Debates in poverty measurement: models and measurement error

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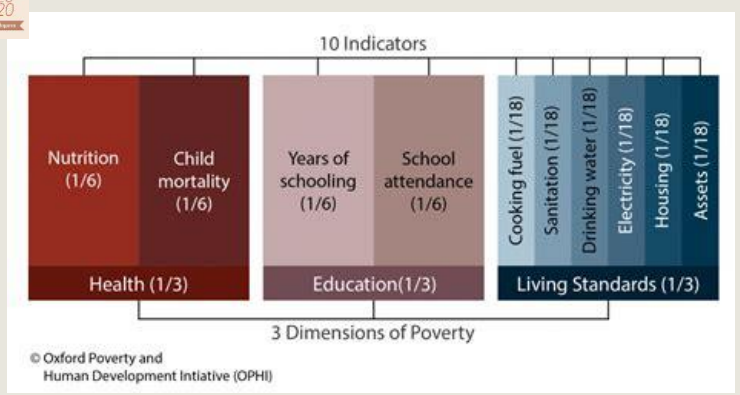
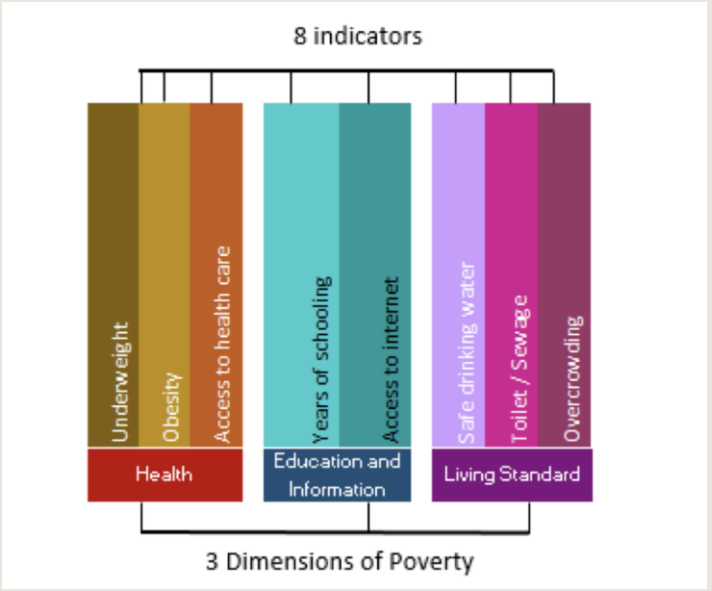
Comments Curtis Huffman

Outline

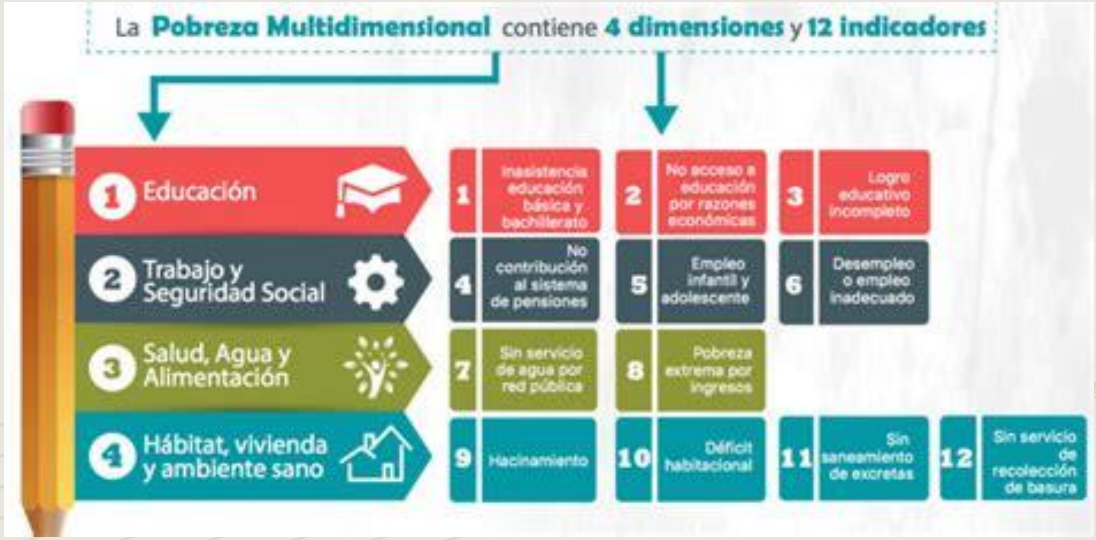
- Desirable principles in measurement
- Common elements in poverty measurement exercises
- Utility and construction of measurement models
- Towards the scientific principles for addressing and estimating measurement error:
- Reliability
- Validity

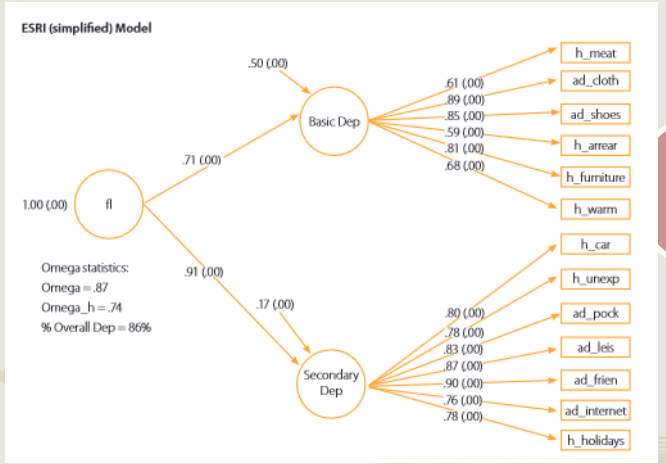
Multiple proposals -models- to measure poverty: Indications and outcomes

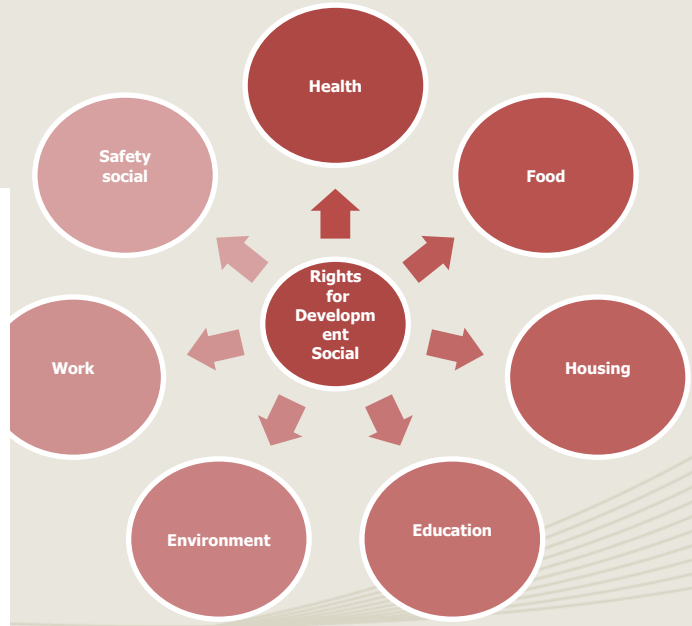




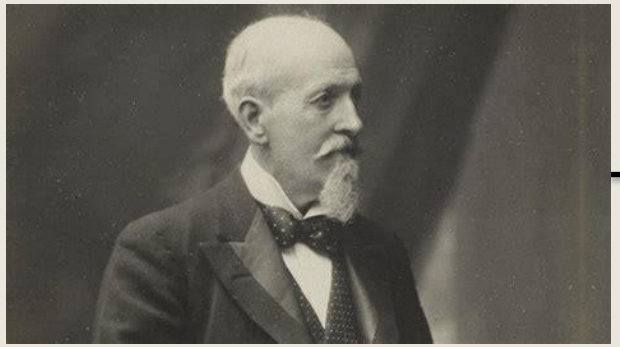
Can we aspire to evaluate them in the same terms?





