



Mental Health in the context of spatial epidemiology

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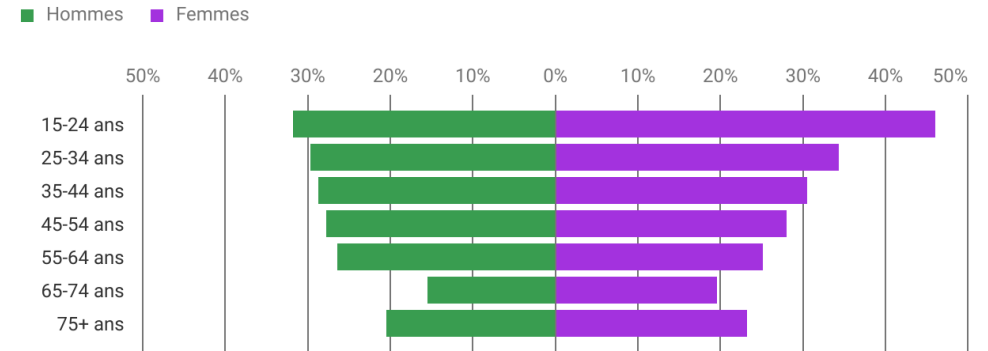
Why do we talk about mental health ?

In Switzerland, the Federal Statistical Office (FSO) conducts surveys every five years, measuring various psychological variables.

We can observe some global patterns but this isn't specific enough in the context of clinical understanding

Moreover, specific geographic effects can also be observed

Sentiment faible de maîtrise de la vie, en 2022
Population de 15 ans et plus vivant en ménage privé

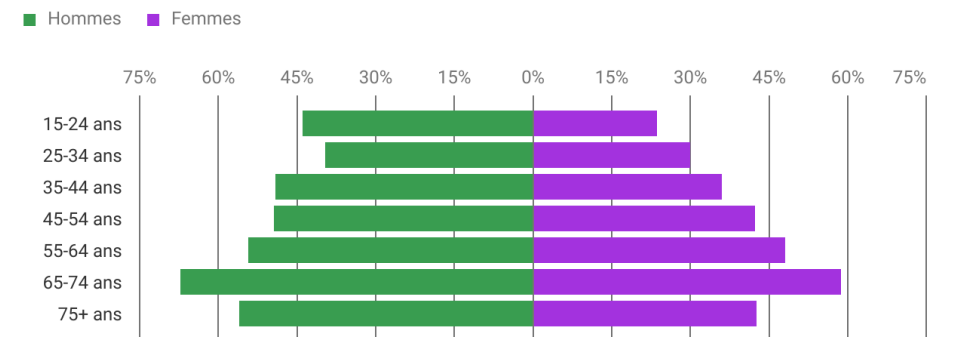


État des données: 08.02.2024
Source: OFS – Enquête suisse sur la santé (ESS)

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Énergie et vitalité forte, en 2022

Au cours des quatre dernières semaines; population de 15 ans et plus vivant en ménage privé



État des données: 08.02.2024
Source: OFS – Enquête suisse sur la santé (ESS)

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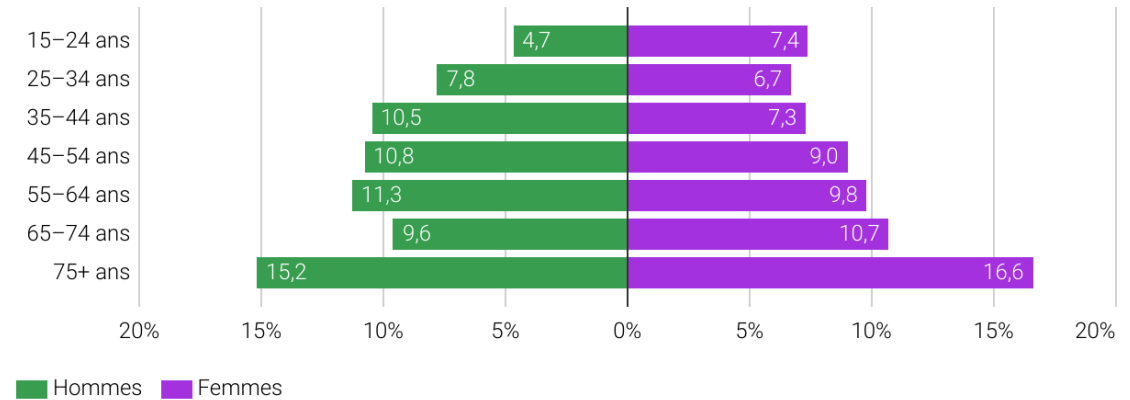
Swiss data on mental health

