P25 LAT3072-1 Demography

Actuarial Sciences

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P25 13/01 - 09/05

Meetings

- Class Meetings: Tuesdays and Thursdays, 14:30 to 15:45, Room NE107.
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Demography

Demography?...

Demography is the statistical study of human populations[a].

- When we talk about demography, what we're really trying to understand is how populations change and evolve over time.
- There are three main processes behind those changes: births, migration, and aging, which, ultimately, implies death.
- Each of these processes has a huge impact on how people are distributed across the world!

[a] The word demography comes from two ancient Greek words: *demos*, meaning "the people," and *graphy*, meaning "writing about or recording something" — so literally demography means "writing about the people."

Demography

Demography?...

Births not only increase population size, but also shape future generations and the culture, values, and characteristics of society.

- New generations are influenced by new factors like education, traditions, and social conditions.
- For example, children born with advanced technology may have a different worldview, potentially changing society's direction.

Demography

Demography?...

- **Migration**, on the other hand, doesn't just move people from one place to another; **it also moves ideas, customs, and even ways of speaking and cooking**.
- And finally, **aging.** As people grow older and some pass away, this reshapes family, work, and even cultural dynamics within a society.
  - As older generations pass away, cultural traditions and values may change, as **newer generations bring different ideas and perspectives, influencing practices in religion, art, politics, and social customs.**

Demography

Understanding underlying causes

Demographic change has increasingly become a topic of political debate and economic concern in many developed countries.

- Birth rates have fallen below the replacement level of 2.1 children per woman, while life expectancy has risen significantly and continues to increase. This combination leads to the **'aging of societies.'**
- While demography itself doesn't provide political or economic solutions to address these changes, demographers aim to describe the phenomena, understand the underlying causes, and analyze their implications[a].

[a] Aging can create an imbalance between economic demands and available resources, which leads to debates on how to manage these changes at the political and economic levels.

Demography

Why does Demography matter?

Demography is crucial across various fields for different reasons:

- **Sociologists** use demographic data to examine how populations evolve over time and how these changes impact social norms, behaviors, and interactions; e.g.,: Analyzing aging populations to understand shifts in family structures.
- **Economists** analyze demographic trends to study labor markets, consumer behavior, and economic growth; e.g., assessing the impact of an aging workforce on economic productivity.

Demography

Why does Demography matter?

Demography is crucial across various fields for different reasons:

- **Public Health Professionals** use demographic data to evaluate disease prevalence, healthcare needs, and access to medical services. This information is essential for designing targeted interventions and effective healthcare strategies; e.g., identifying areas with high disease prevalence to allocate resources more effectively.
- **In Urban Planning,** demographic studies are essential for urban planners to anticipate population growth, migration trends, and housing and education needs. This information guides city development, infrastructure planning, and resource allocation.

Demography

Why does Demography matter?

- Some other disciplines that are typically interested in demography are: political science and international relations, biology, environmental science or business and marketing.
- Additionally, mathematics and statistics equip demographers with the quantitative tools necessary to collect, analyze, and interpret population data (e.g., population projections, life tables, and statistical modeling).

Demography

Why does Demography matter?

However, from the actuarial science side, studying demography is important for two main reasons:

- 1. Risk Assessment and Management: Demographic factors, such as population growth, age distribution, and mortality rates, are crucial for predicting and understanding risks in the insurance and financial industries. Actuaries use this data to estimate the likelihood of events like deaths or accidents, which directly impacts insurance premiums, pension funding, and other financial products.

Demography

Why does Demography matter?

- 2. **Long-Term Financial Planning:** Demographic trends significantly affect long-term financial planning, especially for pension funds and retirement systems. Actuaries use demographic projections to estimate future pension obligations and funding requirements. Changes in demographics, such as increased life expectancy or shifts in retirement age, can greatly influence the financial sustainability of pension plans and social security systems.

Syllabus

Syllabus

This course will be divided into 6 (six) topics.

1. **Introduction: concepts and data**
   - 1.1. Historical background
   - 1.2. Demographic measures: ratios, proportions, rates and the demographic equation.
   - 1.3. Demographic data: defining population
   - 1.4. Demographic transition theory
   - 1.5. Data collection: Censuses, vital registration and sample surveys.

Syllabus

Syllabus

2. Age and sex structure

- 2.1. Structure and vital events
- 2.2. Age measurement and misreporting: Whipple's index.
- 2.3. Population pyramids
- 2.4. Sex ratio and dependency ratios
- 2.5. The determinants of age structure

Syllabus

Syllabus

3. Mortality and life tables

- 3.1. Types of death rates
- 3.2. Standardization: direct (type 1) and indirect (type 2)
- 3.3. Constructing a life table
- 3.4. Abridged life tables
- 3.5. Life table functions and interpretation

Syllabus

Syllabus

4. Fertility and reproductivity

- 4.1. Birth and fertility rates
- 4.2. Level, mean (calendar) and variance of fertility
- 4.3. Coale's indices
- 4.4. Proximate Determinants of Fertility
- 4.5. Cohort fertility*

Syllabus

Syllabus

5. Migration

- 5.1 The importance of migration
- 5.2 Migration: a special type of population movement
- 5.3 Typologies and statistical patterns of migration
- 5.4 Ravenstein's laws (revisited)
- 5.5 Analysis of migration data and characteristics of migrants

Syllabus

Syllabus

6. Demographic models, population projections and forecasts

- 6.1 Growth models
- 6.2 Model life tables
- 6.3 Fertility models (*)
- 6.4 The component method of projection (*)
  - (*) If time allows

Learning activities

Learning activities

The learning activities are divided in two:

- With the **teacher**:
  - Theoretical and practical **discussions**
  - Resolution and discussion of **problems** in class.
- Independent activities:
  - **Bibliographic review**
  - Solving **problems on their own or in teams**
  - Elaboration of documents or **reports**.

Grading

Grading

In chronological order, the grading criteria are as follows:

- **Activity 1: 1st written report** (teams, no more than three people) (18%) (Topics 1 and 2)
- **Activity 2: 1st (theoretical) exam** (14%) (Topics 1 and 2)
- **Activity 3: 2nd (practical) exam** (25%) (Topic 3)
- **Activity 4: 2nd written report** (teams, no more than three people) (15%) (Topic 4)
- **Activity 5: 3rd (theoretical exam)** (14%) (Topic 5)
- **Activity 6: 3rd written report** (teams, no more than three people) (14%) (Topic 6)

All activities add up to 100%

Grading

Some rules

Documents must be **delivered before the indicated deadline**.

- If delivered **after** the deadline, there will be a **penalization of -15% per day**.
- There are NO final exams, **NOR retaking exams NOR retaking projects**.
- During exams, cell phones are prohibitted. If someone violates this rule, his/her exam will be canceled.
- If there are situations out of control that may affect exams or projects, abscence notes or equivalent will be required.

References

References

Here are some references about demography and population studies. Feel free to explore these or other resources.

- Lundquist, J.H., Anderton, D.L., Yaukey, D. (2015). Demography: the study of human population. Waveland Press
- Yusuf, F., Martins, J.M., Swanson D. A. (2014). Methods of demographic analysis. Springer.
- Weeks, J.R. (2011). Population: an introduction to concepts and issues. Wadsworth Publishing.
- Rowland, D.T. (2010). Demographic methods and concepts. Oxford.
- Brown, R.L. (1997). Introduction to the mathematics of Demography. Actex Publications.