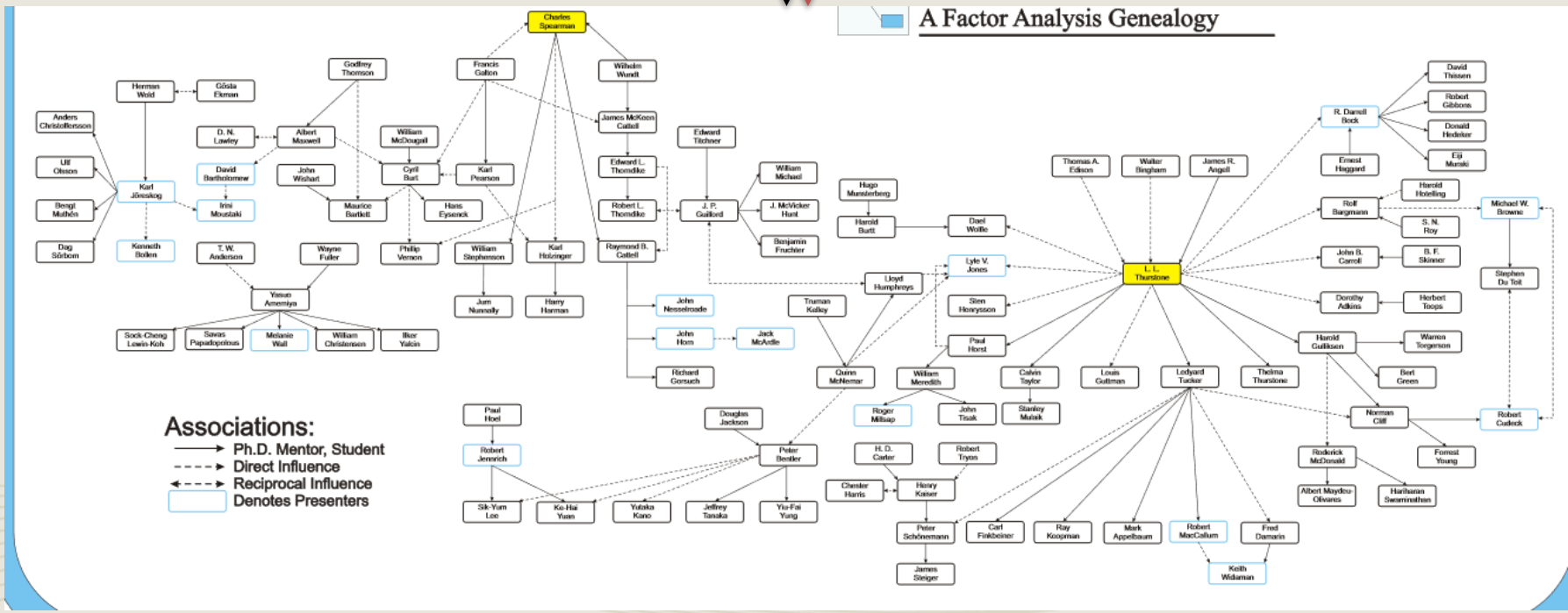


Theory, concepts and methods of measurement: Consensus after more 100 years



Epistemology of measurement (Last Friday)

Approaches based on XXI Century statistical developments

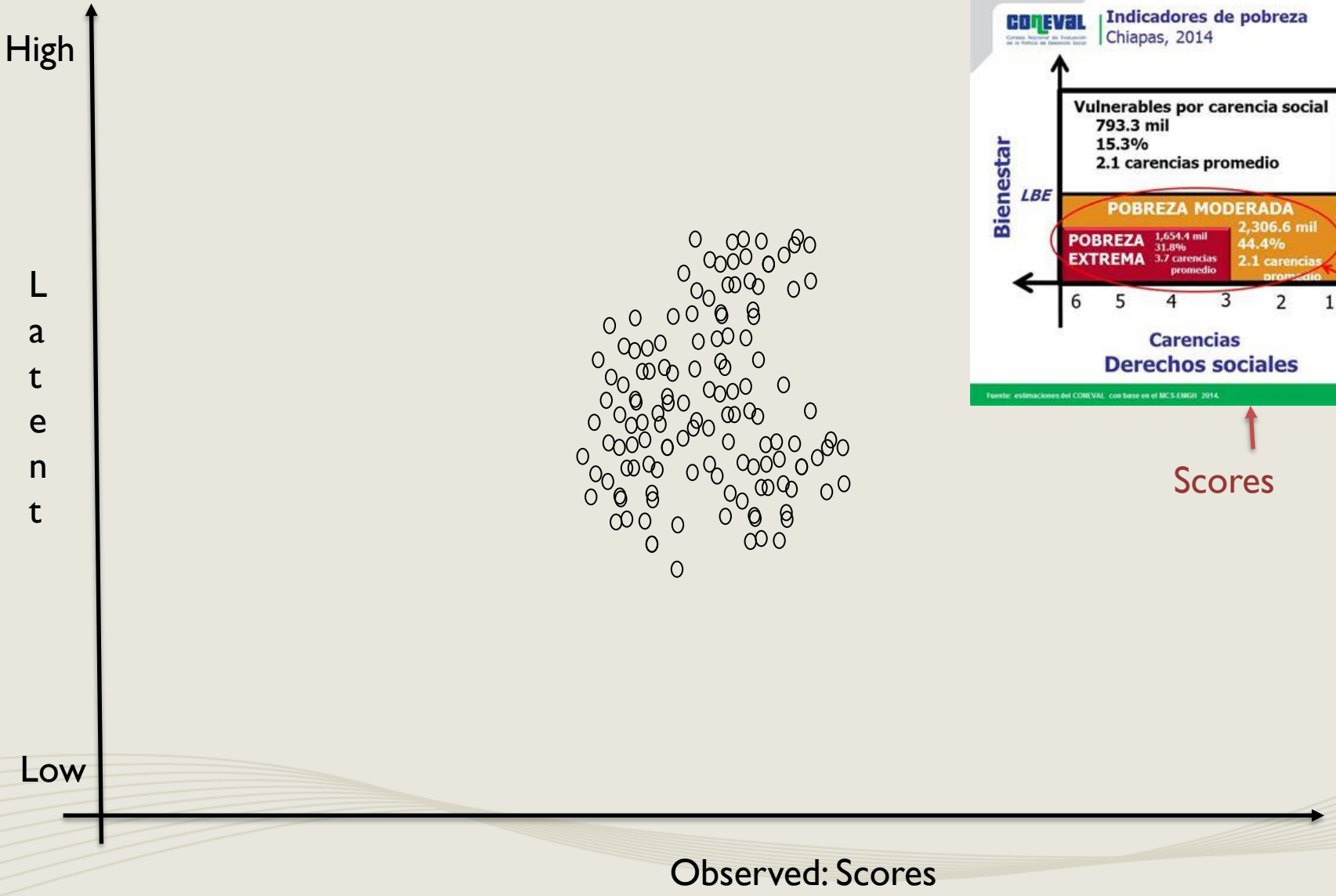


Loken, Eric and Andrew Gelman. 2017. Measurement Error and the Replication Crisis: The Assumption that Measurement Error Always Reduces Effect Sizes is False. *Science* 355(6325):584-585.

