

Index of personal travel impact: *an attempt to square the accessibility circle*

Tom Cohen

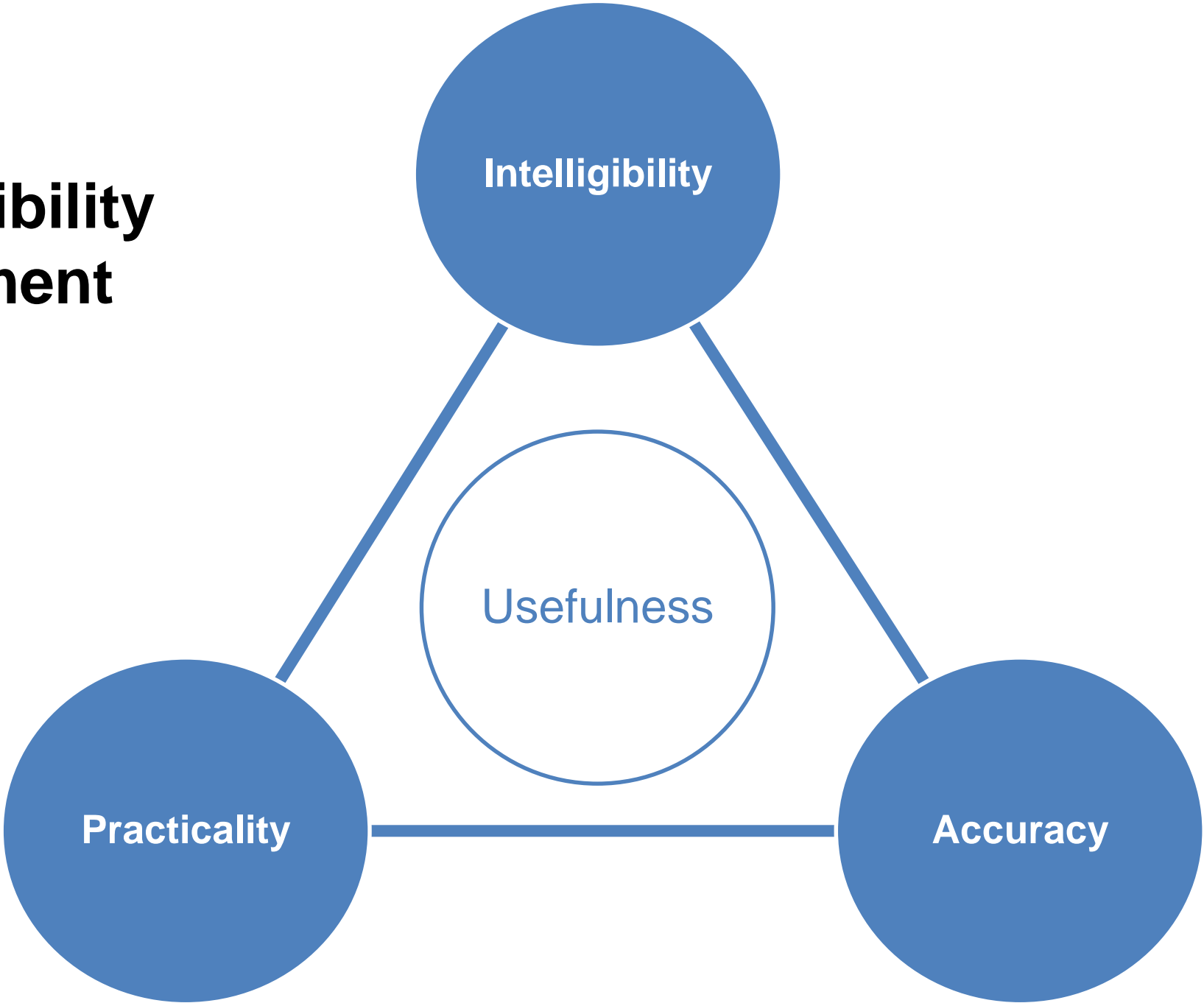
Visit to Technion, 9th February 2020

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Triangle of accessibility measurement



