Neighborhood deprivation and suicide by income levels: a nationwide cohort study in Japan

Yoshikazu KOMURA

Department of Social Epidemiology, Graduate School of Medicine,

Kyoto University, Japan

INTRODUCTION

Neighborhood deprivation is a potential target for suicide prevention

Background

- Suicide is a public health concern

- Neighborhood deprivation is a potential target for suicide prevention

Every year,

700 million die by suicides

(World Health Organization. 2021.)

In Japan, suicide is

- **a leading cause of death among the 20-40s** and
- **a major cause of death among the 50-60s**

(Ministry of Health, Labour and Welfare. 2023.)

Neighborhood deprivation is a potential target for suicide prevention

Background

- Suicide is a public health concern

- Neighborhood deprivation is a potential target for suicide prevention

Neighborhood deprivation is

a general marker of **neighborhood socioeconomic status (SES)**

- Meta-analyses showed **consistent associations between neighborhood deprivation and suicide**, particularly among men

(Soc Sci Med. 2017 Nov:192:102-111.)

(Soc Psychiatry Psychiatr Epidemiol. 2023 Jun;58(6):843-859.)

Heterogeneity by SES remains unclear

What is known

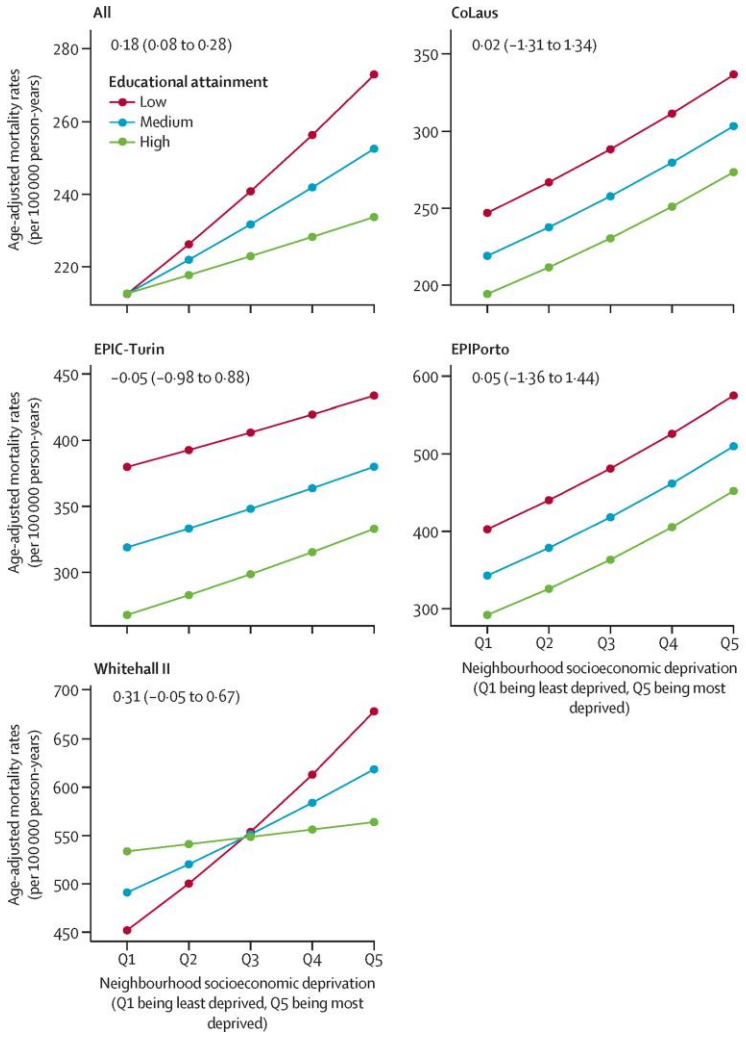
- The association between neighborhood deprivation and **all-cause mortality** is mixed

(Lancet Public Health. 2022; 7(5): e447-e457)

suggesting that the association between neighborhood deprivation and suicide might be **heterogeneous by individual characteristics**, such as SES

What remains unknown

The heterogeneity remains unclear **in suicide**



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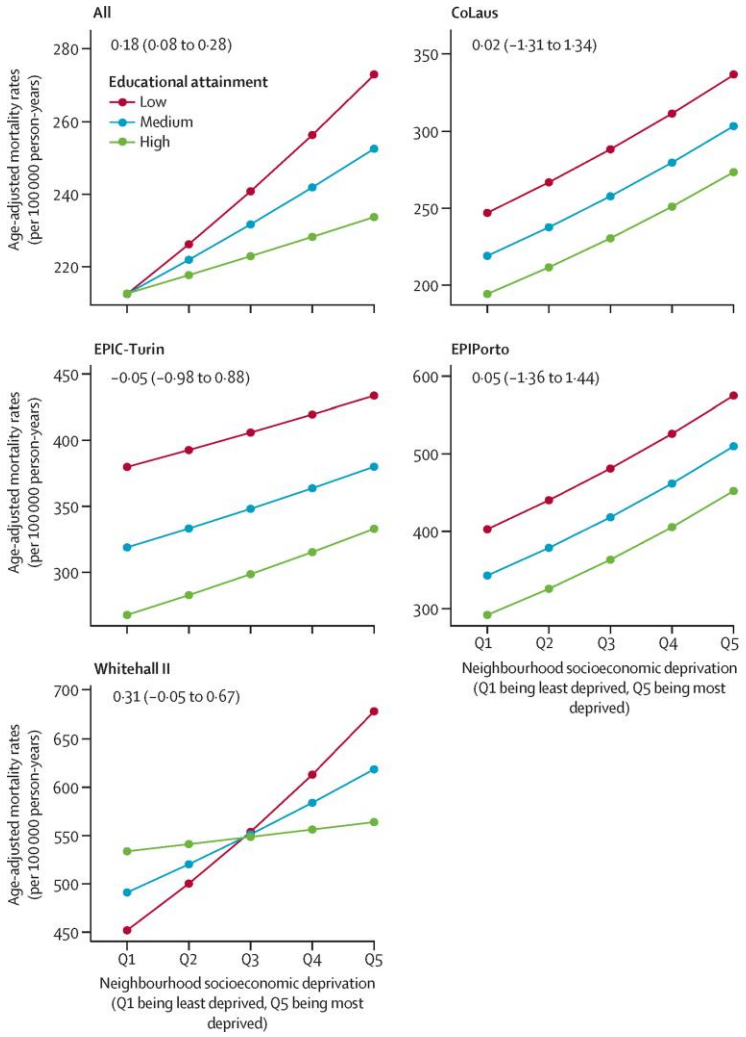