Goals in measurement

Given a population and a set of information we would like to be able to produce scores that:

1) Order our population from highest to lowest standard of living
2) Classify into two groups: Poor and Not Poor



Scores

Goals in measurement

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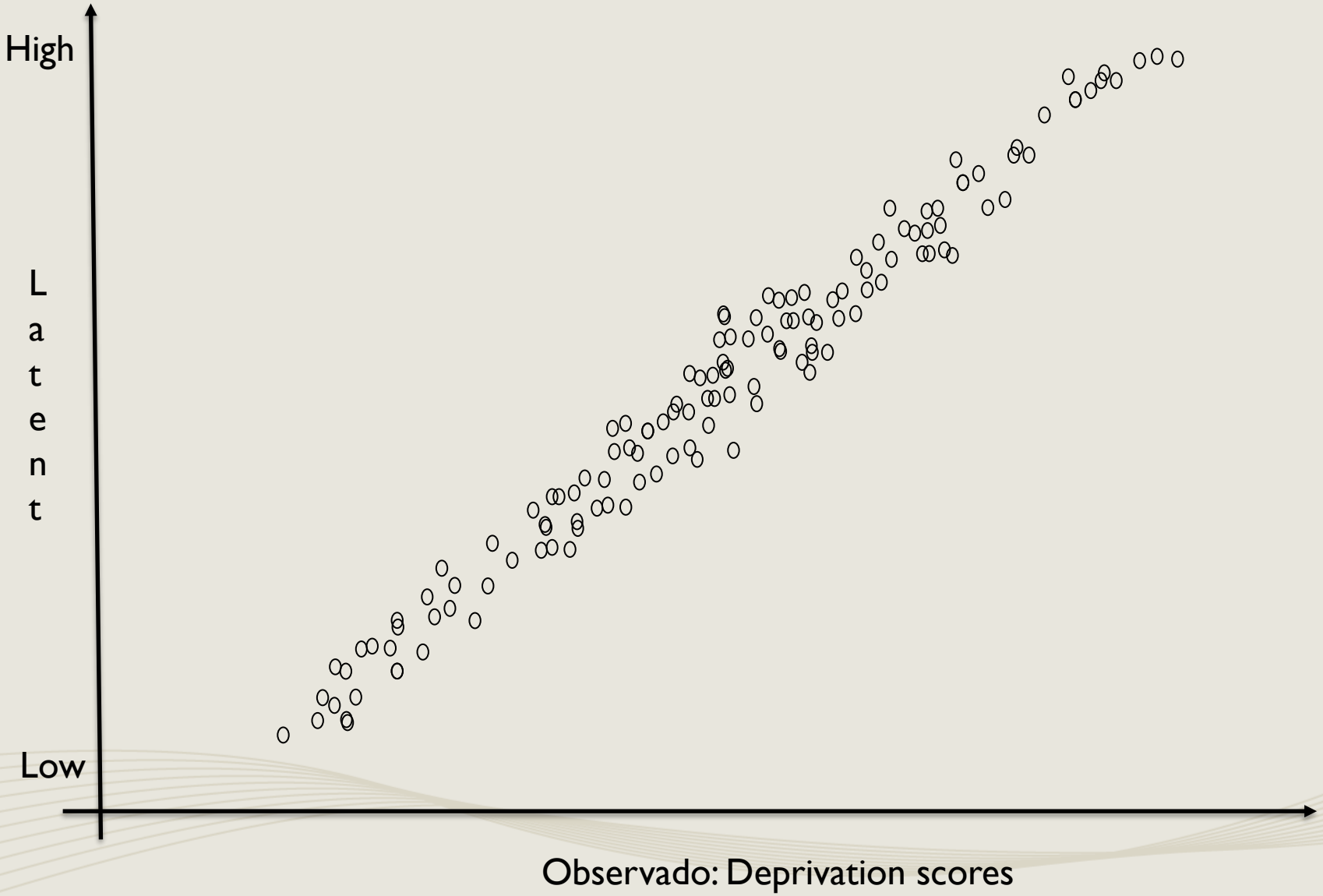

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Goals in measurement

Given a population and a set of information we would like to be able to produce scores:

1) Consistent over time

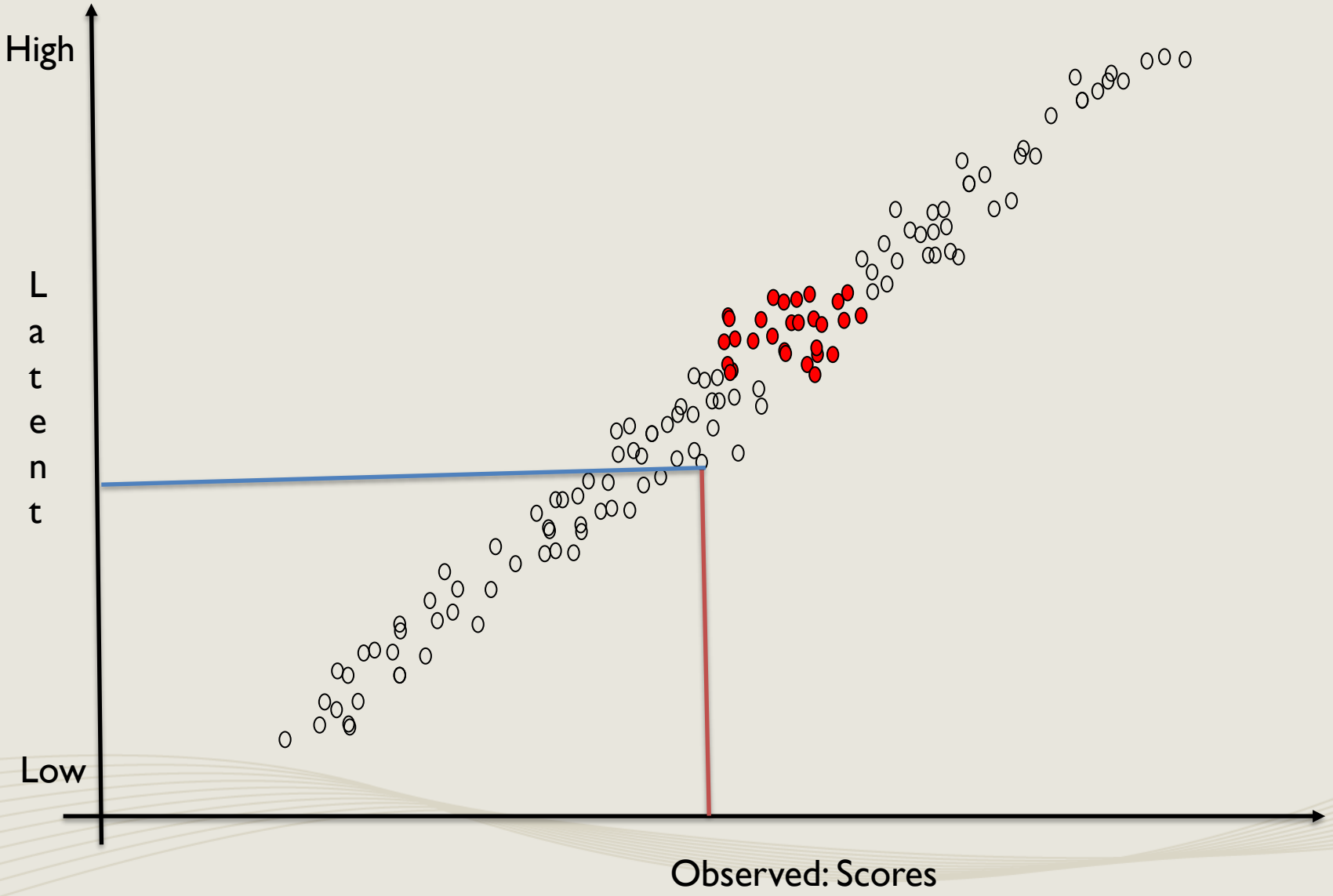
T1 vs T2

If nothing happened, the population orderings should not be modified but, what if something happened (COVID)?

