

Measurement

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Table of Contents

- 1 Introduction
- 2 How to think about measurement
 - Operationalizing measurement
 - Scales of Measurement
 - Consistency and Validity
- 3 Practical questions
- 4 Examples

Introduction

- What do we mean by measurement
- Why do we measure?
- Practical questions to ask related to measurement

What is measurement?

Question

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Definition

Measurement refers to the process of assigning numbers or labels to units of analysis (like individuals, objects, or events) in order to represent specific attributes or characteristics.

- This process involves several key aspects:
 - ▶ Operational Definition
 - ★ Scales of Measurement
 - ▶ Reliability and Validity or Precision and Accuracy

Why do we need to measure things?

Question

Why do we measure?

- **Setting Clear Goal:** "What gets measure, gets managed" e.g., reducing poverty, improving public health
- **Decision-Making:** Without accurate measures, policymakers are left to rely on assumptions or anecdotal evidence.
- **Allocating Resources Efficiently:** For instance, understanding regional disparities in unemployment helps target job creation programs.
- **Monitoring and Evaluation:** helps identify whether a policy is achieving its intended goals or needs adjustment.
- **Accountability, Transparency and trust:** It allows stakeholders, including citizens and advocacy groups, to see whether promises are being fulfilled.
- **Identifying Unintended Consequences:** How a tax reform might disproportionately affect low-income families, enabling mid-course corrections.
- **Facilitating Comparisons:** Consistent measurement allows for comparisons across time, regions, and populations. This benchmarking is critical for understanding relative progress and learning from best practices.

Example: Who is responsible?

	Fraction of population exposure to anthropogenic PM in South Korea, % total	Estimated annual health cost, million 2022\$ ± SE (% total, anthropogenic)	
		This study	Assuming undifferentiated dose-response
South Korea	56.6	305 ± 92 (27.6)	615 ± 70 (58.4)
North Korea	9.9	223 ± 66 (20.1)	97 ± 11 (9.2)
China	33.5	579 ± 66 (52.0)	341 ± 38 (32.3)

Table 1: Average annual contributions to anthropogenic PM exposure and associated change respiratory health spending by origin.

“Simultaneous measurement of health damage from transboundary and domestic air pollution in mixture” by Jaecheol Lee, Andrew Wilson and Solomon Hsiang.

Table of Contents

1 Introduction

2 How to think about measurement

- Operationalizing measurement
- Scales of Measurement
- Consistency and Validity

3 Practical questions

4 Examples

Operational Definition

Definition

Specifying exactly how it is to be measured: what units, for who, for how long, what instrument, etc.

- Examples

- ▶ Let's say we increase the minimum wage, and a policy maker would like to measure the change in income. How would you go about it?
- ▶ What about changes in mental health?

Scales of Measurement

Defining the type of scale in which a variable is working at

- Nominal
- Ordinal
- Interval
- Ratio

Nominal or Categorical

Categories without any quantitative value. The order does not matter.

- Examples:
 - ▶ Gender
 - ▶ Hair Color
 - ▶ County
 - ▶ Type of Job

Ordinal

Categories that have a logical order but the intervals between the ranks are not necessarily equal.

- Examples:
 - ▶ Rankings in a competition
 - ▶ Educational level
 - ▶ Satisfaction rankings
 - ▶ Notice that the difference between 11 years of education and 12 years of education may have different implications relative to the difference between 1 and 2 years of education.

Interval

- Numerical scales where intervals between values are meaningful. However, it lacks a true zero point
- Example:
 - ▶ Temperature in Celsius or Fahrenheit

Ratio

Similar to interval scales but with a meaningful zero point, allowing for statements of how many times greater one unit is than another

- Examples:
 - ▶ Weight
 - ▶ Height

Reliability and Validity or Precision and Accuracy

- Measurements must be reliable (consistent) and
- Valid (accurately measuring what they are supposed to measure).
- Accuracy: What if we have measurement error?

Questions

- When we measure temperature with a different thermometers, will we get the same result?
- If we apply the same questions of mental health, will this be answered the same across cultures?
- What is IQ measuring?

