# Investigating fuel poverty in the transport sector:

# Toward a composite indicator of vulnerability


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## Overview

## 1. A picture of fuel poverty in France

- Fuel poverty in France
- A threat to human well-being

## 2. The mobility side of fuel poverty

- Key drivers of fuel poverty
- What matters when we talk about mobility

## 3. How to measure exposition to rising fuel prices

- Existing indicators
- A composite indicator  <— Our proposition

## 4. Conclusion

- Learnings and recommandations

# Fuel poverty in France

- **2010: Official definition of fuel poverty** according to the Grenelle II Law

*A person who face difficulties to meet its energy needs because of inadequate financial resources or poor housing conditions.*

- **2012: Creation of a National Observatory on Fuel Poverty**

*20% of households are in fuel poverty (5,8 million households)*

*Recent increase of the phenomenon (+17% between 2006-2013)*

- **2015 : Fighting fuel poverty is one priority** of the law on the energy transition

*To reduce fuel poverty by 15% in 2020 compared to 2015 level*

*To eliminate all energy-inefficient housing by 2025*

# A threat to human well-being

**Material deprivation**
30% energy inefficient housing
25% have no access to public transport

**—> Poor living conditions**

- Domestic energy services: cook, light, heat, wash, communication, etc.
- Transport services: work, study, hospital, shop, administrative, etc.

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**Excess Winter Mortality**
+23 000 deaths/year in France
⅓ due to indoor cold

**→ A public health issue**

- Exposure to cold: cardiovascular and respiratory diseases
- Poor indoor air quality: moisture and mould, air pollution, etc.
- Indirect impacts: risky behaviour, depression, reallocation of spending

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**Deprivation**
18% limit car use
12% cannot afford their fuel spending

**→ Risk of social exclusion**

- Access to employment: driving licence, car ownership, spatial matching, etc.
- Ageing population: immobility, access to care, etc.
- Territorial inequality: long distances, less frequent public transport, etc.

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# Key drivers of fuel poverty

## Low income

## High fuel price

## Poor energy performance


## Poor residential location

# What matters when we talk about mobility

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- Allow for **diverse mobility needs**
- Detect **restriction behaviour**
- Evaluate one's **capacity to adapt**

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# Case study: France

- Based on data from the **National Transport Survey**
  (Enquête Nationale Transports et Déplacements)

- Conducted by INSEE every 10-15 years, last available **from 2008**

- Interviewed a sample of **20 200 French households**

- Offers a **detailed description** of travel behaviors (compared to BDF)
  at the **national level** (compared to EMD)

- Focus on **places to work and study**

# How to measure?

- Ratio indicator
- LIHC indicator
- Composite indicator

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→ Transposition from domestic fuel poverty

