IE CONNECT FOR IMPACT

Transforming the Growth Potential of Transport Investments

Practical sampling

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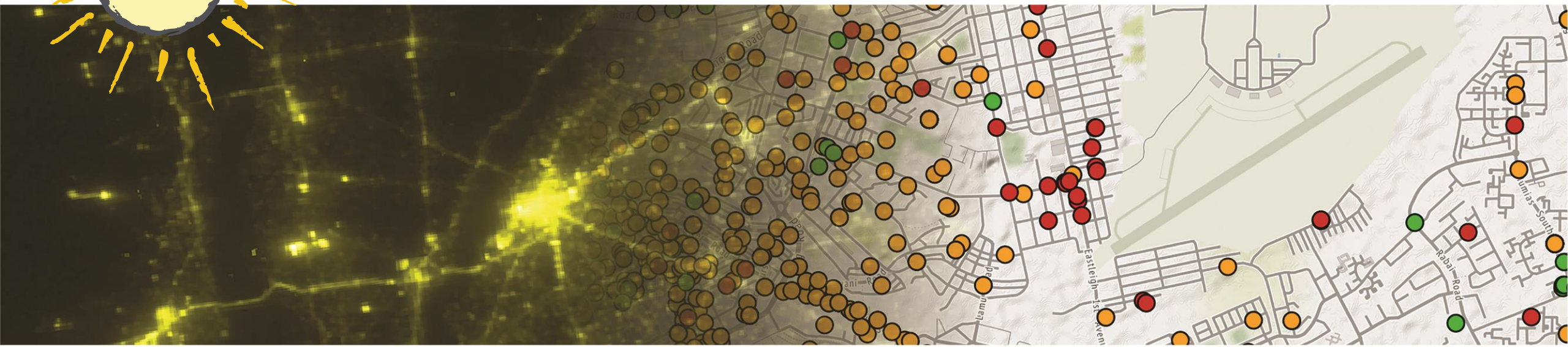
Marrakech, Dec 2019



i2i DIME TRANSFORM DEVELOPMENT

WORLD BANK GROUP Transport

SUSTAINABLE mobility FOR ALL

UKaid from the British people

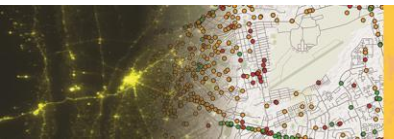
Is a sample always representative of the population?

No WAYS!

Is random sampling the same as random assignment of an intervention?

No WAYS!

Can sampling be fun?



No WAYS!

$$n = \left[\frac{4\sigma^2 (z_{1-\alpha/2} + z_{1-\beta})^2}{D^2} \right] [1 + \rho(m-1)][1-r]$$

This presentation covers two questions:

Why is sample size important?

- Approx time: 2 mins

How big should my sample be?

- Approx time: a lifetime of pain and anguish

Q1: Why is sample size important?

Why is sample size important?

Imagine you had to sample letters to “estimate” what the sentence says:

	S					M		
T	H					N		

Why is sample size important?

Imagine you had to sample letters to “estimate” what the sentence says:

	S	H		W		M		
T	H			M	O	N		Y

Why is sample size important?

Imagine you had to sample letters to “estimate” what the sentence says:

	S	H	O	W		M	E	
T	H	E		M	O	N	E	Y

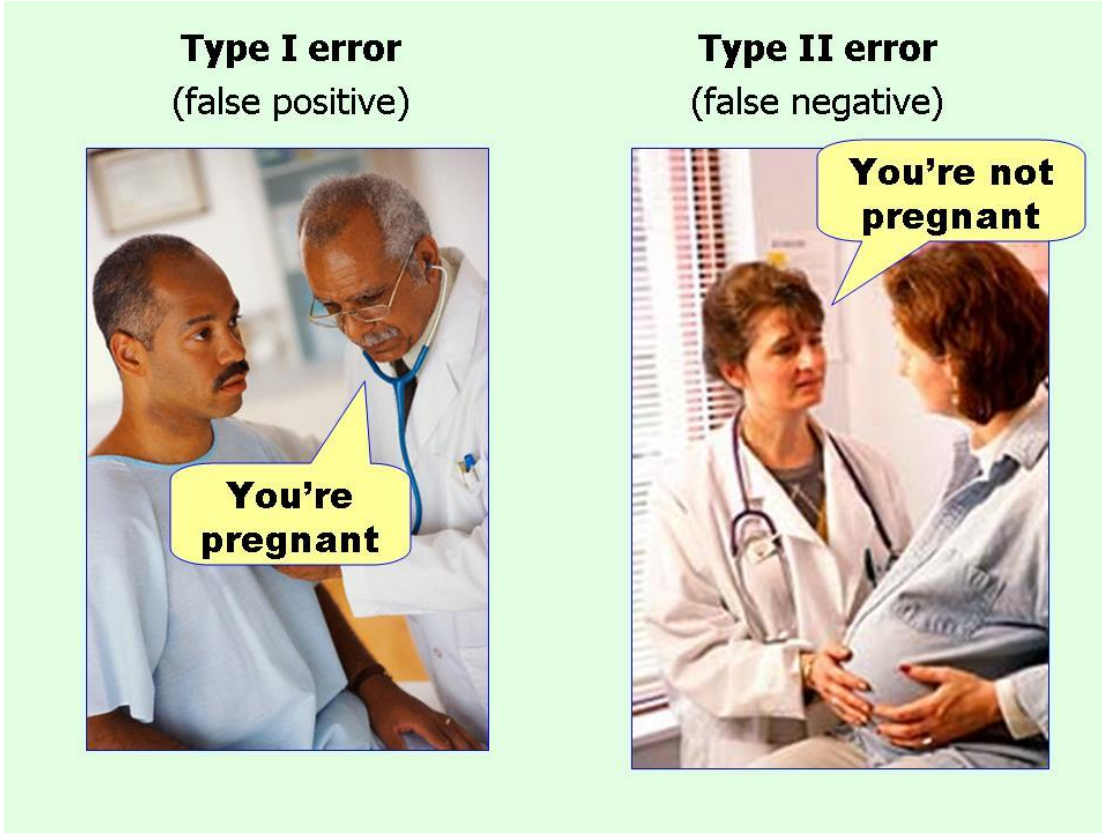
Why is it important for IE?

We want to know the true impact

But we need to estimate this impact from a sample

Estimation means we can sometimes make mistakes

Making mistakes can be costly…



Q2: How big should my sample be?

