

# Earth's Population History

**6 billion reached 1999 (12 years later)**

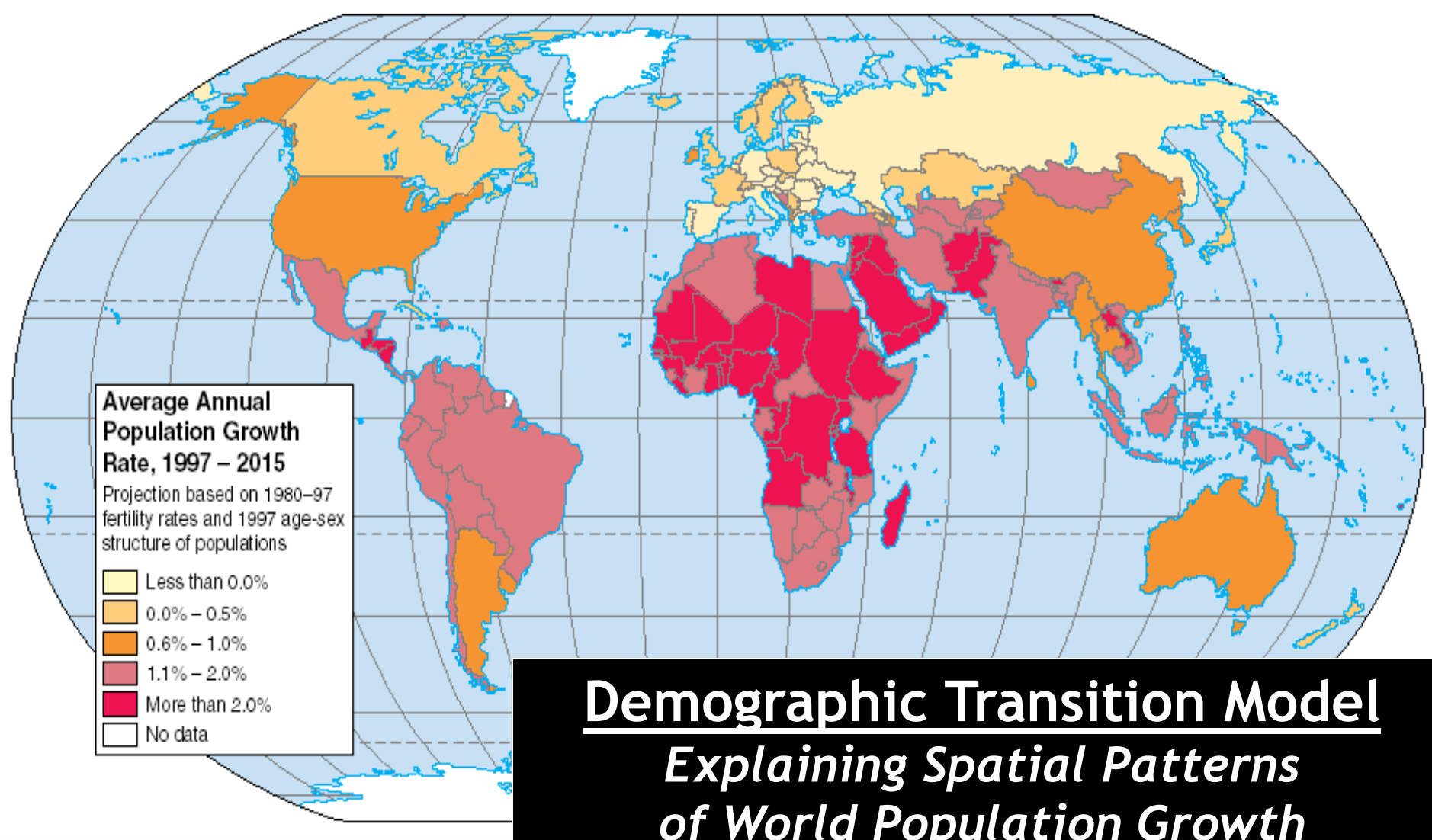
**5 billion reached 1987 (13 years later)**