These data already make it possible to observe specific risk factors according to age and gender in Switzerland.

- Low social support is reported starting at age 75 (rather than 65), particularly among women.
- Psychological distress is described as being on the rise across all age groups, but especially among those aged 15–24 and among women.

Soutien social faible, en 2022

Population de 15 ans et plus vivant en ménage privé

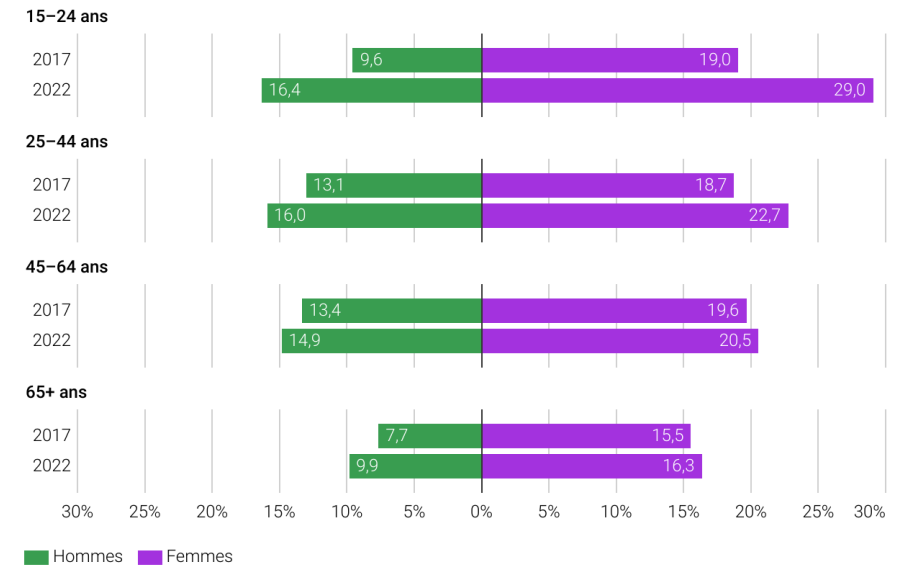


Source: OFS – Enquête suisse sur la santé (ESS)

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Détresse psychologique moyenne ou élevée

Population de 15 ans et plus vivant en ménage privé



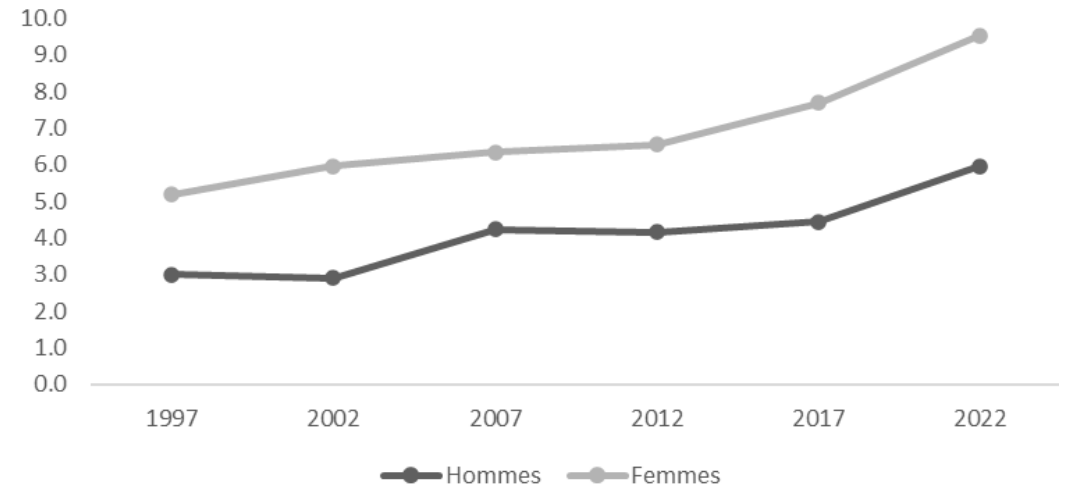
Source: OFS – Enquête suisse sur la santé (ESS)