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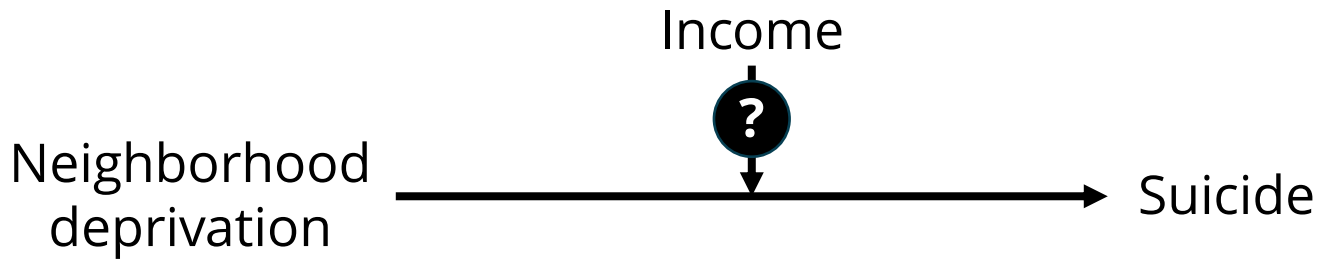
Aim

To investigate whether **the association between neighborhood deprivation and suicide varies according to income level**



Importance

This study's findings provide insight for

- **implementing effective suicide prevention** and
- **minimiizing unintentional harm** by the implementation

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METHOD

Design, setting, data source, and participants

Study design

- Nationwide **open** cohort study

Data source & setting

- The **Japan Health Insurance Association** (**JHIA**) database
- from Apr 2015 to Mar 2022

