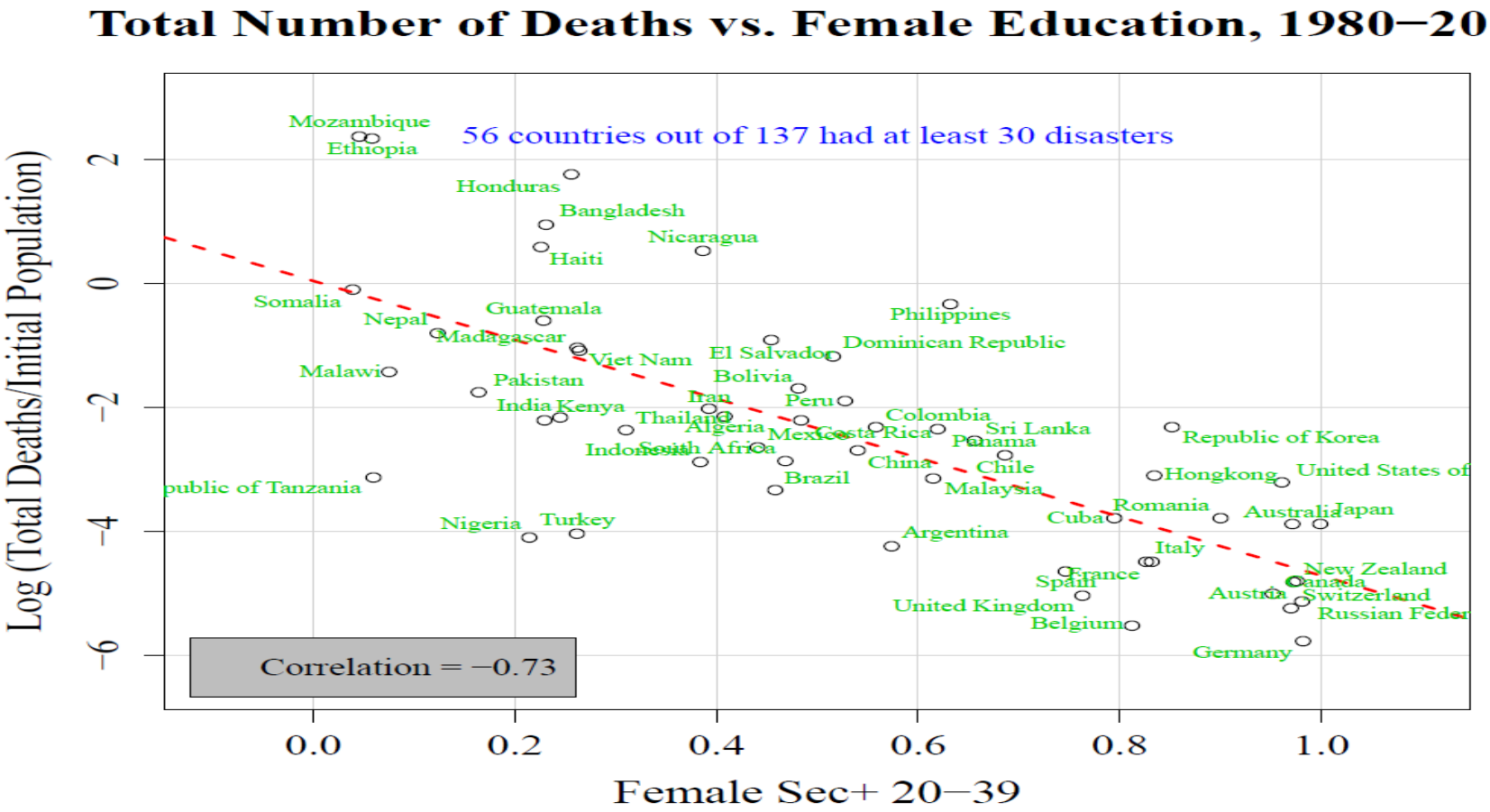
Education is a key factor in enhancing democracy

Demography, Education, and Democracy: Global Trends and the Case of Iran

WOLFGANG LUTZ
JESÚS CRESPO CUARESMA
MOHAMMAD JALAL ABBASI-SHAVAZI

FIGURE 3 Relationship between mean years of schooling and the "democracy index" (index of political rights)

Education reduces diaster mortality and enhances adaptive capacity to climate change



Focus on the Human Resource Base for Sustainable Development

- Human Resources refer to the ability of people to help themselves and help others.
- They crucially depend on age, health, education, motivation, social networks etc.
- Education is central: Learning from the first day to old age.
- Formal education (school) is only one aspect of this that is fairly easy to measure.