- Composite indicator — Our proposition

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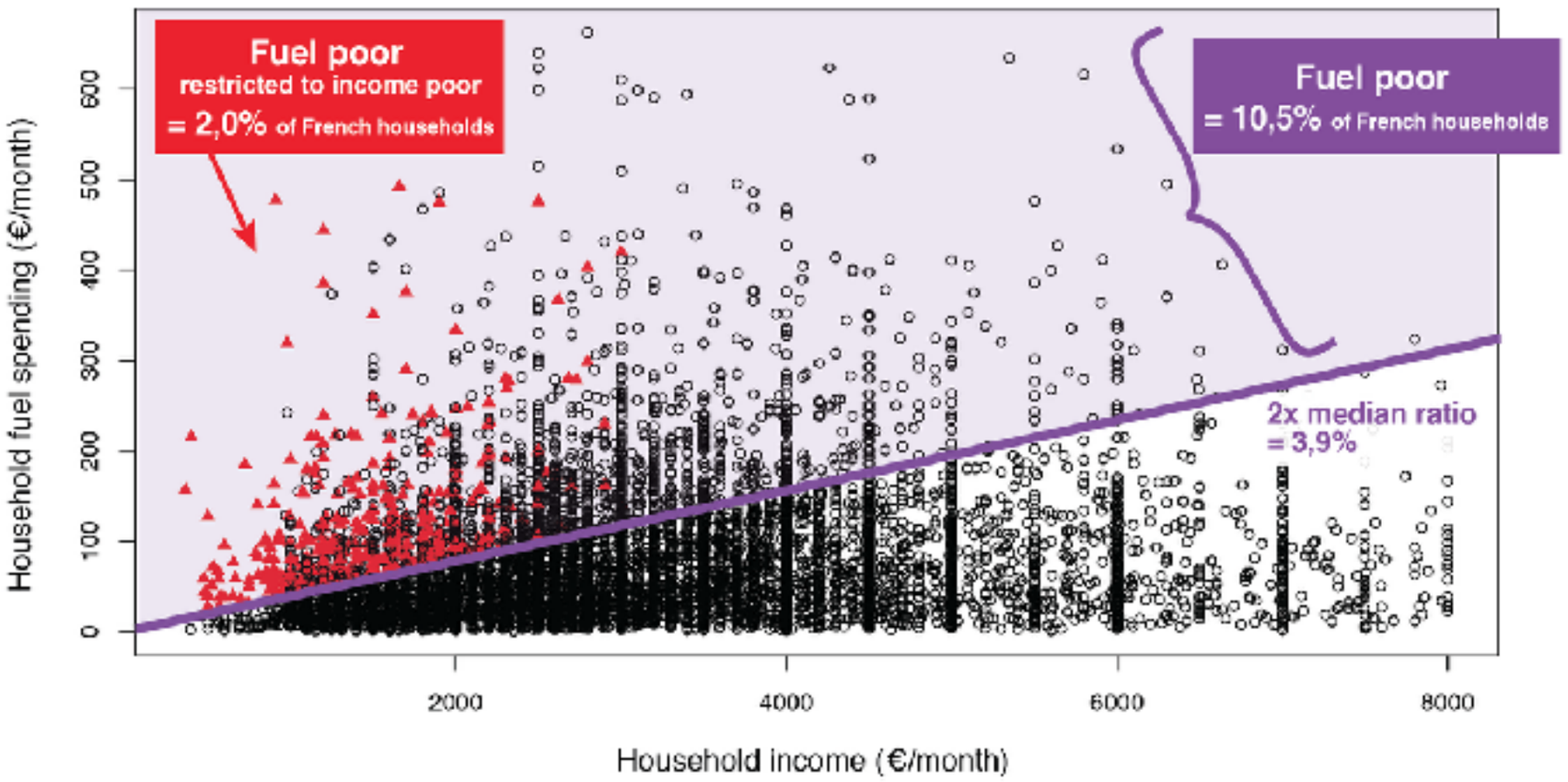
# Ratio indicator