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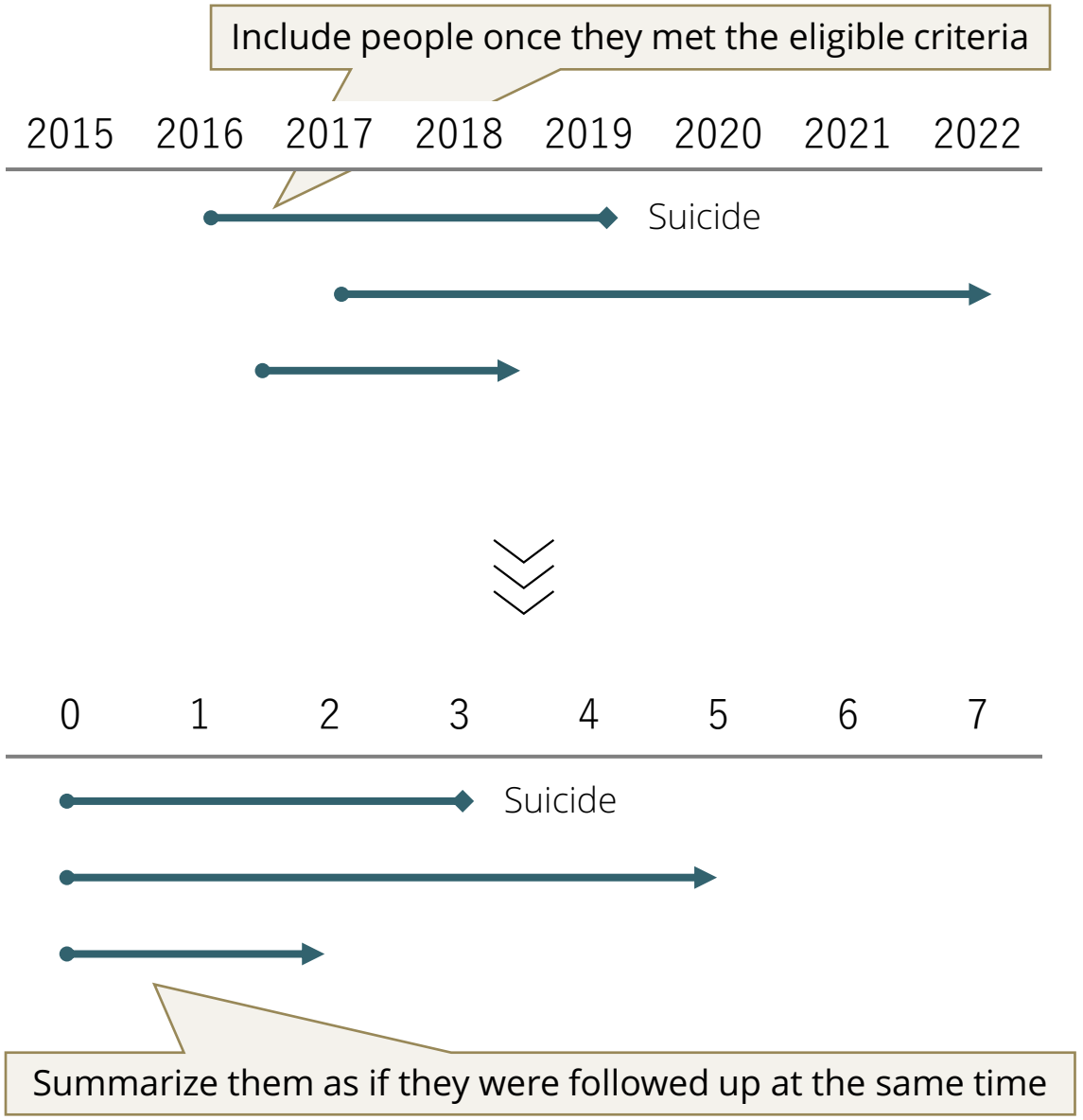
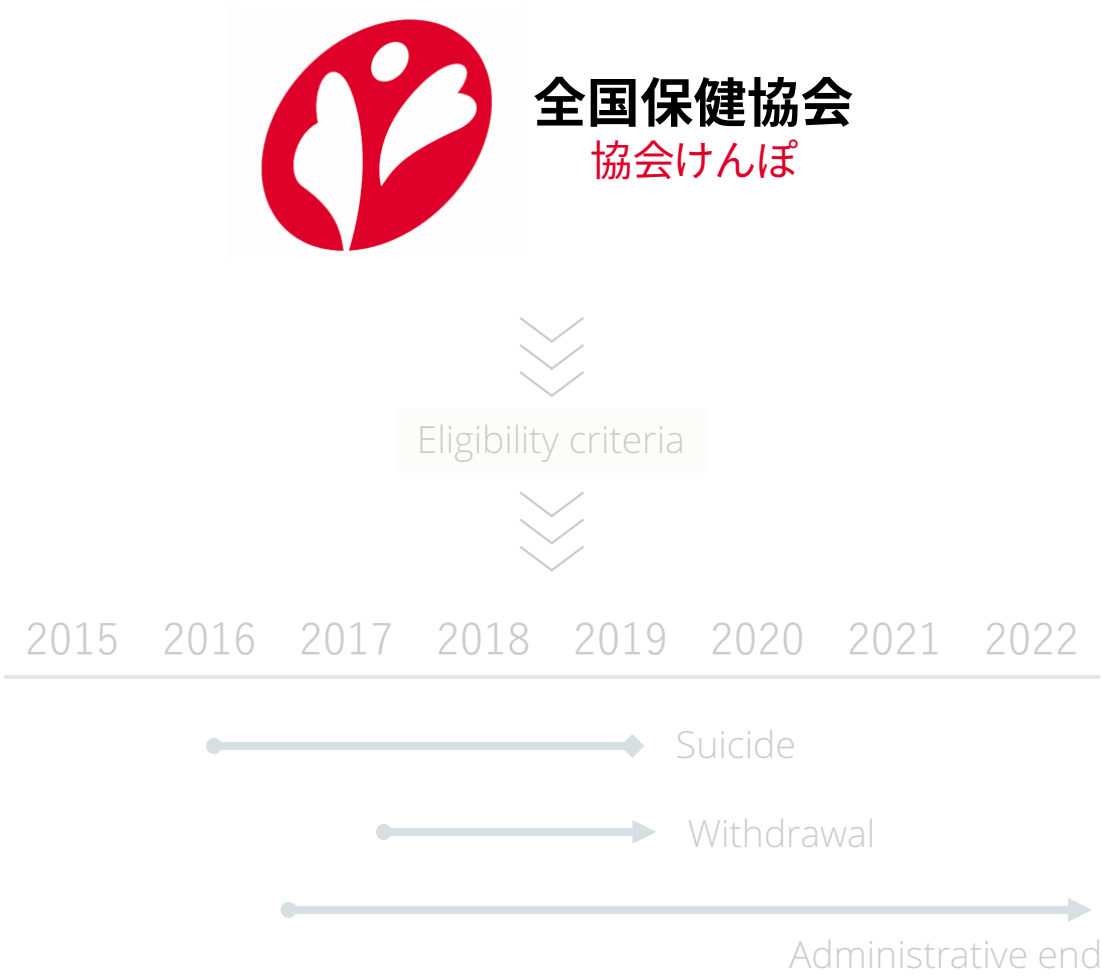


Design, setting, data source, and participants

Participants

- The JHIA is the largest public medical insurer in Japan
- The JHIA provides health insurance for **employees in small- and middle-sized companies**.
- The JHIA covers about 40% (30 million) of the working-age population.

