

COULD EXPOSURE TO AIR POLLUTION INFLUENCE DEMENTIA RISK?

The state of the science

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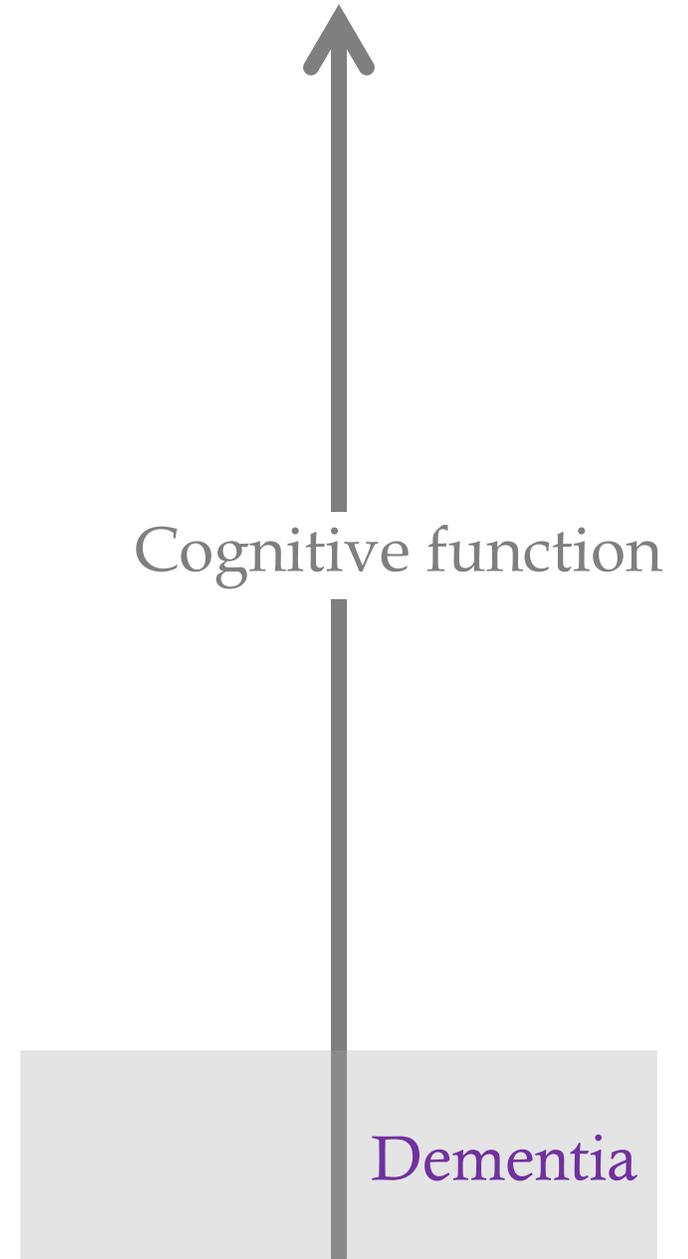
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What we mean by “dementia”