Another triangle of accessibility measurement

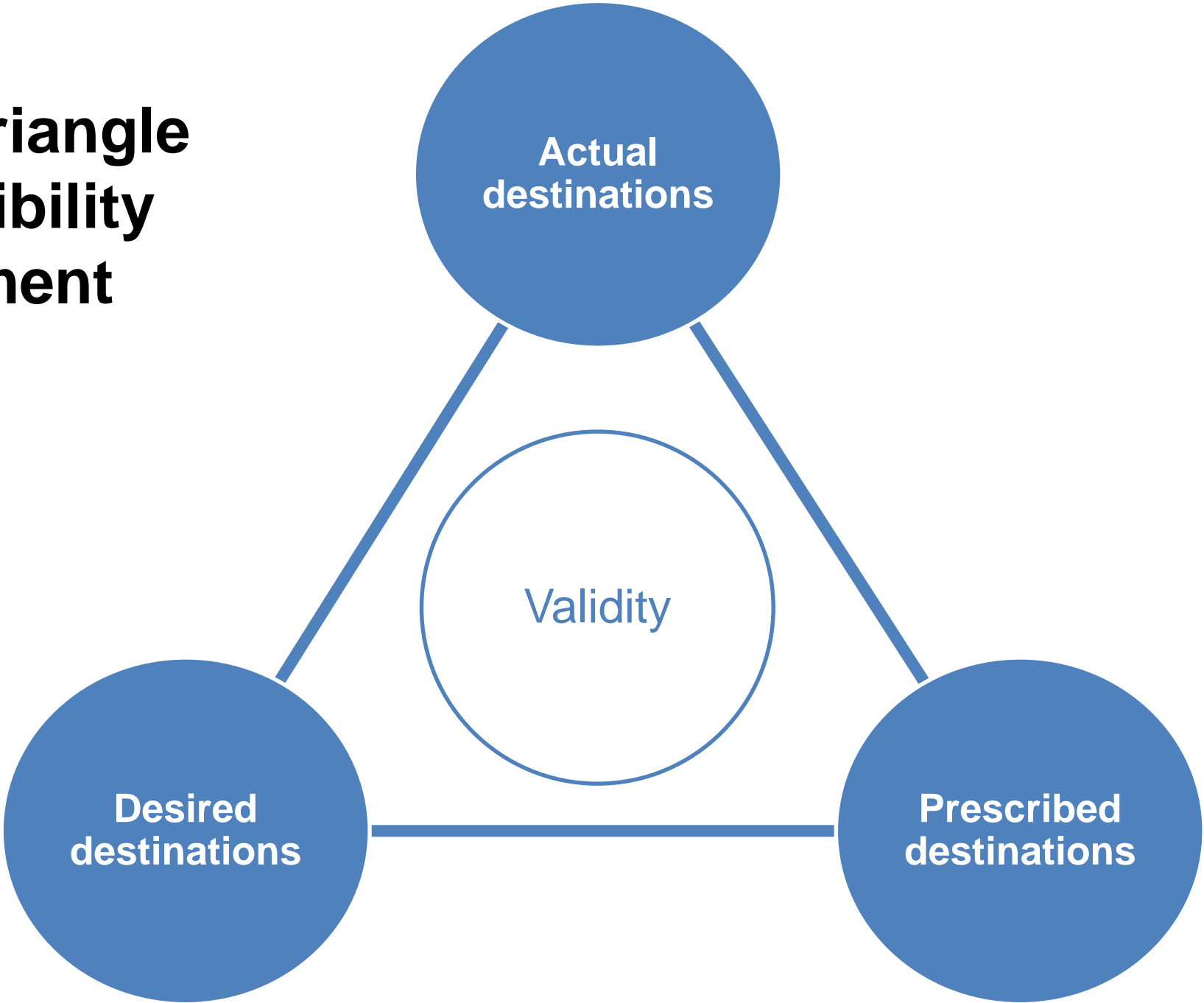
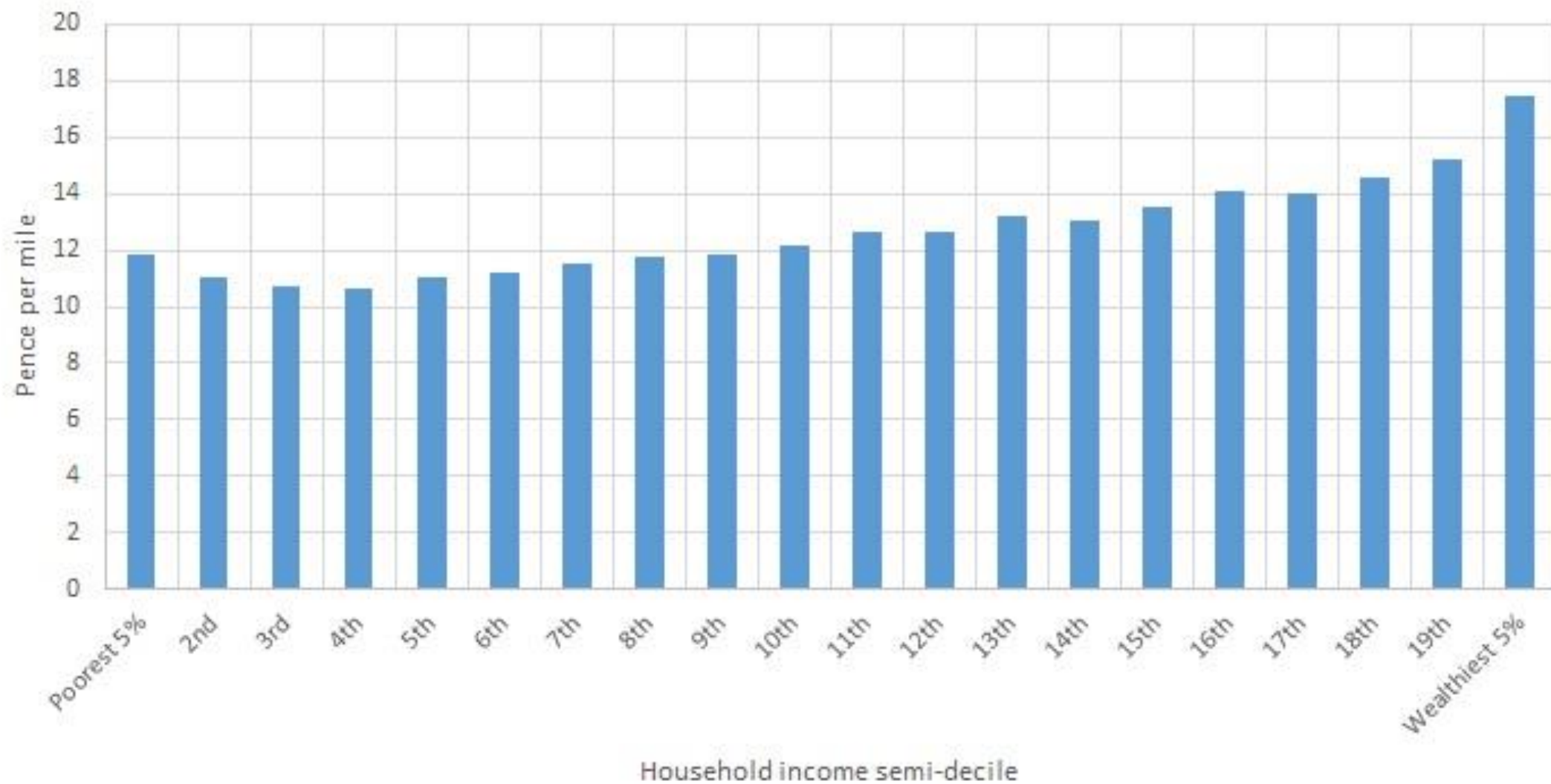


Table 2 Scope of Socio-Demographic Analyses for DIs (Step 2b)