Goals in measurement

Given a population and a set of information we would like to be able to produce scores:

Sensitive to Changes: Determinants of Poverty



Goals in measurement

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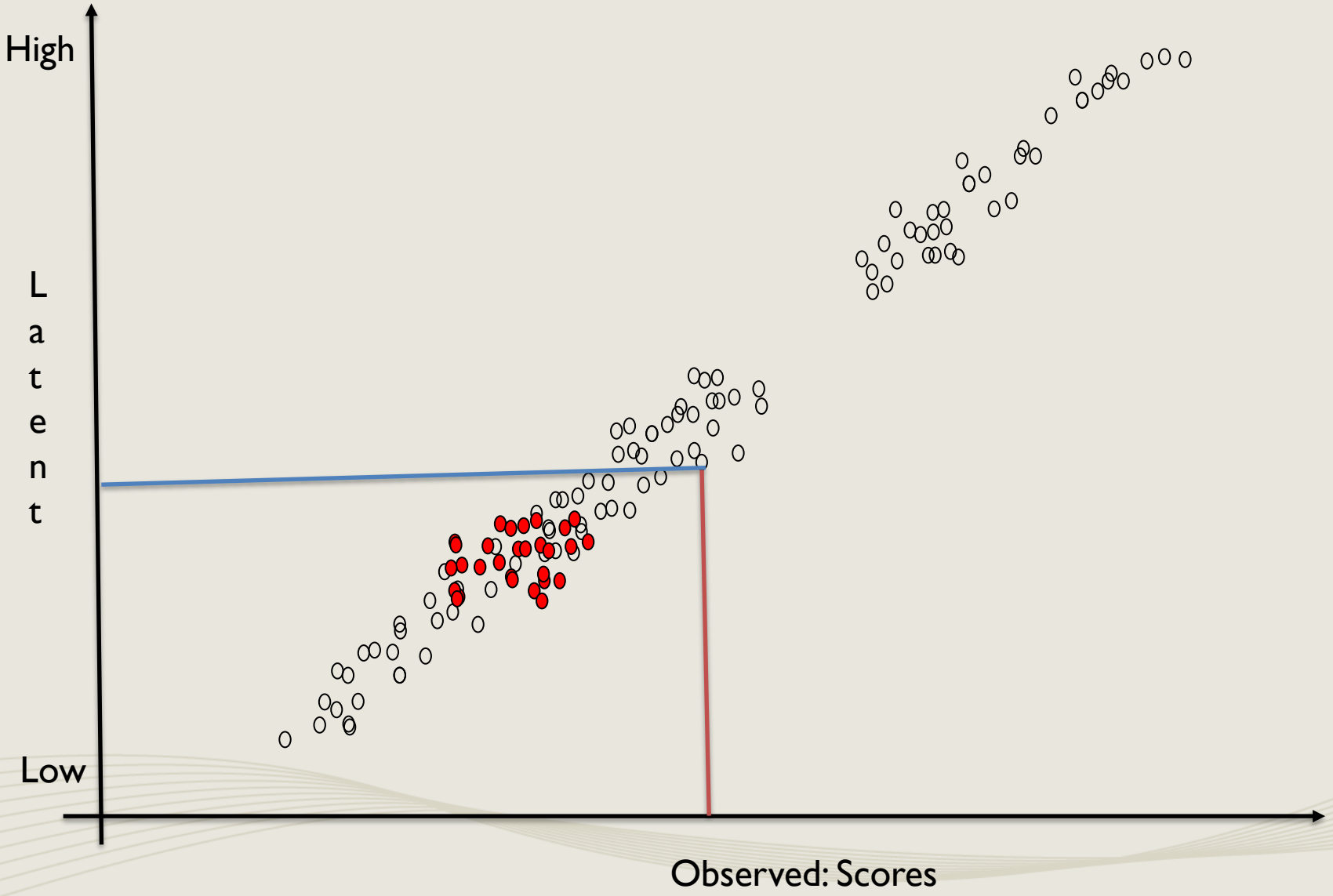
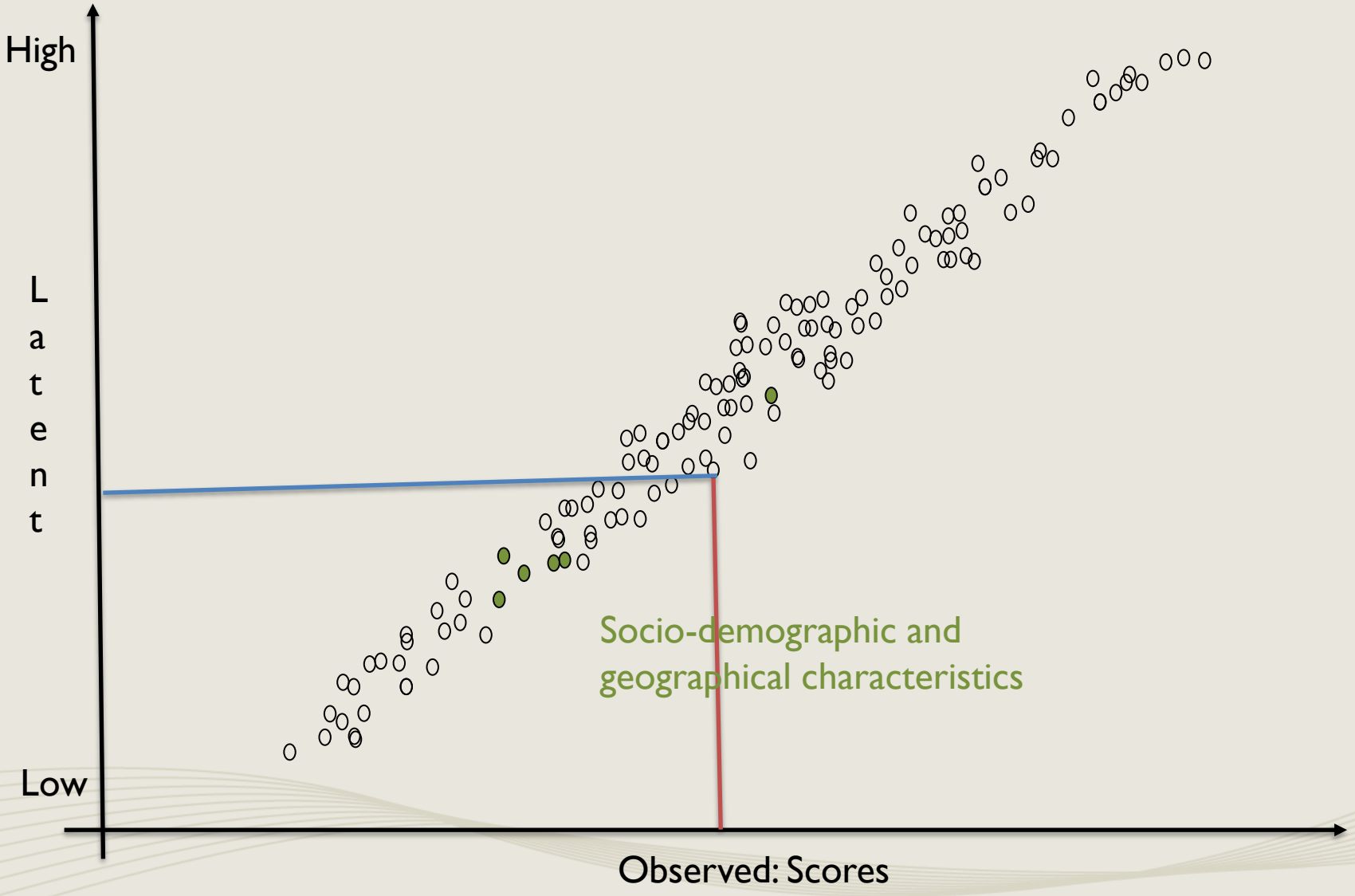