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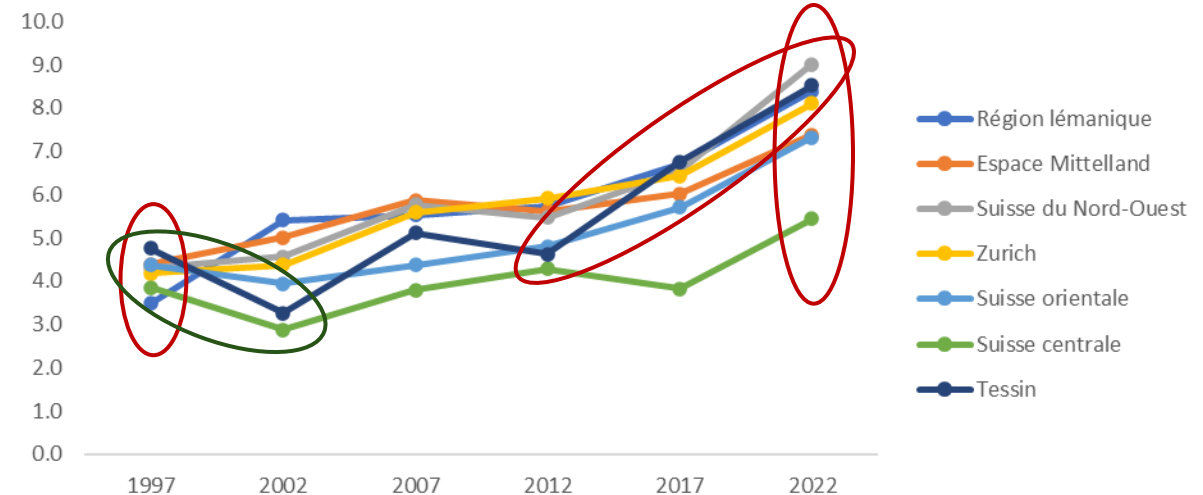
Is the evolution linear ?

As we can see, depending on gender (a variable recognized in the literature as an important factor), the increase in medication use in Switzerland appears to have been linear since 1997, with specificities as function of regions of interest

Evolution de la prise de médication pour troubles psychiques dans le temps en Suisse



Evolution en fonction des zones géographiques



Measuring Mental Health — Concepts & Tools

What is Measured?

- Subjective indicators: emotions, mood, perceived stress, well-being
- Behavioral indicators: performance, engagement, social interaction
- Physiological or clinical indicators: biomarkers, sleep, psychomotor activity

The Role of Psychometric Questionnaires

- Provide quantitative, standardized measures of subjective experiences
- Allow comparison across individuals and time
- Enable screening, diagnosis support, and treatment evaluation
- Examples: STAI (anxiety), BDI (depression), GHQ (general health), GAF (functioning)

Measuring Mental Health — Concepts & Tools

Variety & Psychometric Strengths

- Range from specific symptom scales (e.g., anxiety, depression) to global functioning scales
- Require evaluation of reliability (consistency) and validity (accuracy)
- Support research reproducibility and population-level insights