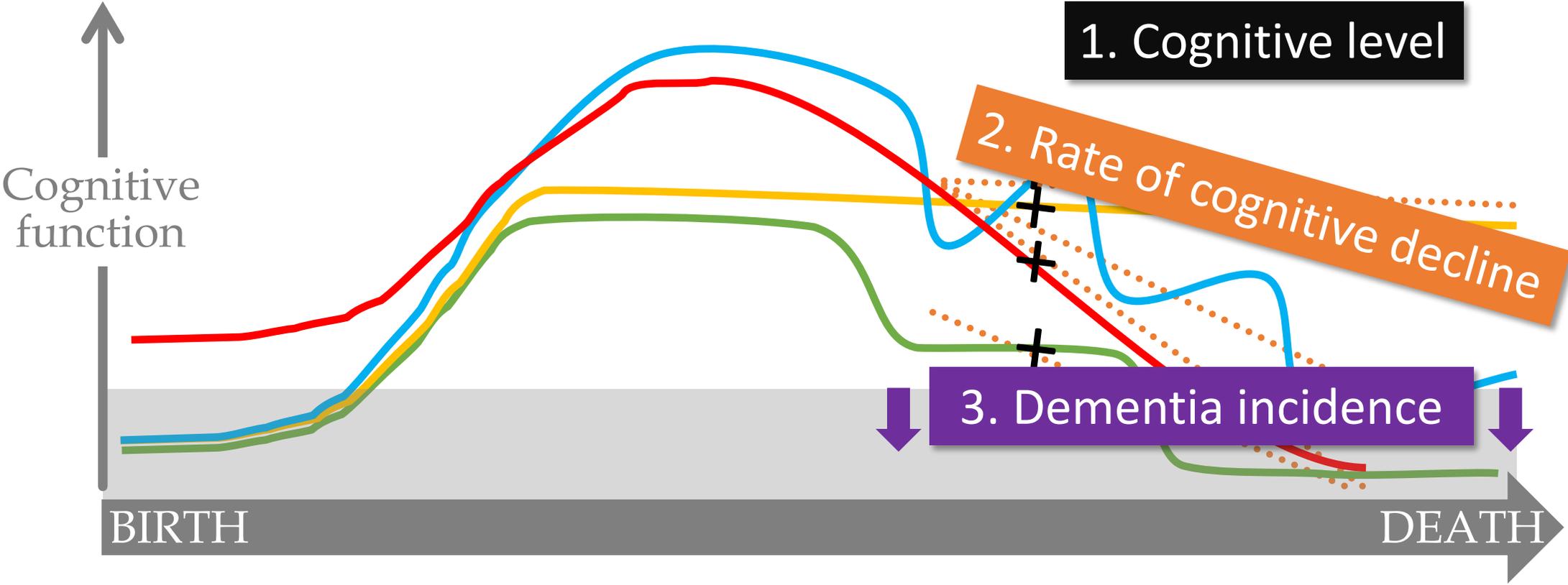
Deficits

in **memory**, language, problem-solving
and other **cognitive abilities**

that affect a person's **ability to
perform everyday activities.**

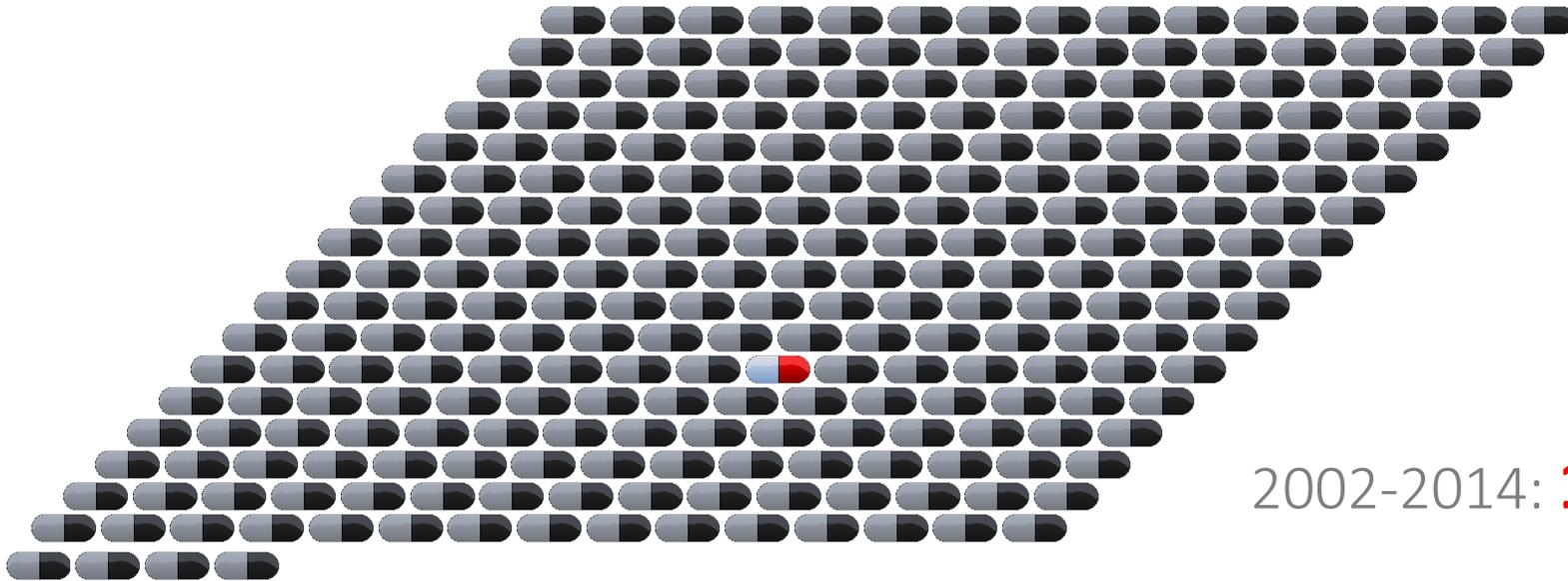


Cognitive function, cognitive decline, and **dementia**