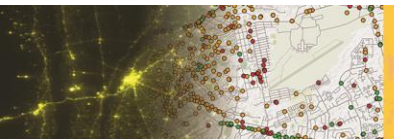
The answer is…

$$N = \left[\frac{4\sigma^2 (z_{\alpha/2} + z_{\beta})^2}{D^2} \right] \left[1 + \rho(H - 1) \right]$$

$$= 42$$

The End

- Questions?

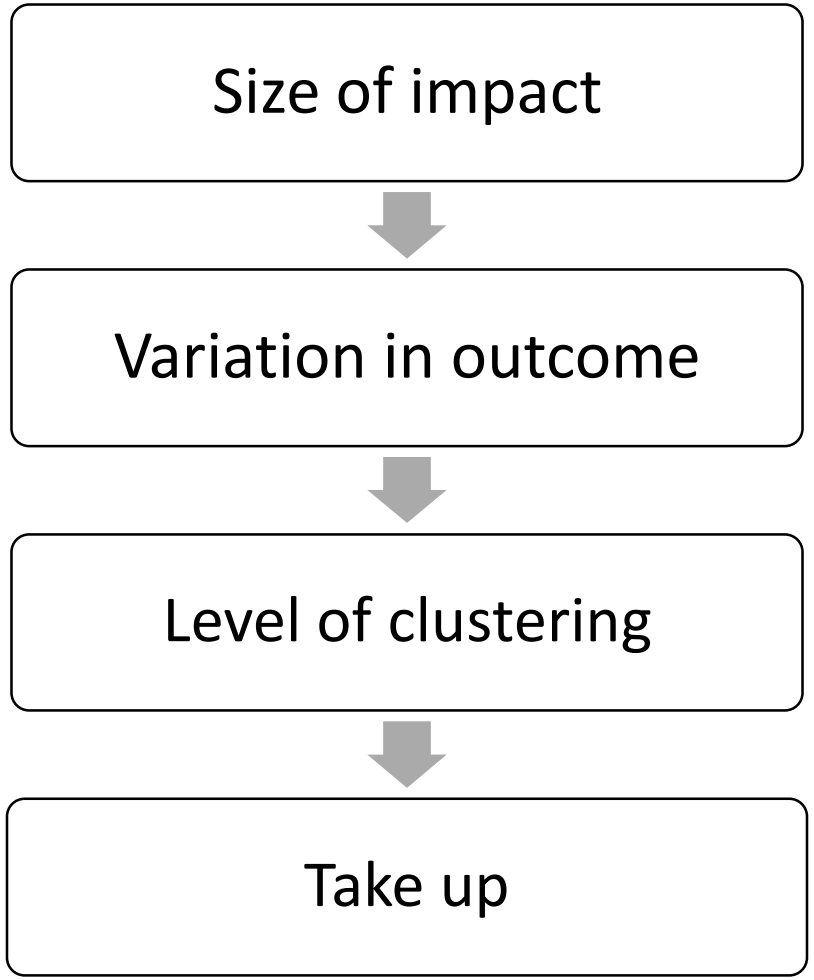


A better question…

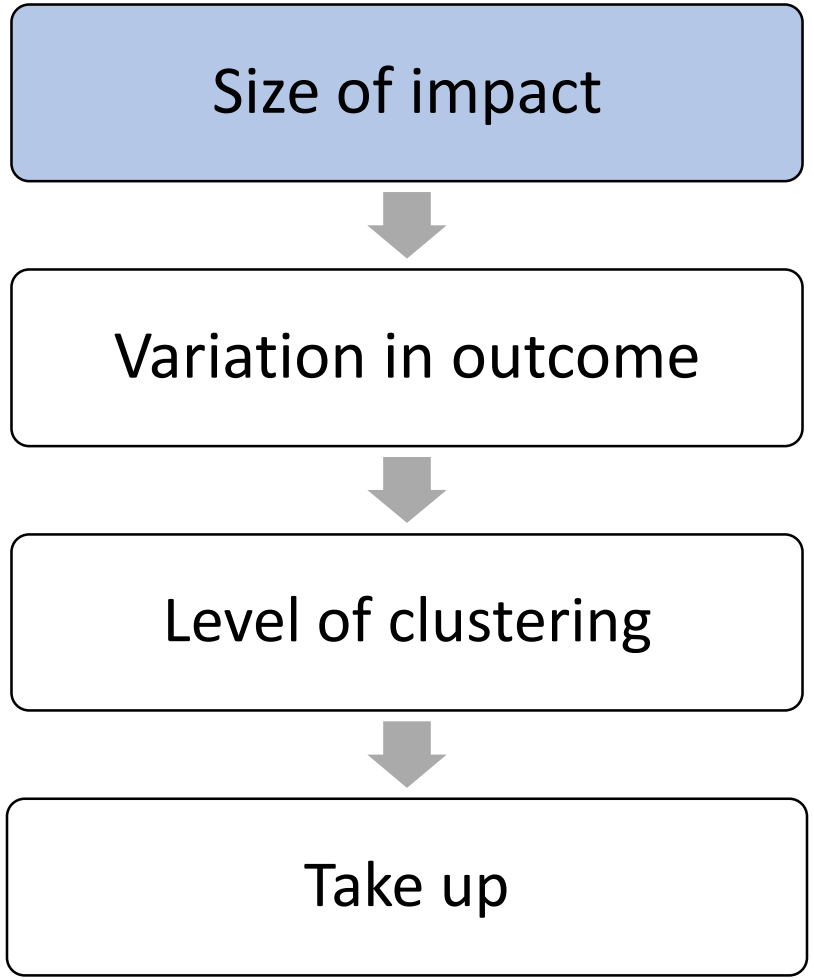
What influences the sample size I need?

- Size of impact
- Variation in outcome
- Level of clustering
- Take up

What influences the sample size I need?



What influences the sample size I need?