**4 billion reached 1974 (15 years later)**

**3 billion reached 1959 (29 years later)**

**2 billion reached 1930 (100 years later)**

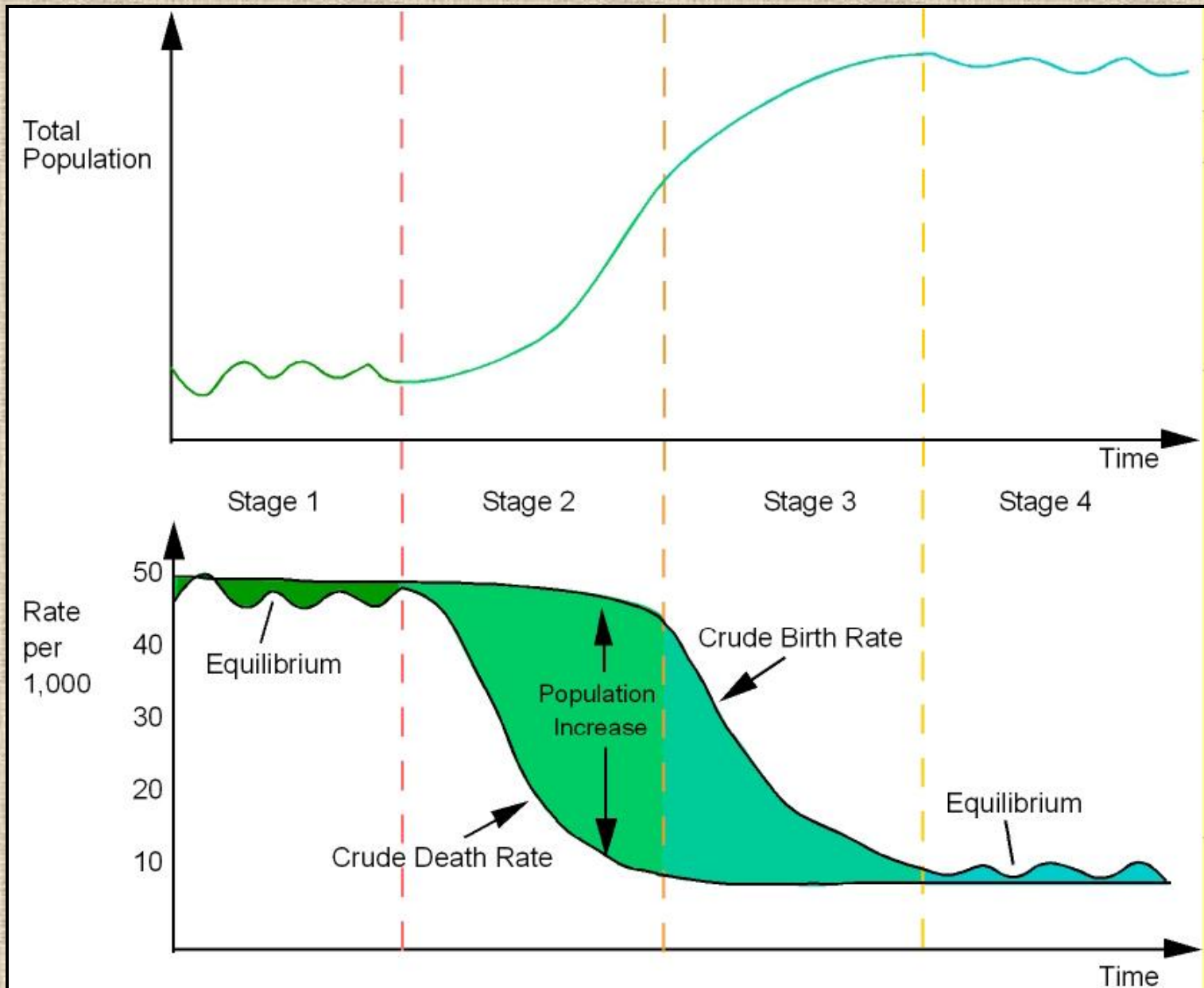
**1 billion reached circa 1830**



## Demographic Transition Model *Explaining Spatial Patterns of World Population Growth*

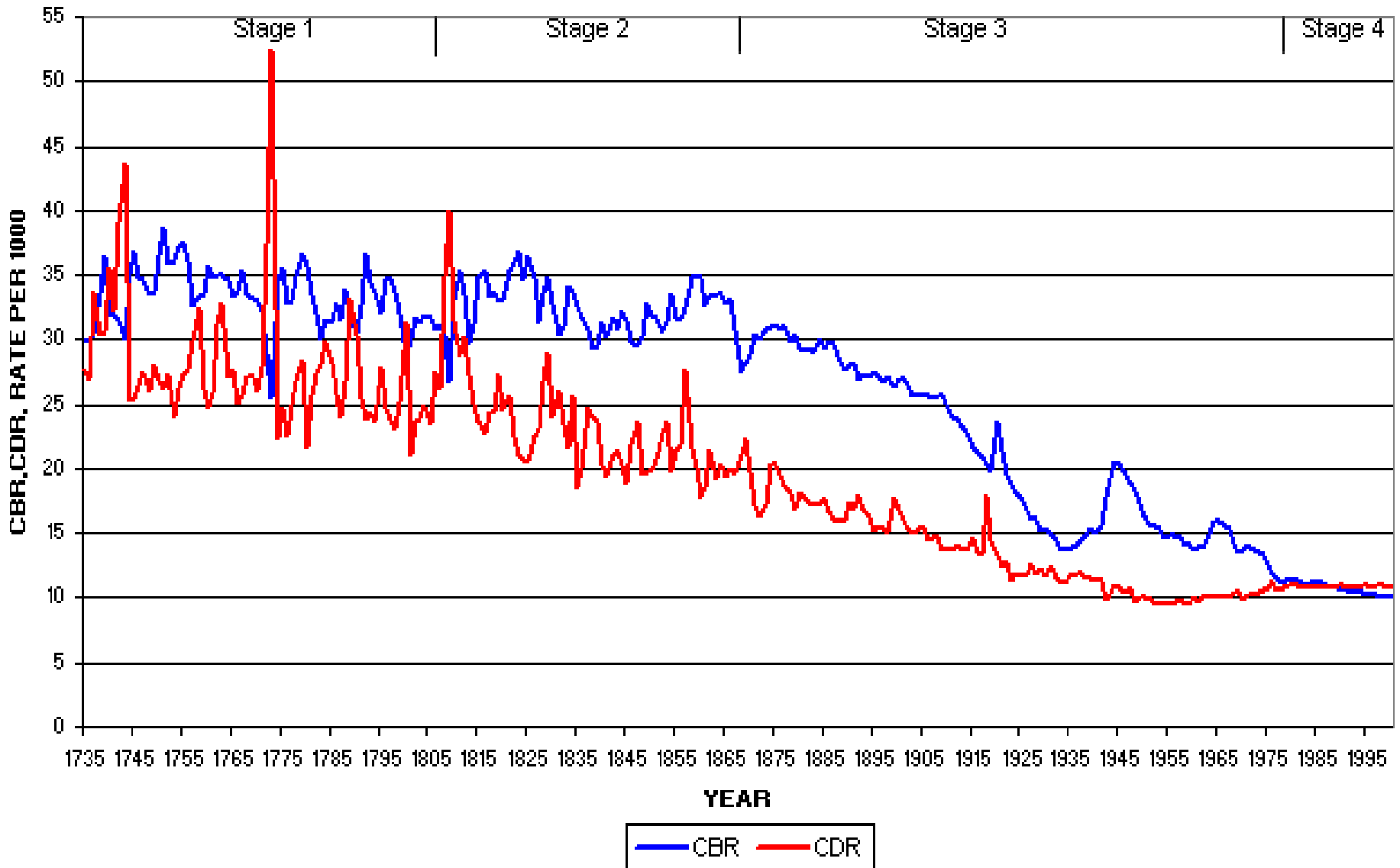
Many graphics in this powerpoint are from Michael Kuby et al., *Human Geography in Action* (instructor package) or online materials posted by Keith Montgomery, Dept of Geology and Geography, Univ of Wisconsin - Marathon County (<http://www.uwmc.uwc.edu/geography/Demotrans/demtran.htm>)