Adapted from M. Maria Glymour

No drug has been shown to alter the clinical course of Alzheimer's dementia

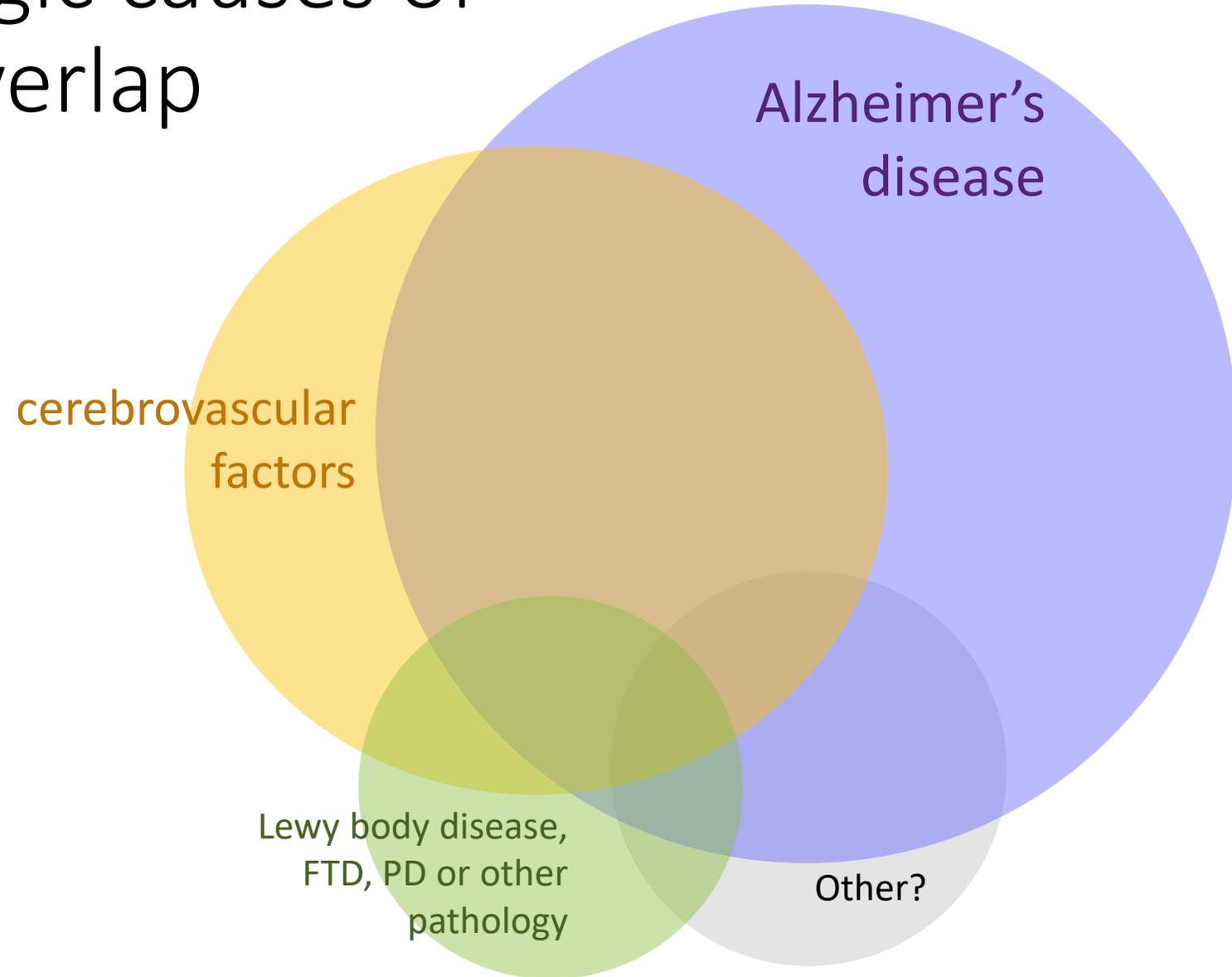


2002-2014: **1** new FDA-approved medication

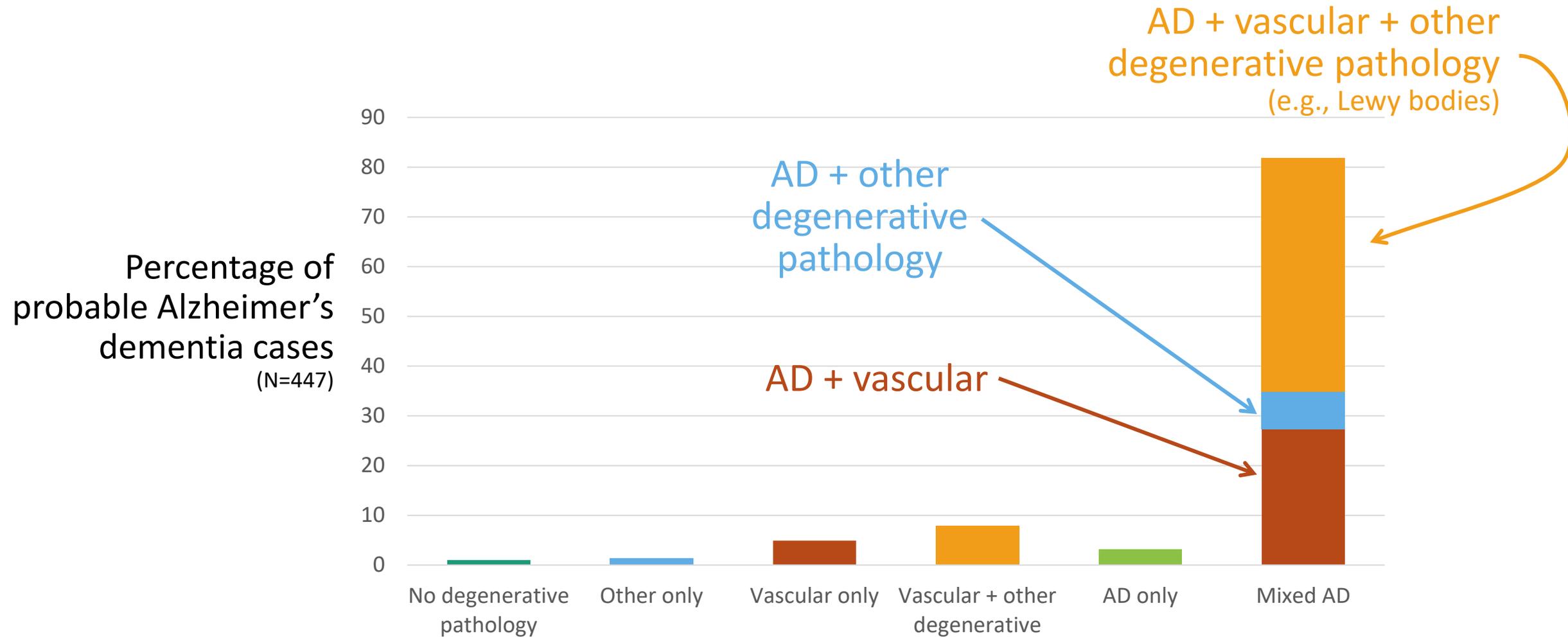
Cummings, et al. *Alzheimer's Res Therapy*. 2014