## Identify:

Disproportionate share of income spent on fuel

## Equation:

$$\frac{\text{Fuel spending}}{\text{Income}}$$

## Threshold:

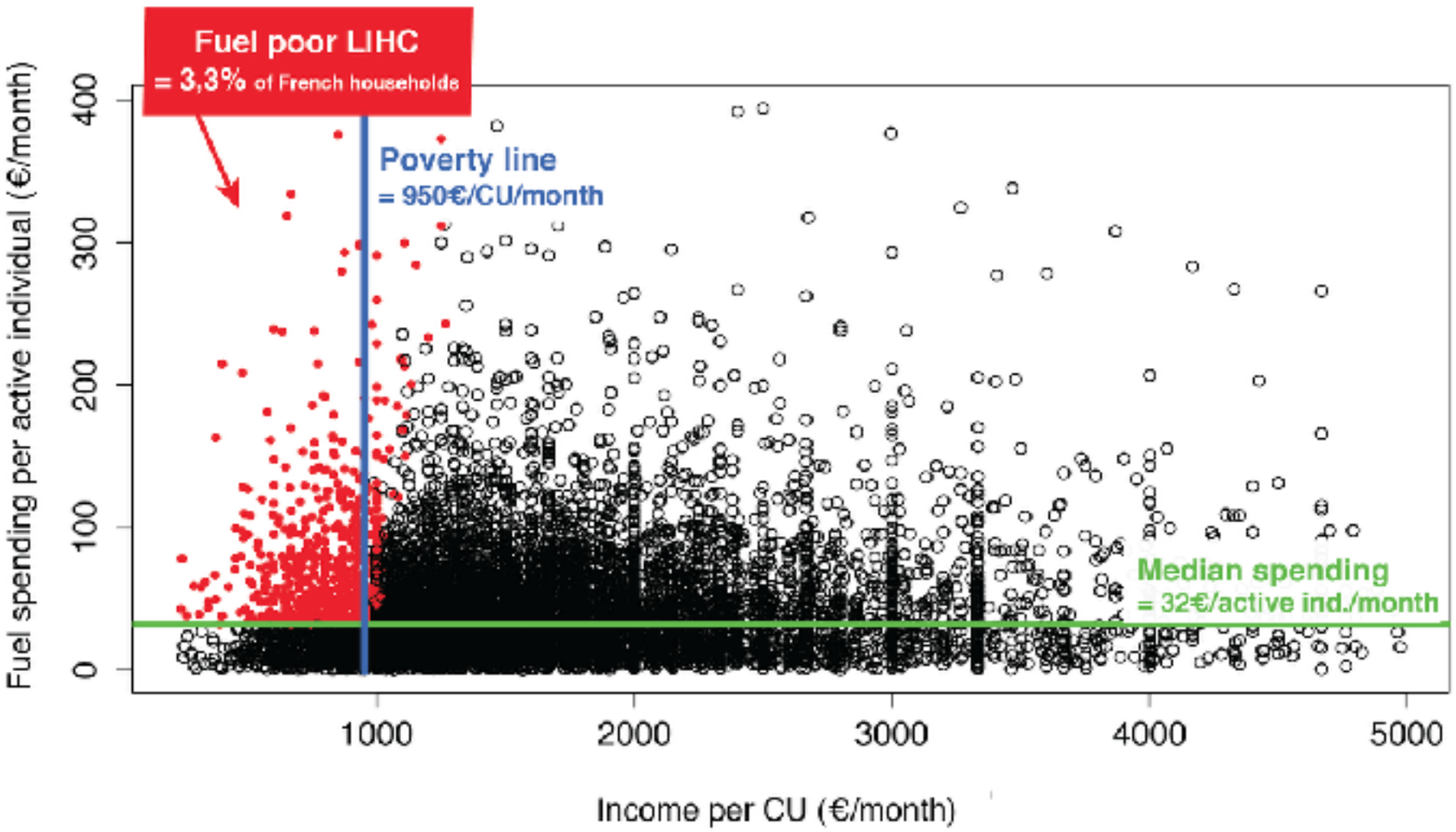
2x median

| | Number of households | % of population |
|---|---|---|
| RATIO | 2.6 millions | 10,5 % |
| RATIO/IP | 0.5 million | 2.0 % |

# How to measure?

- Ratio indicator