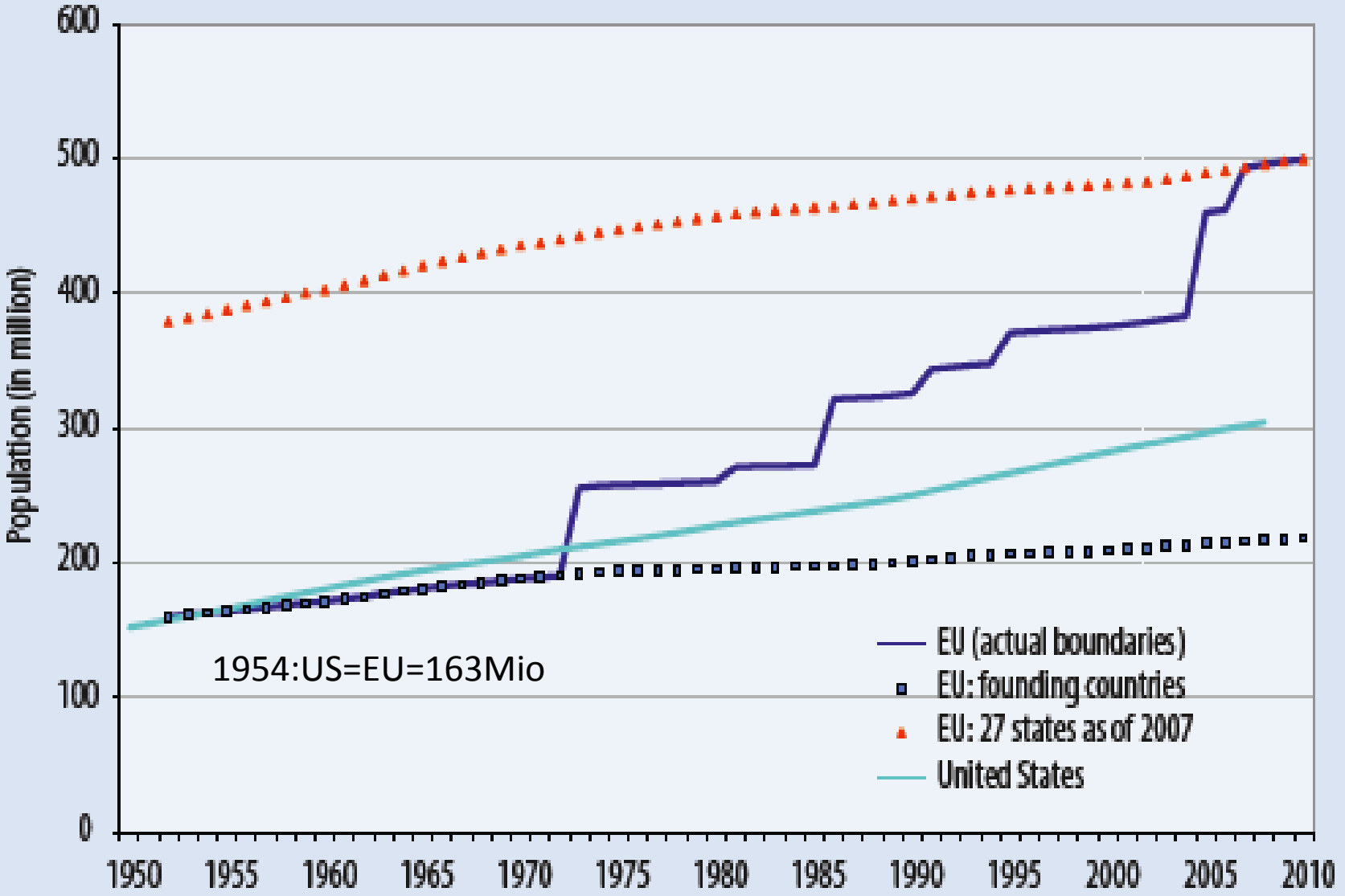
