Health and labor market consequences of low-value care: The role of practice style

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Motivation

▶ Mental health problems are a leading cause of disability and suicide worldwide

▶ Increasing awareness of the social and economic burden of mental illnesses has contributed to growing mental health care costs:
  ▶ Increasing consumption of psychotropic drugs
  ▶ Treatment practice hardly follows guidelines (Currie and McLoad, 2020, Cuddy and Currie 2021)
  ▶ Concerns about overdiagnosis and overtreatment (e.g., Hertzberg et al., 2021)

▶ Physician role in determining the right treatment
  ▶ Substantial variation in the intensity of health care services driven by differences in physician practice style (e.g., Cutler et al. 2019)

▶ Primary care is the most frequently utilized health service and often determines the initial treatment
Benzodiazepine: an example of low-value care treatment

- Benzodiazepines (e.g., Valium, Xanax) are part of the symptomatic management of mental health disorders
- **Choosing Wisely** often lists them among low-value care treatments
  - **Cheap** drug that provides short-term relief from insomnia and anxiety symptoms
  - Highly **addictive** with important side-effects
  - Less effective than CBT (e.g., Baranov et al. 2020)
- Still among the most prescribed drugs in **primary care**
  - Adult prevalence is high (e.g., US 12%) and increases sharply with age
- “Hidden ingredient” in the **opioids epidemics** (Park et al. 2015)
This paper

- Evaluate the effects of GPs practice style in prescribing benzodiazepines on long-term health and labour market outcomes:
  - **Step 1:** Using administrative data about 1.2 million patients in Dutch general practitioner (GP) practices, we estimate an arguably exogenous GP propensity to prescribe benzodiazepines
  - **Step 2:** Dynamic DiD that compares the health and labor market outcomes of patients treated by GPs with different propensities after an exogenous mental health shock: the death of a close relative

- After the shock, patients enrolled in more “lenient” GP practices:
  - are more likely to get a benzodiazepine prescription
  - most prescriptions are against Dutch guidelines
  - have higher health care expenditure
  - shows worse labor market trajectories (income ↓, employment ↓, disability and unemployment benefits ↑)
Related literature

- **Variation** in health care and physicians’ practice style (Skinner, 2011, Finkelstein et al. 2016, Cutler et. al., 2019)
  - Quasi-random assignment in ambulance referrals and to doctor in emergency departments (Doyle et al. 2011 and 2015, Eichmeyer and Zhang, 2021)
  - Doctor’s adherence to guidelines (Abaluck et al., 2020, Currie and MacLeod, 2020, Finkelstein et al., 2022)

- **Mental health** related studies:
  - Antidepressant (AD) for adolescent and children (Cuddy and Currie 2020 and 2021)
  - AD for post-partum depression (Currie and Zwiers 2021)
  - Labour market impacts of ADs (Biasi et al., 2021; Butikofer et al., 2020; Masiero et al., 2020; Shapiro, 2022)

- **Studies on benzodiazepines** in control settings or observational studies
  - associated with increasing falls (Luta et al. 2020), emergency visits (Hampton et al., 2014), dementia (De Gage et al., 2014)
  - Increasing overdose mortality (Bachhuber et al. 2016)
Background: Dutch Healthcare System

Primary care

- Gatekeeper GP system, where GP care is free for the patient
- GP work in ‘practices’
- GP can be freely chosen, but:
  - Practice must be within 15 minutes driving distance
  - Practice must be accepting patients
  ⇒ leaves limited space for doctor shopping

Mental health care

- The starting point of mental health treatment in the Netherlands is the GP
- For severe cases need referral from GP
- Waiting lists: for anxiety, waiting times are around 12-15 weeks in 2019-2021
- Since 2009, benzodiazepines are no longer reimbursed
Data

- **GP data**
  - Subsample of around 500 Dutch GP practices covering 1.2 million patients (2009-2019): prescriptions and diagnoses (Nivel data)
  - Link this via social security number

- **Administrative data (CBS)**
  - Labour market outcomes
  - Health insurance expenditure
  - Demographics
  - Address data