Goals in measurement

Given a population and a set of information we would like to be able to produce scores:

Allow me to perform disaggregations and robust inference



Goals in measurement

Given a population and a set of information we would like to be able to produce scores:

That they measure consistently and that I can interpret them as I intent to do so

Models: Representation in poverty measurement

Given a scientific definition of poverty and the available information –readings–

- Dimensions: D
- Indicators: I
- Thresholds: U
- Weights: P
- Poverty line: L

Measurement model

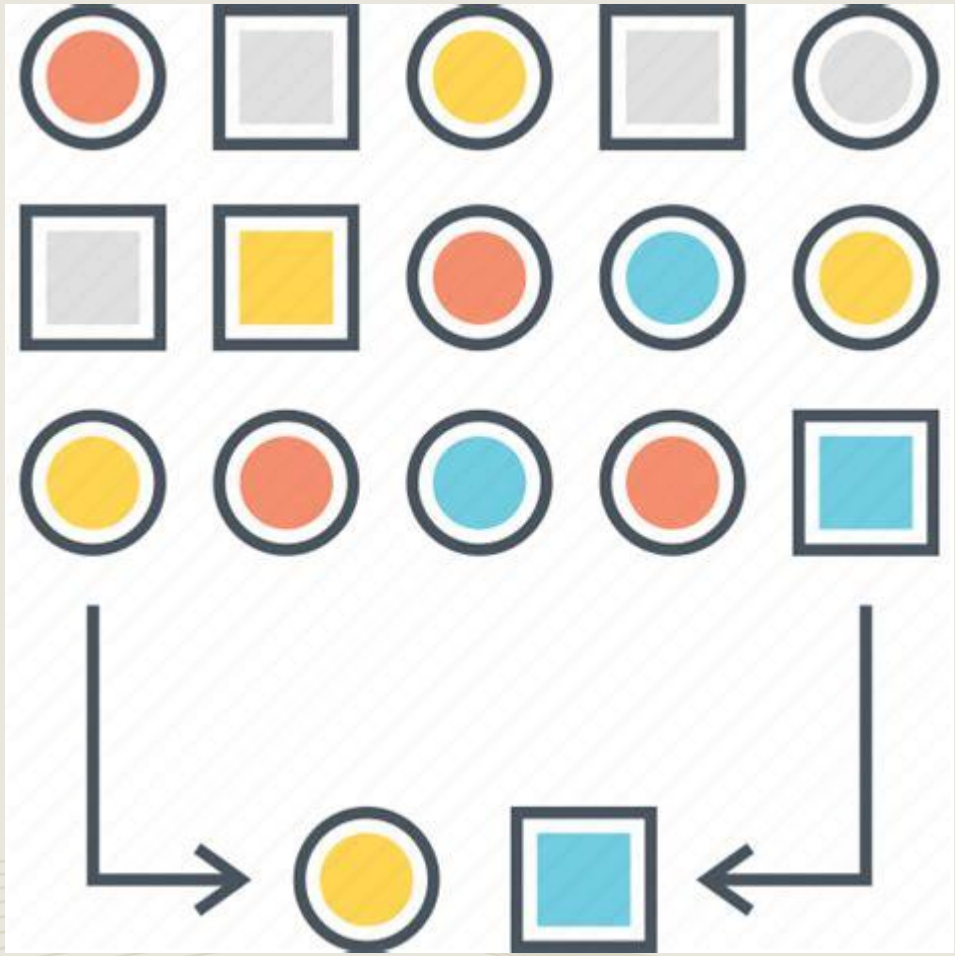
It takes shape from a series of assumptions about each of these elements

Does the measurement model I proposed come close to these aspirations for the (reliable and valid) measurement of poverty?

All models are wrong but some are useful

I don't know the "perfect" measure of poverty.

There is no such thing as a Census with D, I, U, P and L that leads me to a measurement with zero error

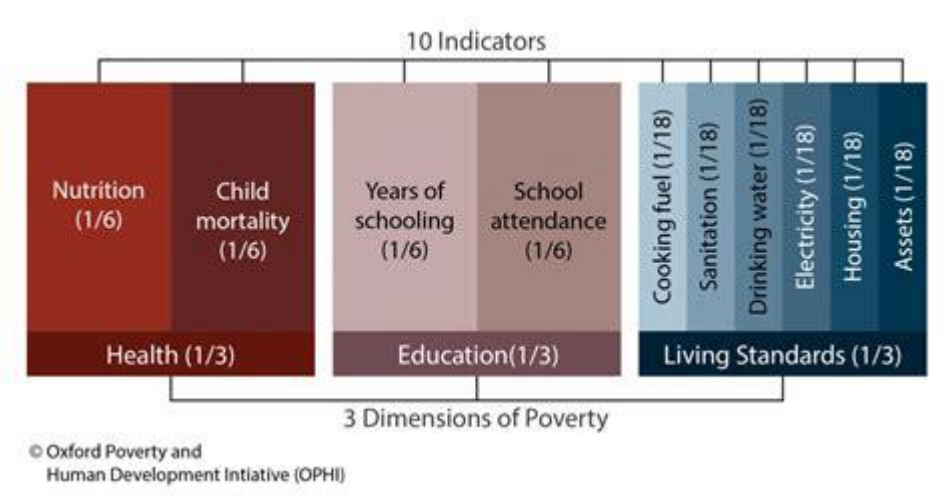


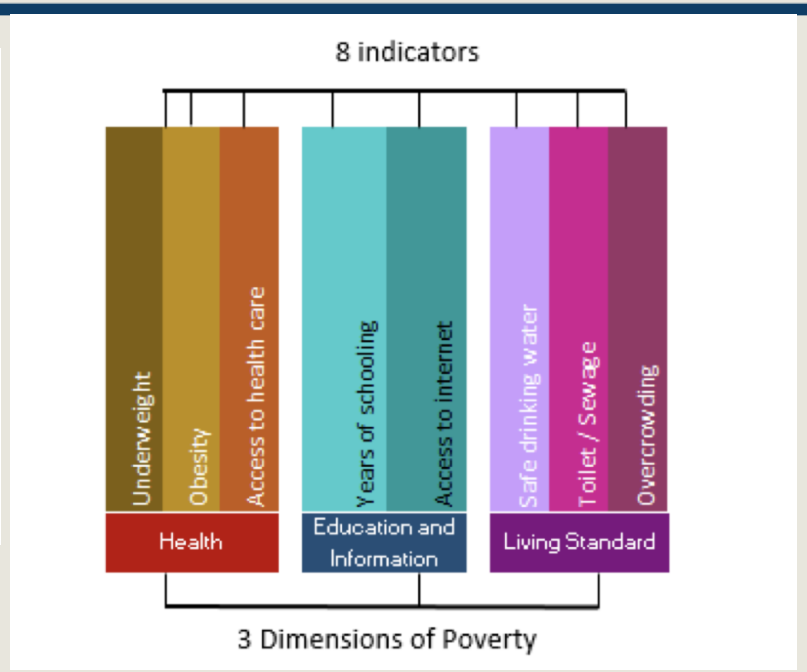
Given a scientific definition of poverty and the available information I take samples -model-

- Dimensions: D
- Indicators: I
- Thresholds: U
- Weights: P
- Poverty line: L
-

I calibrate that information to get to the best possible model, i.e. less error

Different approximations same language: Measurement models





All are the product of a series of decisions regarding:

Dimensions: D
Indicators: I
Thresholds: U
Weights: P

Does the measurement model lead to a reliable and valid representation of poverty?

- Do these assumption hold?