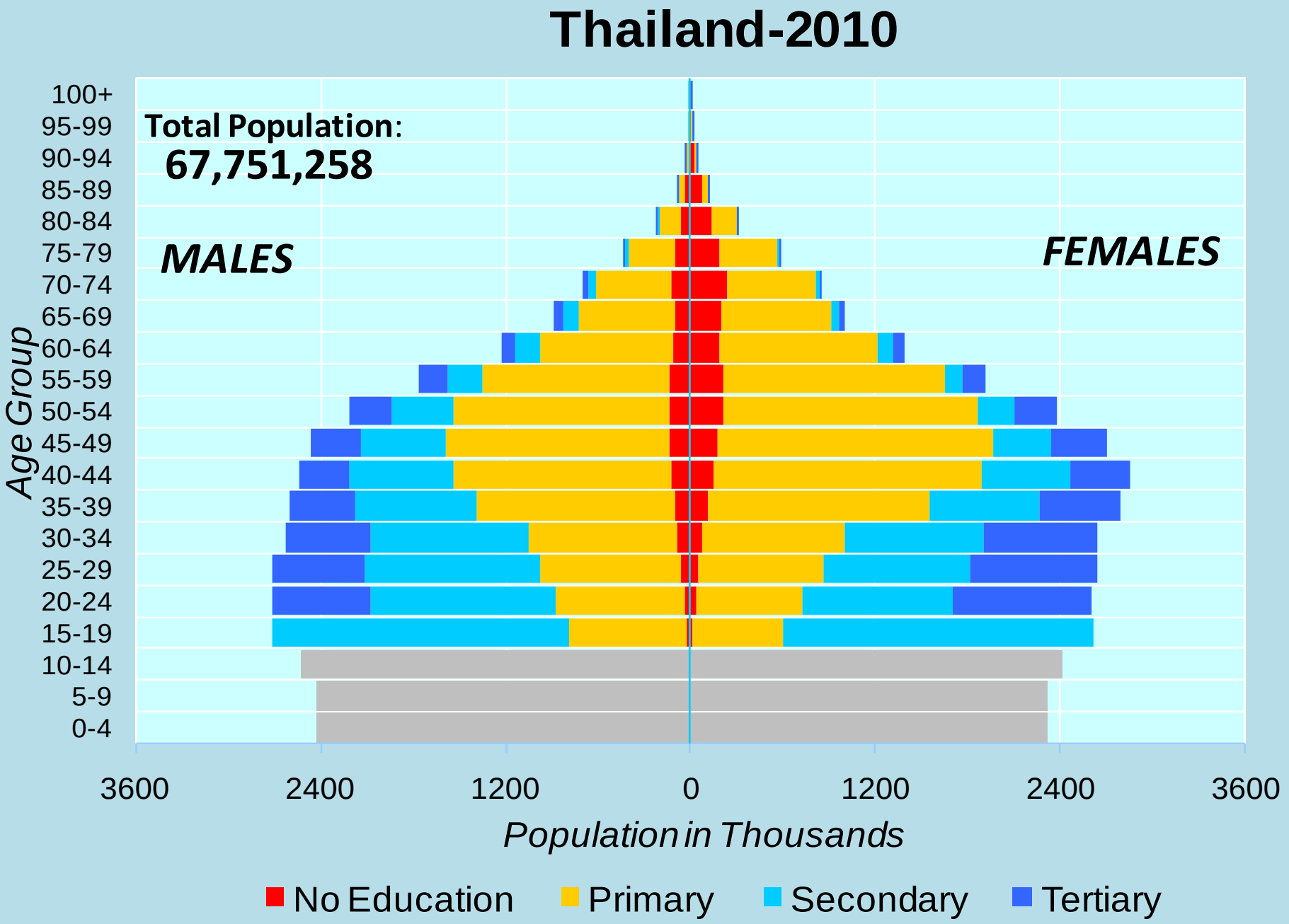