Anti-amyloid agents: reduce amyloid, but do not markedly stall cognitive decline

The neuropathologic causes of dementia often overlap

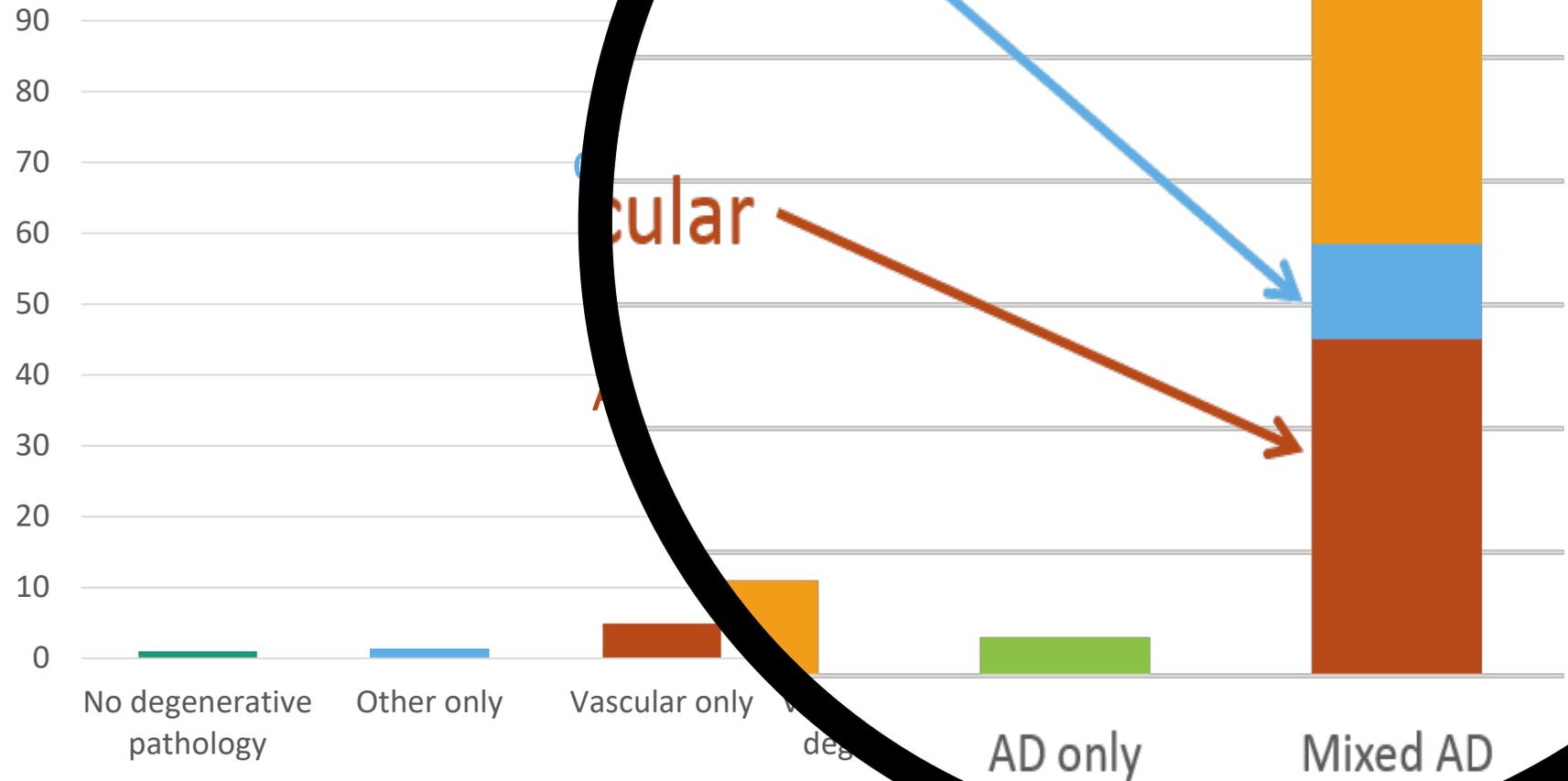


Most Alzheimer's dementia occurs with other pathologies



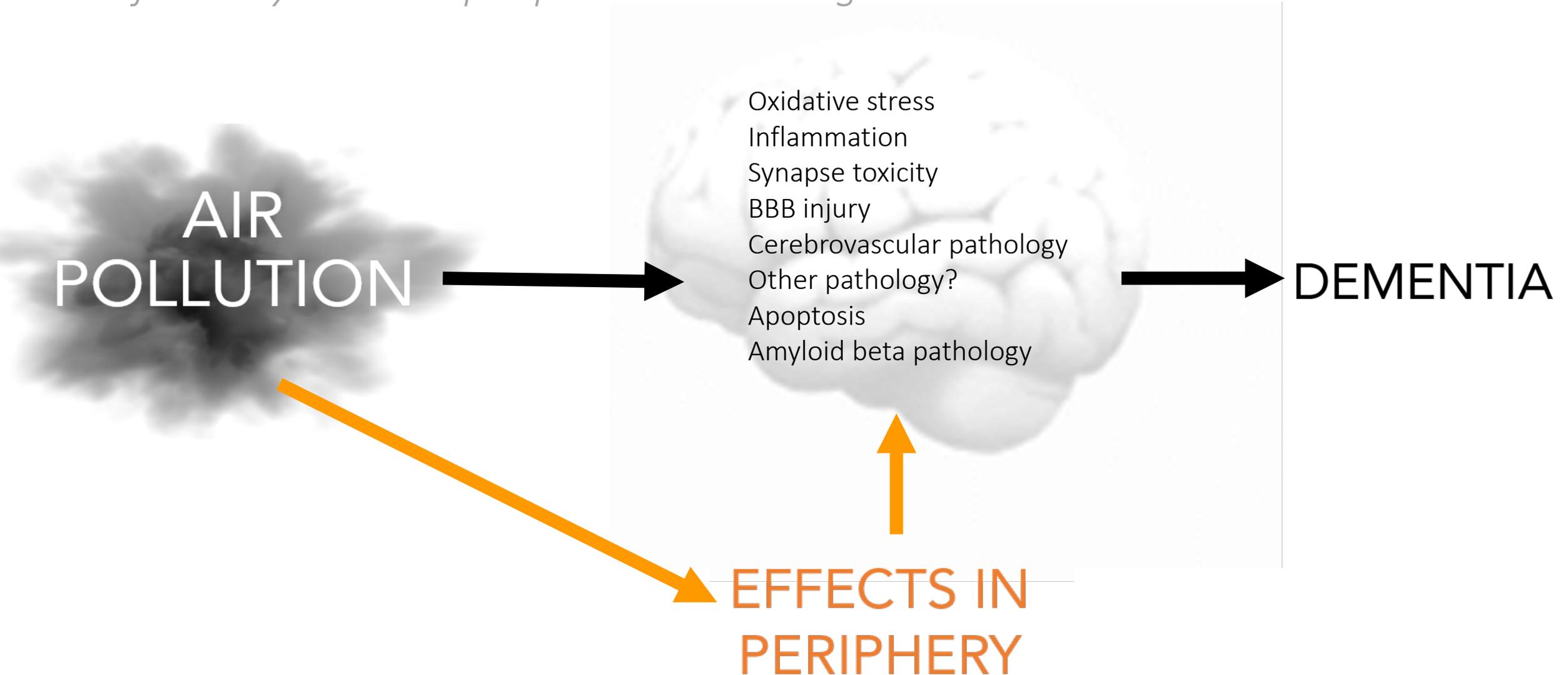
Most Alzheimer's dementia occurs with

Percentage of probable Alzheimer's dementia cases (N=447)



Potential **pleiotropy**

not just amyloid beta plaques and tau tangles



State of the science

UPDATE TO A SYSTEMATIC REVIEW

of published **epidemiologic** research
on the relation of **air pollution** exposure
with **dementia, its precursors and its correlates**



Contents lists available at [ScienceDirect](#)

NeuroToxicology

NeuroToxicology 56 (2016) 235–253



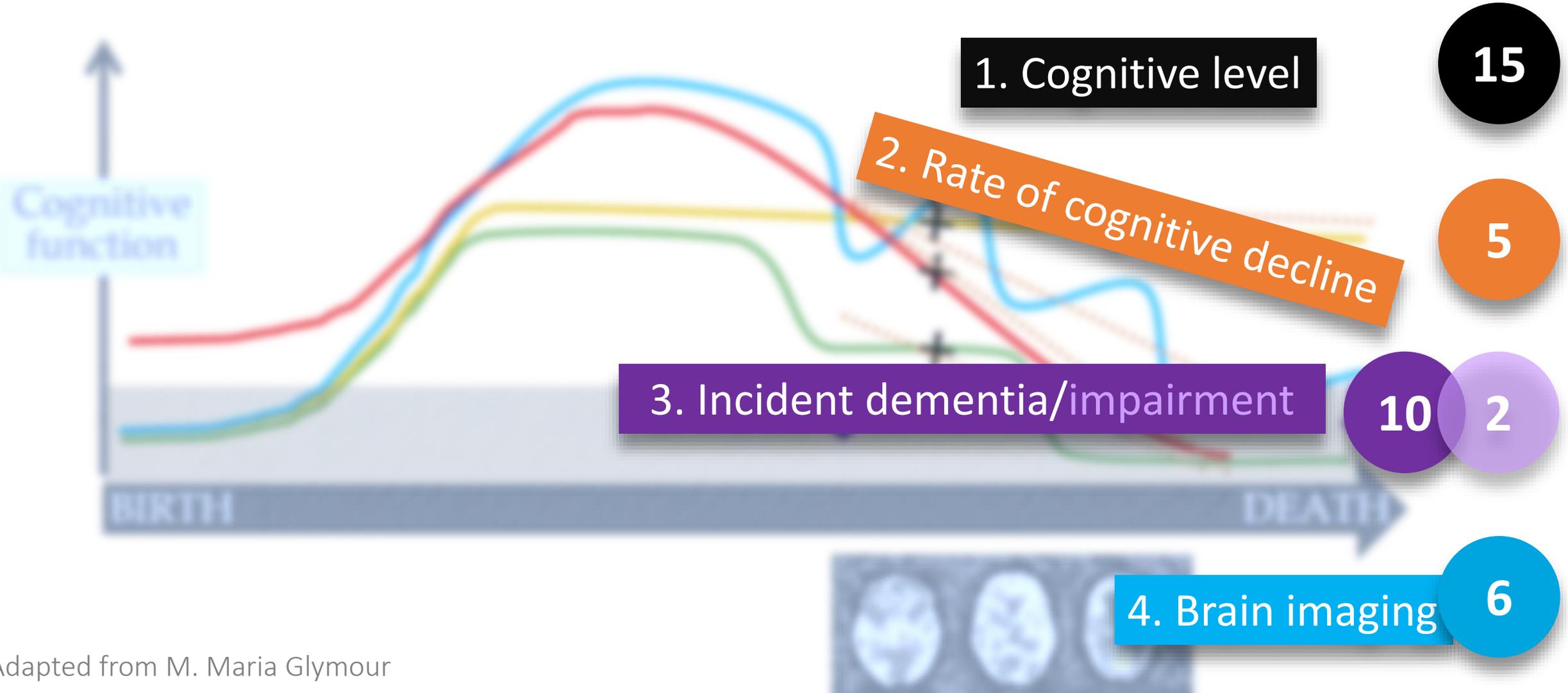
Full length article

Exposure to air pollution as a potential contributor to cognitive function, cognitive decline, brain imaging, and dementia: A systematic review of epidemiologic research