# Demographic Transition Model

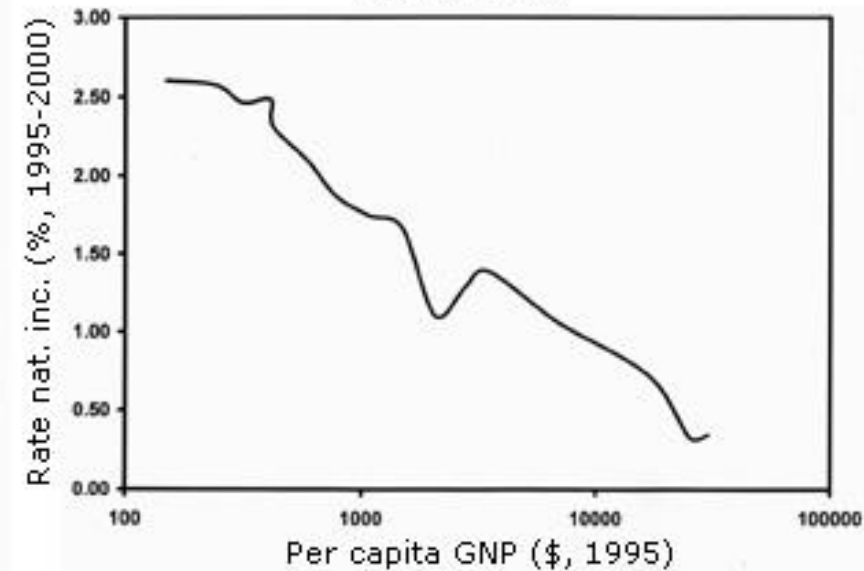


# *DTM based on historical patterns in Europe & other MDCs*

## DEMOGRAPHIC CHANGE, SWEDEN, 1735-2000



### NATURAL INCREASE IN POPULATION VS. WEALTH



DTM only predicts changes in birth/death rates over time

Observed changes in RNI correlate to changes in economic development

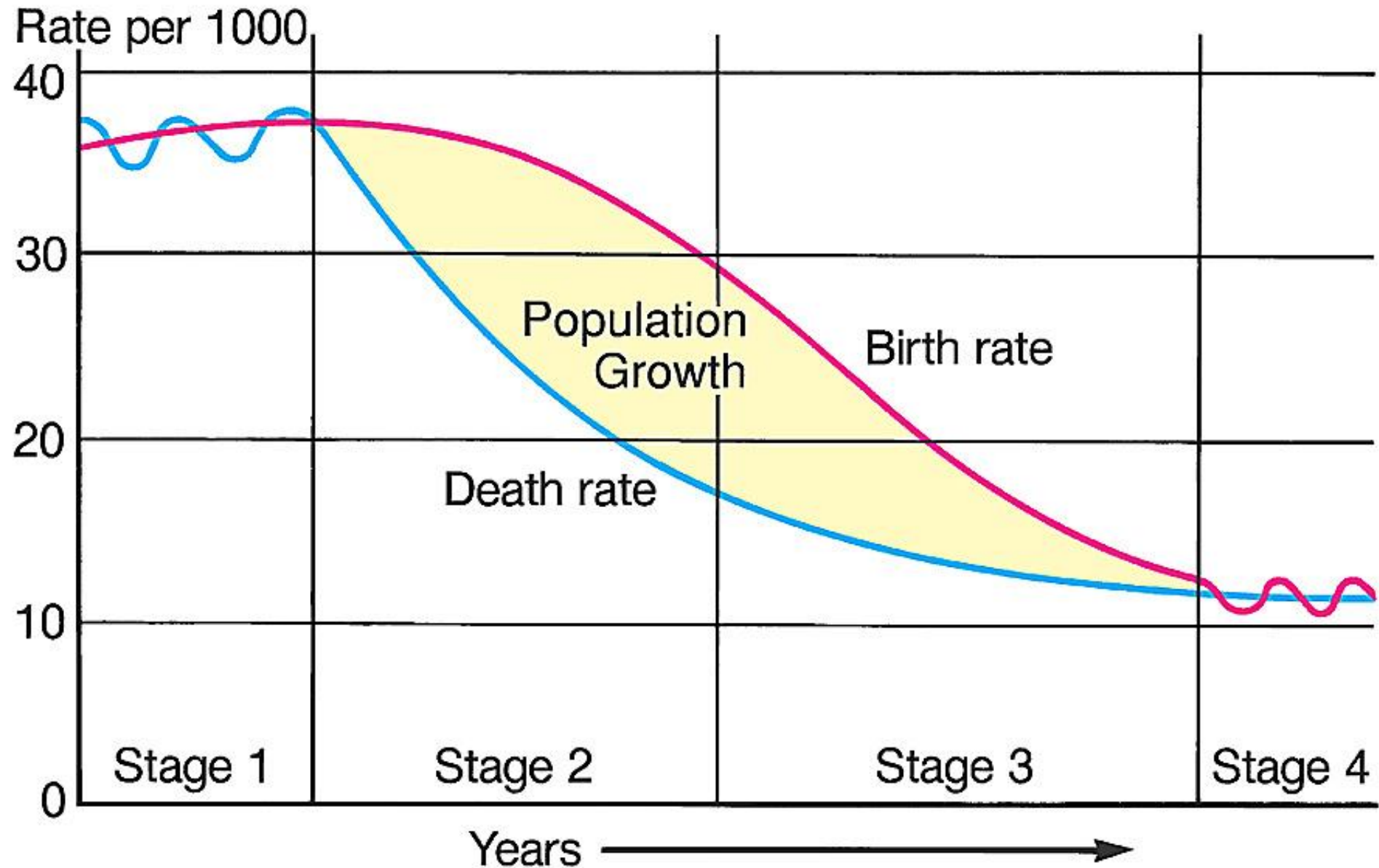
### BIRTH AND DEATH RATES VS. WEALTH

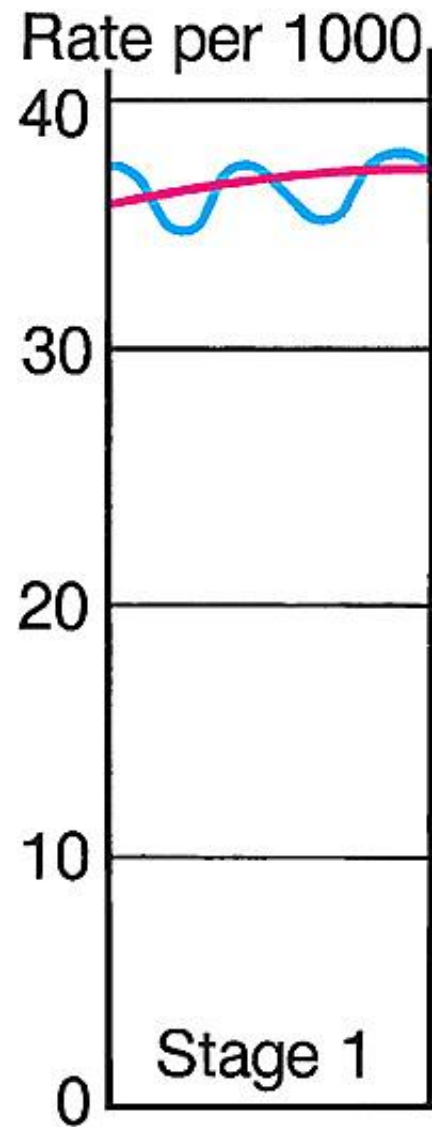


Thus, DTM implies:  
*The greater the wealth, the lower the RNI ... but use caution describing this relationship*

# Stages in Classic 4-Stage Demographic Transition Model (DTM)

(Some books show a 3-stage model; others mention a new 5th stage)





### Stage 1: "Pre-Industrial"

High birth rates and high death rates (both about 40)

Population growth very slow

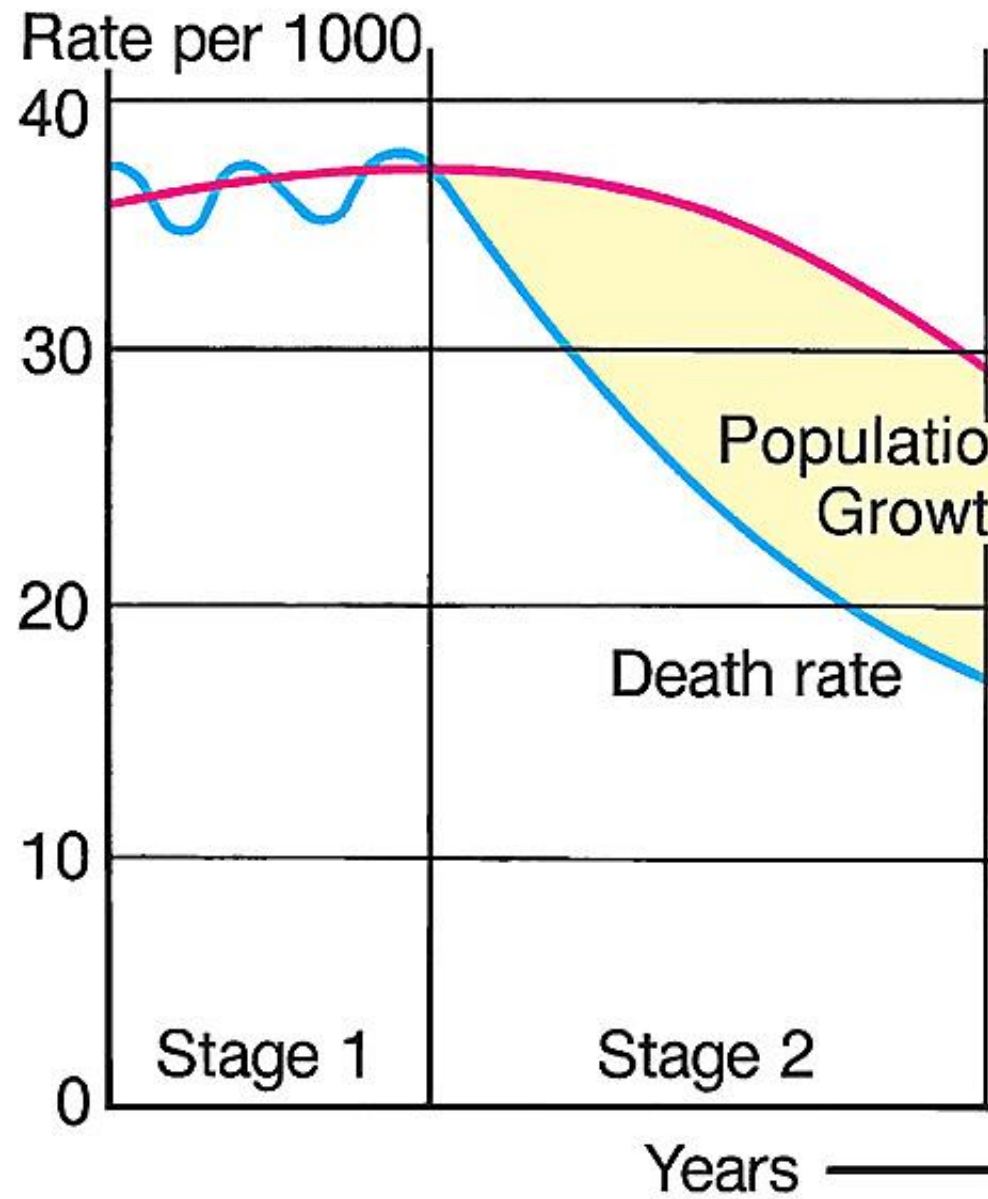
Agrarian society

High rates of communicable diseases

Pop. increases in good growing years;  
declines in bad years (famine, diseases)