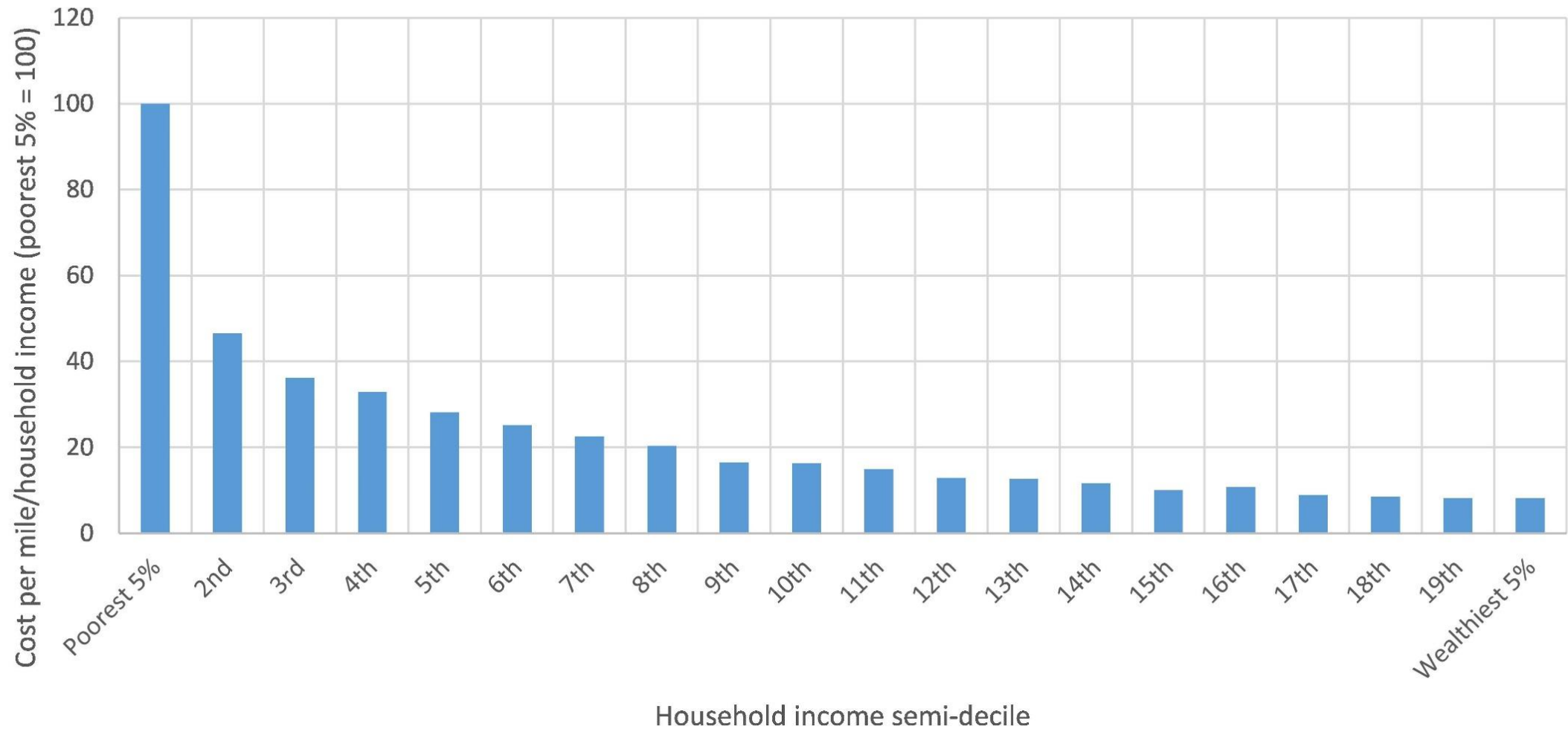
Dataset / social group (Ticks indicate analysis required for each impact)	User Benefits	Noise	Air quality	Accidents	Security	Severance	Accessibility	Affordability
Income Distribution (see below)	✓	✓	✓				✓	✓
Children: proportion of population aged <16		✓	✓	✓	✓	✓	✓	
Young adults: proportion of population aged 16-25				✓			✓	
Older people: proportion of population aged 70+		✓		✓	✓	✓	✓	
Proportion of population with a disability					✓	✓	✓	
Proportion of population of Black and Minority Ethnic (BME) origin					✓		✓	
Proportion of households without access to a car						✓	✓	
Carers: proportion of households with dependent children							✓	

Source: UK Department for Transport

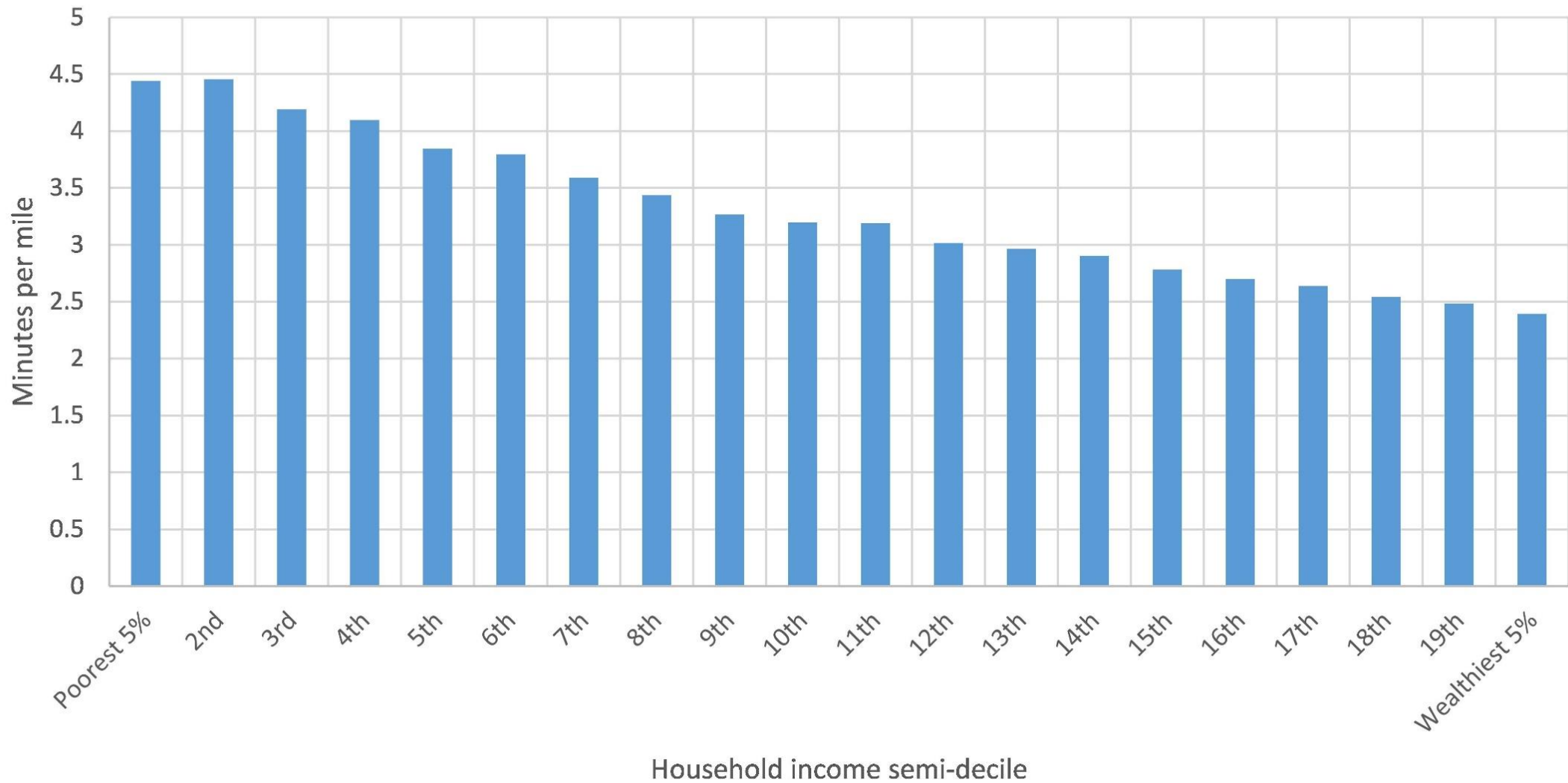
Mean cost of travel per mile by income band