- **LIHC indicator**
- Composite indicator

# LIHC indicator




## Identify:

| High fuel spending | Low residual income |
|---|---|

## Equation:

| $\frac{\text{Fuel spending}}{\text{Number of active individuals}}$ | $\frac{\text{Income - Fuel spending}}{\text{Number of consumption units}}$ |
|---|---|

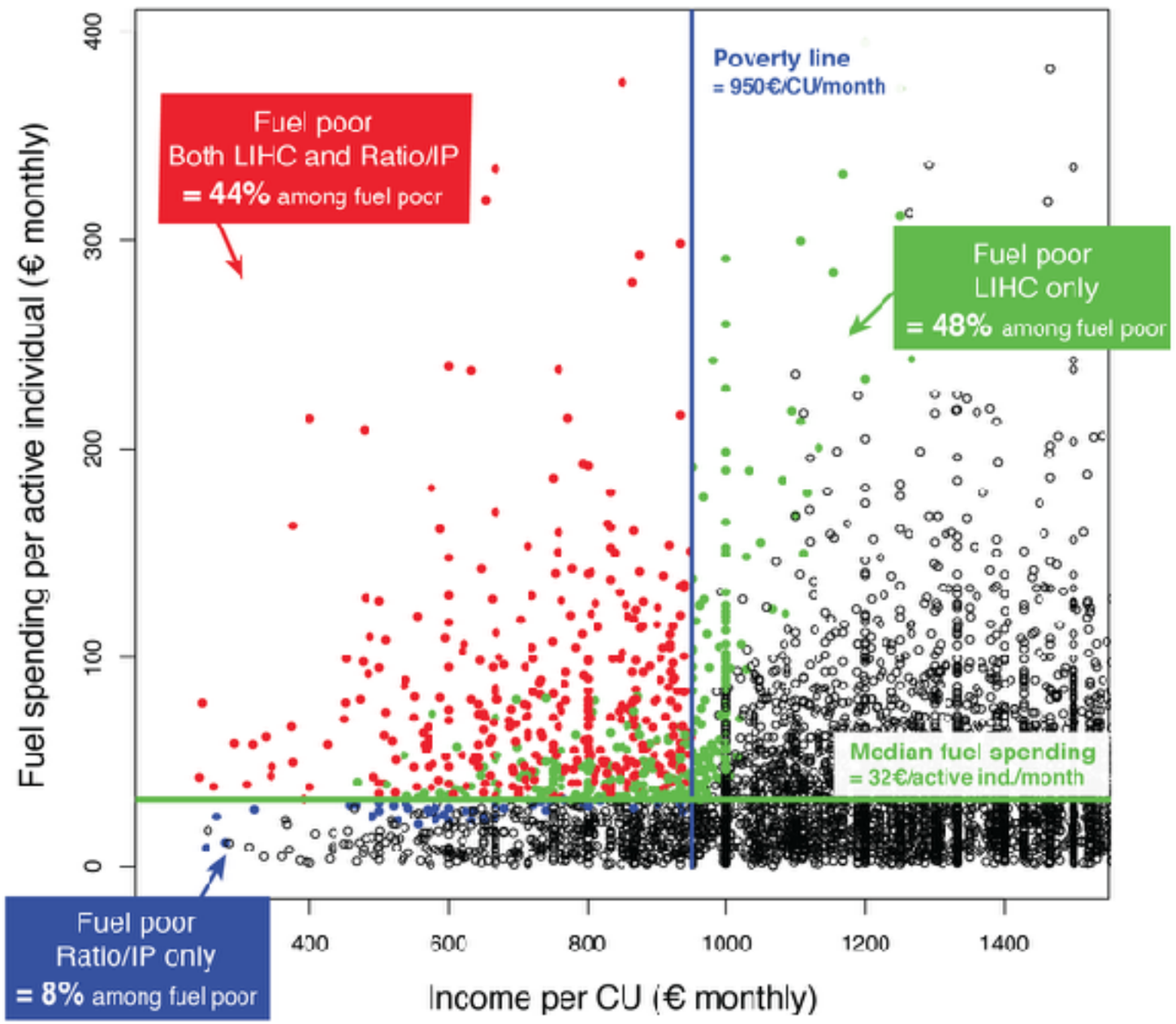
## Threshold:

| Median | 60% median |
|---|---|

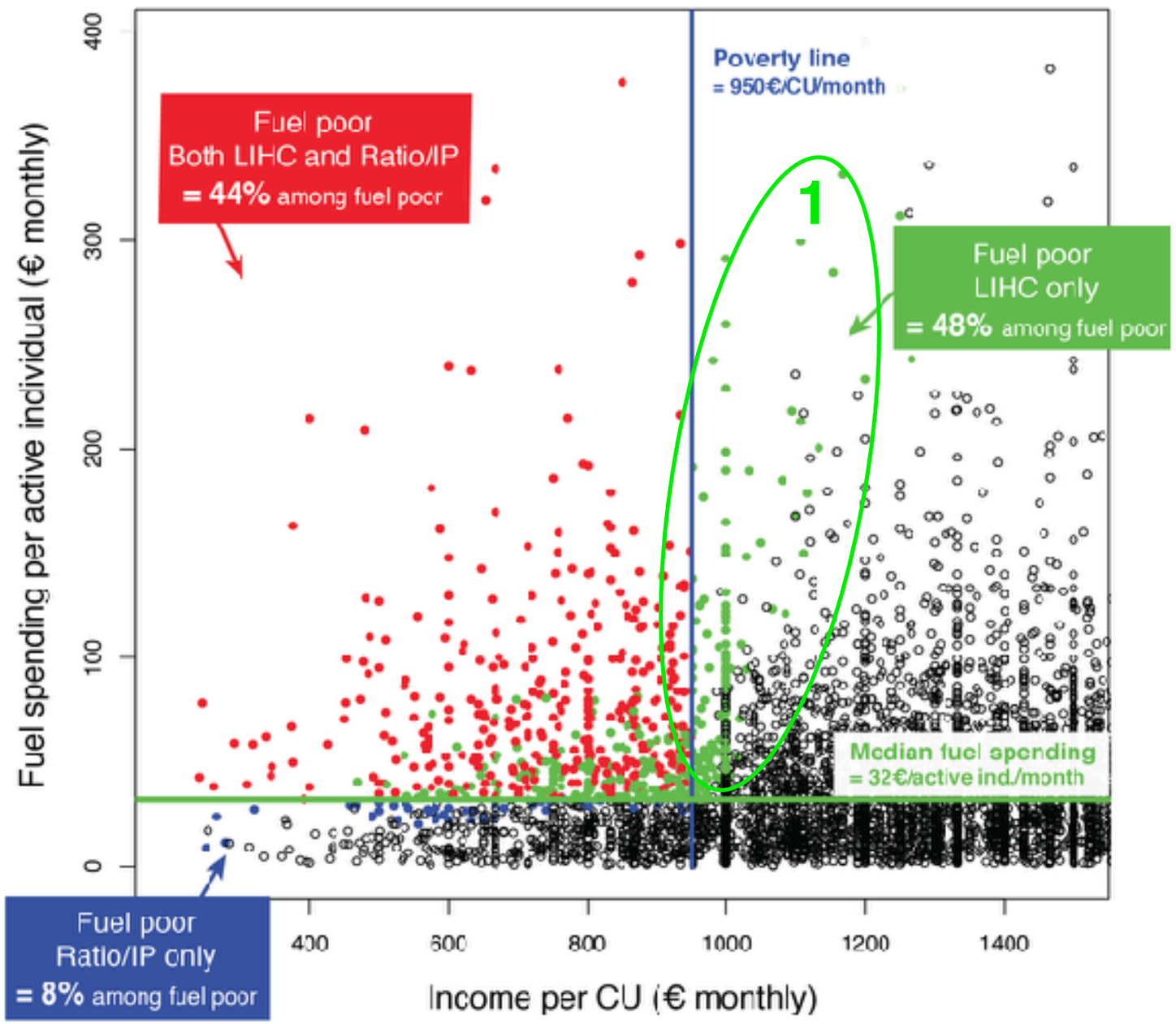
| | Number of households | % of population |
|---|---|---|
| LIHC | 840 000 | 3,3% |