Melinda C. Power^{a,b}, Sara D. Adar^c, Jeff D. Yanosky^d, Jennifer Weuve, MPH, ScD^{e,f,*}

Studies identified

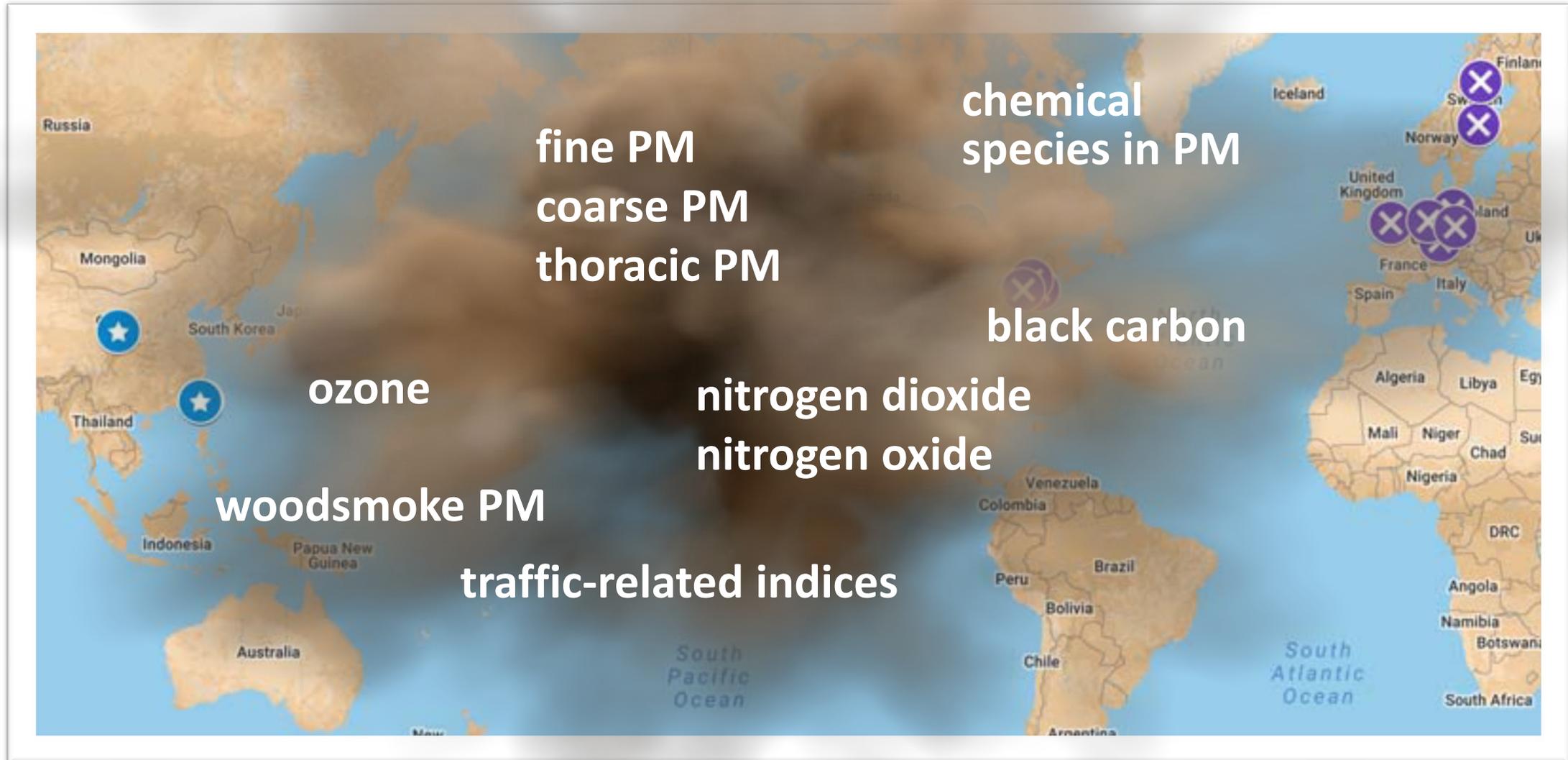


Adapted from M. Maria Glymour

Study locations



Pollutants investigated



Summary of **findings**

Most studies reported an **adverse association** of at least one pollutant exposure with a dementia-related outcome.

Most consistent results involve:

PM_{2.5}
NO₂ NO_x

Cognitive level
Dementia
Infarcts on MRI

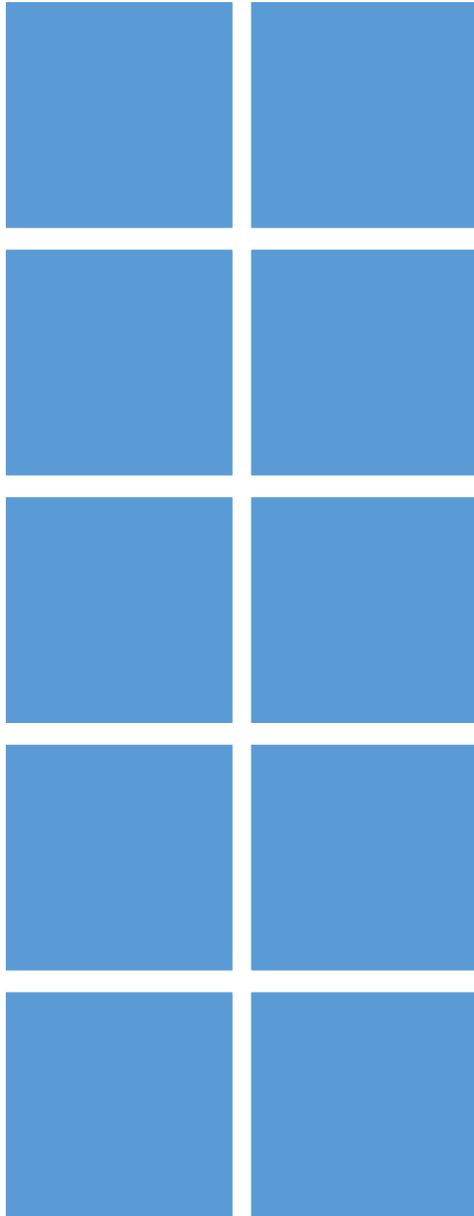
Mixed/sparse results involve:

PM₁₀ PM_{coarse}
Ozone, Sources

Cognitive decline
Other MRI outcomes

Is this

good enough?