Mean cost of travel per mile as proportion of household income, by income band



Mean travel time per mile by income band



Generalised cost (GC)

- The (artificial) sum of the monetary and non-monetary costs of a journey

Monetary	Non-monetary
Fare on a public transport (or taxi) journey	“In-vehicle” time
Costs of fuel	Walking time
“Wear and tear”/depreciation; insurance	Waiting time
Parking charge, toll or congestion charge	“Interchange penalty”

Two dominant aspects of GC

- Financial cost
 - Fares/charges paid
 - Vehicle operating costs
- Time spent travelling
 - Door to door

“Personal travel impact” of a trip

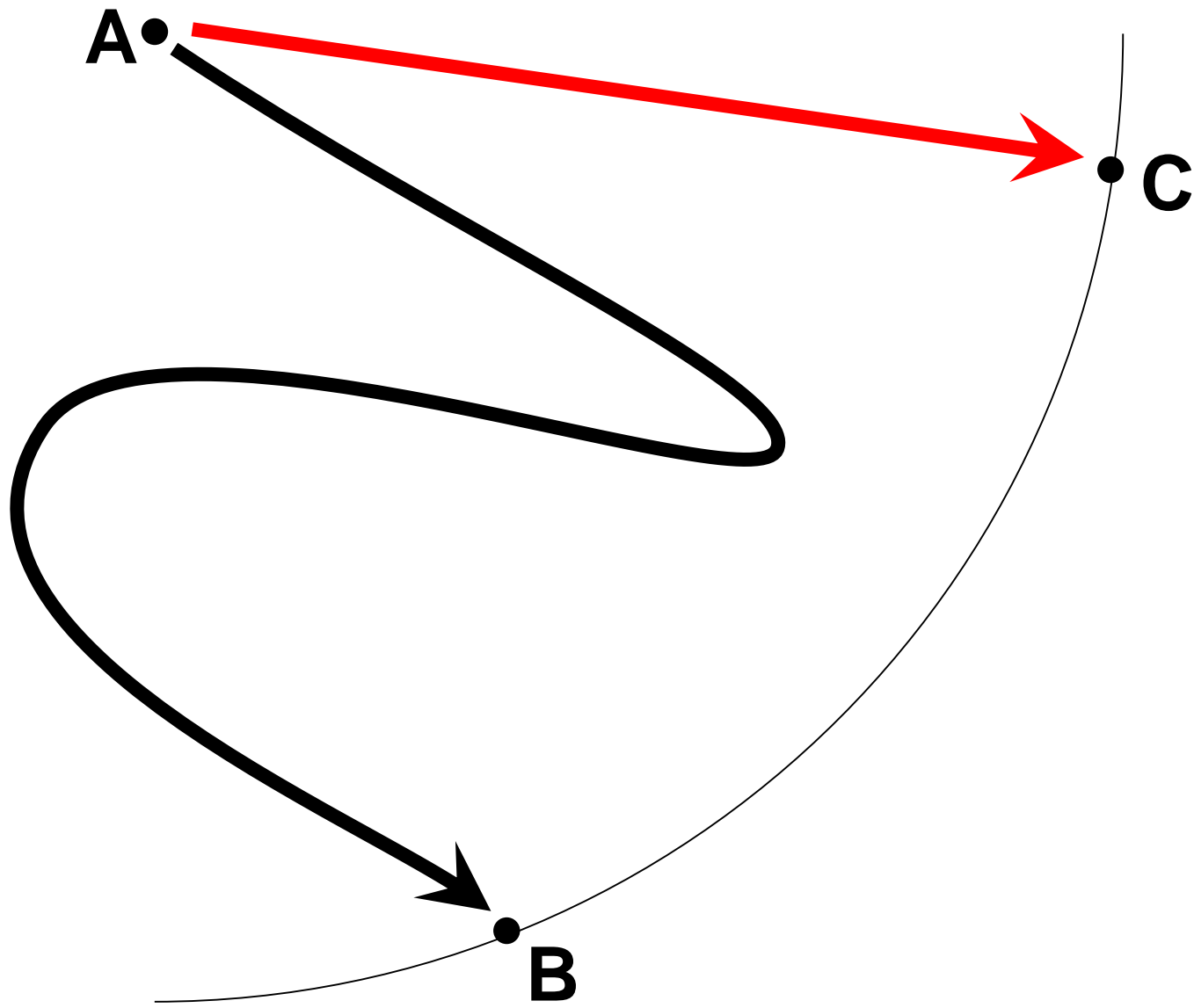
- Adjust financial impact for income
- Combine adjusted financial impact with time:

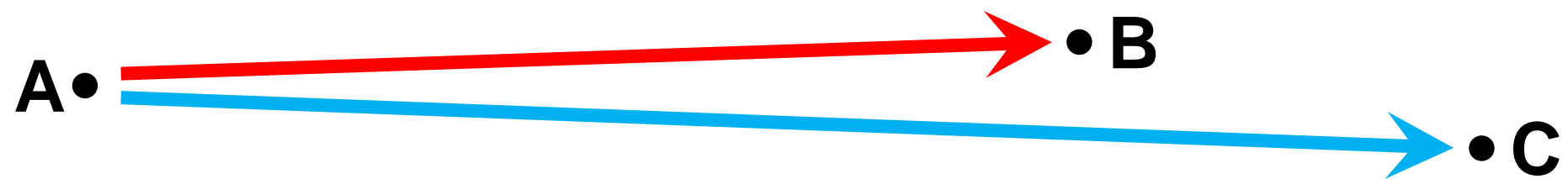
$$\textit{Cost} + V \cdot \textit{Time}$$

- Where V is value of time

Index of personal travel impact (IPTI)

- Sum across x representative **desired** journeys
- Divide by total crow-flies distance





Or, as a formula:

$$I = \frac{\sum_j t_j + \frac{N}{V \cdot i} \sum_j c_j}{\sum_j d_j}$$

Where:

t_j is the door-to-door journey time of the lowest-impact feasible option for trip j

c_j is the absolute financial cost of the lowest-impact feasible option for trip j in terms of fares paid, vehicle running costs etc

N is the average (annual) personal income of the area under consideration

V is the prevailing value of time

i is the individual's (annual) income

d_j is the crow-flies distance between the origin and destination of trip j



Surveys



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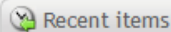
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Questions



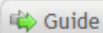
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Guide

The following steps are recommended for your survey:

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- [Add conditional branching](#)
- [Customize look and feel](#)
- [Set privacy and behavior](#)

[Understanding your travel needs and wishes](#)

Section 1

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Thank you very much for taking part in this survey. We will use your answers to help make the future provision of transport fairer for everyone.