*No country or world region still in Stage One*

Years →



## Stage 2: “Early Industrial”

High birth rates (over 30) but **death rates decline** (to about 20)

RNI *increase sharply* (pop. explosion); growth rate increases thruout Stage Two

**Growth not from increase in births, but from decline in deaths**

*MDCs = starts early 1800s*

*LDCs = starts after 1950s*



# TRANSITION TO STAGE TWO IN CLASSIC DTM

## *Known as the Epidemiologic Transition*

### **Agricultural technology**

Improvements in food supply: higher yields as agricultural practices improved in “Second Agricultural Revolution” (18<sup>th</sup> century)

In Europe, food quality improved as new foods introduced from Americas

### **Medical technology**

Better medical understanding (causes of diseases; how they spread)

### **Public sanitation technologies**

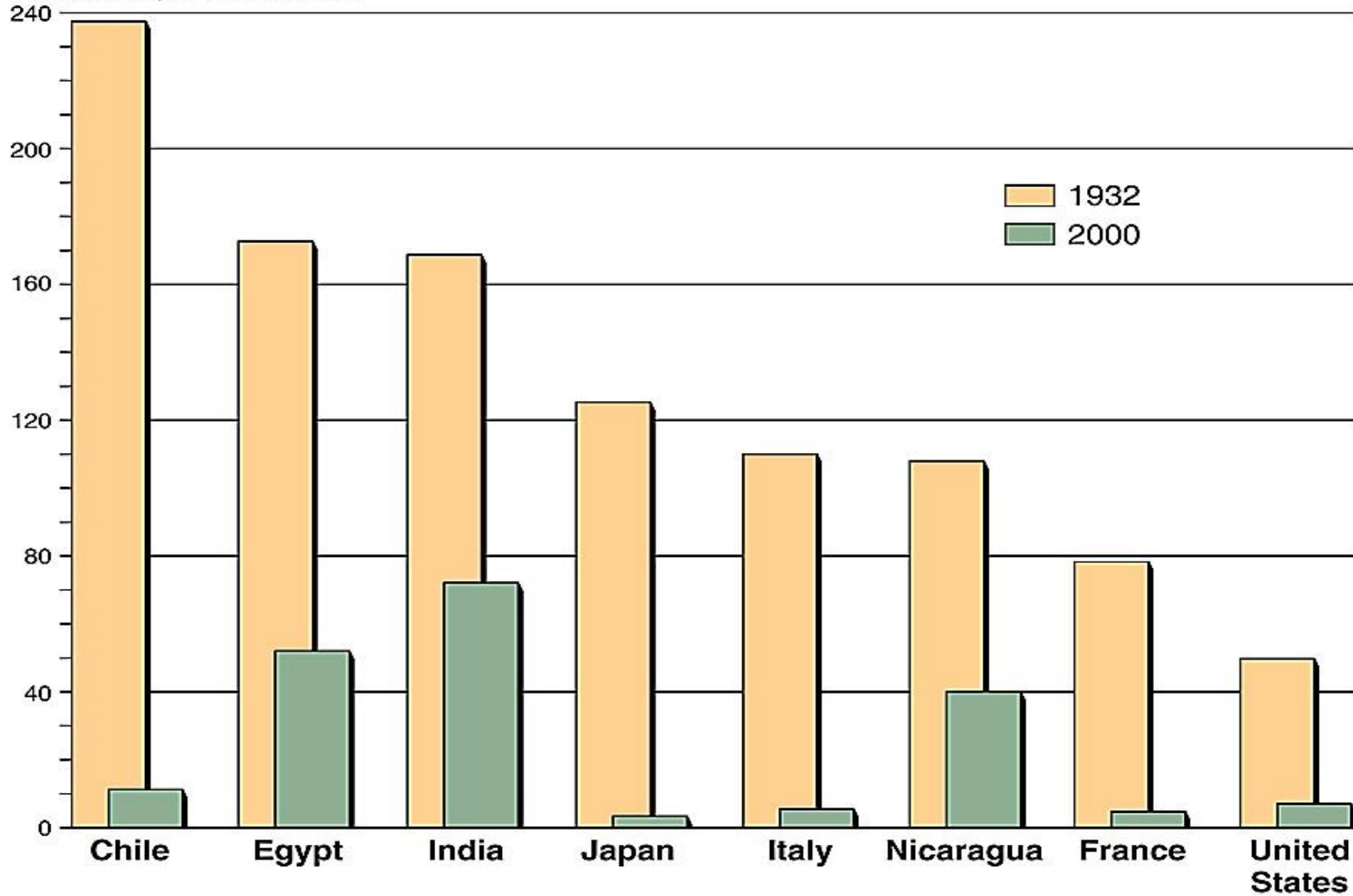
Improved water supply (safe drinking water)