Models of Mental Health & Disease

- Dimensional models: view mental health as a continuum (e.g., well-being ↔ disorder)
- Categorical models: classify disorders (e.g., DSM, ICD frameworks)
- Symptom network models: map interrelations among symptoms instead of latent “disease”
- Integrating psychometric tools within these models enhances precision, early detection, and personalized interventions

Psychometric Tools in Mental Health Assessment: STAI & GAF



STAI — State-Trait Anxiety Inventory

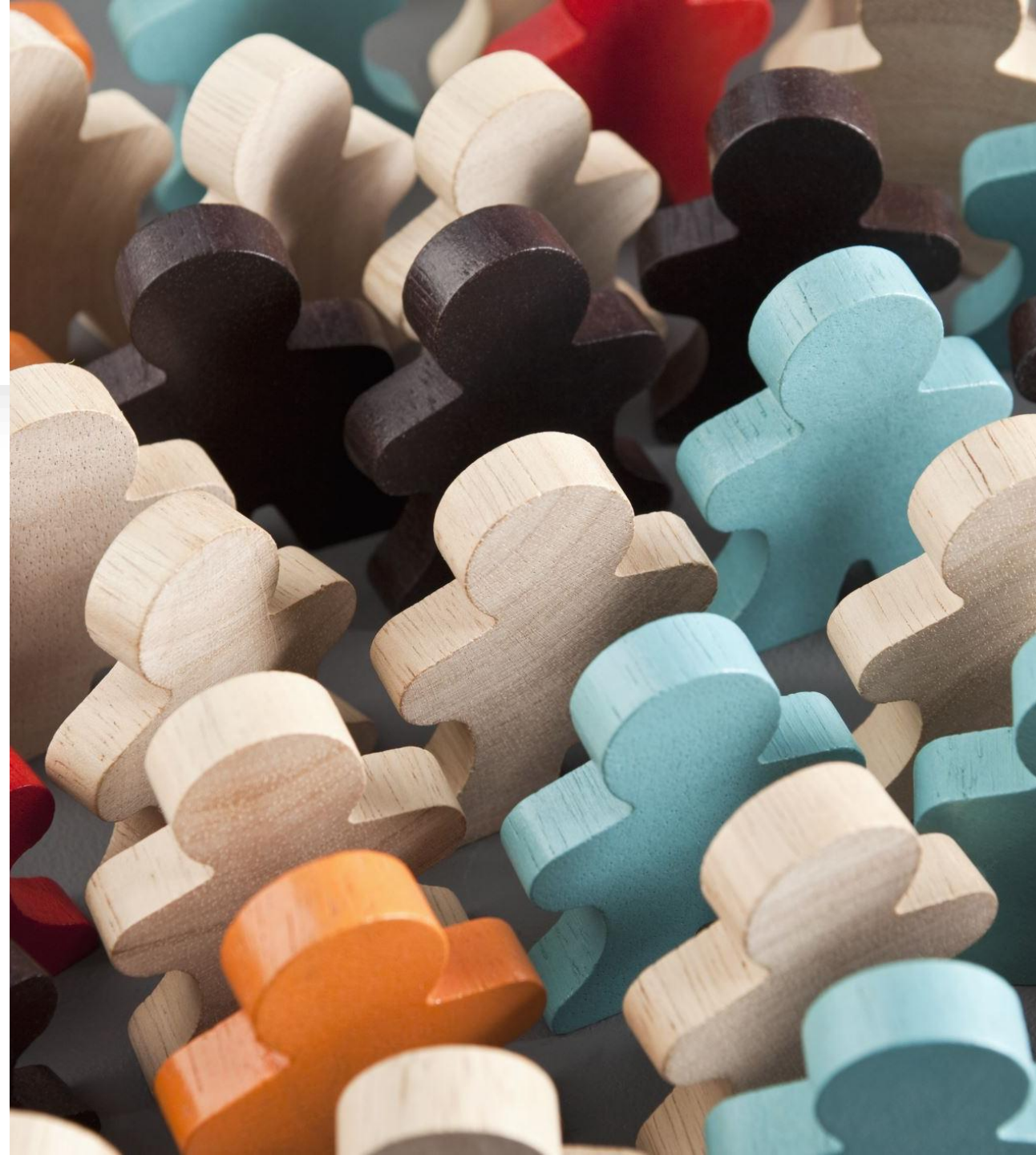
Purpose: Developed by Spielberger (1983) to measure anxiety as a transient state and as a stable personality trait.