We need you to tell us about **between five and ten journeys** you either need to make or would like to make. So there is no need to give us a complete record of your travel.

One really important thing

This survey is about both the journeys you currently need to make *and the journeys you would like to make if you could*. Please bear this in mind as you answer the questions and tell us about those journeys too. Perhaps you'd like to visit a friend but the journey is too expensive or is not possible given current transport services. Perhaps you've always wanted to go to...you tell us!

It should take you approximately ten minutes to complete the survey; the exact time will depend on how many journeys you tell us about.

Please be assured that we'll treat all information you give us in the *strictest confidence*. To ensure you are protected, we want to make sure you remain anonymous, so you'll see at various points that we ask you not to be specific about locations.

[[Edit](#) | [Delete](#)]

..... page break

Section 2

[Edit](#) | [Delete](#)

Background questions

[[Edit](#) | [Delete](#)][New question](#) | [New question from library / other surveys](#)

Question 1

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1. Please tell us your home postcode. *We will treat this in the strictest confidence.*
If you don't know your postcode, please tell us the town and street name of your home.

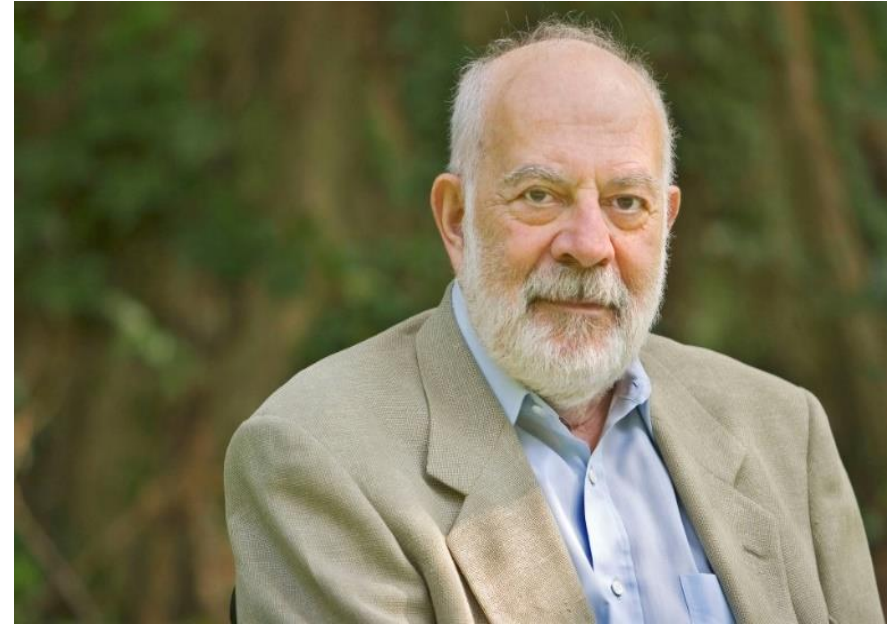
(We need to preserve your anonymity so we aren't asking you to identify a particular building. If you wish to provide a full address, please only do this if many people are based there.)

Recap: distinctive aspects of IPTI

- Based on desired journeys
- Two components:
 - Income-adjusted financial costs
 - Door-to-door journey time
- Controlled for crow-flies distance

“...what is important from the point of view of morality is not that everyone should have *the same* but that each should have *enough*.”

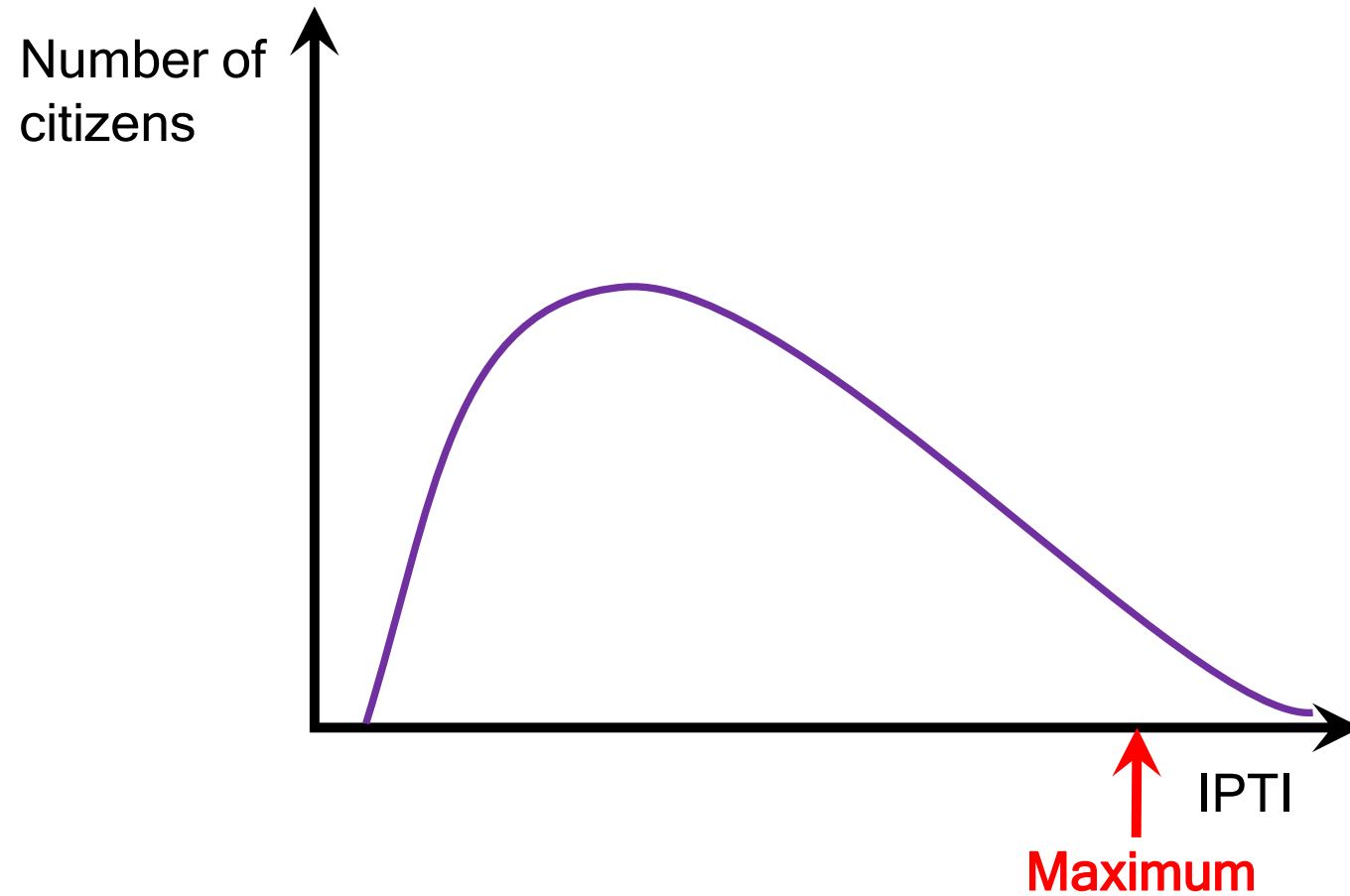
(Frankfurt 1987, p21)