Of the **10 dementia studies**,

- **6** relied solely on **claims/medical records** to identify cases and non-cases.
- **2** relied **partially** on these data sources

Audience quiz

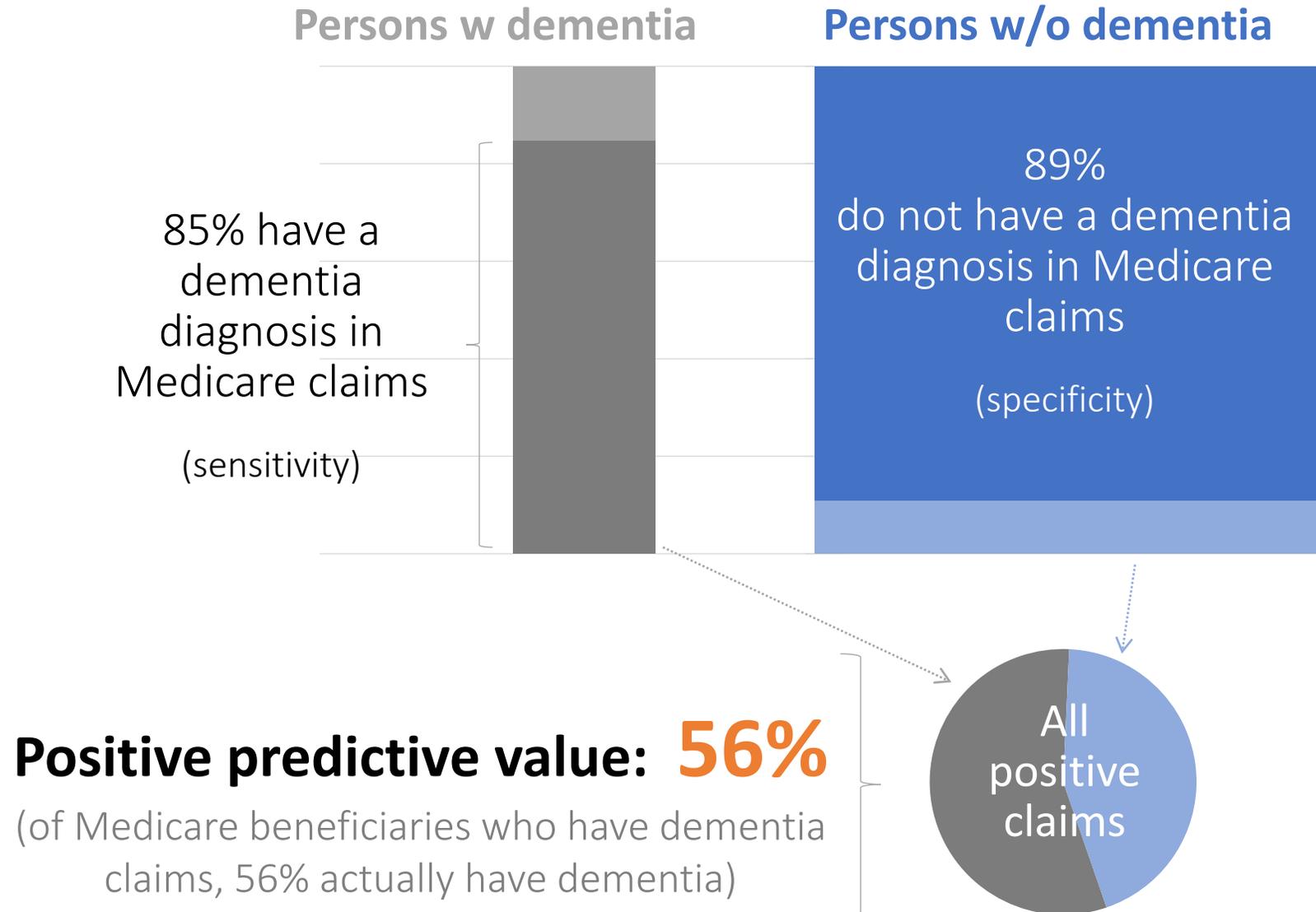
What is the approximate positive predictive value of medical records and insurance claims for classifying people with dementia?

- (a) 95% (b) 83% (c) 75% (d) 64% (e) 56%

Wait, what? Surely it's better in [\[insert non-US country\]](#).

- (a) It is not. (b) Nope. (c) Even worse for dementia "types."
(d) All of these.

Misclassification: Dementia diagnoses via “passive surveillance”

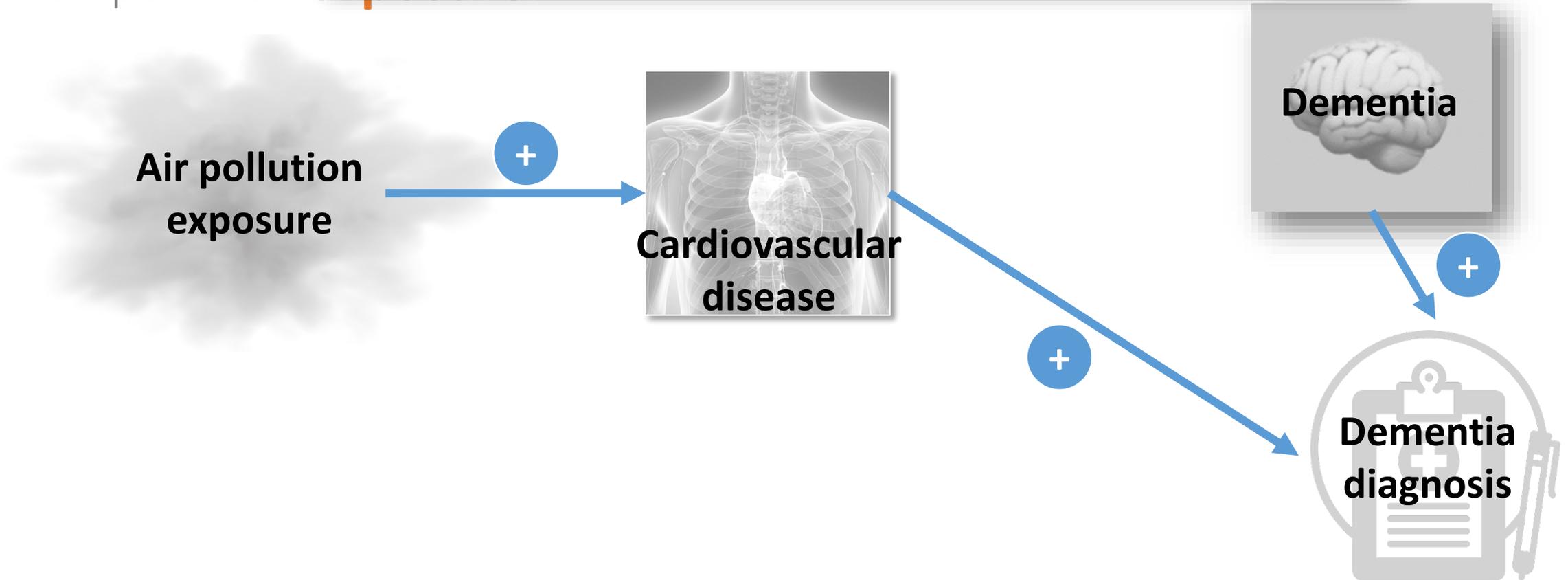


UPSHOT?

Misclassification

overestimation of air pollution's

CONCERN: **Minimal** adverse effect on dementia **on**
air pollution **exposure**.