Better sewage treatment, food handling, and general personal hygiene

*Improvements in public health especially reduced childhood mortality*

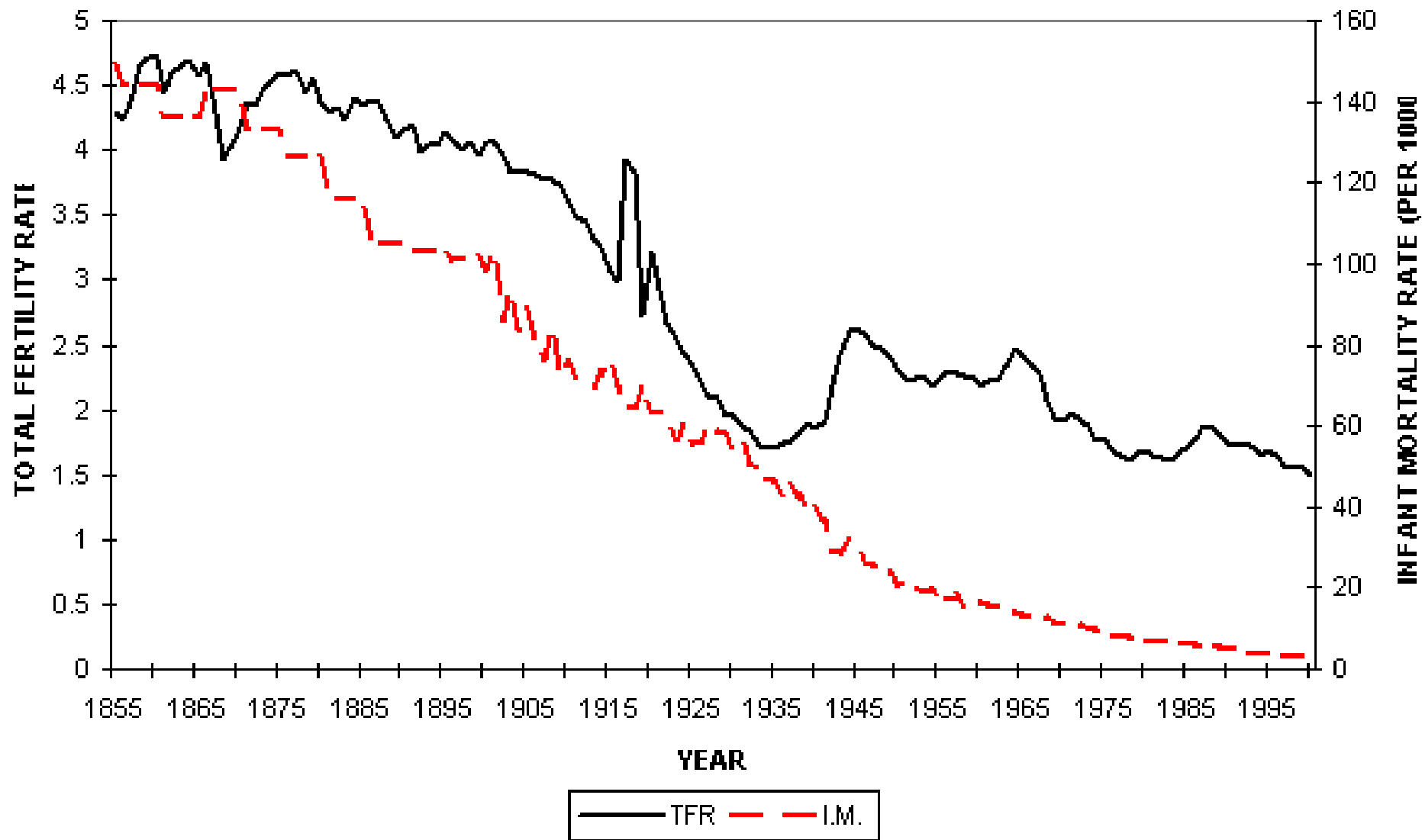
# Declining Infant Mortality Rates

Infant deaths per 1000 live births



*When IMR declines, fertility rates drop soon after*

### INFANT MORTALITY AND FERTILITY, SWEDEN, 1855-2000



Rate per 1000

40  
30  
20  
10  
0

**Stage 3: "Later Industrial"**

**Birth rates decline sharply (to about 15)**

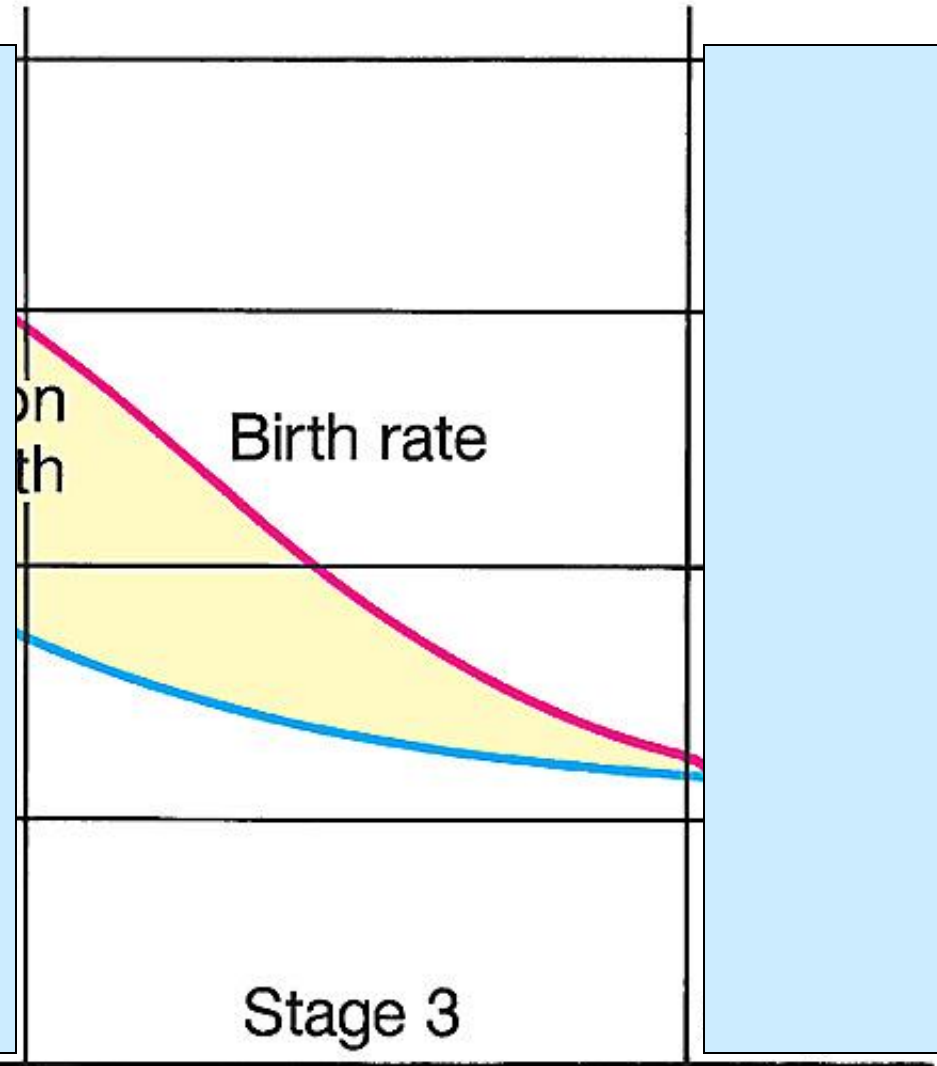
Death rates decline a bit more (to about 10 or less)