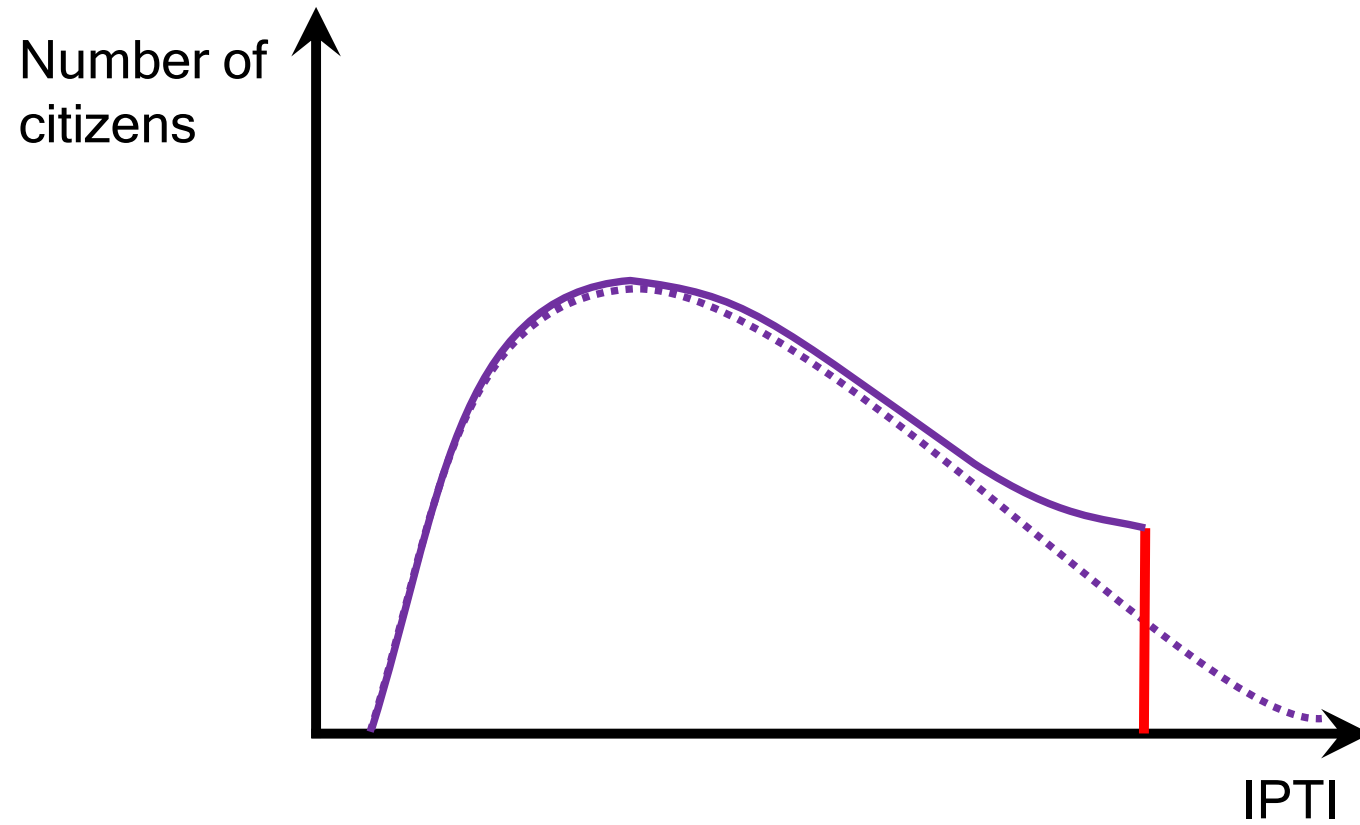
Sufficientarian goal for IPTI

That no one's IPTI should
exceed a defined **threshold**

IPTI distribution: before



IPTI distribution: after



Setting threshold

- Set threshold to exhaust system capacity?
- Work back from fixed budget?
 - *What if these mean too little/too much travel?*

Setting by democratic means

- Assembly of citizens
 - *Stratified random sample*
 - *Expert advisors/witnesses*
 - *Guided (not controlled) by government*