Japan Health Insurance Association



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Participants

Eligible criteria

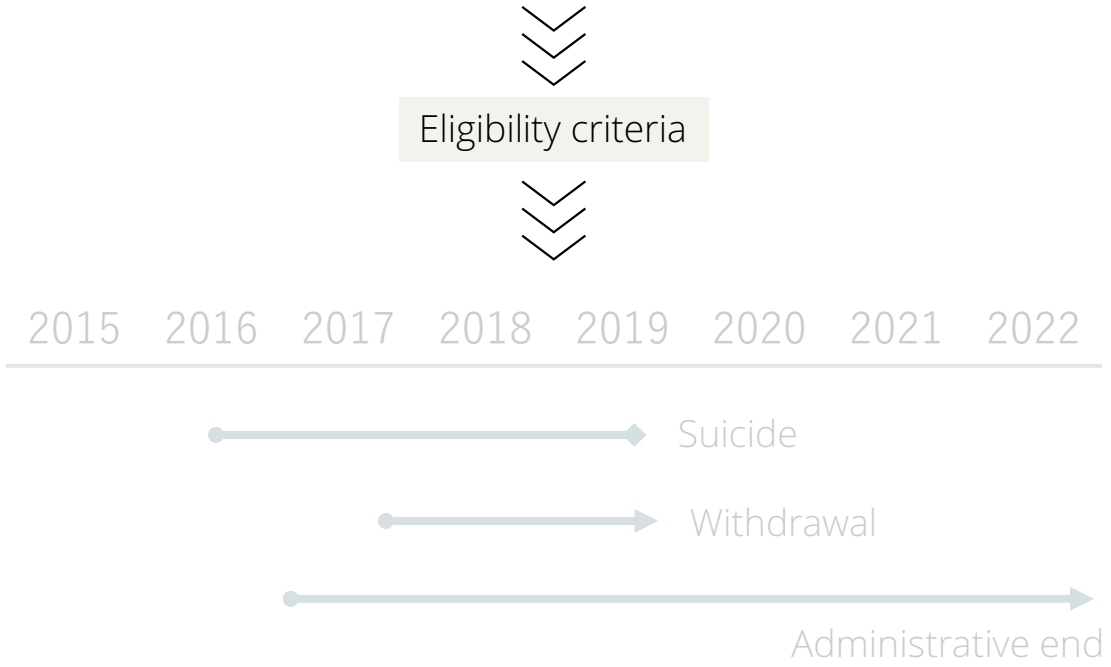
- aged 18 or older
- insured independently
- having memberships for 1 year
- having valid 5-digit zip codes and income levels

Follow-up until

- Death by suicide
- Withdraw from the JHIA,
  including death by other cause
- Administrative end, 31st, March 2022

Japan Health Insurance Association

全国保健協会
協会けんぽ



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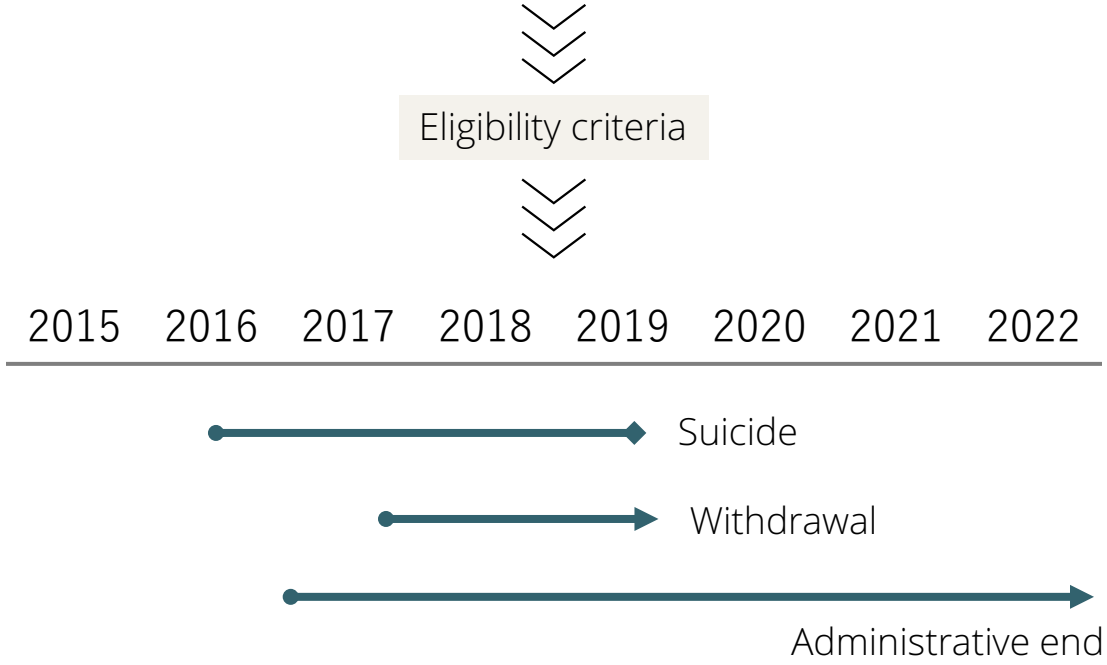


Variables

Exposure

Neighborhood deprivation

- estimated by the Areal Deprivation Index in Japan (ADI)