Size of impact

Big impacts are easy to identify

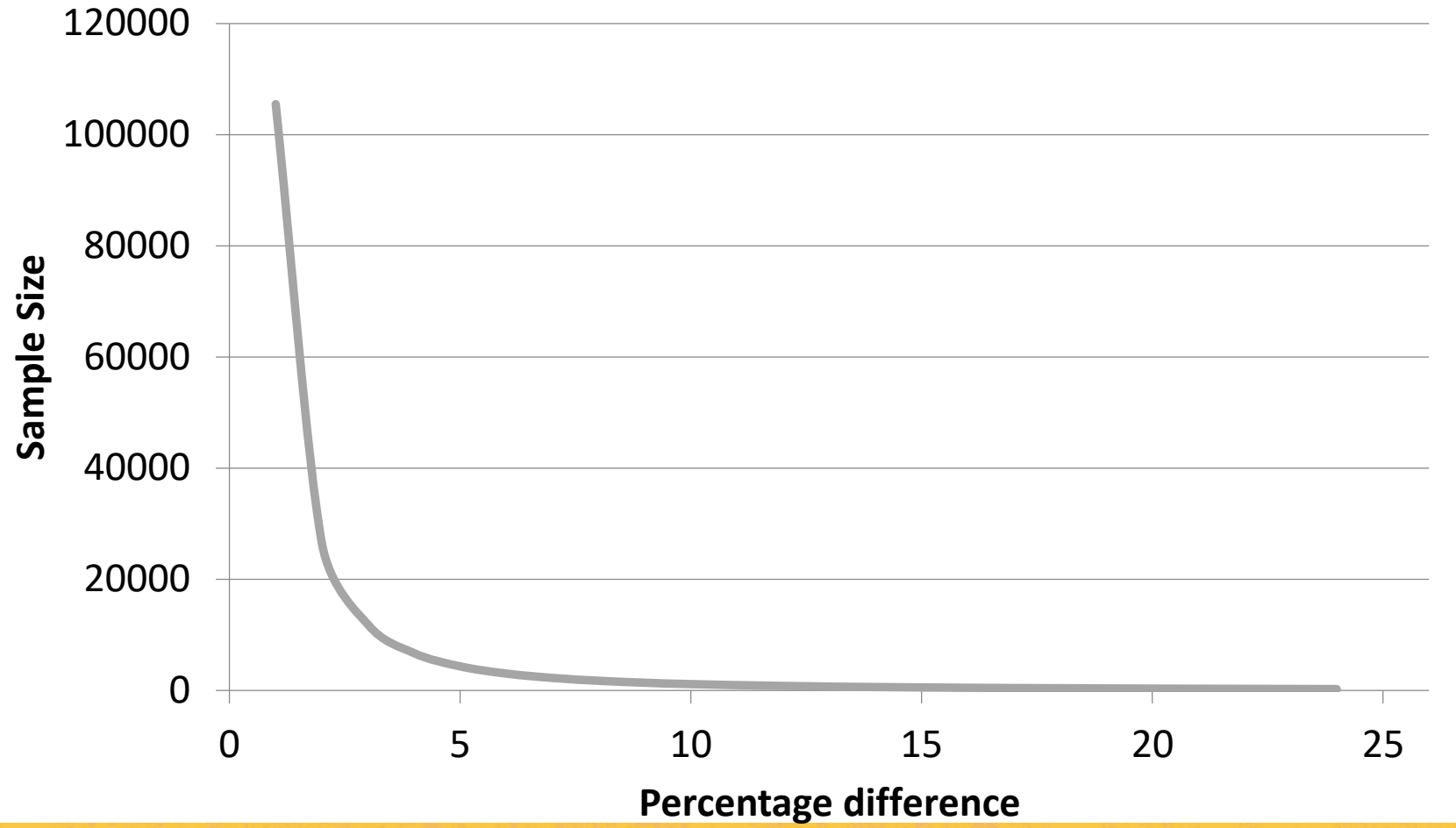
Small impacts are more difficult
Need more precision/accuracy
Larger sample needed

Minimum detectable effect

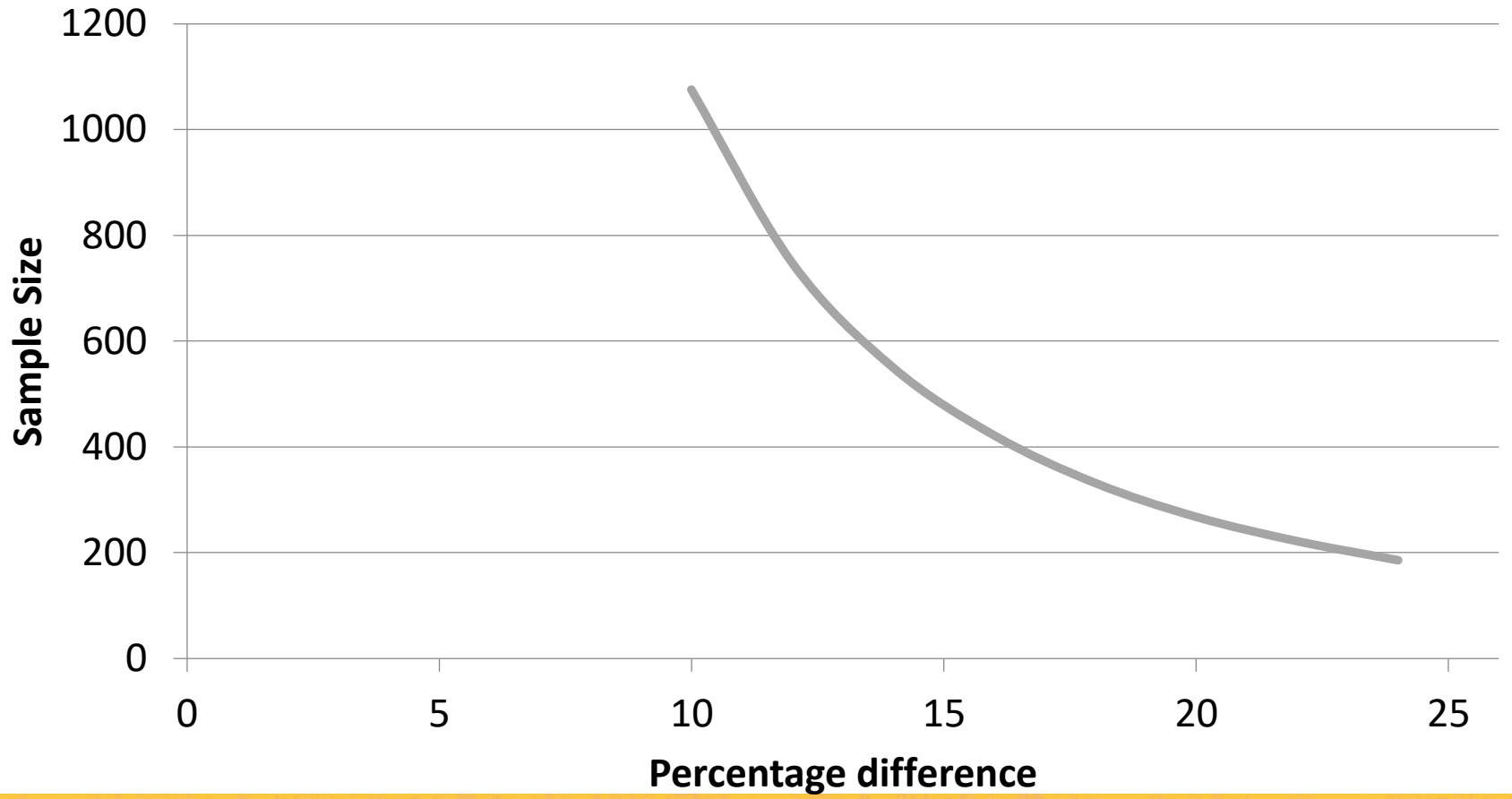
- We need a sample size able to detect the smallest effect size of importance.
- To guide this decision we need to ask:

"What is the smallest effect size that, if it were any smaller, the intervention would not be worth the effort?"

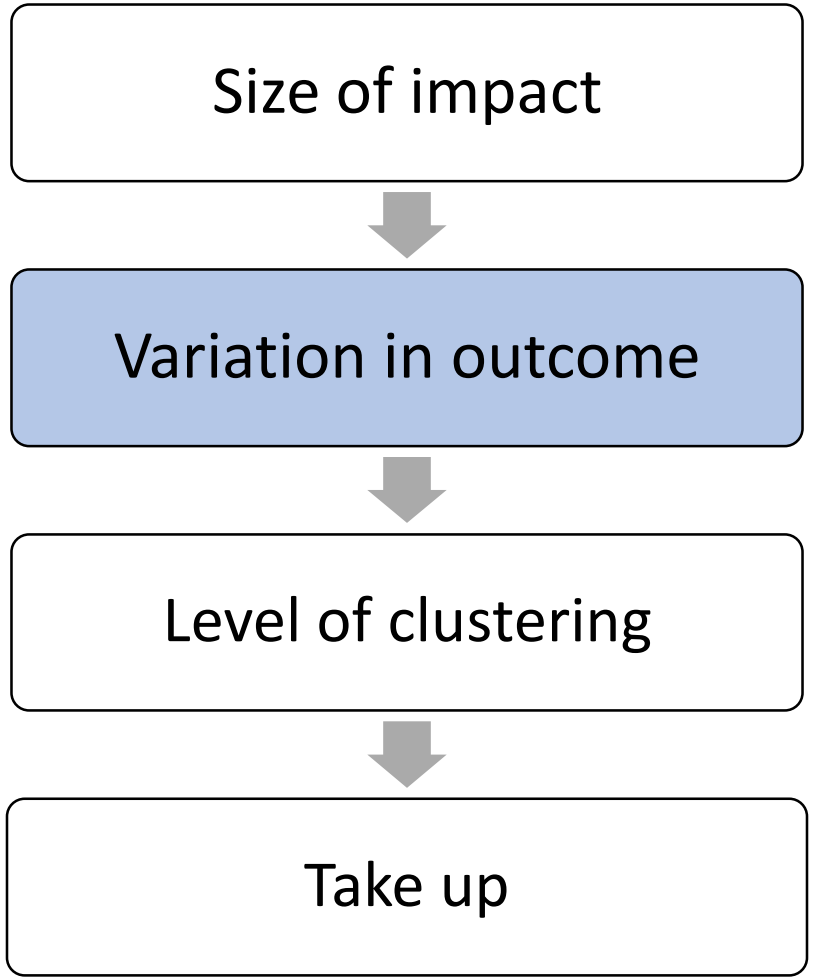
Mo money mo power



Need to be realistic