- State Anxiety: Emotional response to a specific situation (e.g., exams).
- Trait Anxiety: General predisposition to perceive situations as threatening.

Structure: 40 items (20 state + 20 trait), 4-point Likert scale, ~10–15 min.

Psychometric Properties:

- Reliability: $\alpha = .86-.95$ (excellent)
- Validity: High convergent and discriminant validity
- Norms: Adapted for adolescents and adults



GAF — Global Assessment of Functioning

Purpose: Introduced in DSM-IV (APA, 1994) to rate overall psychological, social, and occupational functioning (0–100).

Scoring Guidelines:

- 91–100: Superior functioning
- 61–70: Mild symptoms
- 41–60: Serious symptoms or dysfunction
- ≤30: Severe impairment

Psychometric Profile:

- • Inter-rater reliability: $r = .60-.80$ (moderate)
- • Construct validity: Correlates with WHODAS 2.0 and other measures
- • Limitation: Subjectivity; replaced in DSM-5 but still widely used

Comparative Insights — STAI vs. GAF

STAI: Self-report inventory measuring state and trait anxiety.

GAF: Clinician-rated scale assessing global functioning.

Comparison:

- STAI → Focuses on emotional distress and anxiety processes.
- GAF → Evaluates overall mental, social, and academic functioning.
- STAI has high internal consistency; GAF has moderate inter-rater reliability.
- Combined use gives complementary insight into emotional and functional dimensions of student well-being.

Social and Environmental factors associated to psychiatric disorders

Question: Are individuals who are genetically predisposed to various psychiatric disorders more likely to be born in urban areas or to move to them later in life?

Study focus: Assessment of genetic risk for several psychiatric conditions among 386,000 individuals, including: Schizophrenia

- Bipolar disorder
- Major depressive disorder
- Autism spectrum disorder (ASD)
- Anorexia nervosa
- Anxiety and stress-related disorders
- Attention-deficit/hyperactivity disorder (ADHD)
- Cannabis use disorder

This type of research examines the relationship between urbanicity and genetic vulnerability, helping to disentangle whether city environments increase risk exposure or whether individuals with certain genetic profiles are more likely to migrate toward urban areas.