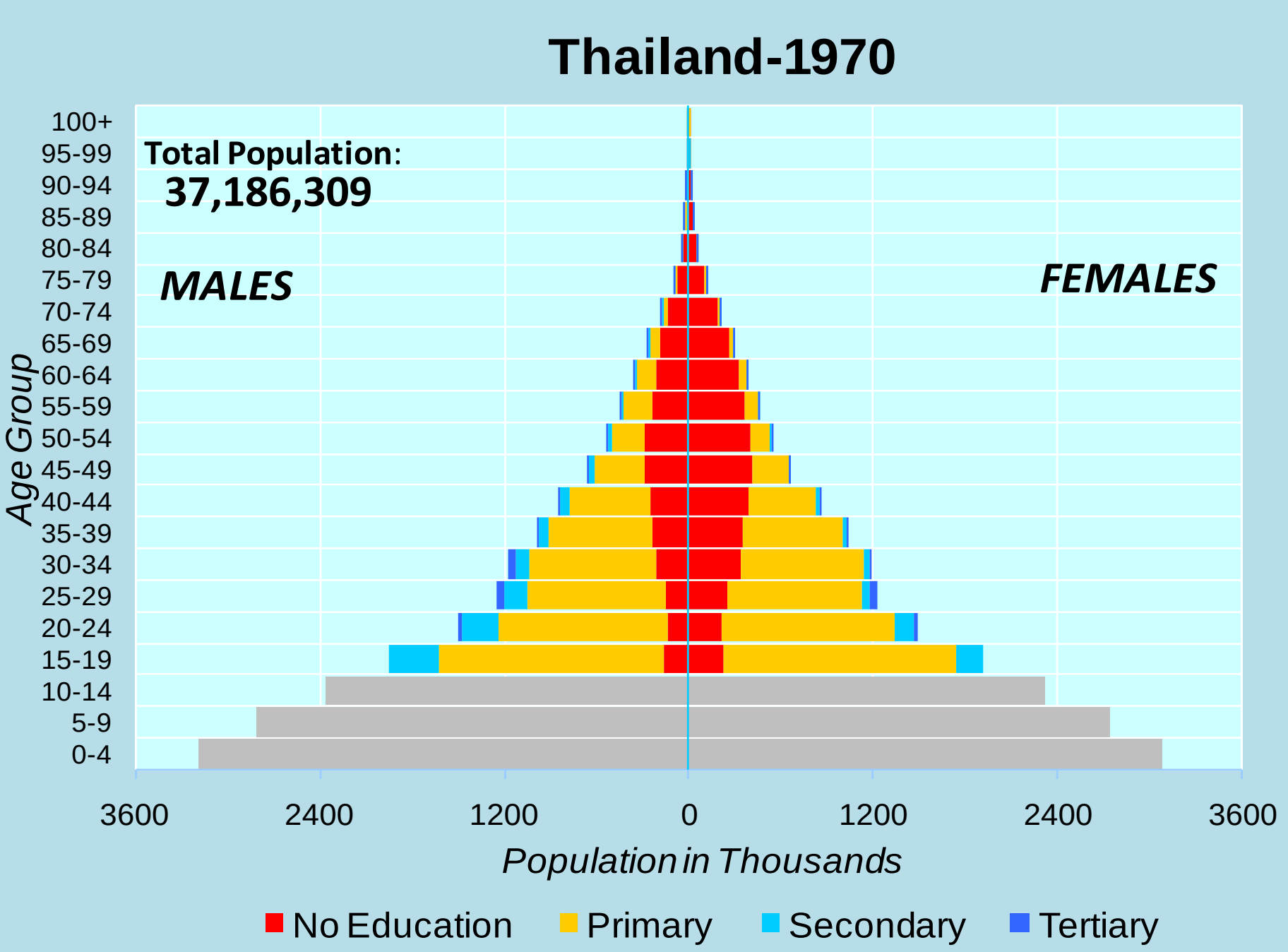
