

Outline

1 Introduction

- Formal demography and population studies
- Historical background
- Demographic measures
- The basic demographic equation
- **Data collection**
- Some current demographic indicators
- Demographic transition

Defining population

What do we mean by Population?

The term "population" is used in distinct ways in demography and statistics:

- In demography, it refers to the total number of people residing in a specific area.
- In statistics, it denotes the complete set of measurements or data points related to a particular random variable, which can encompass not only people but also items like light bulbs, rats, or any other units of interest.

Types of data

Where do we get the data?

The core data used in demography come from two main sources:

- **Population censuses** (or similar large-scale surveys): These provide a detailed snapshot of the population at a specific point in time, capturing key characteristics such as age, gender, and socioeconomic information.
- **Registration systems**: These are ongoing records that track vital events, including births, deaths, and migrations, offering a continuous flow of data that reflects population changes over time.

Population censuses

Census

A census provides a detailed record of individuals at a specific point in time:

- It offers a static, **cross-sectional snapshot** of the population's size and **structure** on the census date.
- It is **funded by the state**.
- It must be **conducted simultaneously** across the entire territory and is associated with a specific date.

The United Nations **recommends** that censuses be carried out every 10 years, specifically in years ending in 0.

Population censuses

Census

There are two types of censuses:

- **De facto:** This census records **the population actually present** in the area at the time of the count—those who are physically there.
- **De jure:** This census accounts for **individuals who legally belong to the area**, such as those with citizenship or legal residence, or their place of habitual residence.

To ensure comparability between nations, the United Nations recommends that countries:

- 1 Exclude foreign military and diplomatic personnel currently stationed in the country.
- 2 Include their own armed forces and diplomatic staff stationed abroad.

Population censuses

Census

- In Mexico, the census conducted is of the **de jure type**. This means that individuals are recorded **based on their legal or rightful place of residence**.
- Specifically, this approach enumerates people according to their officially registered place of residence, **even if they are not physically present there at the time the census is carried out**.
- Consequently, the census reflects **where individuals are legally entitled to reside rather than where they happen to be at the moment of the count**.

Population censuses

Census

Conducting a de facto census rather than a de jure census can be advantageous in specific scenarios where geographical, demographic, or logistical challenges make a de jure approach impractical. Situations where a de facto census might be preferable include:

- **Nomadic or Mobile Population:** In regions with nomadic or semi-nomadic groups whose locations frequently change, determining their habitual residence can be difficult. A de facto census, which counts individuals where they are present at the time of the census, may provide a more accurate reflection of their current distribution.
- **Geographically Remote or Inaccessible Areas:** In mountainous regions, isolated rural areas, or locations with limited infrastructure, carrying out a de jure census can be logistically challenging. A de facto census could offer a more practical and realistic assessment of the population in such hard-to-reach areas.

Population censuses

Census

- **Unstable Political Situations:** During times of armed conflicts, civil unrest, or other unstable political situations, conducting a precise and secure de jure census might be difficult. In such cases, a de facto census could be more feasible.
- **Significant Events or Festivities:** On special occasions like major religious festivals, massive cultural events, or temporary population concentrations due to fairs or other gatherings, a de facto census might better reflect the population present at that moment.
- **Specific Data Needs:** In certain instances, a de facto census might be chosen to gather specific and detailed data about the population at an exact point in time, which could be useful for planning and decision-making.

Population censuses

Census

De facto censuses are **less common nowadays** as they require more complex logistics to carry out the count at a specific moment. However, some countries have chosen to conduct de facto censuses under certain special circumstances. Examples of countries that have used or have used de facto censuses include:

- **India:** In some previous censuses, India has conducted de facto censuses, where individuals are counted at the location where they are at the exact moment of the census. This is due to the geographic and demographic diversity of the country.
- **Indonesia:** In certain censuses, Indonesia has opted for de facto censuses due to the vast expanse of its territory and the dispersed distribution of its population.

Population censuses

Census

- **Mongolia:** In some censuses, Mongolia has conducted de facto censuses to obtain an accurate picture of the nomadic and semi-nomadic population in the country.
- **Iraq:** Under special circumstances, such as during the 1997 census, Iraq chose a de facto census due to the country's political and social situation at that time.

It's important to note that the majority of countries have adopted de jure censuses as they are considered to provide a more accurate and stable representation of the population, in addition to being less costly and logistically simpler to carry out.

Population censuses

Why census matters?