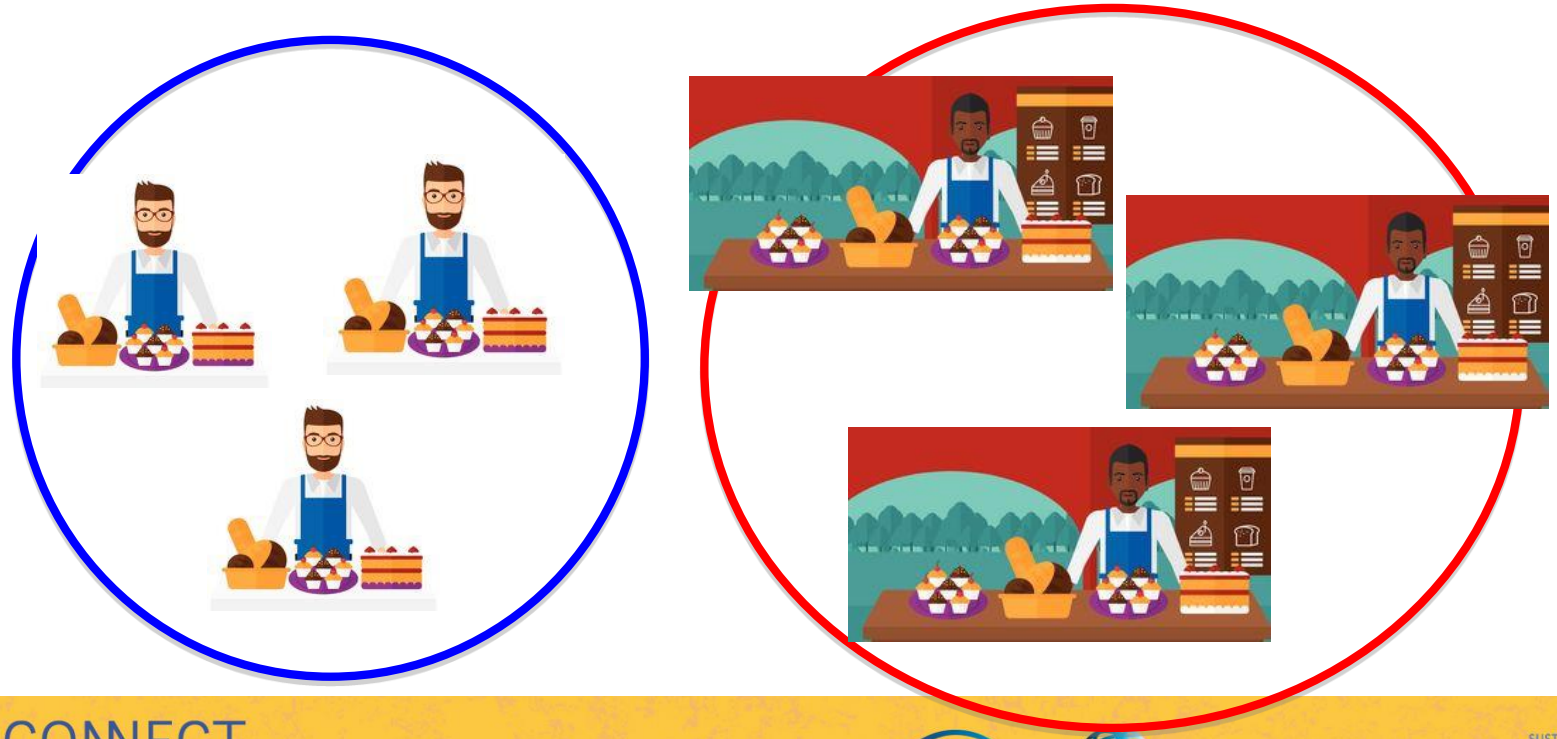


What influences the sample size I need?



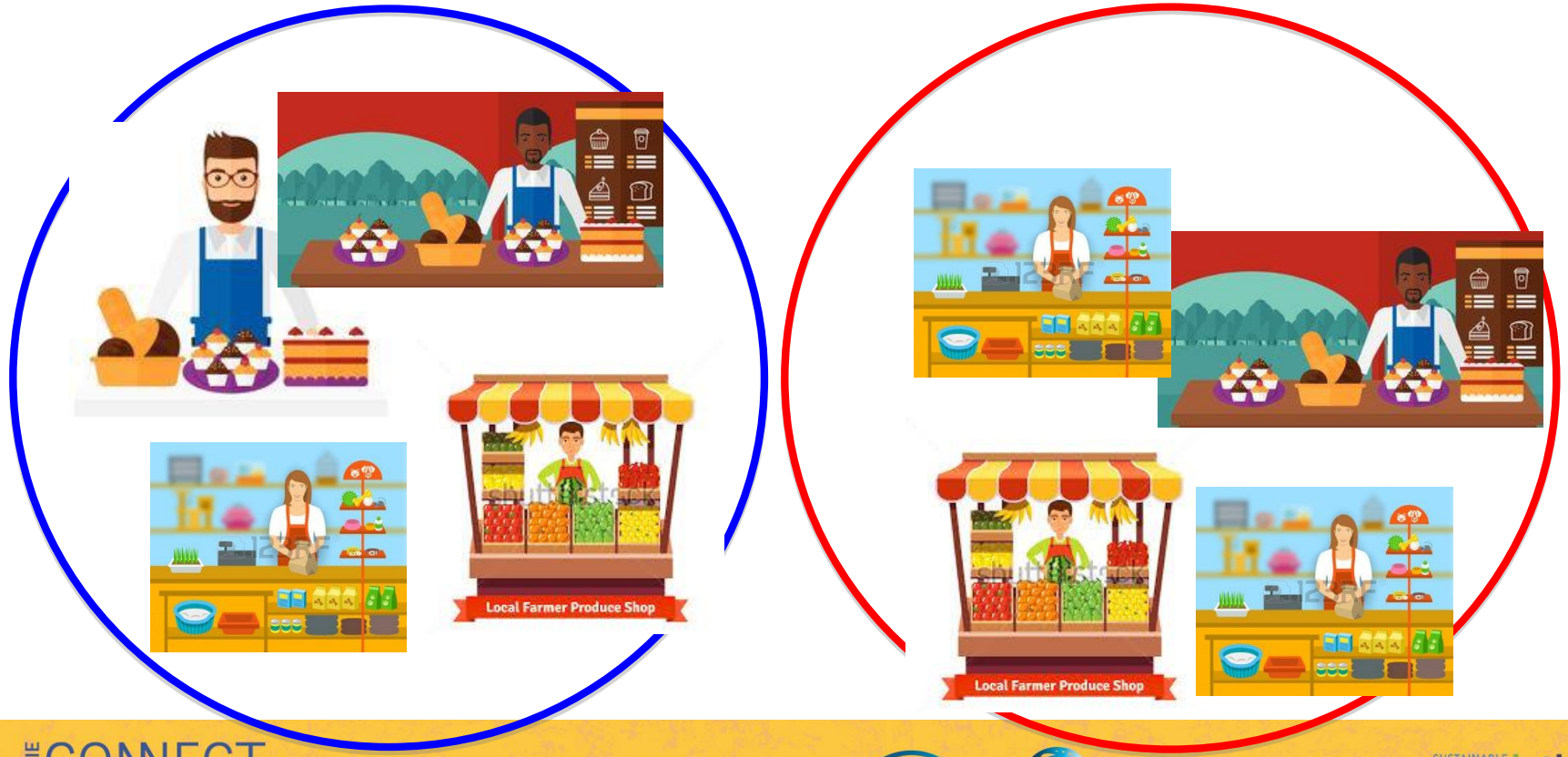
Which group has more to sell?

- How does the variance of the outcome affect our ability to detect an impact?