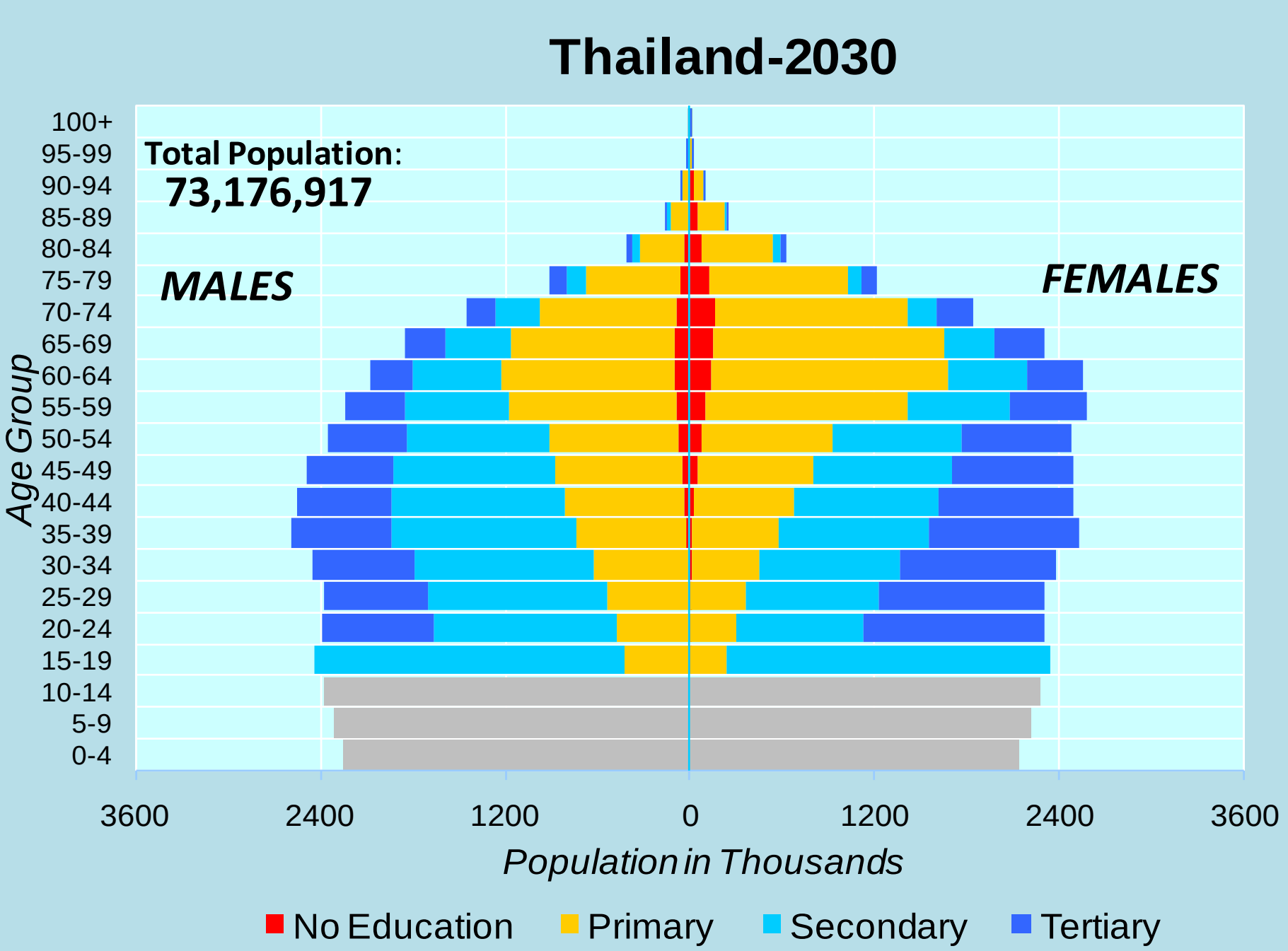