- 1. It is the basis of population projections
- 2. In developing countries, it is the basis for studying migration
- 3. Allows indirectly estimate fertility and mortality
- 4. It allows to link demographic and socioeconomic characteristics of individuals and households

Registration systems

Vital Registers

In **registration systems**, **events** are recorded as they occur, indicating **moment and place of occurrence**.

- They are essentially dynamic
- They give information on **flows over time**
- Since births, deaths, immigration and outmigration in a period are affected by the numbers “at risk”, **it's common to calculate rates when using them**.
- This let us compare levels of mortality, fertility, mobility instead of just births, deaths or moves.

Registration systems

Civil Registry

The most important of vital records is the **Civil Registry**^a

- Initially it was the Church that had the control and record of these stats.
- Since the 19th century, it has been the responsibility of the State to manage vital records.

^aAlthough there are also other registers: educational, health, population, social security, etc.

Registration systems

Civil Registry nowadays

In modern States, every individual must register the vital events, preferably soon after they occurred.

- The vital statistics are used to:
 - Study mortality and fertility, locally or nationally
 - They allow to find factors associated with mortality or fertility, as education, age, place of residence, socioeconomic level, etc.
 - If the records manage to gather information on migration, they can serve to compare the quality of a census.

Surveys

Surveys

Surveys are a more recent method for collecting demographic information.

- The process involves selecting a **representative sample** from the population.
- Based on this sample, **inferences are made about the characteristics of the entire population**.
- Surveys can be funded and conducted by **The State or private organizations**.

Surveys

More on surveys

Surveys can be either **periodic** or **conducted as a one-time event**, depending on the objectives.

- They can cover **a wide range of topics**, including health, economy, business, preferences, and more.
- Surveys are useful for:
 - **Testing census instruments** before their implementation and evaluating the quality of the collected information.
 - Providing **preliminary results to the public** before a full census is completed.
 - With lower costs compared to censuses, surveys allow for **a more detailed exploration of specific topics** such as mortality, fertility, and migration.

They also offer the flexibility to include additional questions on subjects related to the main themes.

Final comparison

Differences Between Censuses and Surveys

Census:

- Collects data from **the entire population**.
- Focuses on **general and basic topics** (e.g., age, education, housing).
- Provides a broad overview for planning and policy-making.
- **Limited depth** due to its large-scale nature.

Final comparison

Differences Between Censuses and Surveys

Surveys:

- Uses a sample to gather detailed information.
- Allows for in-depth analysis of specific topics.
- Flexible design to explore complex questions.
- Results depend on a well-designed sampling strategy.

Final comparison

Complementary Nature

Surveys:

- Censuses give a broad overview (“what happens everywhere”).
- Surveys provide detailed insights (“why and how things happen”).
- Census data often serves as a foundation for designing surveys.

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Population numbers

	Africa		NorthAm		LatAm & Car		Asia		Europe		Oceania	
	2018	2022	2018	2022	2018	2022	2018	2022	2018	2022	2018	2022
Pop. Mid (2018 & 2022)	1,284	1,419	365	372	649	656	4,536	4,730	746	742	41	44
GNI per Capita PPP (2017 & 2021) (**)	4,965	5,212	58,737	68,545	15,273	16,633	13,714	14,638	35,501	42,820	33,668	39,522
Percent Urban	43	44	82	83	78	81	49	52	74	75	67	67
Births per 1,000 Population	35	33	12	11	17	15	17	15	10	9	17	16
Deaths per 1,000 Population	9	9	9	10	6	8	7	7	11	13	7	7
Rate of Natural Increase (%)	2.6	2.4	0.3	0.1	1.1	0.7	1.1	0.8	-0.1	-0.3	1	0.9
Infant Mortality Rate (*)	50	47	6	5	16	14	26	23	4	4	21	15
Total Fertility Rate	4.6	4.3	1.7	1.6	2.1	1.9	2.1	1.9	1.6	1.5	2.3	2.1
Life Expectancy at Birth (years), Males	61	61	77	74	73	70	71	71	75	75	76	76
Life Expectancy at Birth (years), Females	64	64	81	80	79	77	74	76	82	81	80	81
Life Expectancy at Birth (years), Both	63	63	79	77	76	74	73	74	79	78	78	79
Population Ages <15, 2018 & 2022 (%)	41	40	19	18	25	23	24	24	16	16	24	23
Population Ages 65+, 2018 & 2022 (%)	3	3	15	17	8	10	8	10	18	19	12	13

(**) GNI: gross national income per capita at Purchasing Power Parity (PPP). The GNI per capita is the dollar value of a country's final income in a year, divided by its population.