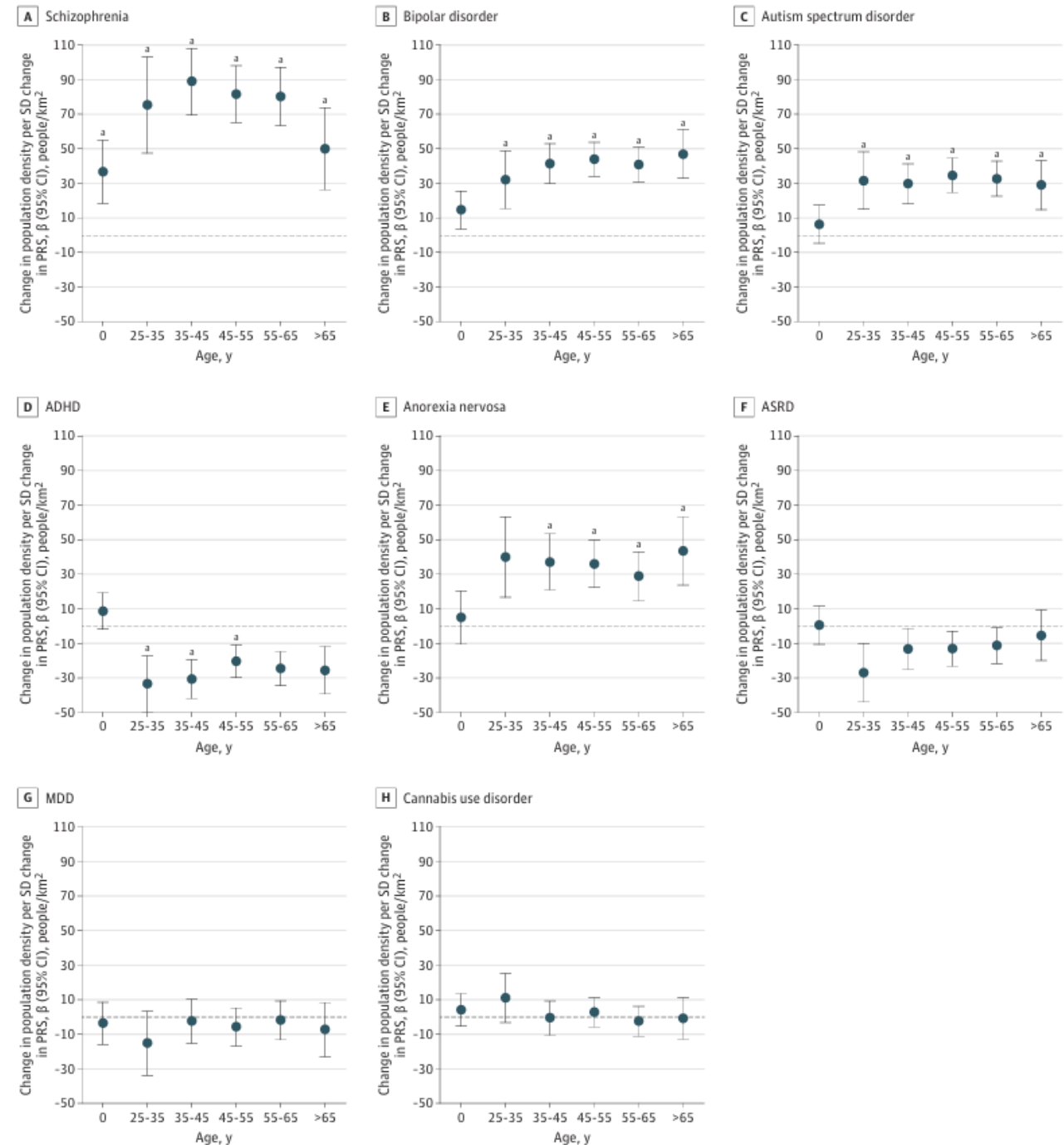
Population density and genetic risk for disease

Polygenic risk scores showed significant associations with increased population density throughout adult life (from age 25 to over 65), reaching the strongest significance in the 45–55 age group for:

- Schizophrenia: +88 people/km² (95% CI: 65–98 people/km²)
- Bipolar disorder: +44 people/km² (95% CI: 34–54 people/km²)
- Anorexia nervosa: +36 people/km² (95% CI: 22–50 people/km²)
- Autism spectrum disorder (ASD): +35 people/km² (95% CI: 25–45 people/km²)
- In contrast, the polygenic risk score for ADHD was significantly associated with lower population density, for example in the 35–45 age group: –31 people/km² (95% CI: –42 to –20 people/km²).

The only significant association with population density at birth was found for the polygenic risk score for schizophrenia ($\beta = +37$ people/km²; 95% CI: 19–55 people/km²; $P = 8 \times 10^{-5}$).

Figure 1. Polygenic Risk Score (PRS) Association With Population Density Across the Life Span



Moving dynamics and psychiatric disorders

These results suggest that individuals with higher polygenic risk scores (PRS) for **schizophrenia, bipolar disorder, anorexia nervosa, and autism spectrum disorder**, as well as those with **lower PRS for ADHD**, tend to **move preferentially from rural areas to cities**.

In contrast, individuals with a **higher polygenic risk score for major depressive disorder** were **born in cities and remained there**.

Figure 2. Polygenic Risk Scores (PRSs) and Migration Patterns In or Out of Cities