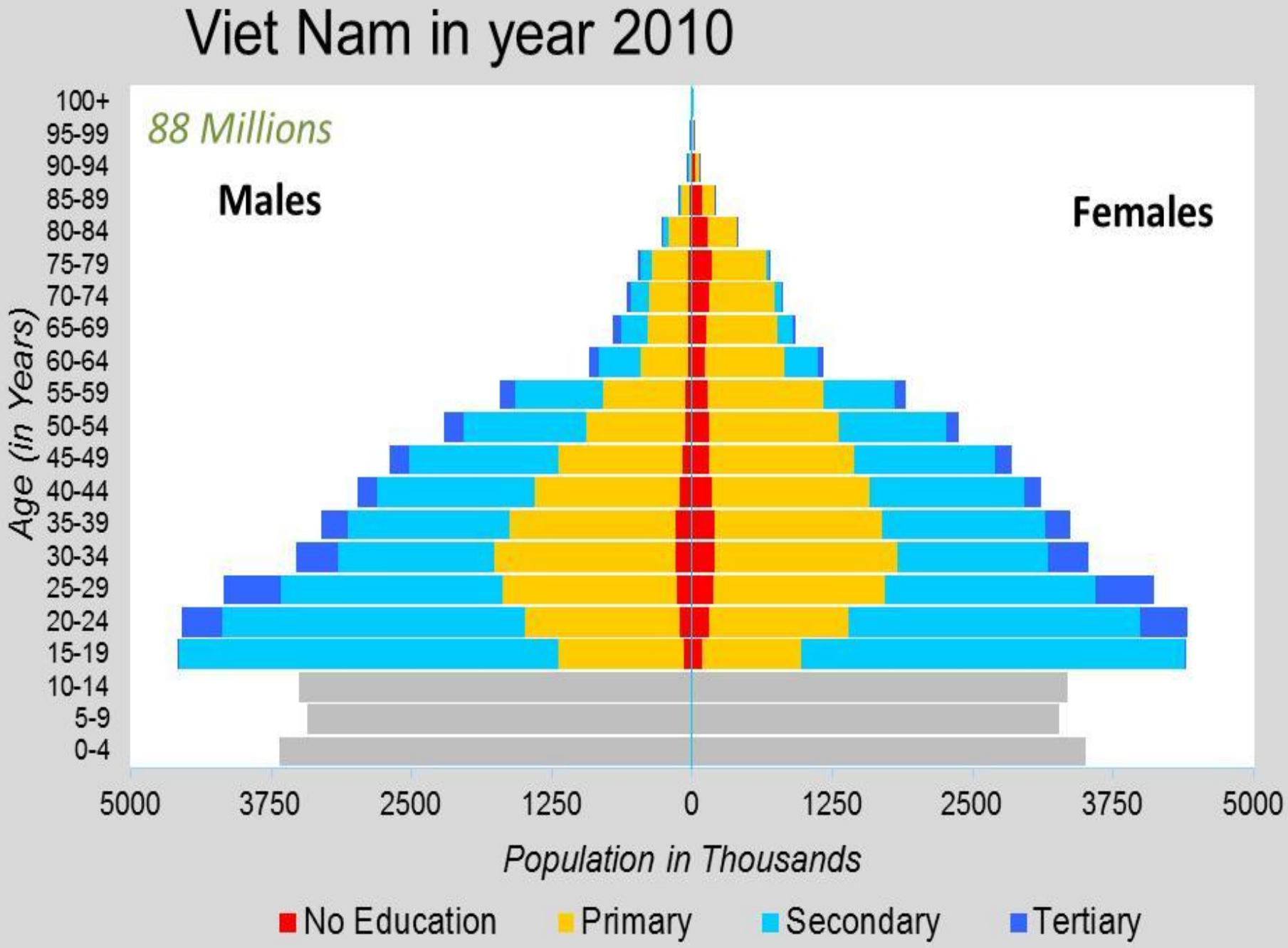