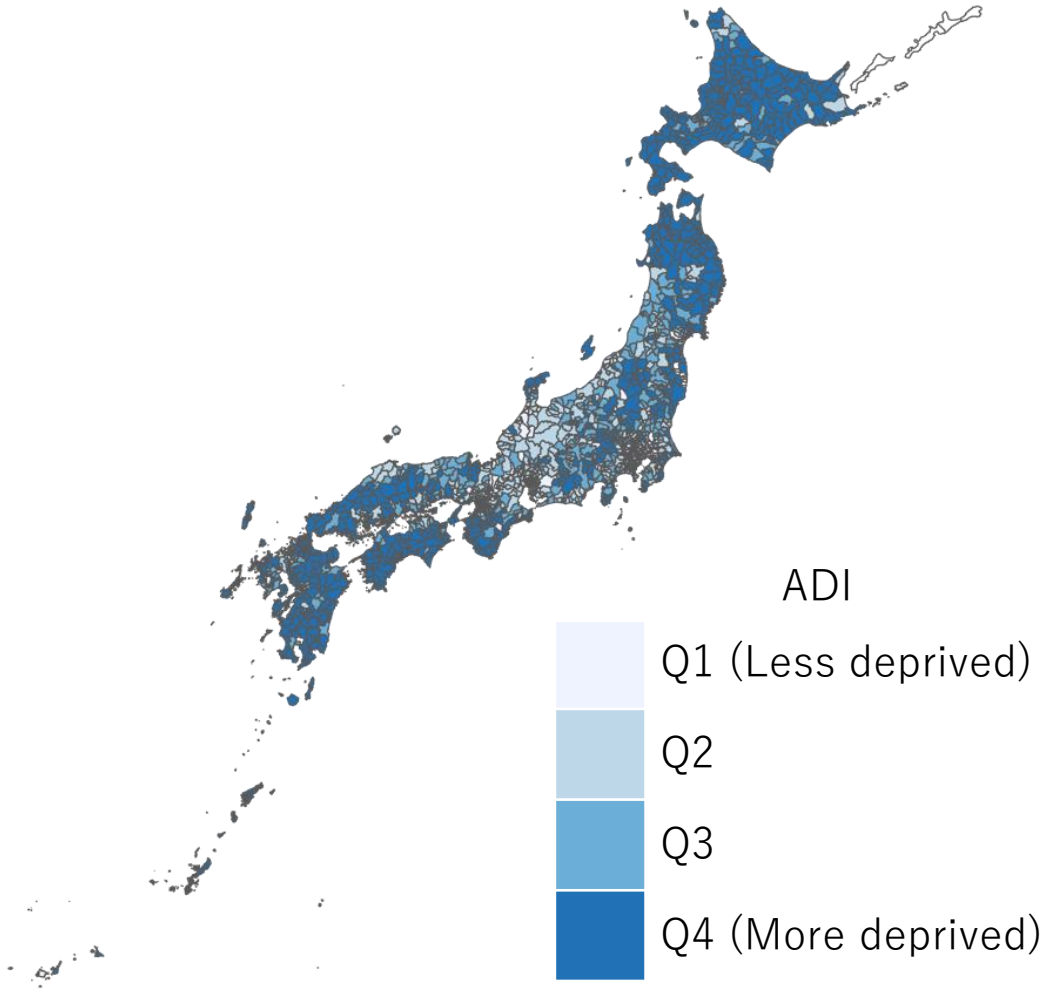
(PLoS One. 2014;9(6):e97802.)

Outcome

Suicide

- identified by death certificates submitted by family members
- classified by ICD-10 (X64-X80)

Distribution of Neighborhood deprivation



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Distribution of Neighborhood deprivation

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Covariates

Area-level

- The proportion of those living in densely inhabited districts
  as a marker of urbanicity
- The Rurality Index in Japan
  as a marker of medical access

Individual-level

- **Income**
  collected from the insurance information
- Age
- Sex
- No. dependents
- History of psychiatric disorders

Statistical analysis

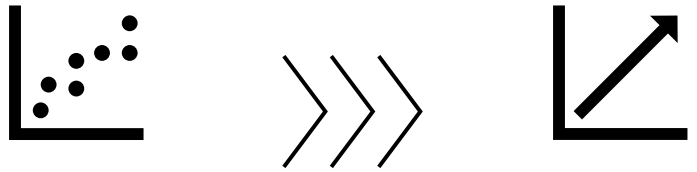
Incidence rate ratios

- using Poisson regression
- with offset term of person-year
- for men and women, separately
- adjusting for
  - age
  - No. dependents
  - History of psychiatric disorders
  - two area-level factors

Adjusted predictions

- It is a model-based prediction, **given means of covariates**
- Three different lines based on income levels (mean, mean ± SD)