(*) Infant deaths (<5) per 1000 live births

Figure: 1. Demographic data per region, 2018-2022. Source: Population Reference Bureau. World Population Data Sheet, 2018, 2022.

Economic and Demographic indicators

Africa

Economic and Demographic Indicators: Africa

- Income Levels: Africa has the lowest income globally.
- Life Expectancy: Africa has the lowest life expectancy, comparable to Mexico's levels in the early 1970s.
- Urban Population: Africa has the lowest percentage of urban population, similar to Mexico's percentage in the late 1950s.
- Youth Population: Africa has the youngest population, with a proportion of under-15s akin to Mexico's in the early 1980s.
- Total Fertility Rate (TFR): Africa has the highest TFR, matching Mexico's rate in the early 1970s.
- Infant Mortality Rate (IMR): Africa experiences the highest IMR, comparable to Mexico's rates in the early 1980s.
- Rate of Natural Increase: Africa has the highest rate of natural increase.

Economic and Demographic indicators

Europe & NorthAm

Economic and Demographic Indicators: Europe and North America

- Income Levels: Europe and North America **have the highest incomes globally.**
- Life Expectancy: Both regions feature some of the highest life expectancies. In 1995, **Europe's life expectancy was similar to Mexico's current level** (around 75 years).
- Rate of Natural Increase: Europe has a negative rate of natural increase, while North America has a positive but relatively small rate.
- Total Fertility Rate (TFR): Both regions have **among the lowest TFRs.**
- Aging Population: Europe has **nearly 20% of its population aged 65 and over**, with North America showing a similar proportion.
- Urban Population: North America is **the wealthiest region and has the highest percentage of urban population.**

Economic and Demographic indicators

Comparison

Regional Comparisons

- Europe and North America: Generally have similar figures overall.
- Oceania: Shows similar trends to Europe and North America, but as of 2022, its life expectancy has surpassed that of both regions.
- Latin America, Central America, and Asia: Have similar numbers overall, despite significant differences in population size.
- Africa: Stands out as the most distinct region, with the lowest socioeconomic and health-related indices.

Industrial Revolution (IR)

Industrial Revolution

Understanding the Numbers: The story behind these numbers dates back to the Industrial Revolution (IR)

- Transition to New Manufacturing Processes: The Industrial Revolution marked a shift in Europe and the US from ~1760 to between 1820 and 1840.
- Technological Advancements: This period saw a move from hand production methods to machines, including advancements in chemical manufacturing and iron production.
- Steam Power: There was a significant increase in the use of steam power.
- Factory System: The development of machine tools and the rise of the factory system were key aspects of this era.

Industrial Revolution (IR)

Industrial Revolution

Impact of the Industrial Revolution

- Turning Point in History: The Industrial Revolution represents a major turning point.
- Growth Trends: Average income and population started to show unprecedented and sustained growth.
- Standard of Living: For the first time in history, there was a consistent increase in the standard of living for the general population.

Industrial Revolution (IR)

What changed?

Changes Resulting from the Industrial Revolution

- Economic and Scientific Advances: The Industrial Revolution brought significant economic and scientific advancements, which improved public health and reduced mortality rates. Innovations in medicine, sanitation, and nutrition played key roles in lowering death rates.
- Cultural and Social Shifts: As mortality rates declined, cultural and social changes gradually led to a decrease in fertility rates. This shift often occurred later than the drop in mortality, as societies adapted to new living conditions and improved standards of living.
- Population Growth: The combination of reduced mortality and changing fertility patterns led to a substantial increase in population. This demographic transition marked a period of rapid population growth and significant shifts in societal structures.

Industrial Revolution

Colonialism and expansionism

Impact of European Colonialism and Expansionism

- Era of Colonialism: This period was marked by **European colonialism and expansionism**, influencing global dynamics.
- Diverse Global Phenomena: Other regions experienced **similar changes, but on a much different scale due to varying cultural differences**, beliefs, and customs.
- Disparity in Demographic Changes: The gap between declines in mortality and birth rates **was much more pronounced in different regions**, leading to uneven demographic transitions.
- Explosive Population Growth: The world saw disproportionate and **rapid population growth** as a result of these changes.
- Emergence of Global Concern: These demographic shifts **began to raise global concerns about the implications for societies and resources**.