**Note growth still occurs, but at a reduced and declining rate**

*MDCs = starts in late 1800s*

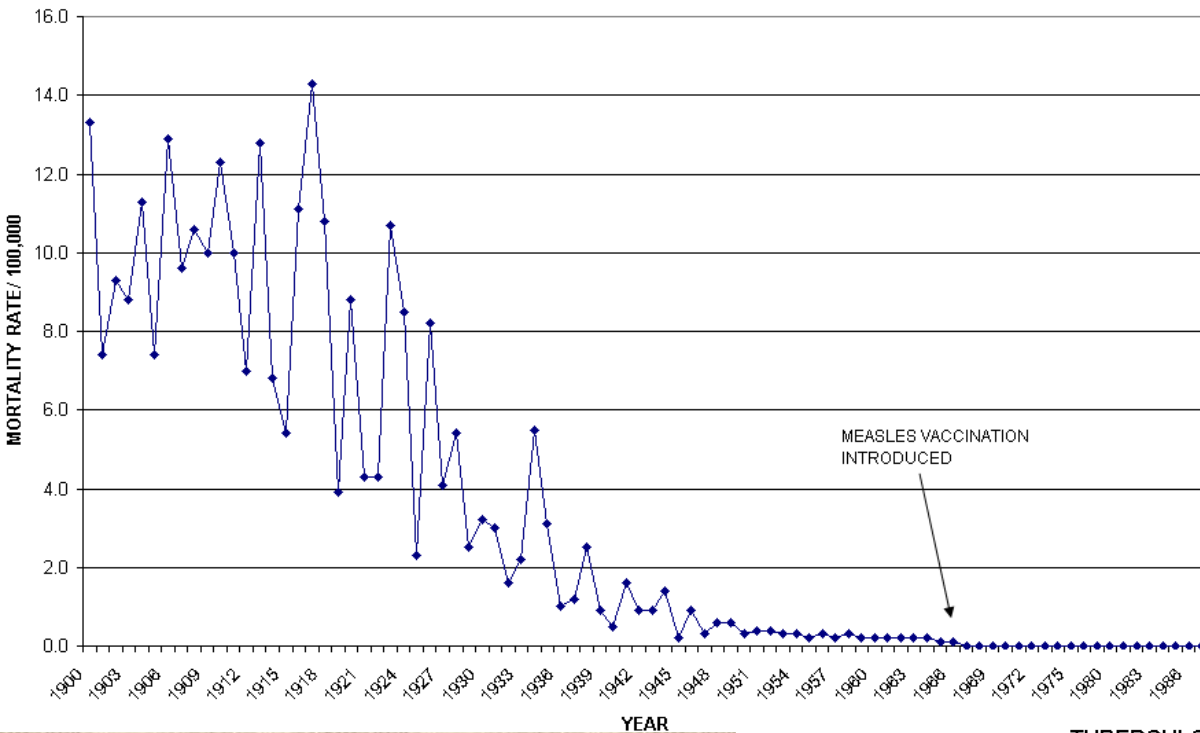
*LDCs = starts after 1980s\**

*\* Or hasn't started yet*



Years →

MEASLES MORTALITY RATE, USA, 1900-1987

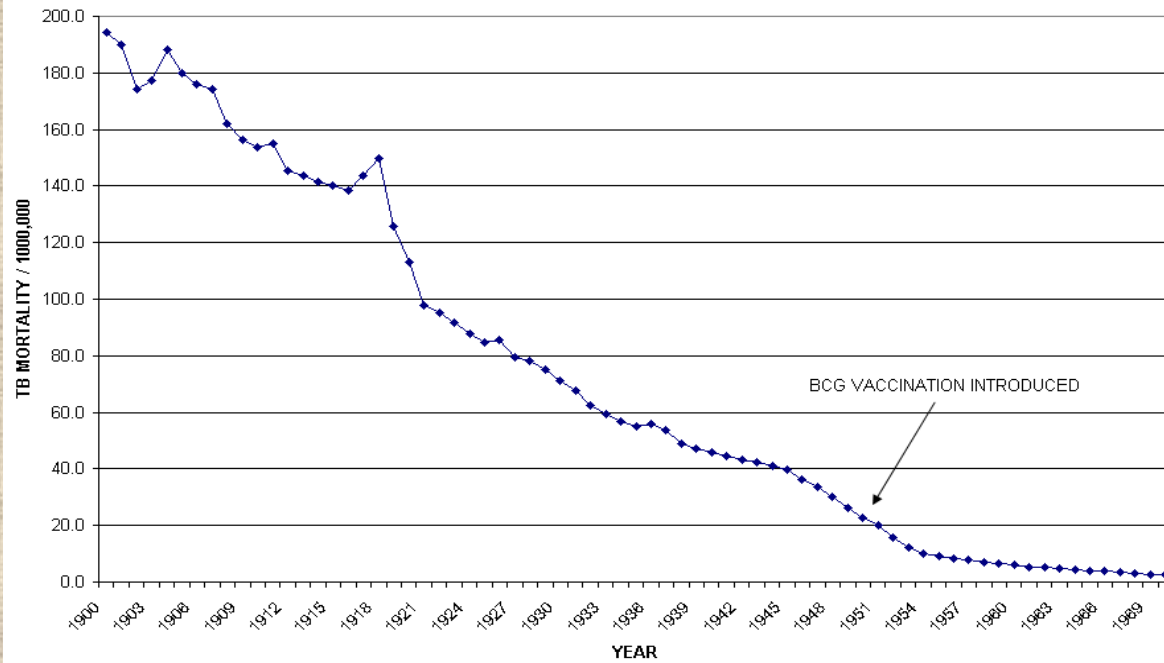


**Stage Three:**  
**Further improvements in medicine lower death rates more; raise life expectancies**

Measles Mortality, US, since 1900

TB Mortality, US, since 1900

TUBERCULOSIS MORTALITY RATE, USA 1900-1970



# TRANSITION TO STAGE THREE IN CLASSIC DTM

## *Known as the Fertility Transition*

Societies become more urban, less rural

Declining childhood death in rural areas (fewer kids needed)

Increasing urbanization changes traditional values about having children

City living raises cost of having dependents

Women more influential in childbearing decisions

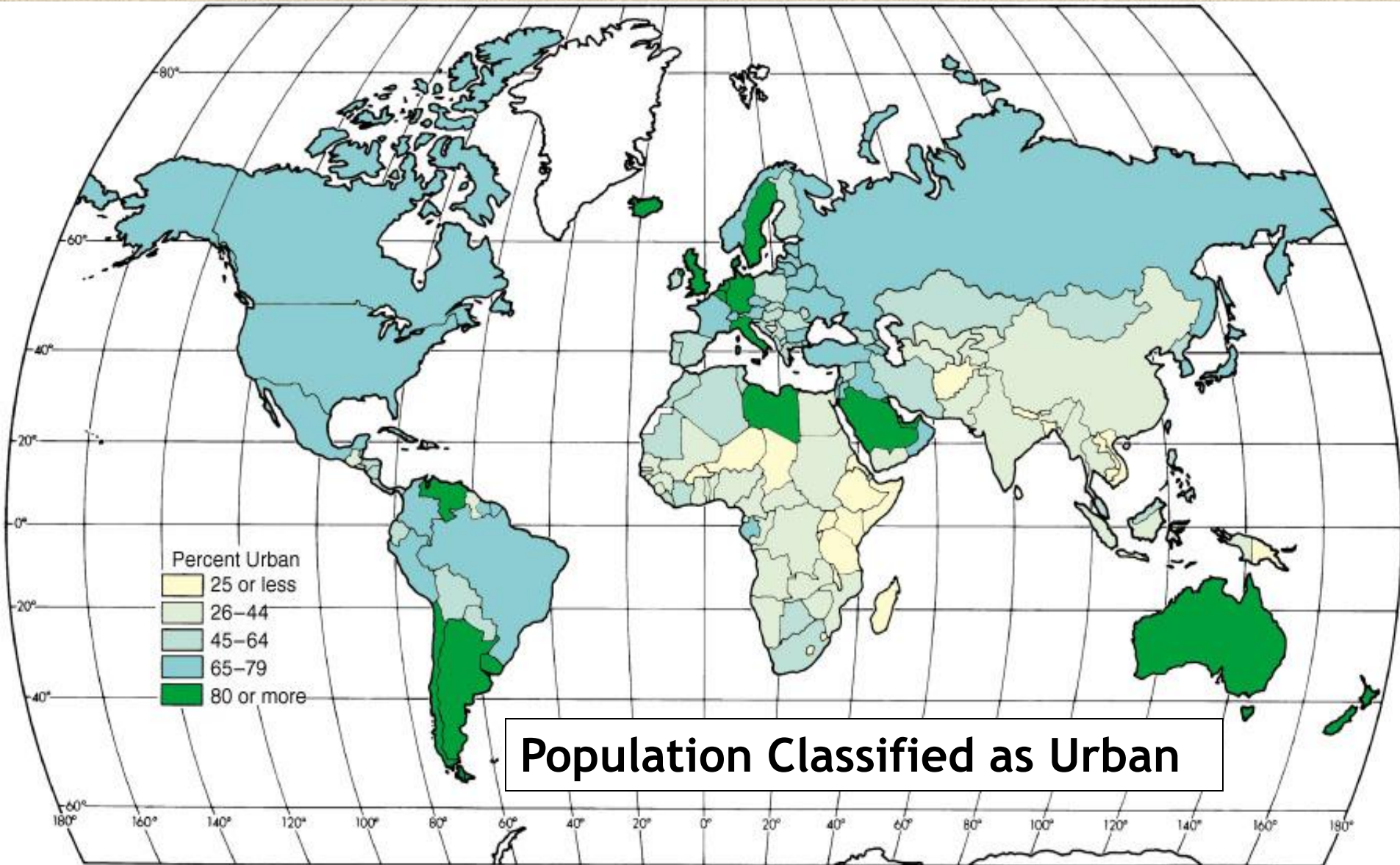
Increasing female literacy changes value placed on motherhood as sole measure of women's status

Women enter work force: life extends beyond family, changes attitude toward childbearing