Step 1. Fit the model



Data Model

Step 2. Draw lines using the model

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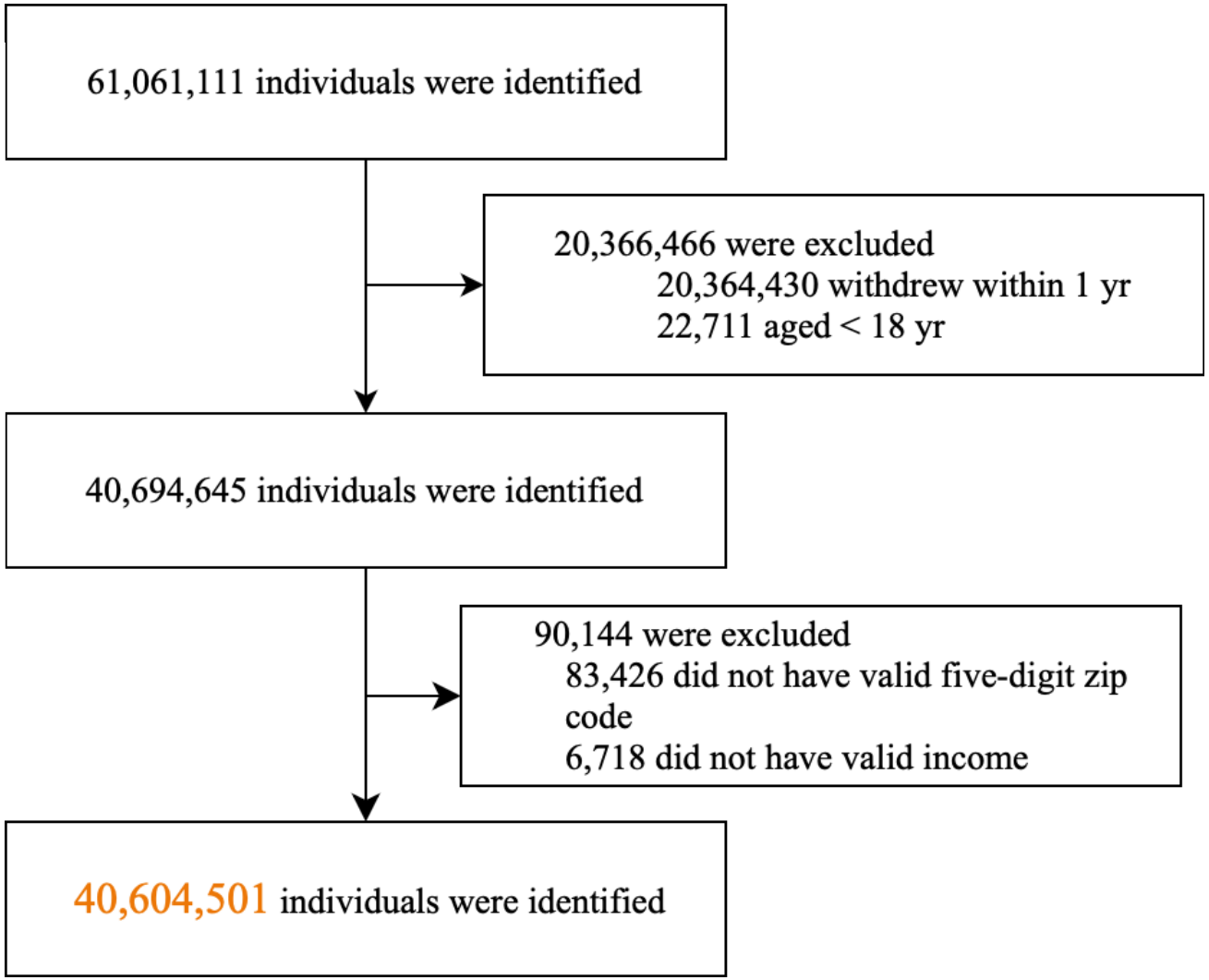
RESULTS

40 million participants were included

Analyzed samples

- Over 138 million person-years,
  6503 suicides were identified
- Suicide rate
  = **4.68 / 10^5 person-year**



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People in deprived areas were less diagnosed with depressive disorders