Dimensions
Indicators
Thresholds
Pesos
Poverty Line

Clear models (Definition, data, assumptions) allow both clear hypotheses and conclusions about what I am attempting to measure

L leads me to the best possible separation of the poor from the non-poor – Classification error–

P helps me to improve the ordering of the population from lowest to highest standard of living

I (*given U*) it is a set that has the same source – signal: multidimensional poverty–

U it is the best way to separate the population with lack from those who do not have it

D is the best way to classify *I* to represent multidimensional poverty

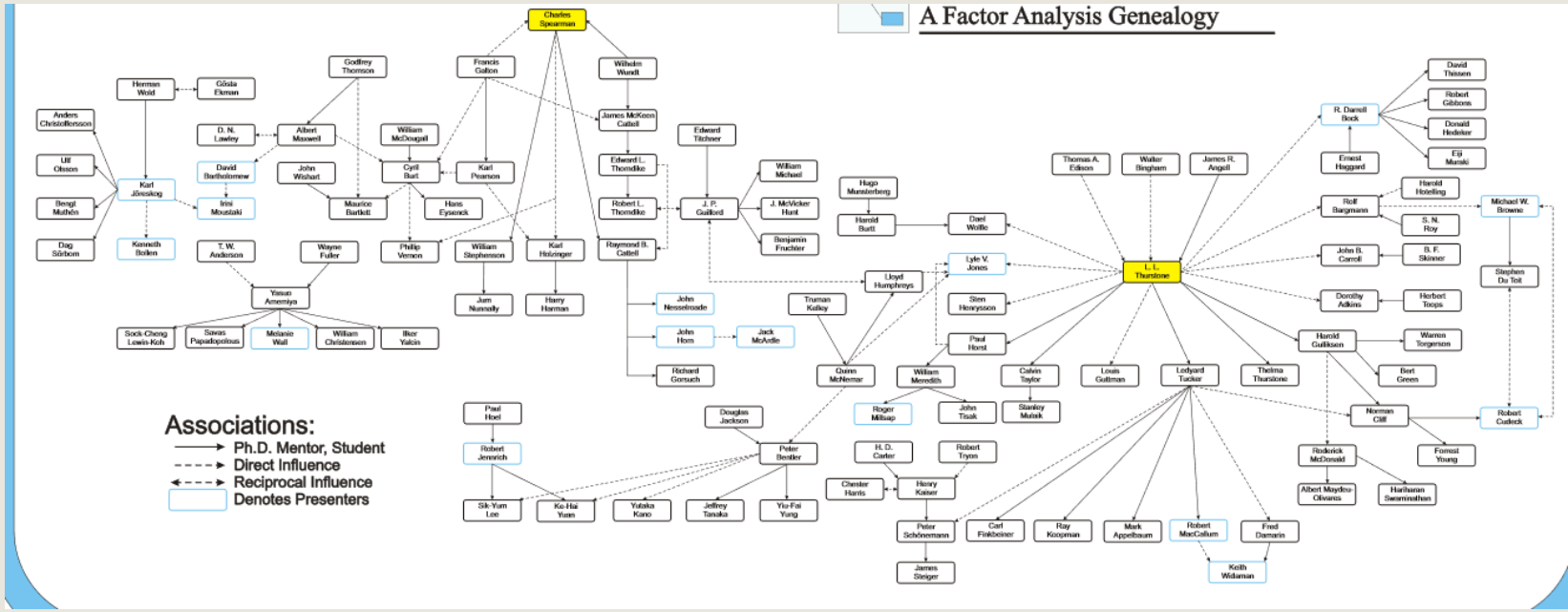
I comes from data designed to capture what I want to measure

L,P,U,I,D they allow me to make the inference I want to make

Latent variables

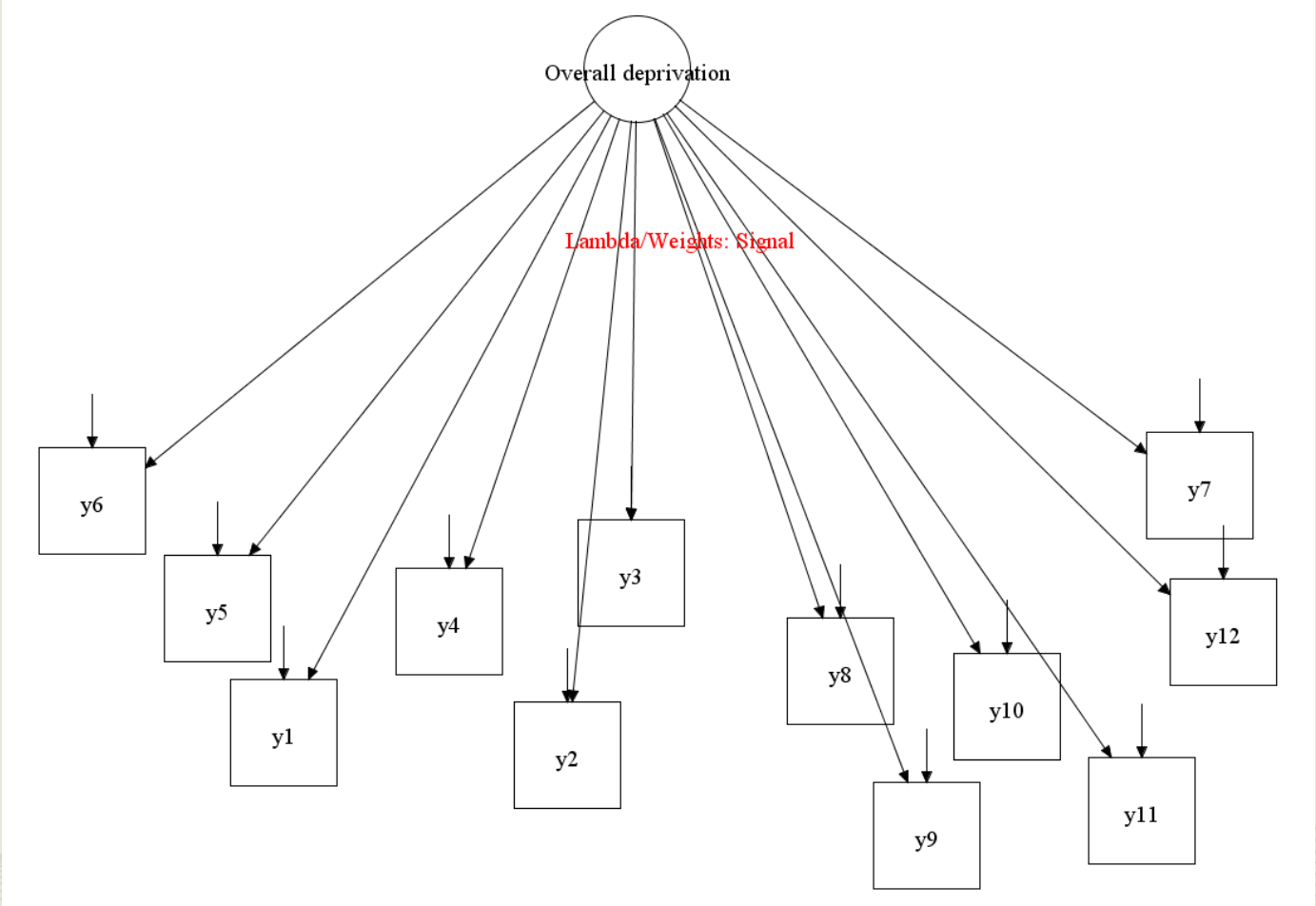
Moving from the theoretical model of measurement to its empirical scrutiny requires some technology that connects both worlds.