World population growth

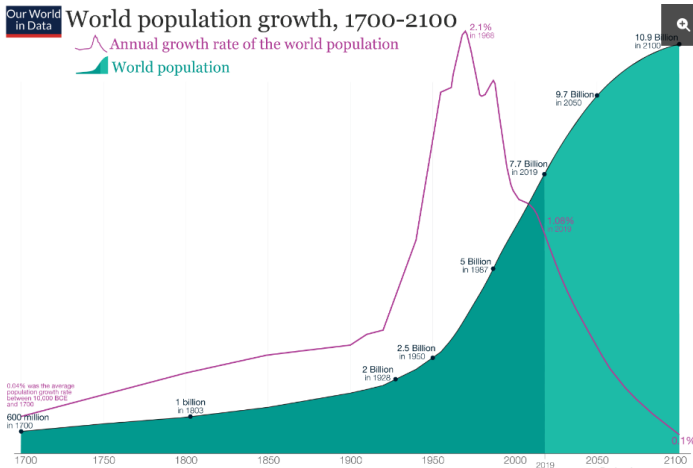


Figure: 2. World population growth, 1750-2100. Source: ourworldindata.org

World population growth

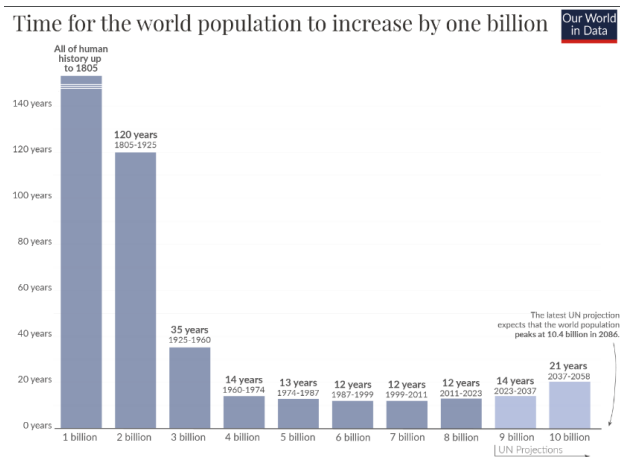


Figure: 3. Time for adding 1000 millions more to world population. Source: ourworldindata.org

Demography

Human Population Through Time

Explore the Evolution of Human Population

- You might find the following video interesting, as it delves into the evolution of the human population across different periods in history.
- Video Title: Human Population Through Time
 - Link: https://youtu.be/PUwmA3Q0_OE

This video provides a visual journey through the growth and changes in the global population, offering valuable insights into how demographics have shifted over time

Demography

The Rise and Role of Demography

Demography gained global importance 60-80 years ago due to the demographic explosion.

- Significant investments were made in population studies, leading to the creation of national and international institutions focused on demographic research.
- Demographers became key figures, shaping policies in social, economic, and development planning.

Demography

The Ongoing Importance of Demography

Demography remains essential for planning and decision-making in an increasingly complex world.

- It plays a key role in **designing and evaluating social programs**, ensuring that resources are allocated where they are most needed.
- By analyzing population trends, **demographers help identify challenges such as aging populations, migration patterns, and urbanization** before they become critical issues.
- Insights from demographic studies also **inform public policy, healthcare strategies, and even marketing campaigns** by understanding diverse demographic profiles and consumer behaviors.

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Demographic transition

The Demographic Transition

Understanding the Demographic Transition. The demographic transition outlines how mortality, fertility, and population growth evolve as societies progress through stages:

- 1. **Pre-Industrial Era:** High mortality and fertility rates keep population size stable.
- 2. **Early Industrial Era:** Mortality rates drop due to technological and healthcare advancements, while high fertility rates drive rapid population growth.
- 3. **Late Industrial Era:** Both mortality and fertility rates decline, slowing population growth and leading to a new stabilization.
- 4. **Post-Industrial Era:** Low mortality and fertility rates result in stable or declining populations, with a focus on aging demographics.

It was [Frank W. Notestein](#) who first introduced the term 'demographic transition' in 1945.

Demographic transition

The five stages of the demographic transition

The demographic transition is a model that describes why rapid population growth is a temporary phenomenon.