Figure 2: Population growth in the European Union and its predecessor as compared with the United States, 1952-2010

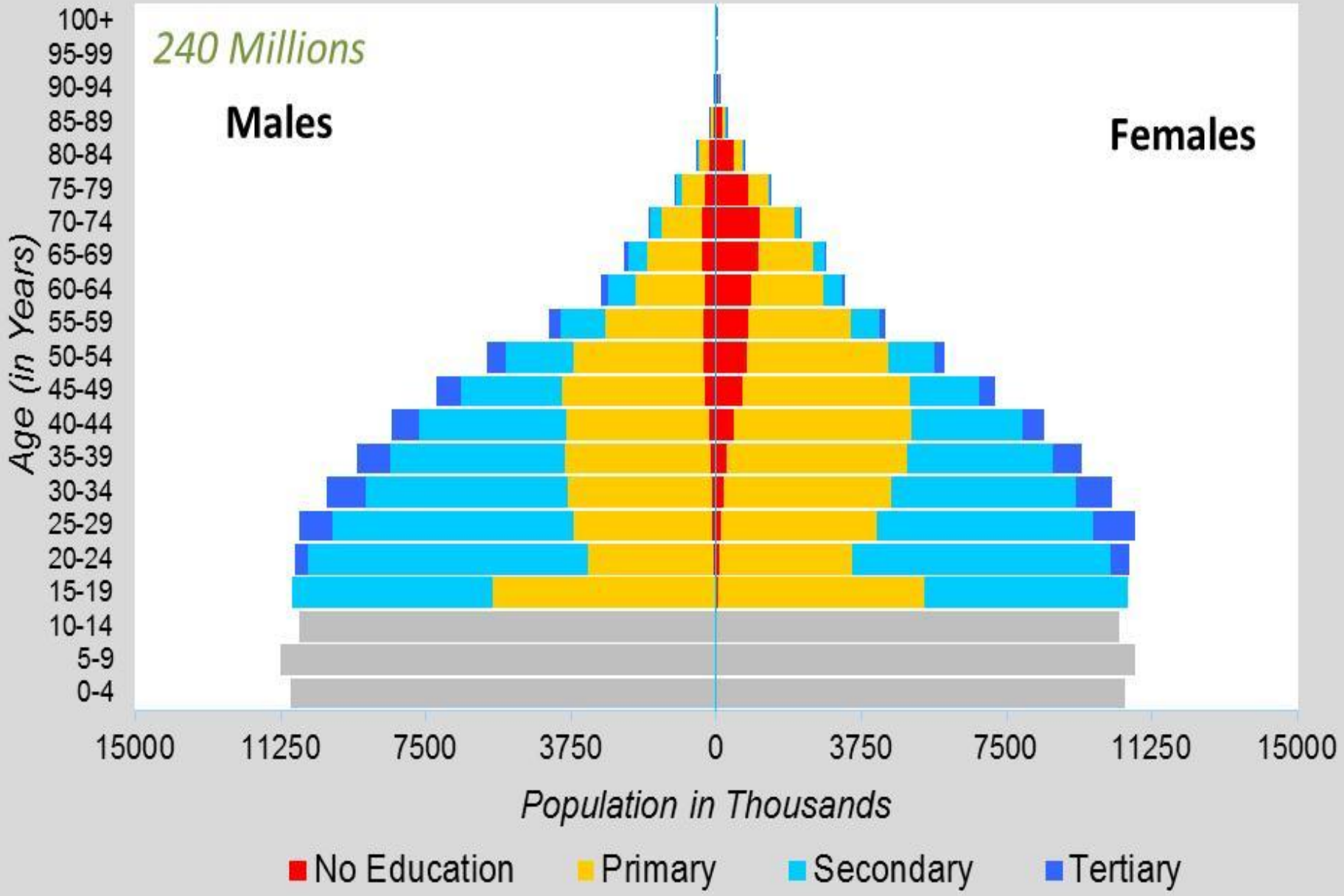

Thailand-2010
Total Population:
67,751,258
MALES
FEMALES
Age Group
100+
95-99
90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
3600
2400
1200
0
1200
2400
3600
Population in Thousands
No Education
Primary
Secondary
Tertiary