Baseline characteristics

Characteristic	Q1, less deprived N = 11,532,208	Q2 N = 13,889,081	Q3, more deprived N = 15,183,212
Sex, man, n (%)	6,610,172 (57.3%)	8,100,698 (58.3%)	8,748,950 (57.6%)
Age, mean (SD)	42.38 (13.82)	42.87 (14.01)	43.34 (14.13)
No of dependents, mean (SD)	0.69 (1.15)	0.77 (1.22)	0.80 (1.25)
Annual income, /million yen, mean (SD)	3.63 (3.34)	3.23 (2.43)	3.02 (2.23)
History of psychiatric disorders, n (%)	898,202 (7.8%)	1,025,748 (7.4%)	1,118,326 (7.4%)
Schizophrenia spectrum disorders, n (%)	96,929 (0.8%)	108,285 (0.8%)	109,893 (0.7%)
Bipolar disorders, n (%)	61,327 (0.5%)	63,223 (0.5%)	61,370 (0.4%)
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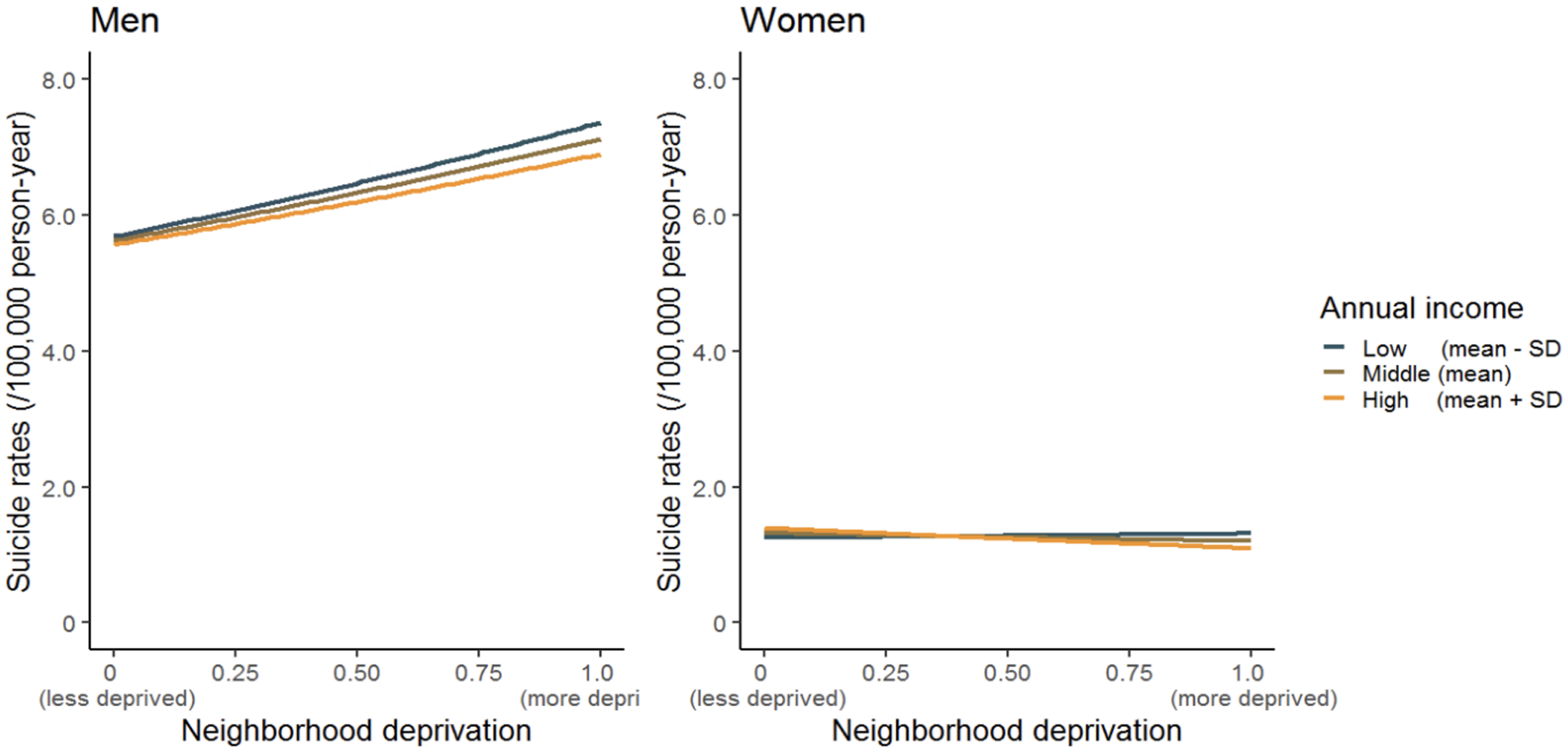

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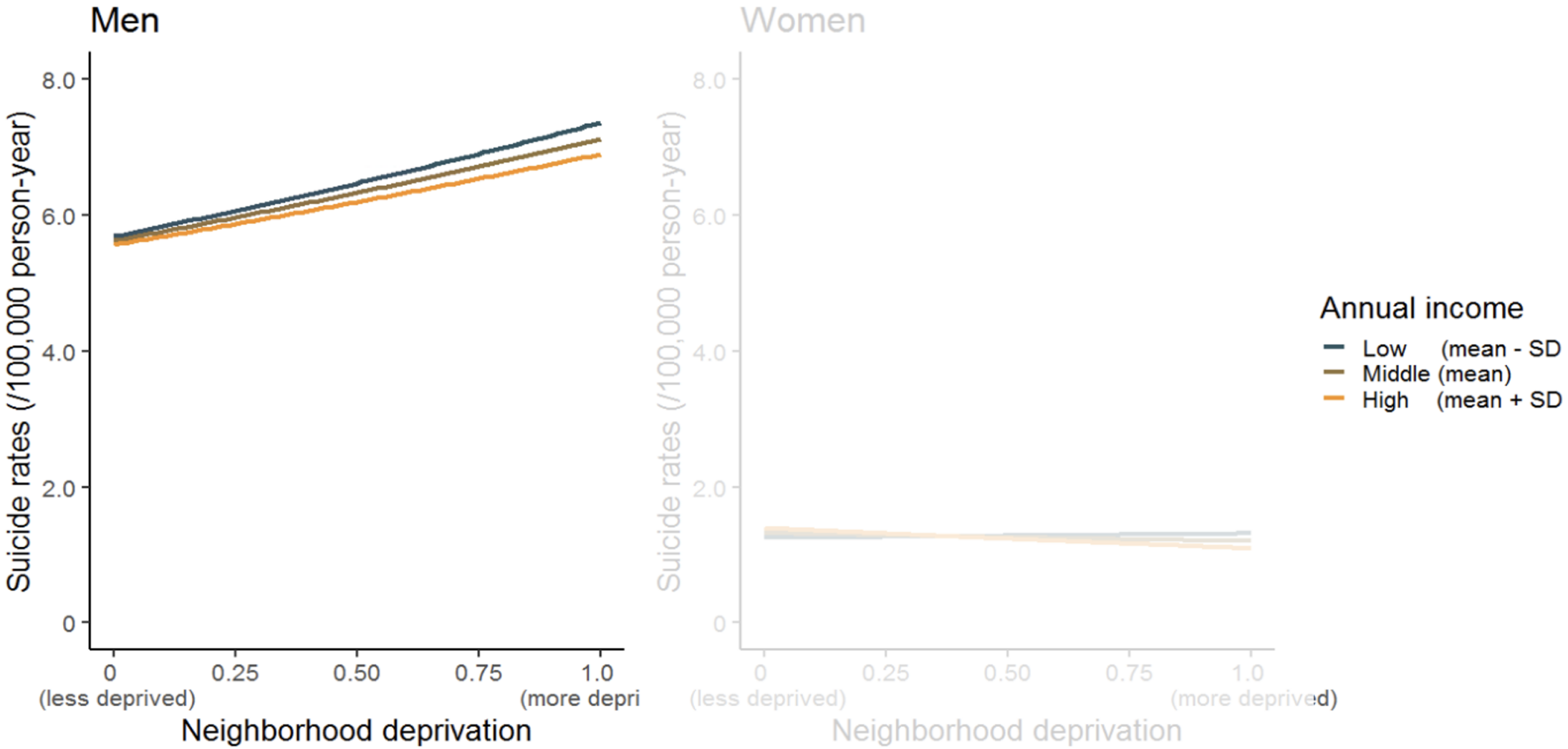