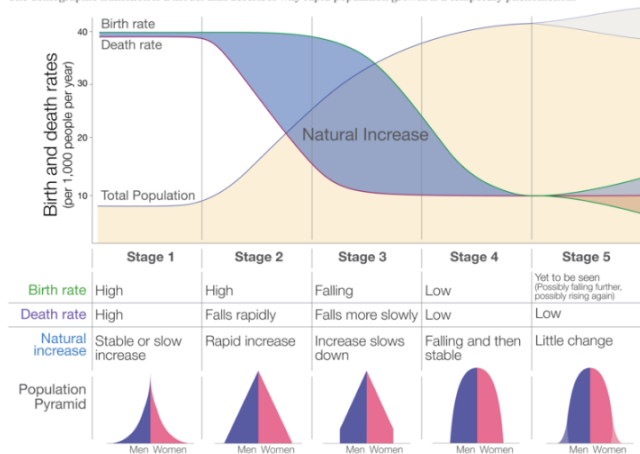


Figure: 4. Five stages in the demographic transition model.

Demographic transition

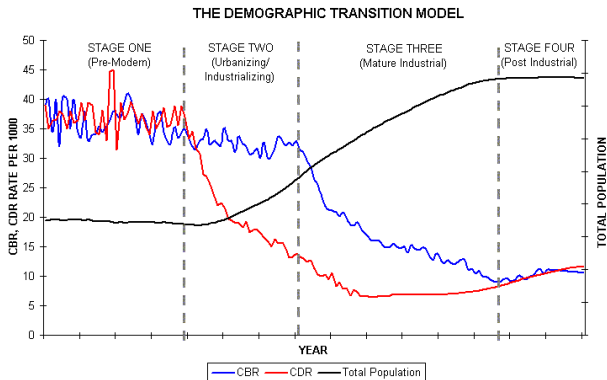


Figure: 5. The demographic transition model (how it actually may look like).

Demographic transition

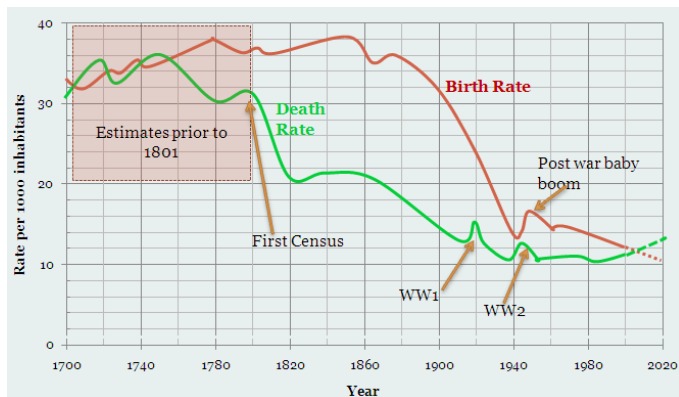


Figure: 6. Britain's demographic transition from 1700 onwards.

Demographic transition

Describing the DT model stages

Stage 4: Low Mortality and Low Birth Rates

- Population growth stabilizes as birth rates align with low mortality rates (driven by education, urbanization, and access to contraception).
- Populations become stable or begin **aging, with a more balanced age distribution reflected in a box-shaped population pyramid.**
- This stage represents **the culmination of the demographic transition,** highlighting the impact of socioeconomic and cultural changes on population dynamics.

Demographic transition

Describing the DT model stages

Stage 5 is, in many ways, the most intriguing and still evolving.

- This stage represents **unexplored demographic territory**, where development has advanced beyond traditional models, and future trends remain uncertain.
- Some theorists predict a fertility rebound, while others anticipate continued declines.
- In many highly developed regions, **fertility rates have fallen below mortality rates**, resulting in negative population growth.
- This shift presents critical challenges, including **aging populations, workforce shortages, and socioeconomic impacts**, requiring proactive policies and forward-thinking strategies.

Demographic transition

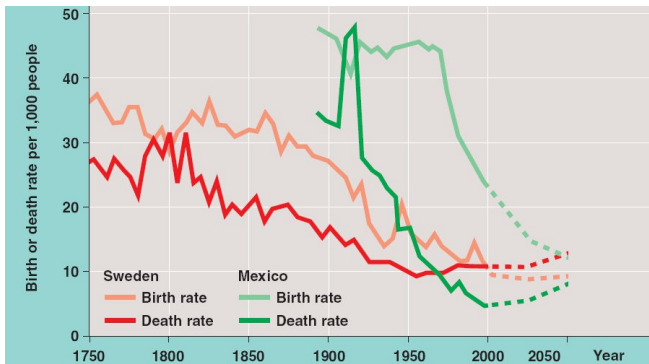


Figure: 8. Demographic transitions of Sweden and Mexico. While Sweden had a quite long DT, México will have a relatively short DT.