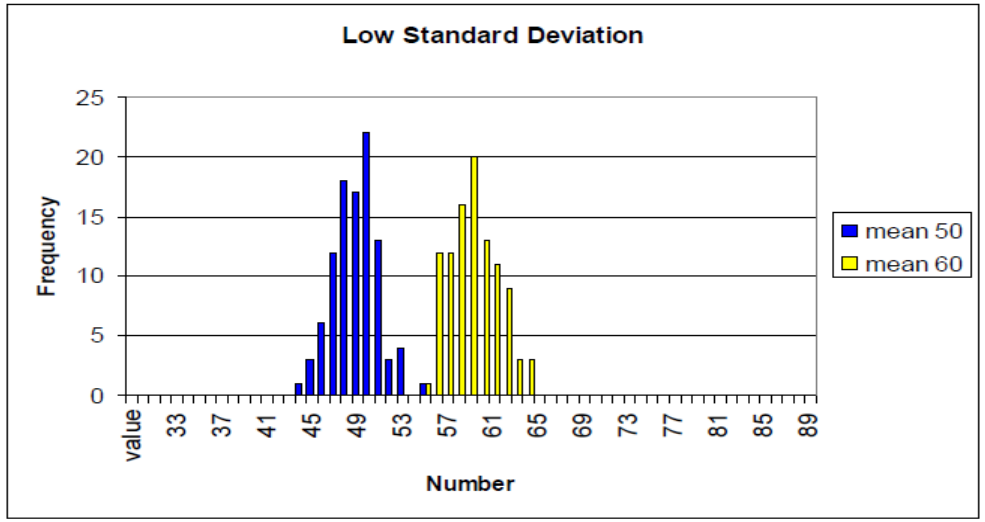


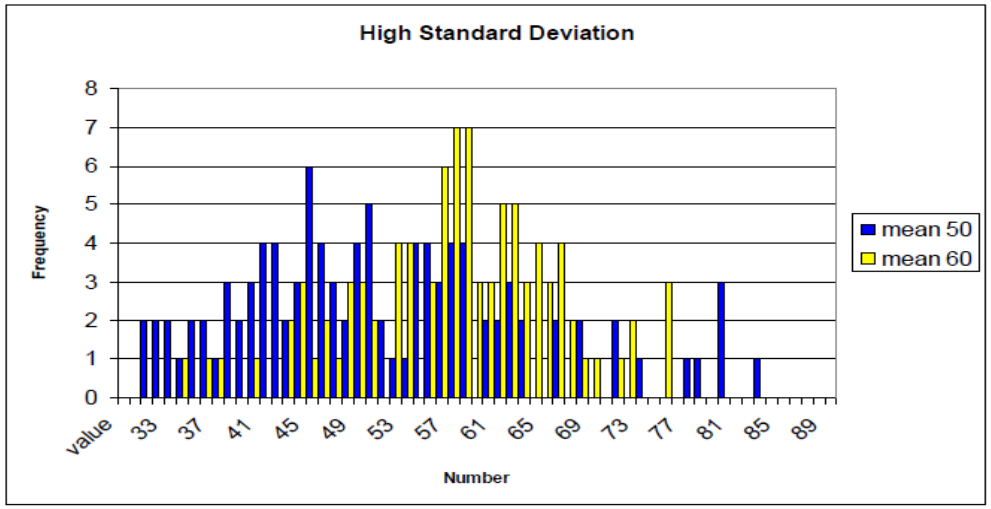
Now… which group has more to sell?

- How does the variance of the outcome affect our ability to detect an impact?



Which instance requires a larger sample?





Variation in outcomes (summary)

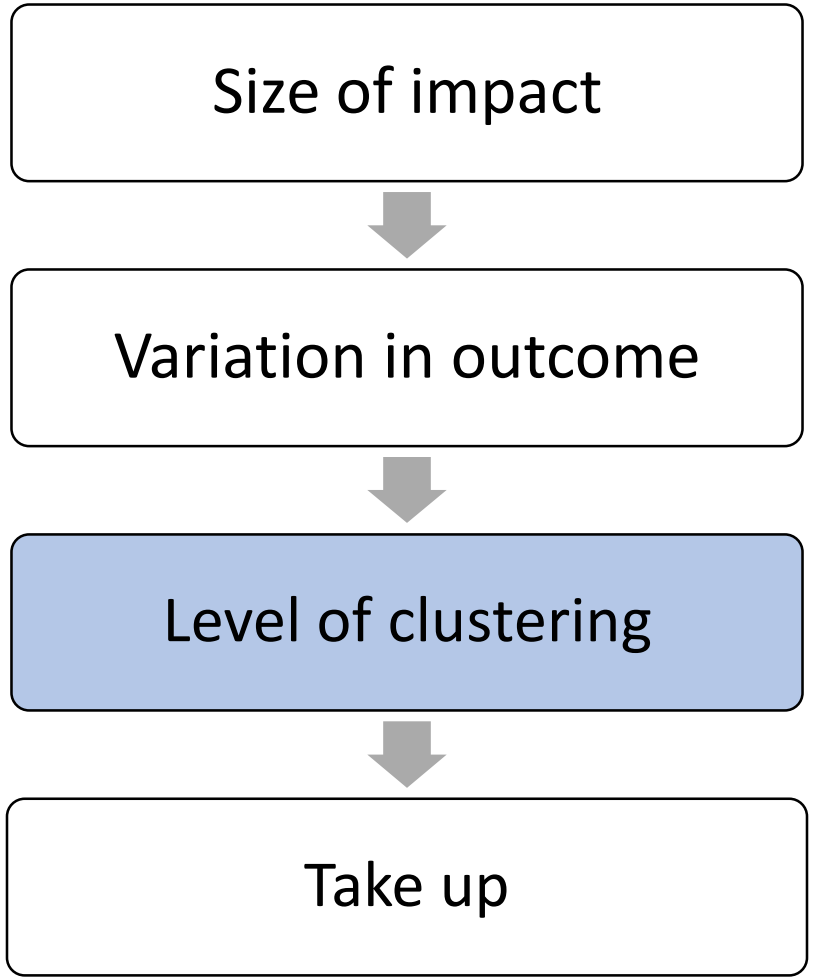
In sum:

- More underlying variance (**heterogeneity**)
- → more difficult to detect difference
- → need larger sample size

Tricky: How do we know about **heterogeneity** *before* we decide our sample size and collect our data?

- Ideal: pre-existing data … but often non-existent
- Can use pre-existing data from a *similar* population
- Example: enterprise surveys, labor force surveys
- Common sense

What influences the sample size I need?



Clustering (1/4)

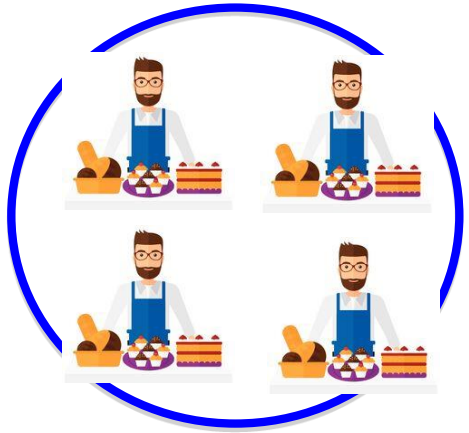
Sample size required increases, the higher the level of intervention assignment

- Business level
- Business group level
- Village/port/…
- Province?

Even if unit of analysis is the firm, if level of randomization is at province (cluster) level, we run into challenges quickly…

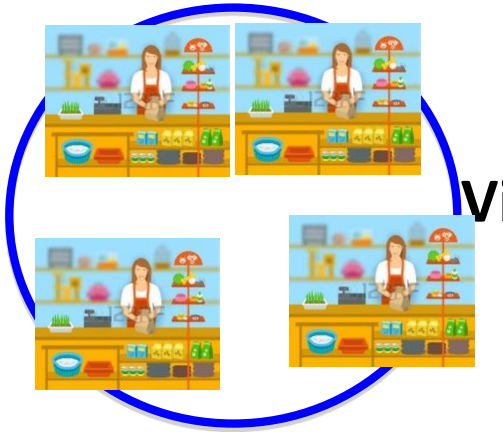
Clustering (2/4)

What is the added value of more samples in the same cluster?