Selection bias: e.g., health

UPSHOT?

underestimation of air pollution's adverse effect

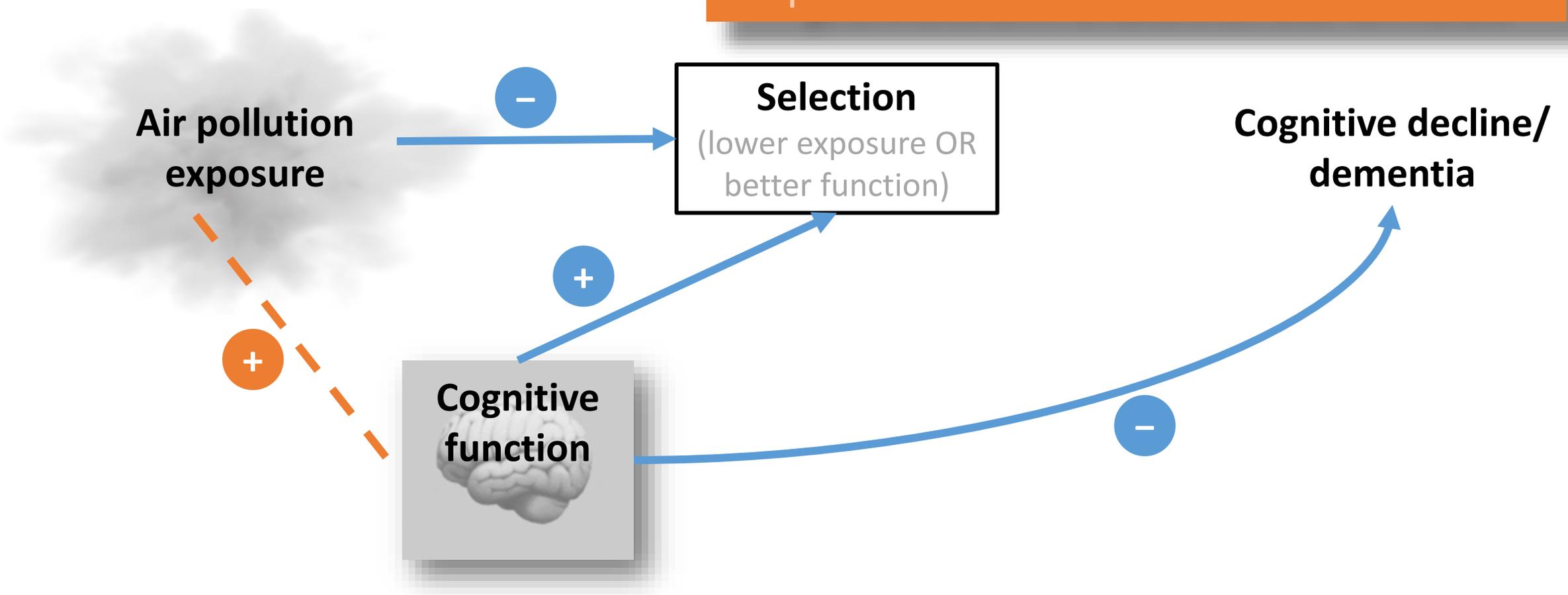
Air pollution exposure

Selection

(lower exposure OR better function)