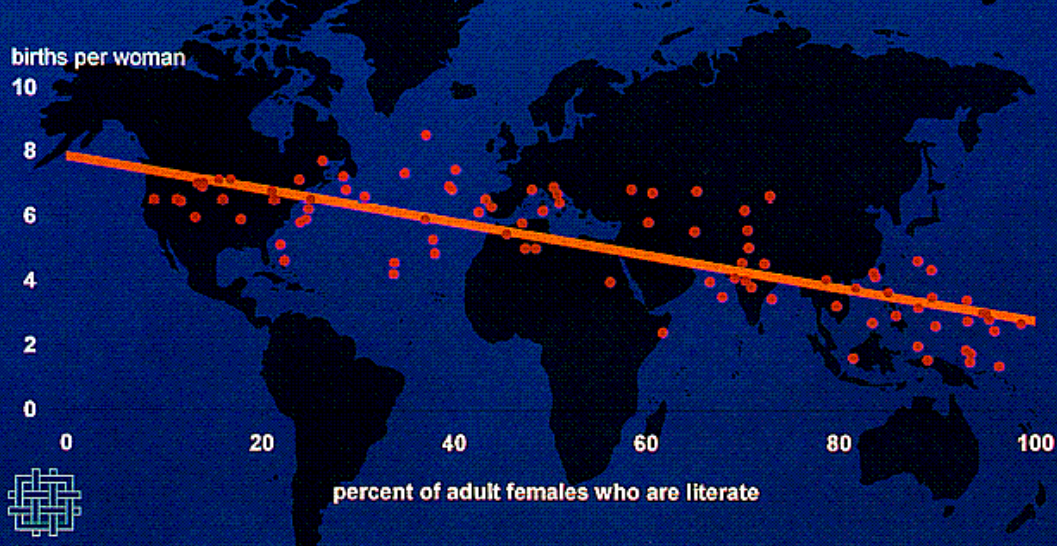
Improved contraceptive technology, availability of birth control

But contraceptives not widely avail in 19<sup>th</sup> century; contributed little to fertility decline in Europe ... ***Fertility decline relates more to change in values than to availability of any specific technology***

# *Rapidly increasing urbanization in world LDCs today*



# Fertility Rates and Female Literacy



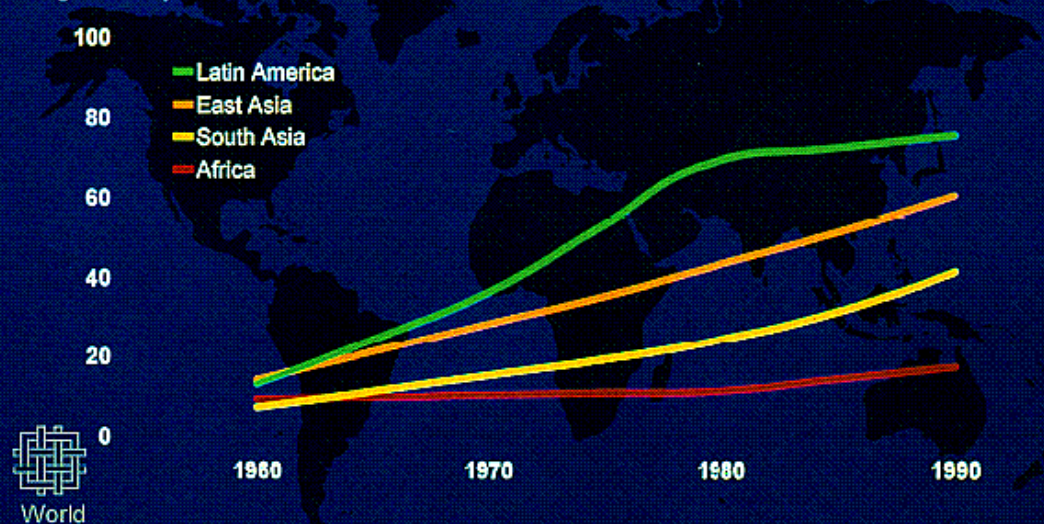
World Resources Institute  
Sources: United Nations Population Division, 1992; United Nations Educational, Scientific, and Cultural Organization, 1990.  
Note: Data refer to 1990.

*Strong inverse relationship between female literacy and fertility rates, observed globally*

*Increasing availability and use of modern contraception in most LDCs since 1970s*

# Contraceptive Use

percent of married couples using contraception



World Resources Institute

Source: Population Reference Bureau, 1990.



Rate per 1000

40  
30  
20  
10  
0

**Stage 4: "Post-Industrial"**

Birth rates and death rates both low (about 10)

*Population growth very low or zero*

*MDCs = starts after 1970s*

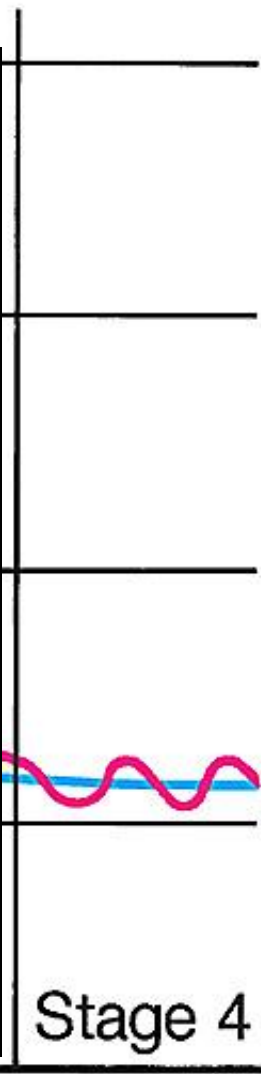
*LDCs = hasn't started yet*

**Stage 5 (?): Hypothesized (not in Classic DTM)**

Much of Europe now or soon in *population decline*  
as birth rates drop far below replacement level

Stage 4

Years →



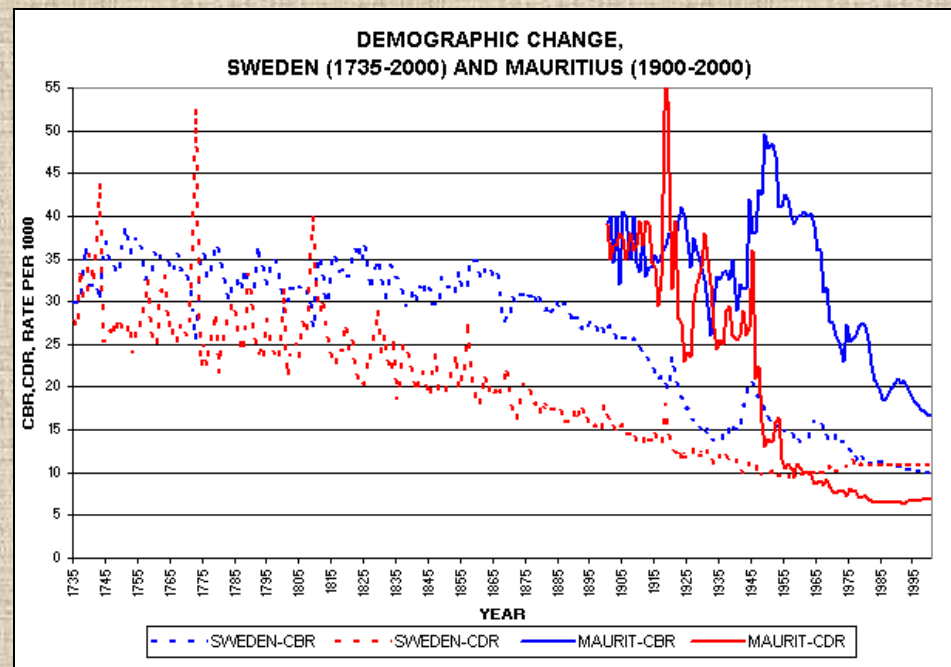
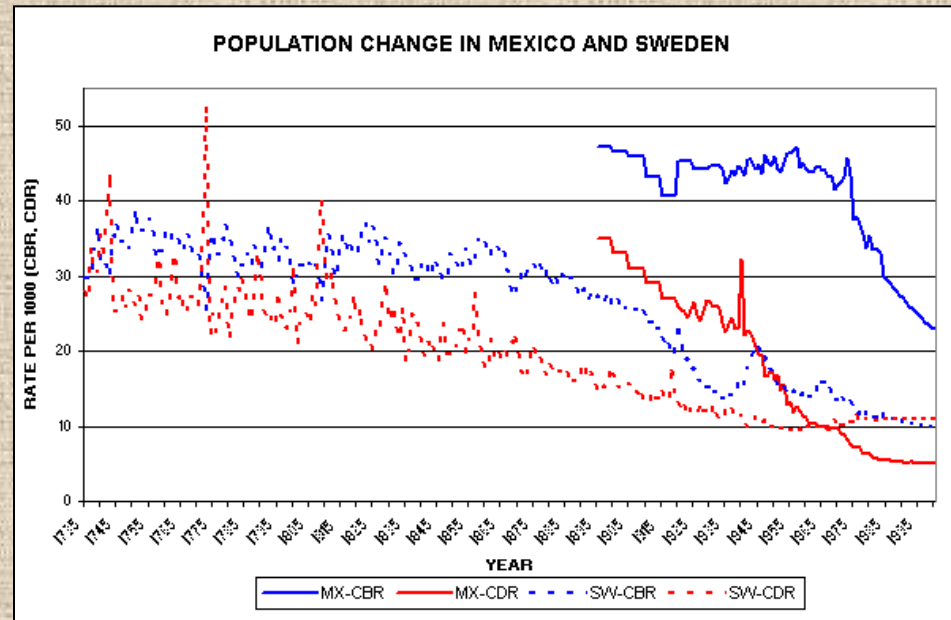
# Key Population Indicators for Selected Countries