The framework of latent variables – structural equations – is a technology with more than 100 years of development



Modelos de medición

- Do all Y's capture the same signal?
- Do changes in thresholds affect the signal I capture?
- Is one dimension an adequate representation of the data?
- Are the weights equivalent or different? –Does it matter?-



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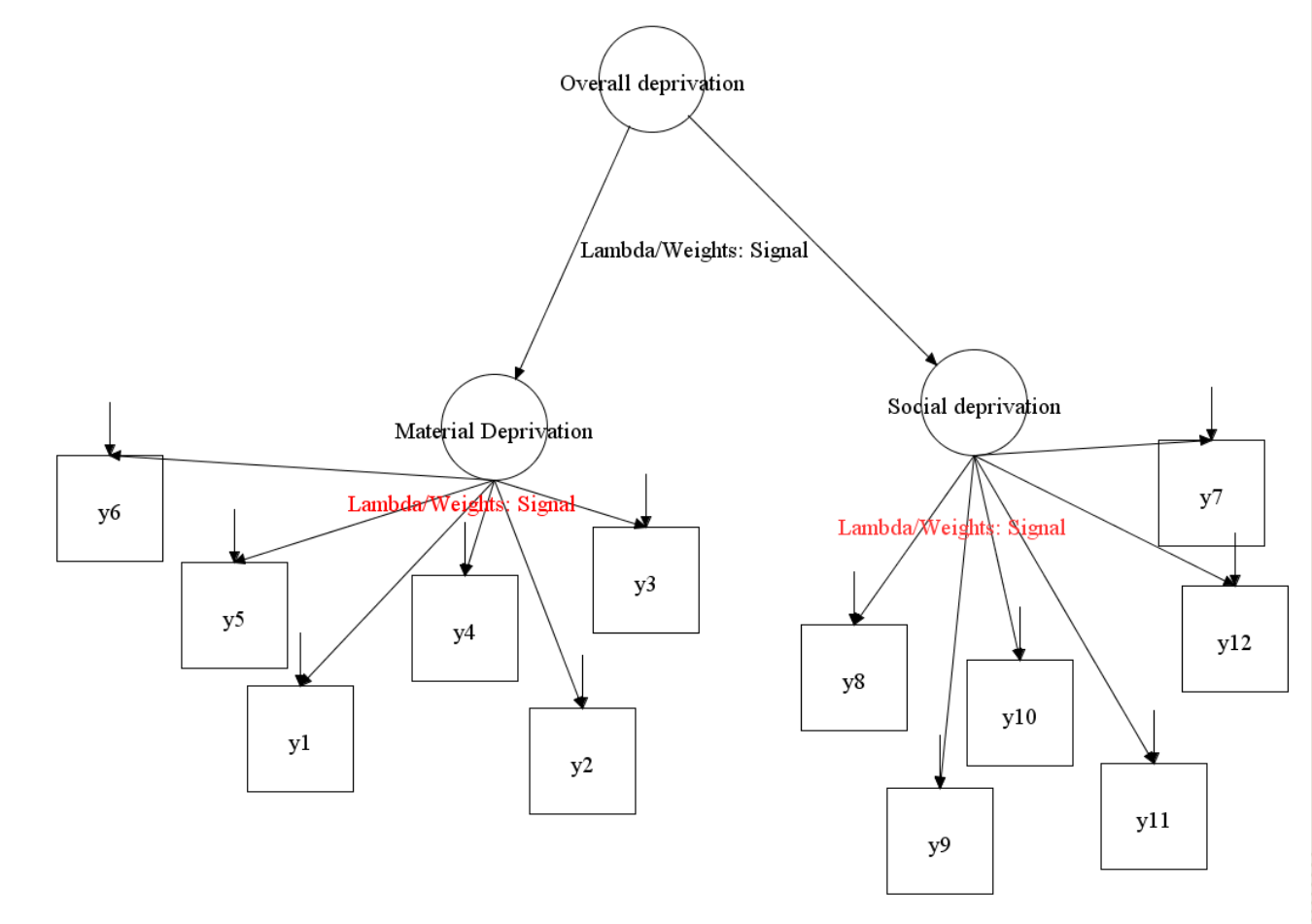
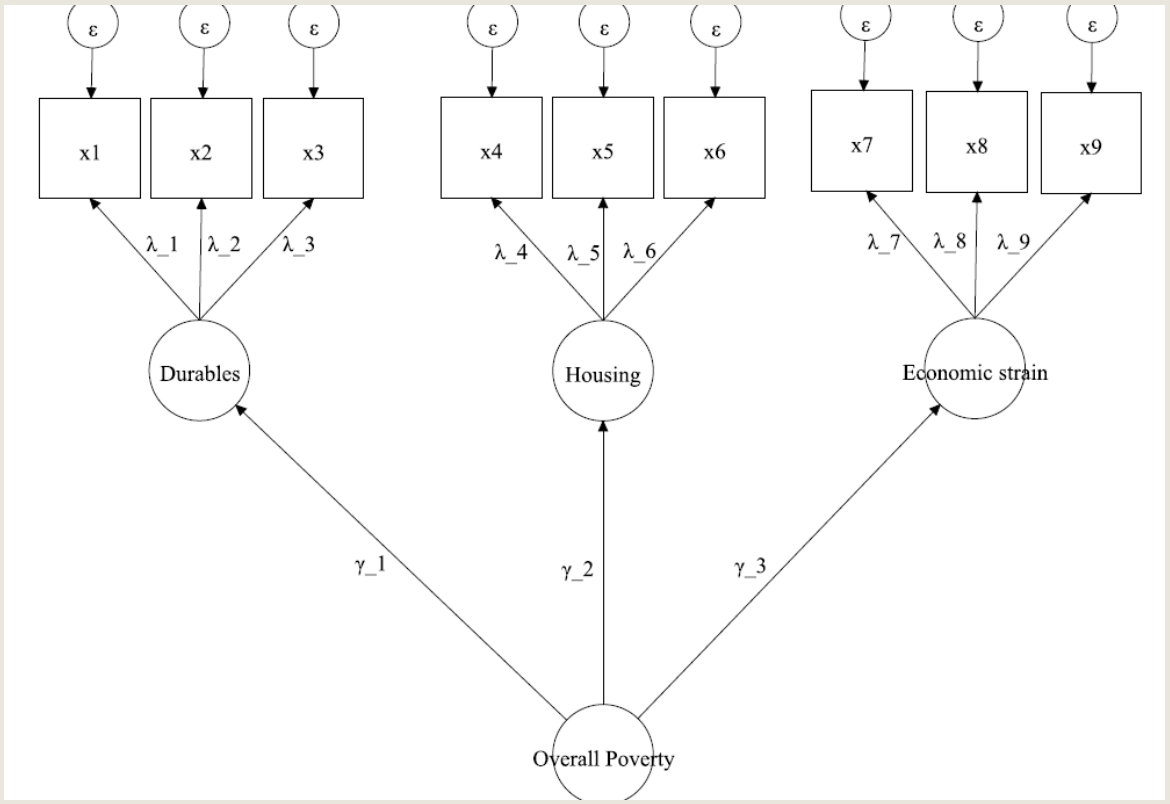
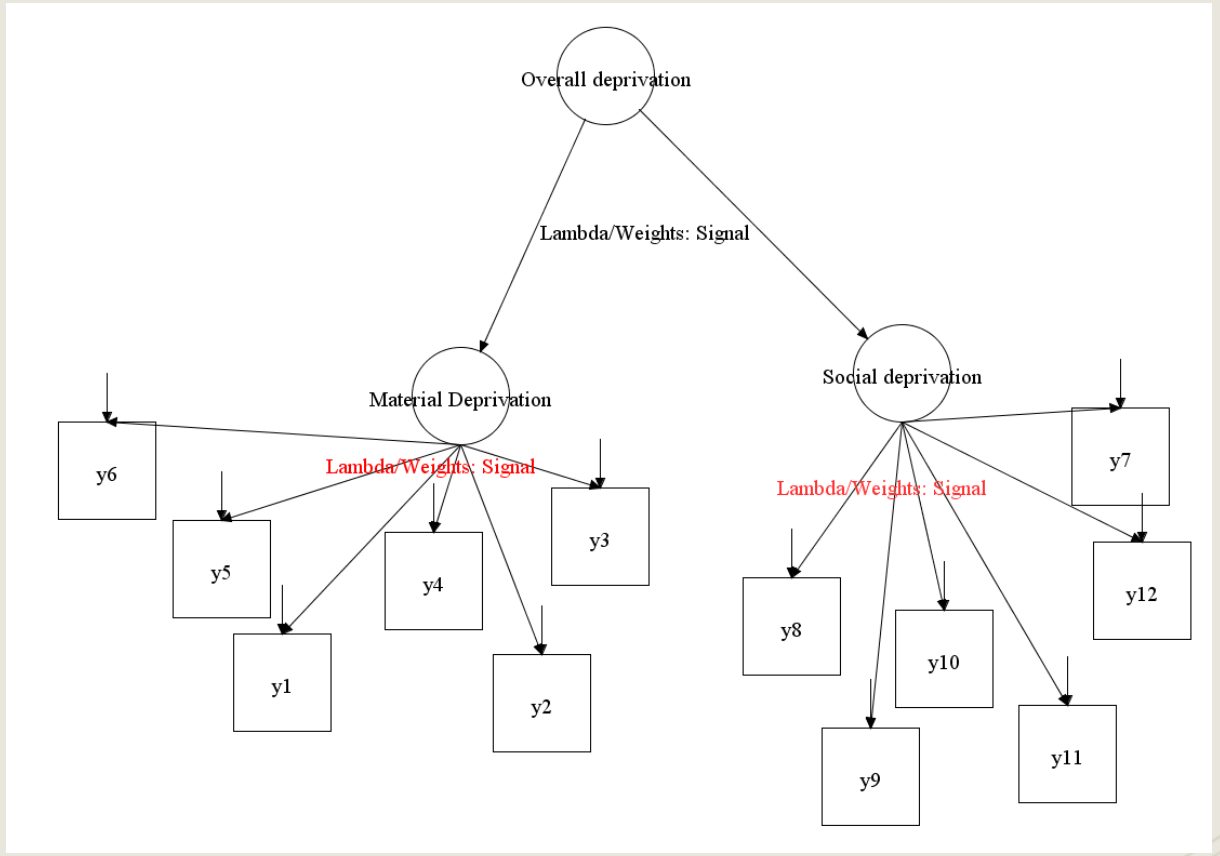