# What are the differences between the two approaches?

# RATIO/IP vs LIHC



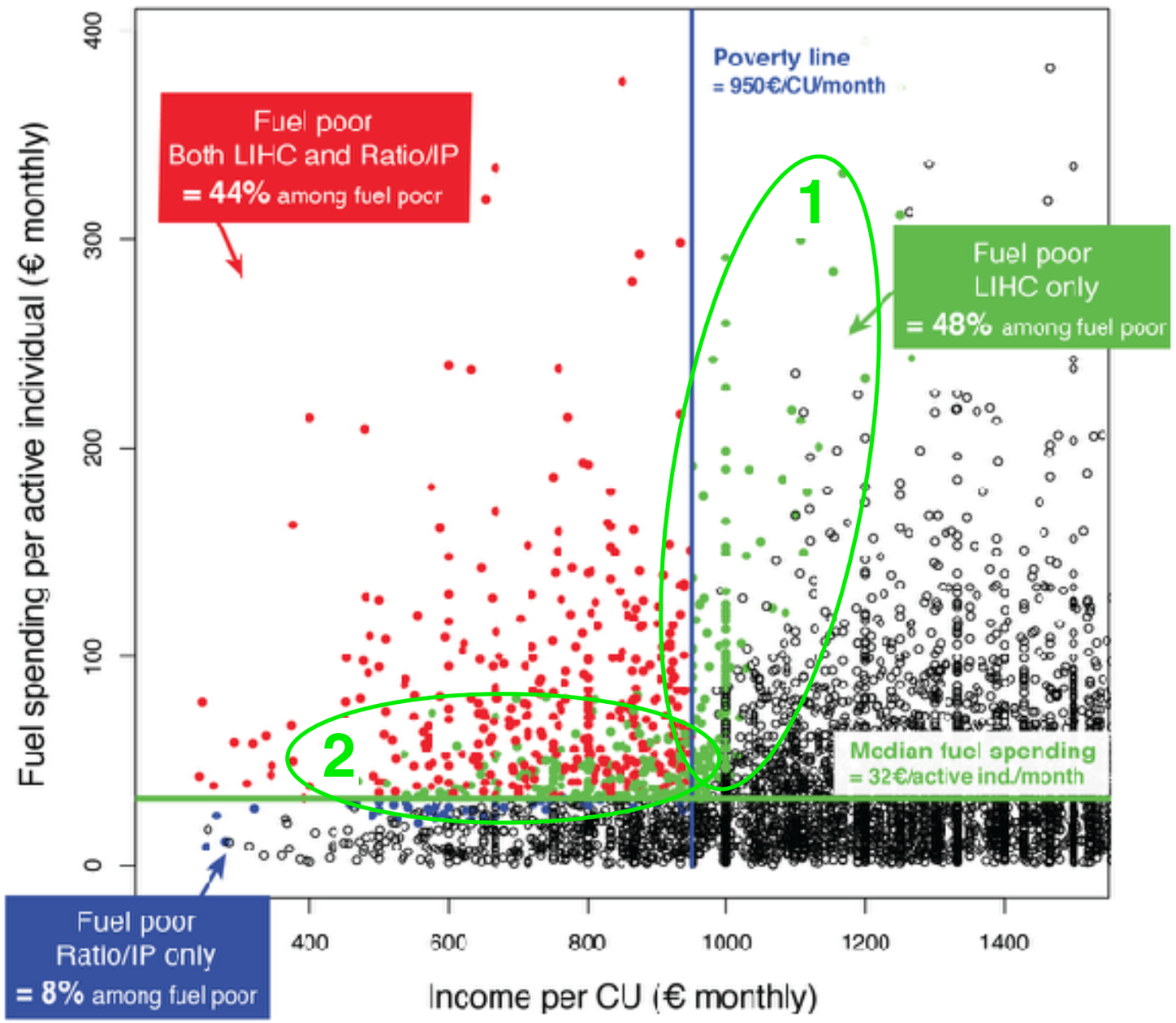
# RATIO/IP vs LIHC




## Differences:

**1/ LIHC includes middle-class households, whose standard of living is lowered because of their fuel expenses.**

# RATIO/IP vs LIHC

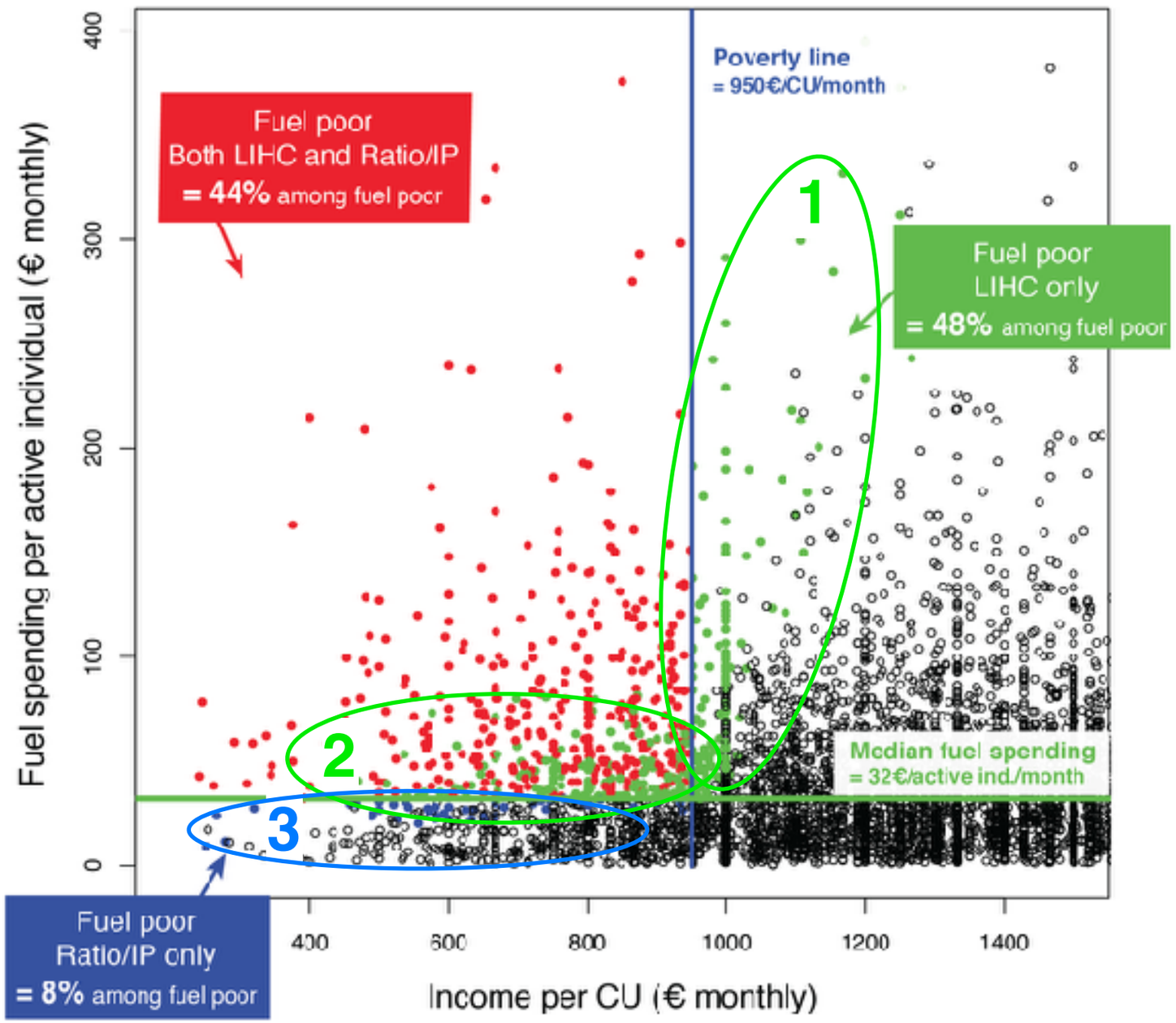



## Differences:

1/ LIHC includes middle-class households, whose standard of living is lowered because of their fuel expenses.