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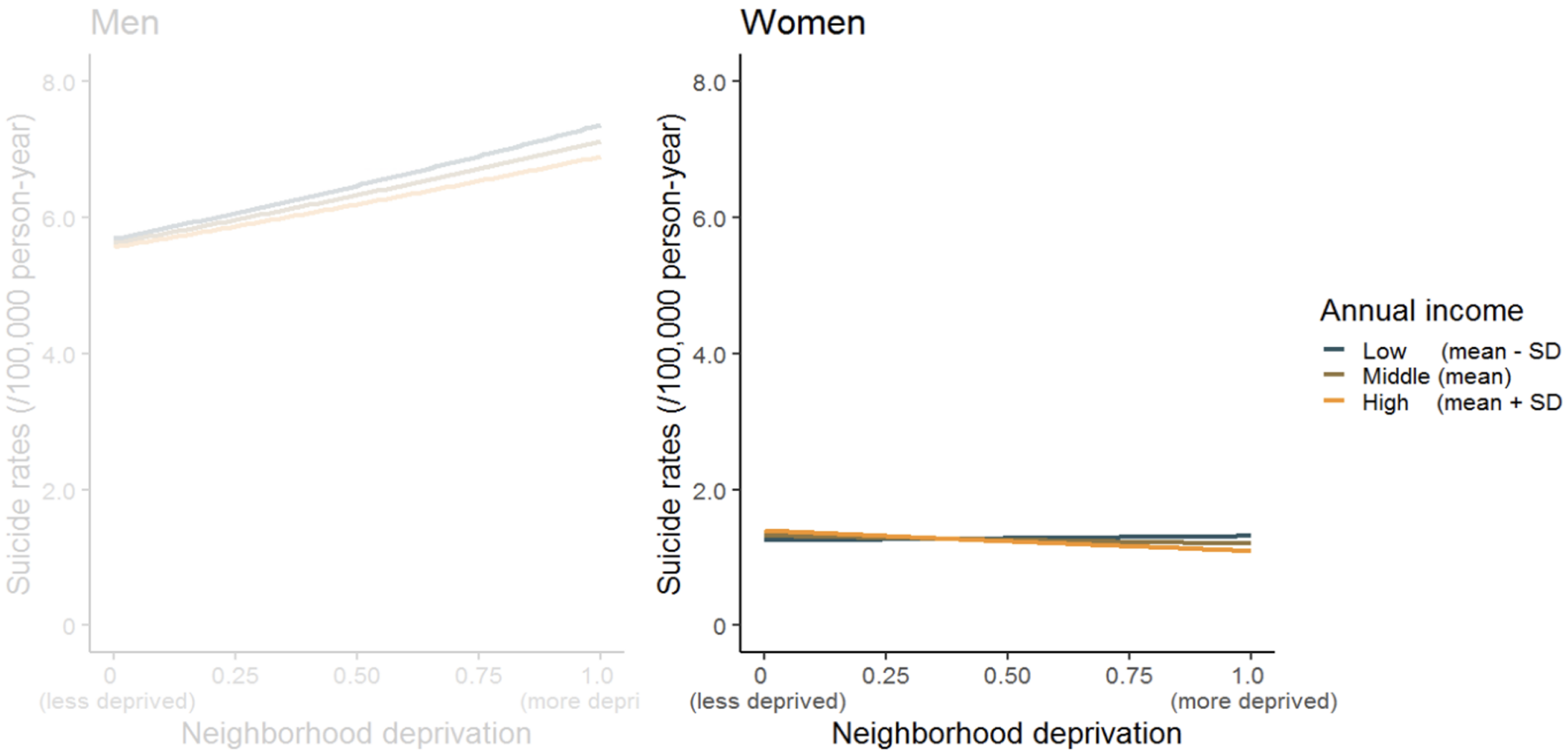

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DISCUSSION

The association is unique across income level

Summary and comparison with other studies

- Aline with previous studies, neighborhood deprivation was associated with suicide particularly among men, but not among women
- Our study found that **the association did not vary by individual-level SES**

Limitations

- **Residual confounding**
  Social drift: vulnerable people tend to live in deprived areas
- **Selection bias**, due to loss-to-follow up
  leading to an underestimation of suicide rates
- **Limited generalizability and transportability**
  still useful where the suicide rate is high among the working-age population

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Discussion | Neighborhood deprivation is a potential targets

Conclusion

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