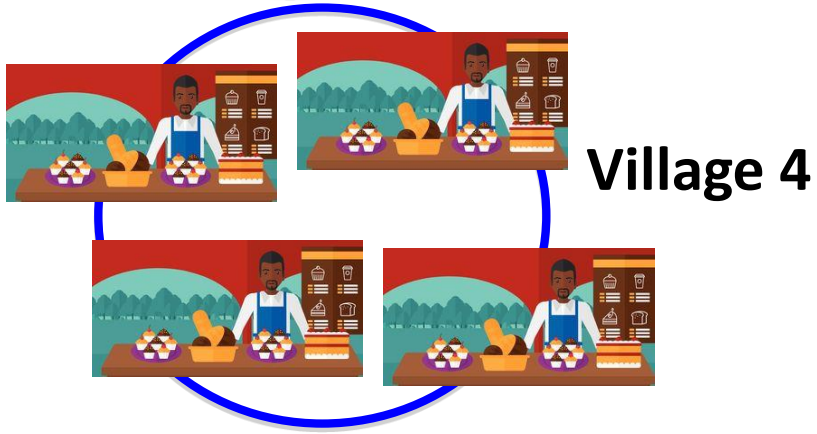


Village 1

Village 2



Village 3



Village 4

Clustering (3/4)

Village 1

Village 3

Village 2

Village 4

Clustering (4/4)

Takeaway

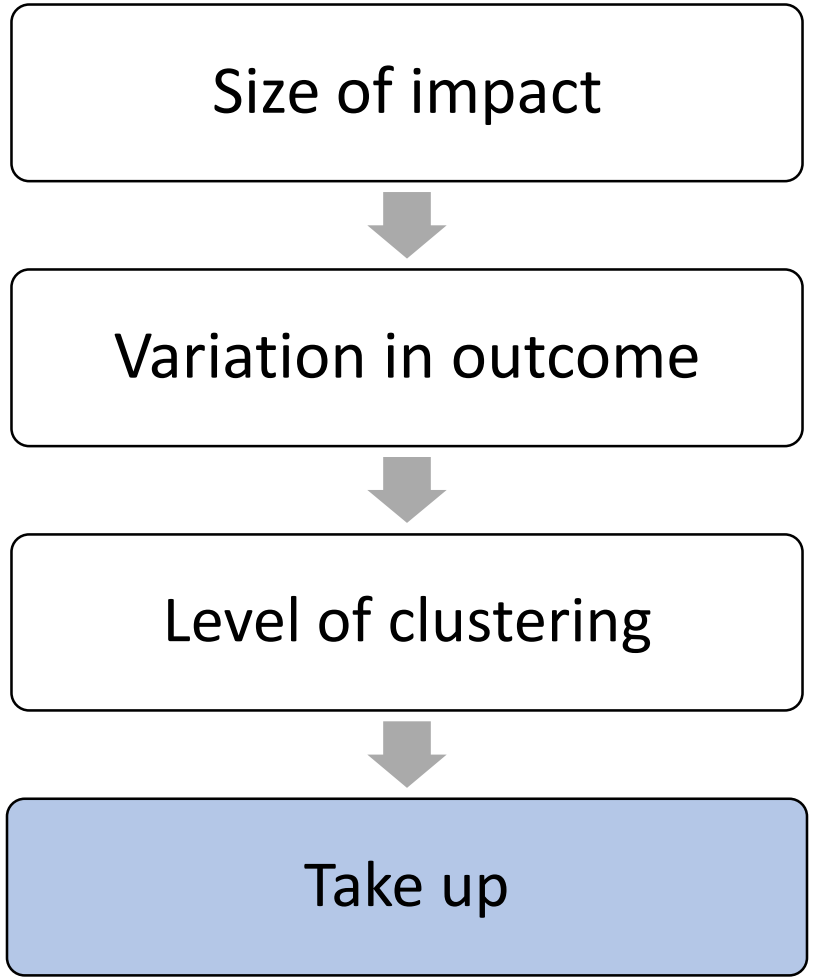
Larger *within cluster* correlation (guys in same cluster are similar)

lower marginal value per extra sampled unit in the cluster

higher sample size/more clusters needed than a simple random sample.