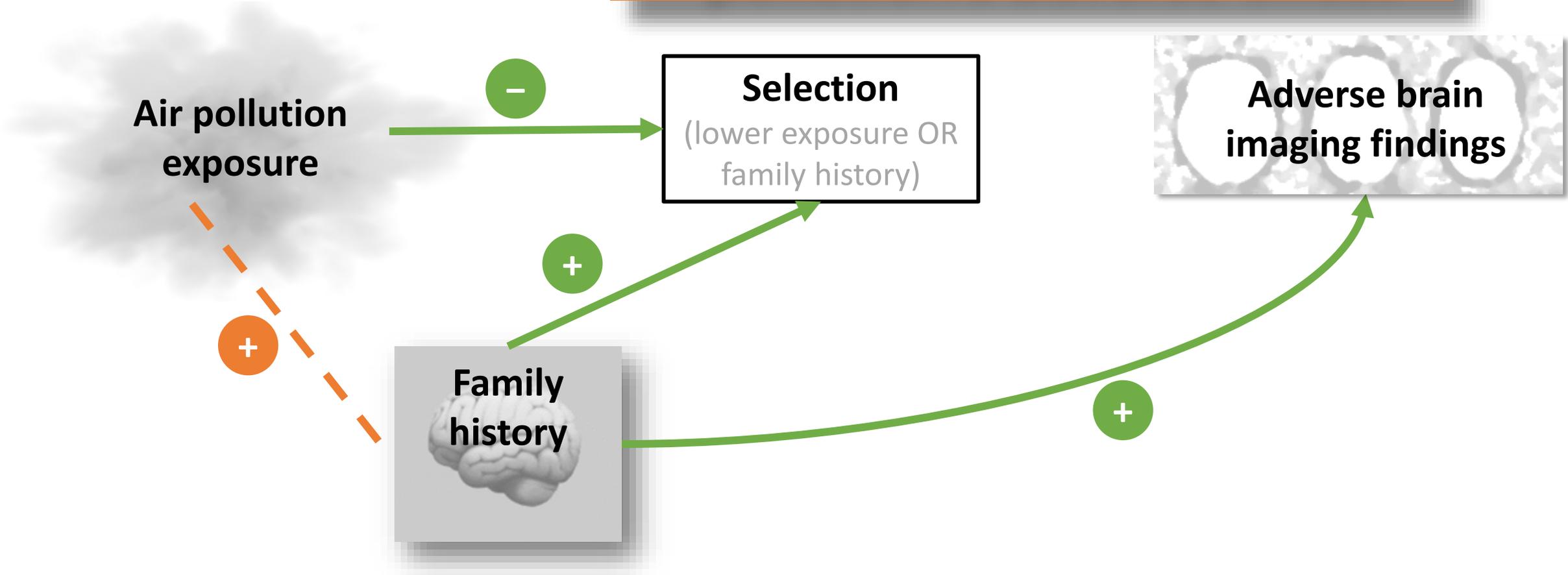
**Cognitive decline/
dementia**

Cognitive function

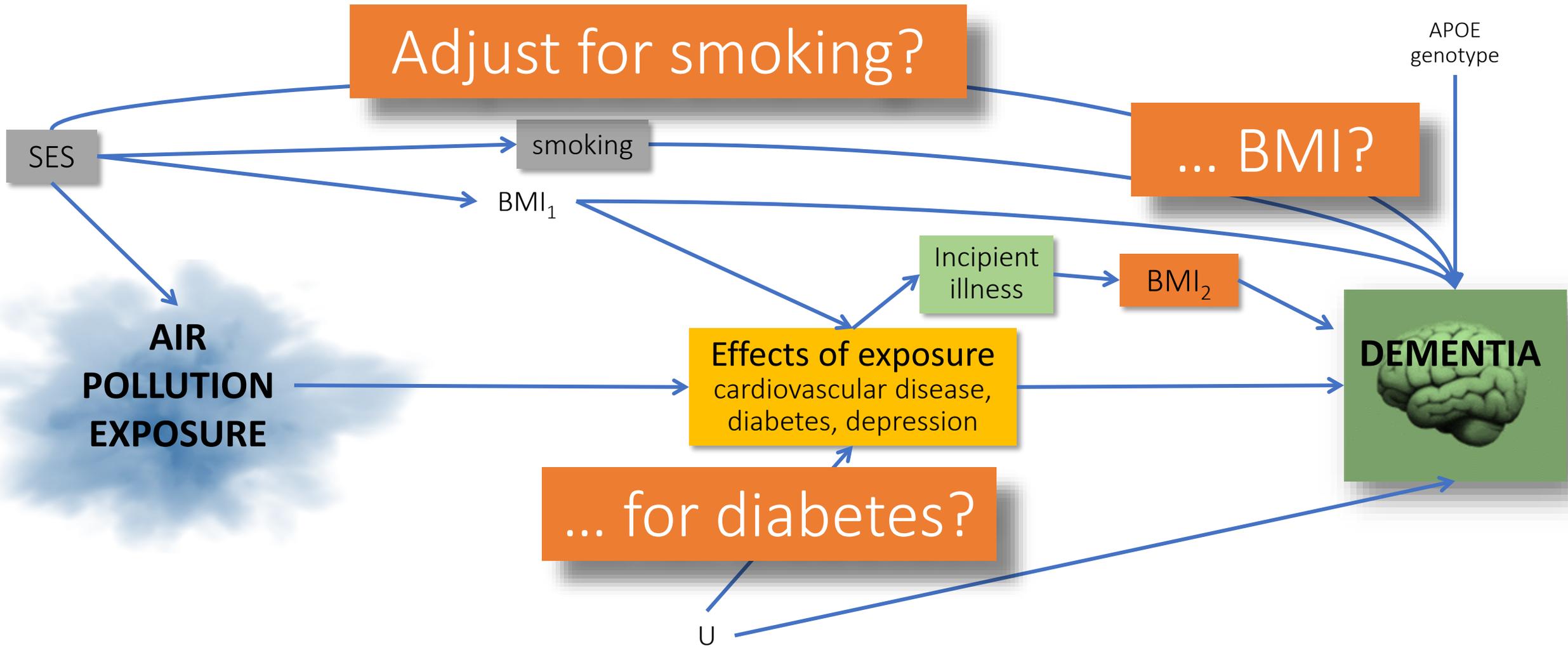


Selection bias: e.g., high-risk volunteers

UPSHOT?
overestimation of air pollution's adverse effect



Attention to mechanism: to **make informed decisions about adjustment**



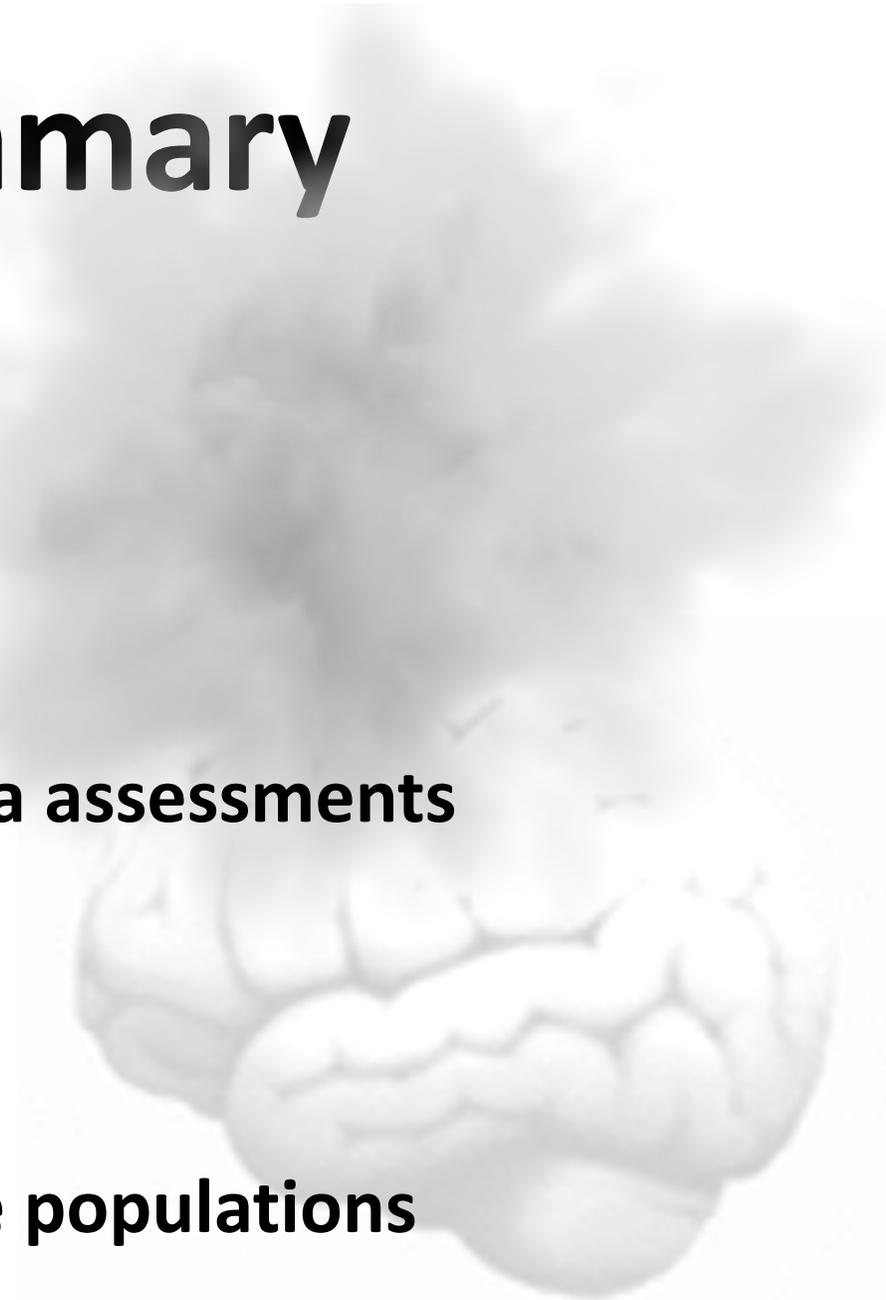
State of the science: **summary**

*Suggestion of **adverse association***

Method deployed have improved, but ...

Needs:

- Studies using **uniform, standardized dementia assessments**
- Attention to **misclassification, selection bias**
- Realistic **time scales**
- Adequate **exposure contrasts**
- Involvement of **researcher disciplines, diverse populations**



ACKNOWLEDGMENTS

- Sara **Adar**
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- NIH-NIA/R01AG065359
- NIH-NIA/R01AG067497
- NIH-NIA/R13AG064971
- And the posse of other people who have bravely dared to cross disciplinary lines to ply their combined superpowers to investigate matters of air pollution and dementia risk.

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