**2/ LIHC includes poor households, whose individual motorized mobility is higher than half the population.**

# RATIO/IP vs LIHC




## Differences:

1/ LIHC includes middle-class households, whose standard of living is lowered because of their fuel expenses.

2/ LIHC includes poor households, whose individual motorized mobility is higher than half the population.

**3/ RATIO includes households with high fuel ratio, whose financial capacity is particularly low.**

# But…

- It brings a normative approach to mobility though mobility needs are diverse: **how to interpret?**

- Restriction and capacity to adapt are not evaluated: **don’t we miss essential features?**

It calls for a **new indicator** to measure the **different dimensions** of fuel poverty.

# How to measure?

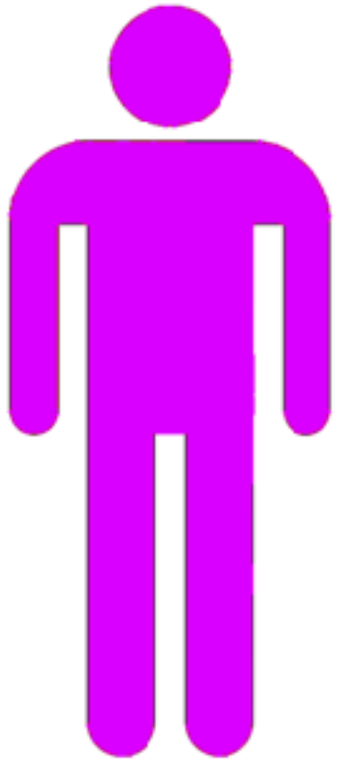
- Ratio indicator
- LIHC indicator
- **Composite indicator**

# The composite indicator is a three-dimensions indicator…

| Dimensions | Factors |
|---|---|
| **Financial resources** | Low income |
| **Mobility practices** | High fuel spending |
| | Car use restriction |
| | Extra travel time |
| **Conditions of mobility** | Poor spatial matching |
| | No alternative |
| | Low vehicle performance or No vehicle |