Rule of thumb: <u>at least</u> 40 clusters per treatment arm

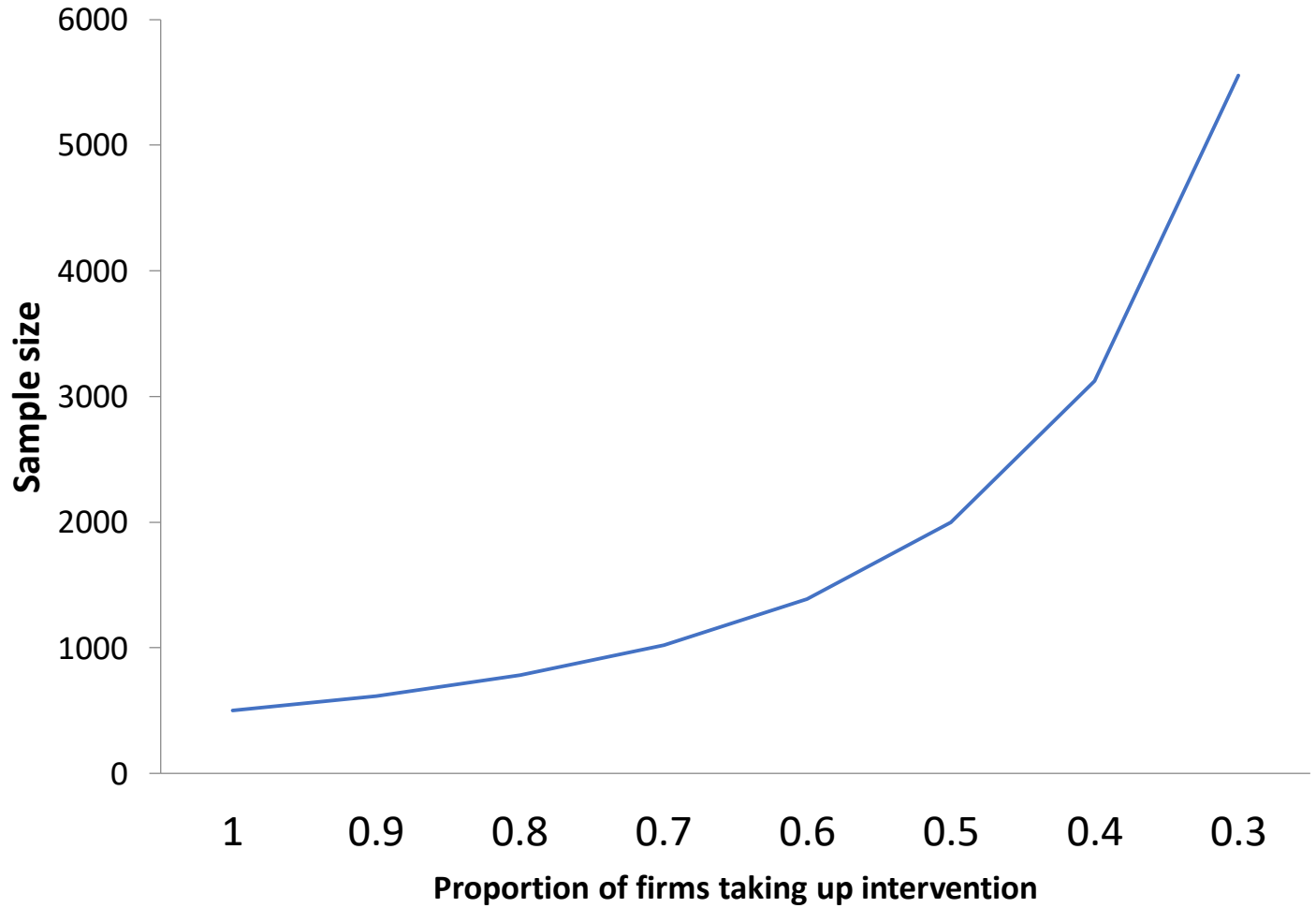
What influences the sample size I need?



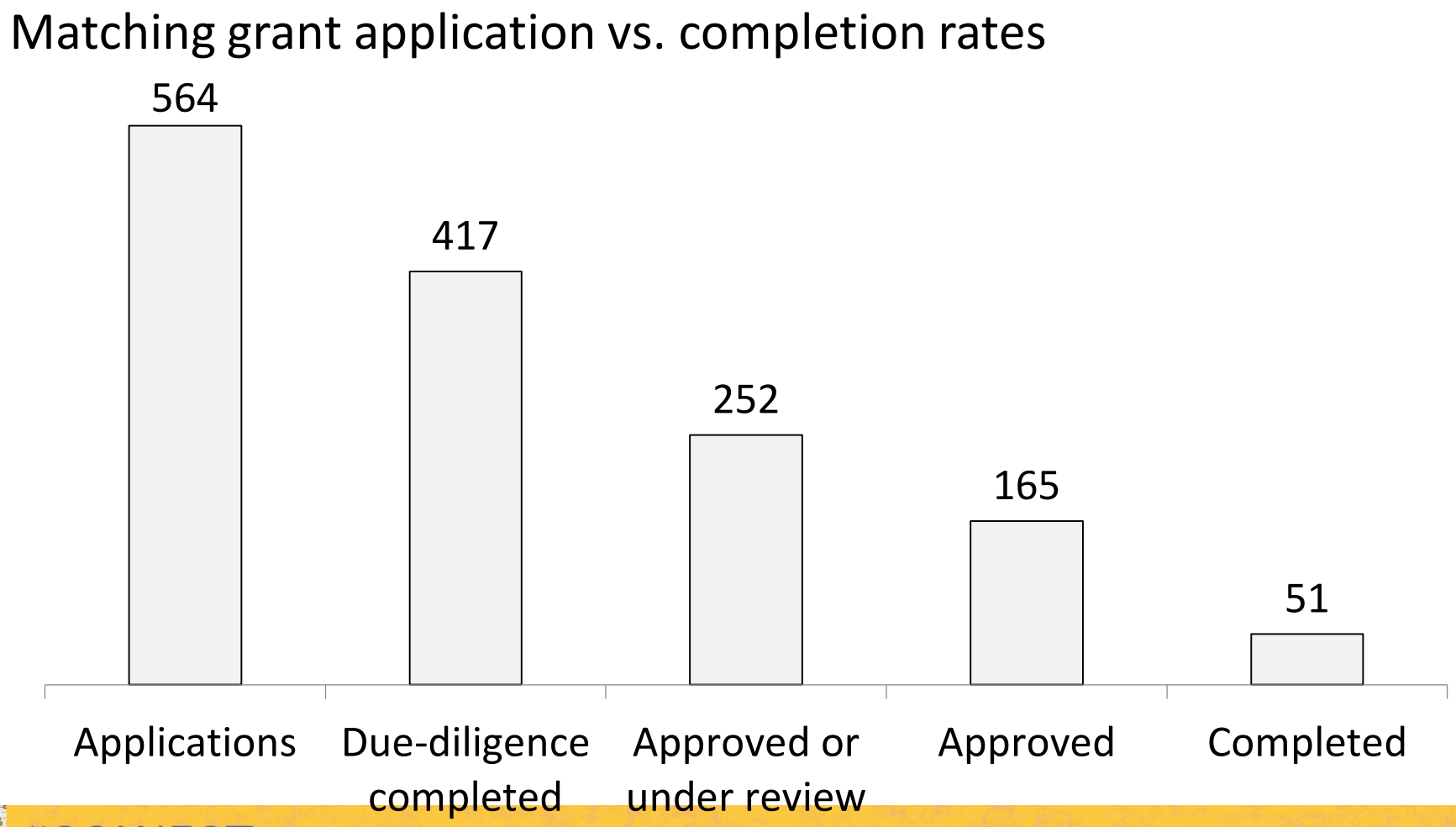

Oversubscription


Over-optimistic

Take up vs. sample size



A real-life example



Overview

- **Who** to interview is ultimately determined by our research/policy questions
- **How Many**:

Elements:	Implication for Sample Size:
The **smaller effects** that we want to detect	The **larger** the **sample size** will have to be
The more underlying **heterogeneity** (variance)	
The more **clustering** in samples	
The lower **take up**	

How can we boost power

- Focus on homogenous group (if applicable)
- High frequency data on core indicators
- Increase take up
- better quality data (its worth it…)
- Avoid clustering where possible