Country	Demographic Transition Stage	Crude Birth Rate (per 1,000)	Crude Death Rate (per 1,000)	Rate of Natural Increase (percent)	Percent Urban	Percent of Workforce in Agriculture
Afghanistan	2	48	21	2.7	22	80
Nigeria		42	13	2.9	36	70
Palestinian Territory		39	4	3.5	57	15
Brazil	3	20	7	1.3	81	20
Mexico		25	5	2.1	75	18
Philippines		26	6	2.0	48	36
South Africa		24	13	1.0	53	30
Sri Lanka		19	6	1.3	30	38
Australia	4	13	7	0.6	91	4
Canada		11	7	0.3	79	3
Cuba		11	7	0.5	75	24
Germany		9	10	-0.2	88	3
Italy		10	10	-0.1	90	5
United States		14	8	0.6	79	1
Russia	Severe Population Decline	10	17	-0.6	73	12
Ukraine		9	16	-0.8	68	24

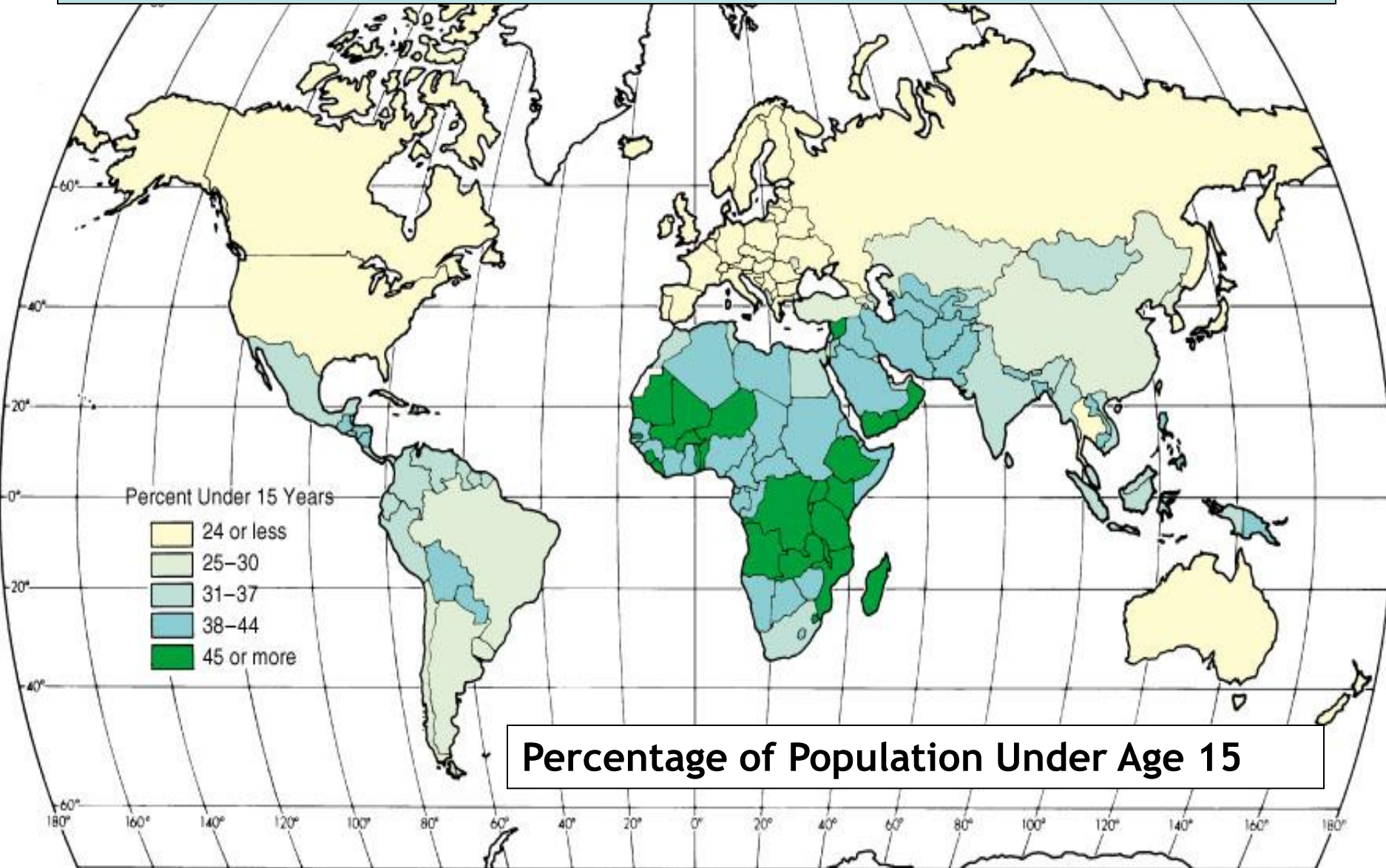
Sources: Population Reference Bureau, *World Population Data Sheet 2004*, <http://www.prb.org>;  
 Central Intelligence Agency, *World Factbook 2005*, <http://www.odci.gov/cia/publications/factbook/>

## Differences in DTM experience: MDCs & LDCs

- Faster decline in death rates – Tech improvements diffused from MDCs & applied rapidly in LDCs post-WW2
- Longer lag between decline in deaths and decline in births – Stage 3 slower start in LDCs where econ growth is delayed
- Higher max rates of growth in LDCs – Over 3.5% peak RNI in Mauritius and Mexico; only 1.3% peak in Sweden



*Age structures today in LDCs are much younger than MDCs experienced - leading to prolonged “Demographic Momentum” - expected growth of pop. long after fertility declines*



**Percentage of Population Under Age 15**

## ***Summary of DTM for LDCs***

***Industrializing LDCs with some economic development follow DTM more closely; now in Stage Three.*** Most like MDCs in places where female literacy has increased the most.

***Lowest-income countries have high birth rates and deaths are leveling off at higher rates than DTM predicts (Stage Two).***

***In some LDCs, death rates starting to increase (epidemics, worsening poverty)***

# AZ: Breakdown by Ethnic Population

*Groups within MDCs may have varying pop patterns*