Mismos datos diferentes modelos





Which model is better? What assumptions harm which model?

Methods

Given a scientific definition of poverty and available information

Dimensions: D

Indicators: I

Thresholds: U

Weights: P

Poverty line: L

We don't want a model that leads us to a random distribution of observations, we want consistency and accuracy.

Measurement error

It is recognized that is unacceptable to work with high measurement error and the need to estimate the size of such error

Measurement error: All that signal that does not interest me –
The error of my measurement model-

That is, the measurement error is a product of the assumptions not of the readings themselves!

The error does not arises from the swab of the COVID-PCR test but from the series of principles that are behind the processing

How is it calculated? On what terms?

How is it calculated? On what terms?

In scientific measurement, the estimation of measurement error is systematic and standardized. It rests on the principles of validity – systematic error – and reliability – random error –

In the cutting-edge areas in social sciences the same principles are used and the methods have been unified (Structural equations and latent variables)

In the measurement of poverty there is still no agreement: ad hoc analysis of sensitivity vs estimation of measurement error

The problem with the first is that it does not allow us to know the fulfillment of the ideals indicated above – consistency and precision.

Can I ignore measurement error?

Ignoring the measurement error does not mean that it disappears

The classification (poor/not poor) is as good as our measurement

Cross-tabulations, estimation of small areas, reports on the poor/non-poor ratio will propagate measurement error

¿What is the central idea behind the estimation of measurement error?

Given a scientific definition of poverty

Dimensions: D

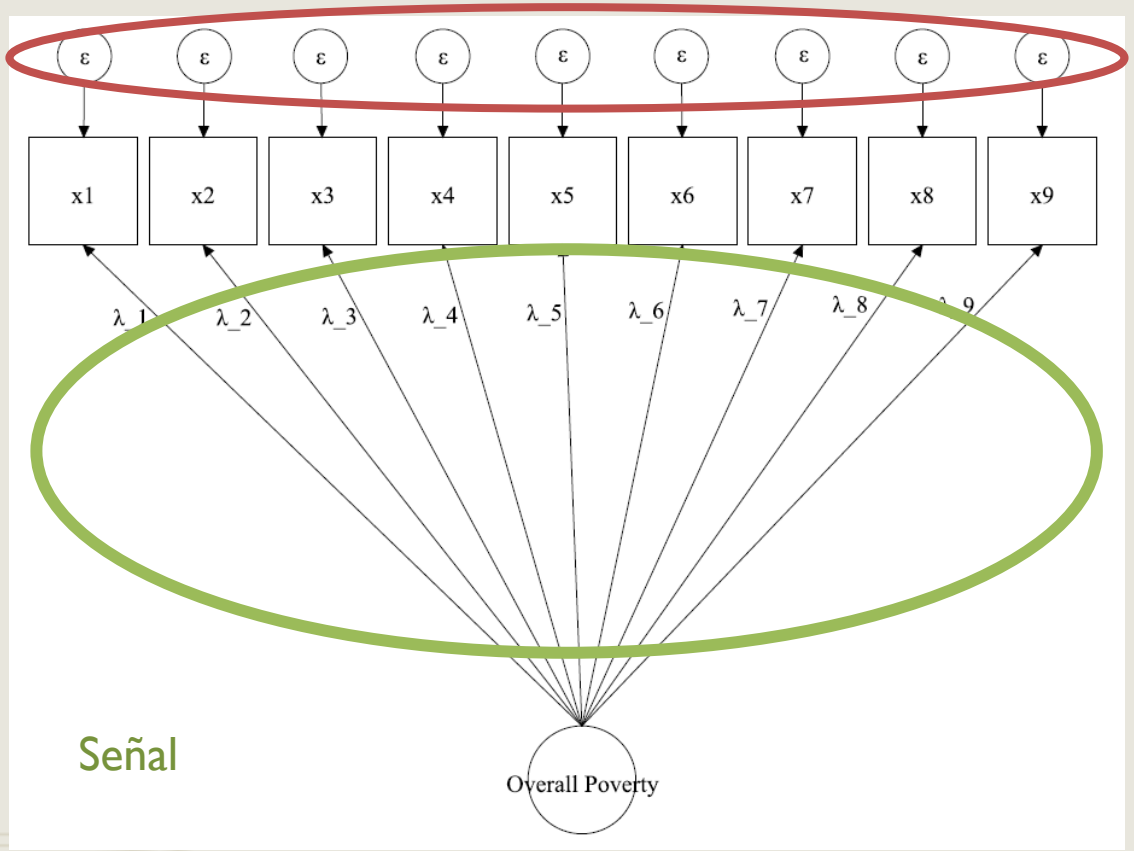
Indicators: I

Thresholds: U

Weights: P

Poverty line: L

Ruido



What proportion of the signal is due to the latent variable?

Is the ratio distributed equally for all variables?

Conclusions

Given a scientific definition of poverty and available information

Dimensions: D

Indicators: I

Thresholds: U

Weights: P

Poverty line: L

All the decisions I make regarding D, I, U, P and L result in a better or worse measurement

Good decisions start from a clear definition, high-quality data that is consistent with that theory, with well-defined thresholds and with a weight scheme that is consistent with statistical theory.

We will see examples of each of these aspects

How then can I estimate the measurement error?
That distance between what I set out to do and what I ended up doing via my assumptions.

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