Causes of high IPTI

Low income

Money cost

Suitable transport

Available transport

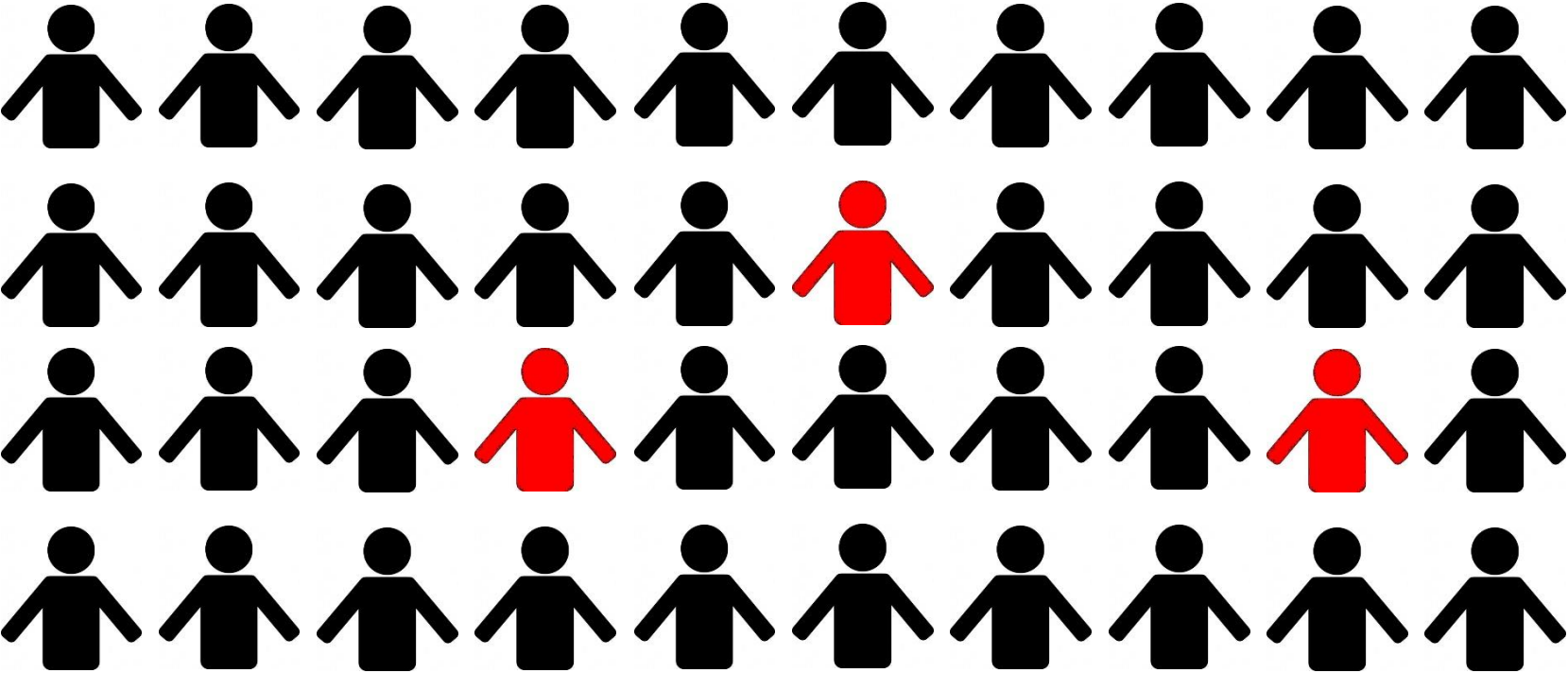
Congestion

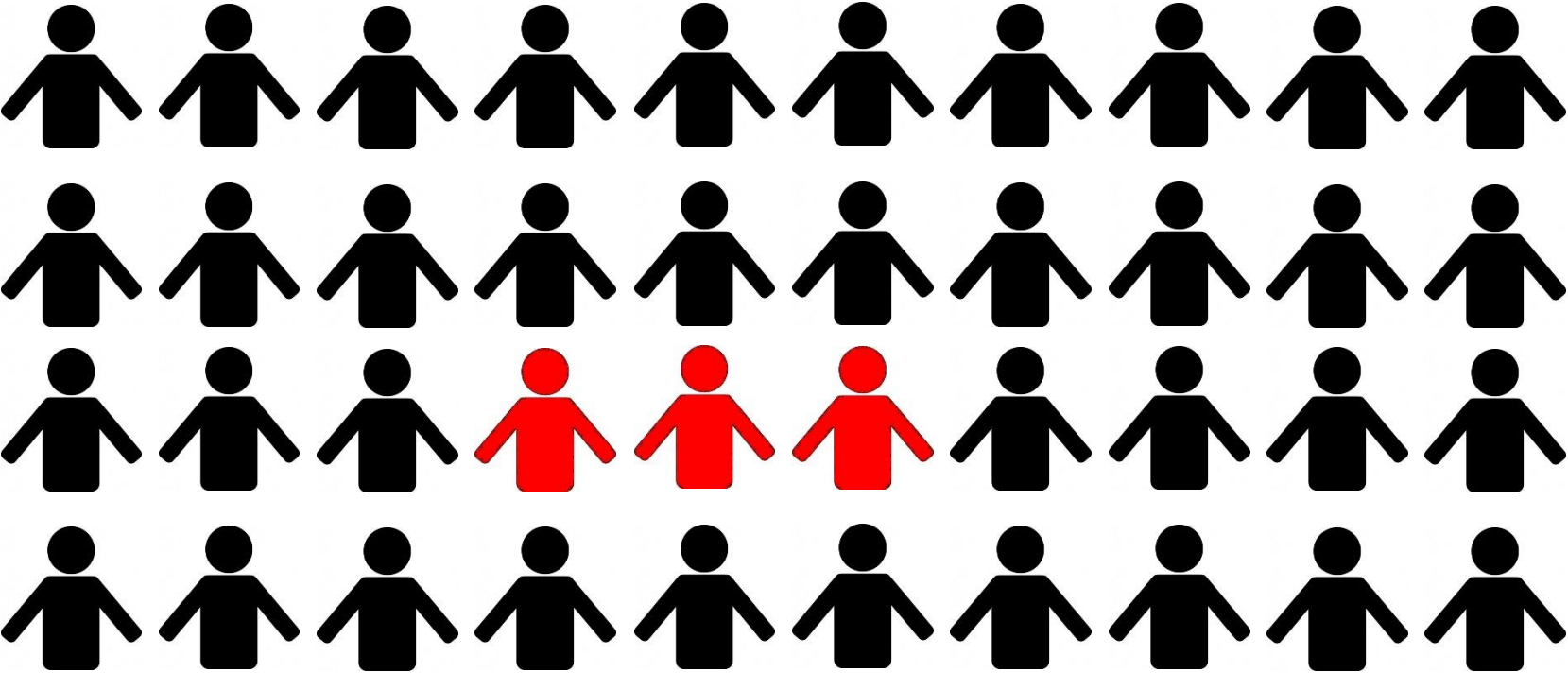
Network

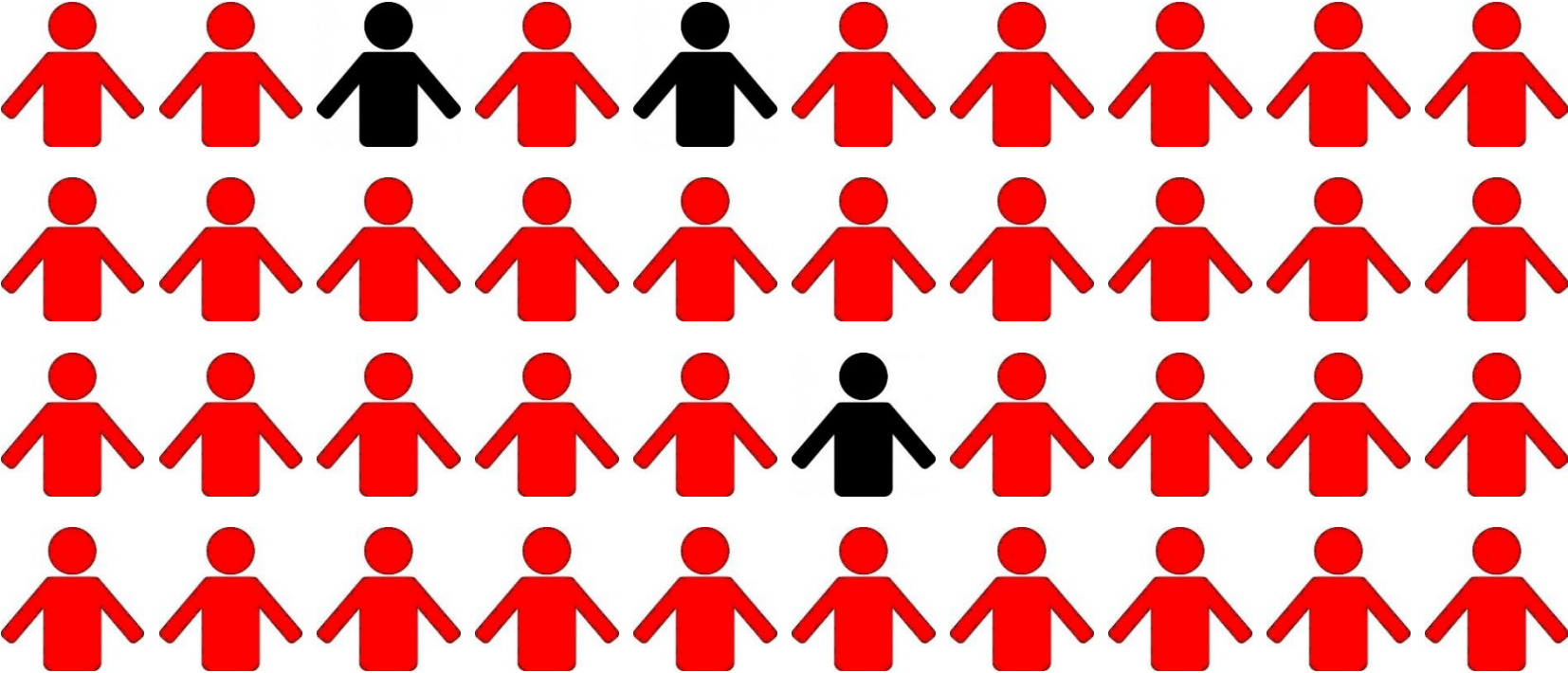
Circuitous

Slow

Sparse







Interventions

“Classical”

New link

New service

Speeding up

“Novel”

Personal subsidy

Provision of personal transport

Provision of taxi/private hire

Progressive road pricing

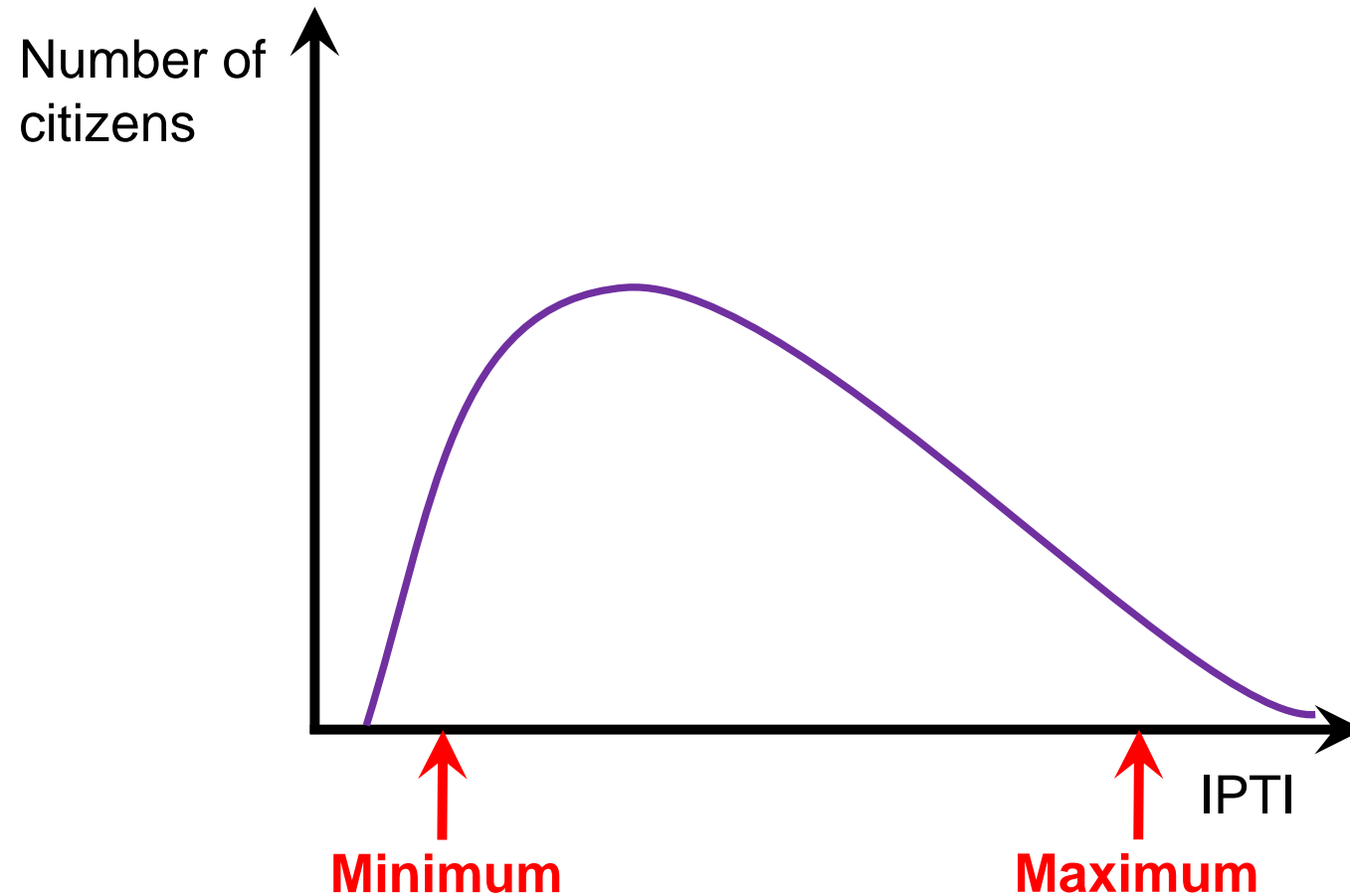
Possible policy implications

↑ justice means:

↓ environmental sustainability?

↓ liveability?

IPTI thresholds: two-tailed?



“Sufficientarian” position on safety

**No one should face injury risk
exceeding x**

- Subject to reasonable conduct**



IPTI goal expanded for externalities

That no one's IPTI should exceed **x**

Subject to:

- Their exposure to air pollution not exceeding **y**
- Their risk of road injury not exceeding **z**
- etc



IPTI goal further expanded

That no one's IPTI should exceed **x**

Subject to:

- Externality constraints (as above)
- Remaining within their **highway capacity allocation**

Thank you

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