Table of Contents

- 1 Introduction
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Summary of operationalizing it

- How do you plan to operationalizing it?
 - ▶ What would be the scale or type of measurement?
 - ▶ Units?
 - ▶ Timeframe?
- What instrument will you use? Will it be consistent?
- Does the objective align with the measure?
- What will it measure? What is it's validity?
- Can it be used to compare across insert characteristic? (e.g. regions, time, people, countries, genders, race, etc)
- Could there be measurement error, if so how?
- Who are you measuring?
- Is this measure actionable? Can you collect the information? How would you go about it?

Practicing operationalizing it

Pick one of the following concepts and create a specific measure

- Poverty
- Mental health
- Quality of education
- Gender equity
- Climate resilience

Of note

- In rare situations, “single metrics” will be sufficient. We usually want to focus on a number of metrics for a given outcomes or topic.
- Each measurement has trade offs.
- The goal is not to find “the one measurement”. The goal is to understand the pros and cons of each measurement.
- *“If two studies say child poverty fell — but one uses income and another uses consumption — which is right?”*

Broad takeaway

- What we measure matters, how we measure and who we measure matters for interpretation of the results.
- Therefore, thinking carefully about this can help into thinking of the interpretation of the results.
 - ▶ When you are presented with research, reports, etc. Ask yourself questions about the way we measure first. This can help explain findings later.
- In this class we won't be focusing on this because this requires field-specific context. We'll try to keep it in mind.
 - ▶ We'll look back at the stuff we can fix.
- When there is a measurement we don't think its great, the first question is why would the researchers use this? data availability? what other constraints?

Table of Contents

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BrightPath Microfinance Alliance

Impact Report Excerpt (Paragraph):

- *“At BrightPath Microfinance Alliance, our mission is to expand economic opportunity for communities living in poverty by providing responsible, accessible microloans through our trusted financial partners. To date, 9.4 million of the world’s poor have been reached by our microfinance institution partners, enabling individuals and families to begin their journey out of poverty. These small, affordable loans have supported entrepreneurship, strengthened household resilience, and empowered borrowers to build sustainable livelihoods. By investing in people rather than handouts, BrightPath continues to drive long-term, community-led economic growth.”*

Questions

- What are they measuring on their impact report? Is that their goal?
- Do we know if they are having a positive impact?

EmpowerCycle Initiative

Impact Report Excerpt (Paragraph):

“Before she attended training, Sophia never left her home. Now she goes out to work every day, and in nearby villages people recognize her and ask for her help. She earns a steady income, and her work as a bicycle mechanic has helped to improve the standing of women in her community, too. “At first I doubted she could do it,” said a male neighbor, “but she does the job as well as any man I’ve seen.”

CleanFuture Development Network

Impact Report Excerpt (Paragraph):

Another milestone we are proud to share: 288,303 sanitation facilities have been built with CleanFuture Development Network's guidance, improving public health, safety, and dignity for families across the communities we serve.

Body Worn Cameras

- In the context of police accountability a proposal that was touted as a solution is Body worn cameras. Let's imagine we do a RCT in which a set of police-people in many departments had to use BWCs and other departments did not.
- Let's say that one of the metrics they used to measure the effects of the policy is **number of arrest per capita in a given year**.
- They find that the policy decreased the per-capita arrest by 20%.

Question

How could we interpret this result? What does this result mean?

Exercise: Health Insurance and Health

- Get in groups of 2 or 3 and go over the in-class worksheet. Think about the things we've learned in class today and discuss the following questions.
- Questions:
 - ▶ What are the measurements used in this paper to determine the effect of the policy?
 - ▶ The paper analyzes the effects of the reform in VA. If a policy maker were to ask you if this policy was successful what would you tell them?
 - ▶ What else would you like to see if you would like to talk broadly about the success of the policy?

Education

- Let's say that we are focused on improving teacher's quality and we provide an intervention to improve teacher's quality.
- We are interested in improving teacher's quality to improve outcomes of students.
- What should be some outcomes we should evaluate?
 - ▶ Let's go through this and think about when are situations in which they can be positive vs. negative.