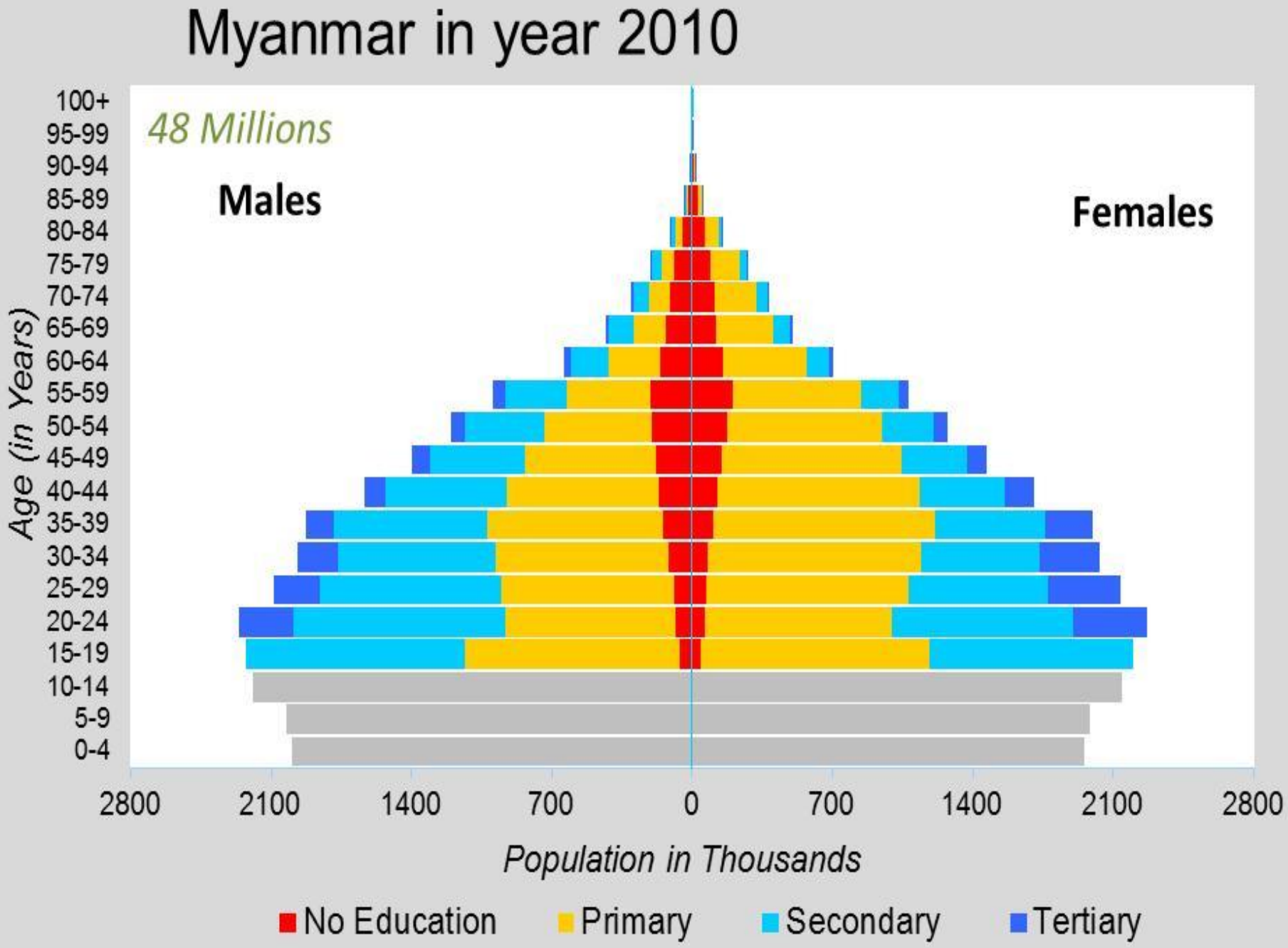

Thailand-1970
Total Population:
37,186,309
MALES
FEMALES
100+
95-99
90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
Age Group
3600
2400
1200
0
1200
2400
3600
Population in Thousands
No Education
Primary
Secondary
Tertiary


Thailand-2030
Total Population:
73,176,917
MALES
FEMALES
100+
95-99
90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
Age Group
3600
2400
1200
0
1200
2400
3600
Population in Thousands
No Education
Primary
Secondary
Tertiary


Viet Nam in year 2010
88 Millions
Males
Females
Age (in Years)
100+
95-99
90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
5000
3750
2500
1250
0
1250
2500
3750
5000
Population in Thousands
No Education
Primary
Secondary
Tertiary

Indonesia in year 2010




Myanmar in year 2010
48 Millions
Males
Females
100+
95-99
90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
Age (in Years)
2800
2100
1400
700
0
700
1400
2100
2800
Population in Thousands
No Education
Primary
Secondary
Tertiary

What should be the goal of population related policies?

- Increasing aggregate level GDP?
- Increasing GDP per capita?
- National strength versus competitors?
- Increasing happiness –subjective wellbeing?
- Increasing cultural/national identity?
- Strengthening social cohesion?
- Global environmental sustainability?