# …identifying three levels of exposition to rising fuel prices.

Fuel poor



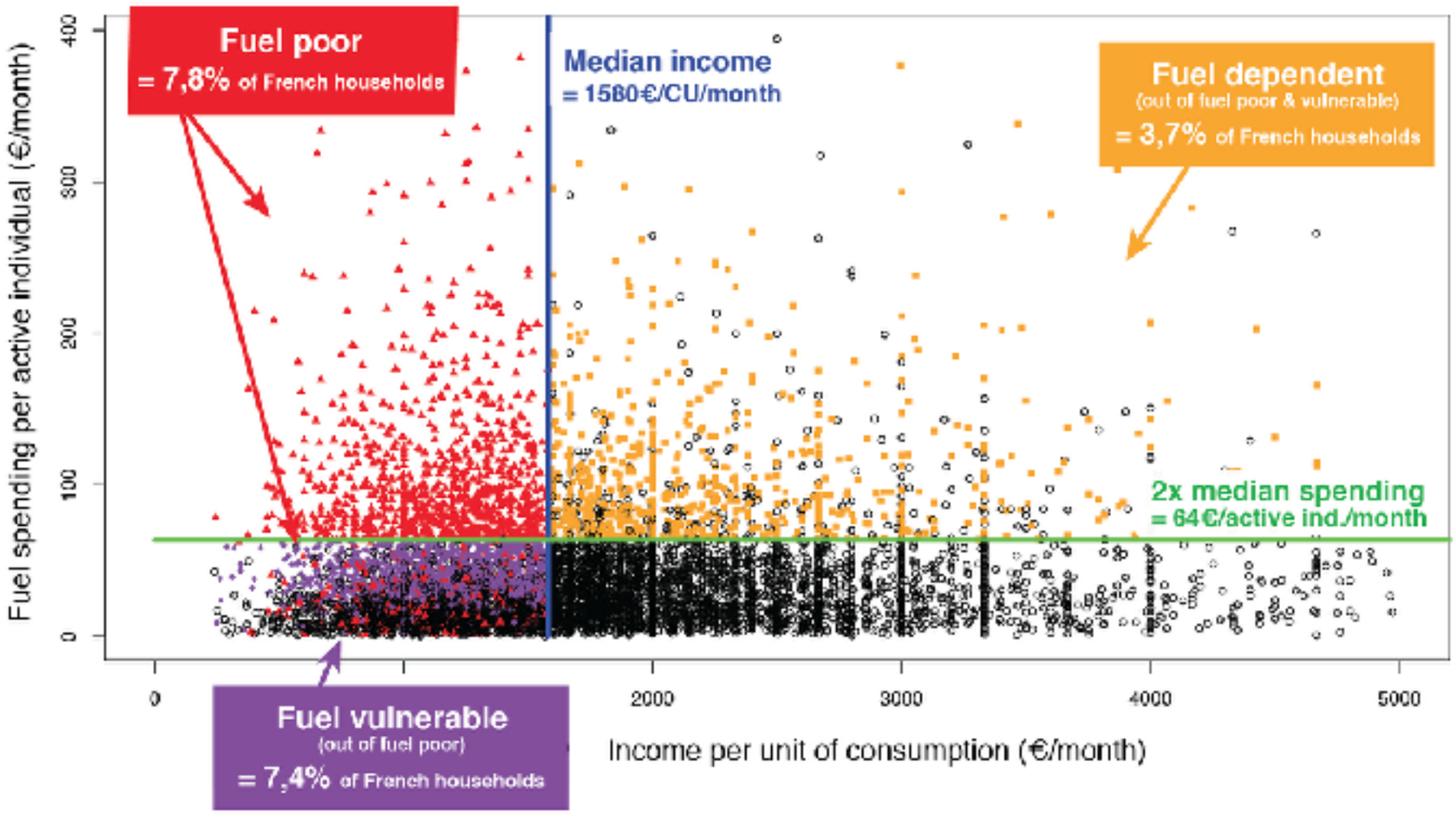
Vulnerable in mobility

Car dependent

# How?

| Combinations of factors (gather at least) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mobility practices | | | Conditions of mobility | | | Financial resources | | |
| **High fuel spending** | **Extra travel time** | **Car use restriction** | **Poor spatial matching** | **No alternative** | **Low vehicle performance or No vehicle** | **Low income** | | |
| X | | | | | | X | Fuel poor | **Level of exposition** |
| | X | | | | | X | | |
| | | X | | | | X | | |
| | | | X | X | | X | Fuel vulnerable | |
| | | | X | | X | X | | |
| X | | | | X | | | Fuel dependent | |

# Composite indicator




## Identify:

Disadvantageous combinations of factors

## Measure:

Financial resource
Energy consumption
Conditions of mobility

## Threshold:

Per factor / Across factors

| Number of households | % of population |
|---|---|
| 1.9 millions | 7,8 % |
| 1.8 millions | 7,4 % |
| 0.9 million | 3,7 % |

# Summary of results

| | Factor | Threshold (Exposed if) | Number of households exposed | Share among households with required mobility / active households | Share among French households |
|---|---|---|---|---|---|
| Financial resources | Low income | <1580 €/UC/month (median) | 9 300 000 | 57,7 % | 36,9 % |
| Fuel consumption | High fuel spending | >64 €/active/month (2x median) | 2 500 000 | 15,3 % | 9,8 % |
| | Car use restriction | 1 | 1 300 000 | 8,1 % | 5,2 % |
| | Extra travel time | At least one person with >60 extra min/day | 300 000 | 1,9 % | 1,2 % |
| Conditions of mobility | Poor spatial matching | >382 km/active/month (median) | 8 030 000 | 50,1 % | 32,0 % |
| | No alternative | 1 | 7 190 000 | 44,8 % | 28,7 % |
| | Low vehicle performance or No vehicle | >10c€/km or 1 | 2 560 000 | 15,9 % | 10,2 % |
| **Composite indicator** | Fuel poor | | 1 900 000 | 12,1 % | **7,8 %** |
| | Vulnerable in mobility | | 3 000 000 | 18,7 % | **12,0 %** |
| | Car-dependent | | 1 900 000 | 11,7 % | **7,5 %** |
| **LIHC indicator** | Fuel poor | | 840 000 | 5,2 % | **3,3 %** |
| **Ratio indicator** | Fuel poor | | 2 620 000 | 16,3 % | **10,5 %** |
| | Fuel poor (restricted to income poor) | | 510 000 | 3,2 % | **2,0 %** |

# Conclusion

- Ratio and LIHC **are not satisfactory** in the transport sector.

- A **good fuel poverty indicator** should account for:

  - diverse mobility needs  - restriction behaviours  - variable capacity to adapt

- A composite indicator can reflect the **conditions of mobility** and reveal one's **exposition to rising fuel prices**.

Thanks !

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A. Berry, et al., Investigating fuel poverty in the transport sector: Toward a composite indicator of vulnerability, Energy Res Soc Sci (2016), http://dx.doi.org/10.1016/j.erss.2016.02.001

# What matters when we talk about mobility