Mexico's DT

Mexico's DT

Mexico's Demographic Transition

- **"Late but Rapid":** Mexico's demographic transition began later than in other American countries but **advanced quickly, especially after the mid-20th century**, due to improvements in healthcare, education, and urbanization.
- **Current Stage:** Mexico is transitioning between Stage 3 (declining mortality and fertility) and Stage 4 (low birth and death rates, with **a growing aging population**).
- **Global Context:** Similar demographic patterns are seen in countries like India, Colombia, South Africa, Jamaica, Kenya, and the UAE. However, some of these nations, like Kenya, are still experiencing high growth rates characteristic of Stage 3, while others, like South Africa, face challenges related to health issues like HIV.

Sweden's DT

Sweden's DT

Sweden's Demographic Stage

- **Current Stage:** Sweden is in Stage 4 of the demographic transition, characterized by low birth and death rates. The population is primarily middle-aged (30-39 years), with balanced representation in the 20-29 and 40-49 age groups. Approximately 20% of Swedes are 65+, reflecting an **aging population**, while 18% are under 15, indicating **low birth rates**. The country enjoys a high life expectancy, around 82 years.
- **Stage 4 Characteristics:** This stage is marked by slow and stable population growth, but it also presents challenges such as **aging populations and the strain on social services**.
- **Global Comparisons:** Other countries in Stage 4 include Argentina, Australia, Canada, China, Brazil, most of Europe, Singapore, South Korea, and the United States. However, **the process is not uniform; some regions within these countries still experience dynamics typical of earlier stages**, like higher fertility rates or growth in rural areas.

DT stage 5: science fiction?!

Stage 5 of the DT

Stage 5 of the Demographic Transition

- **Key Feature:** Death rate exceeds birth rate, leading to **potential long-term population decline**.
- **Uncharted Territory:** Humanity has **never faced this scenario**. Experts debate the future—will we face extinction?
- **Current Concern:** Countries like South Korea (TFR 0.78) are grappling with the consequences of very low fertility rates, including: Aging population and growing burden on social services, labor shortages affecting the economy, and social changes and challenges to traditional family structures.
- **Possible Futures:** Some predict labor shortages, potentially solved by robots; others warn of economic and social collapse.
- **Examples:** Germany, Estonia, Ukraine, and Japan are dealing with aging populations and declining birth rates.

DT in five countries, 1820 to 2010

OurWorld
in Data

The Demographic Transition in 5 Countries

The Demographic Transition refers to the transition from high birth & death rates to low birth & death rates. It is shown here for five countries that achieved the transition one after the other.

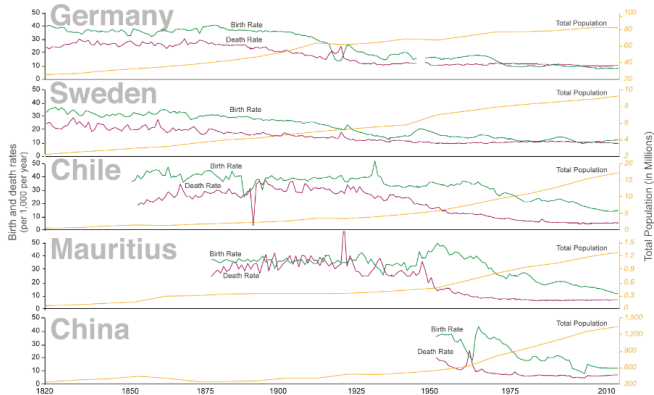


Figure: 8. Demographic transition in 5 countries, from 1820 to 2010. Source: ourworldindata.org

What are the effects?

What are the effects of having a slow-rapid DTs?

What are the effects of slow vs. rapid demographic transitions?

- **Social, Economic, and Cultural Effects:**

- Slow Transitions (e.g., Sweden): Social stability, gradual economic adaptation, and longer-term planning.
- Rapid Transitions (e.g., Mexico): Fast-paced societal change, pressures on infrastructure, and challenges in meeting the needs of a young, growing population.

- **Consider:**

- How do these transitions affect things like education, healthcare, and employment? What are the potential challenges and opportunities in each case? Think about it! Reflect on how these transitions shape the future of a country and its people.