- From GP data we can identify 5 potentially inappropriate prescriptions (**Red-Flags**):
  - long treatment period (> 3 months)
  - no mental health diagnoses
  - no therapy after the first diagnosis
  - treatment for light anxiety
  - joint prescription with opioids.
Research Design

- **Ideal experiment**: compare outcomes of (otherwise identical) individuals treated for an anxiety or insomnia issues by doctors with different practice style. In practice:
  - **Selection** of worsts into high prescribers
  - **Different trajectories** before treatment
  - **Pre-treatment** effect due to previous interactions

- How we address these issues:
  - The Dutch context mitigates the selection concerns (Currie and Zwiers 2023)
  - We focus on patients with a common (exogenous) mental health trigger: relative’s death (child, partner, parents or siblings) between 2010-2019
  - We focus on patients with no benzo, anxiety, insomnia, depression before shock (3 years)
Relative’s death, mental health and benzodiazepines

(a) Mental health diagnoses

(b) Benzodiazepine prescription
Step 1: Practice Propensity to Prescribe

On the whole sample of Nivel patients, we estimate our prescribing propensity measure using a leave-out (jackknife) residualized approach:

\[ \text{prescribed}_{ijt} = \delta_0 + \gamma_t + \gamma_{wc} + \gamma_d + \delta x_{it} + \varepsilon_{ijt} \]

- \( \gamma_t \): time fixed effects
- \( \gamma_{wc} \): neighborhood fixed effects
- \( \gamma_d \): MH diagnoses fixed effect
- \( x_{it} \): gender, nationality, marital status, 5-years age bins

Practice propensity to prescribe benzodiazepines:

\[ pp_i^j = \frac{1}{N_{-i}^j} \sum_{i' \neq i} \sum_t \hat{\varepsilon}_{i'jt} \] (1)

- Rescale: \( \frac{pp_i^j}{p(90) - p(10)} \)
- Interpretation: moving from the 10th (low-prescribing) to the 90iest percentile (high-prescribing)
Step 1: Practice Propensity to Prescribe

**Figure:** Propensity distribution
Balancing test: unconditional

F=4.3
Balancing test: Conditional on neighborhood FE

- Age
- Female
- Married
- Migrant
- Income
- Employed
- Self employed
- Recipient social Assistance
- Retired
- Recipient unemployment benefits
- Savings
- Urbanization
- GP Expenditures
- Drugs Expenditures
- Hospital Expenditures
- Any drug Expenditure
- Total Health Expenditures
- Mental Health Expenditures
- Any therapy
- Contact Doctor Assistant
- Antibiotics
- Psychological Diagnosis
- Drug misuse
- Relative Gender
- Relative age
- Child
- Spouse
- Sibling
- Cancer death
- Injury death
- Cardiovascular disease death
- Cardiac therapy drugs
- Antihypertensives drugs
- Diuretics
- Peripheral vasodilators
- Vasoprotectives
- Beta-blocking
- Calcium blockers
- Agents acting on renin-angiotensin system
- Lipid modifying agents

F=2.5
Balancing test: Conditional on neighborhood FE and SES

- Age
- Female
- Married
- Migrant
- Income
- Employed
- Self employed
- Recipient social Assistance
- Retired
- Recipient unemployment benefits
- Savings
- Urbanization
- GP Expenditures
- Drugs Expenditures
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- Any drug Expenditure
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- Diuretics
- Peripheral vasodilators
- Vasoprotectives
- Beta-blocking
- Calcium blockers
- Agents acting on renin-angiotensin system
- Lipid modifying agents

F=2.4
Step 2: Main Estimating Equation

Staggered Event Time DiD:

\[ Y_{it} = \alpha_i + \alpha_t + \sum_{k=-3}^{6} \delta^k \tau^k_{it} + \sum_{k=-3}^{6} \gamma^k \tau^k_{it} \cdot pp^j_{i} + \delta x_{it} + \varepsilon_{ijt} \]

▷ \( \alpha_i, \alpha_t \): individual and time fixed effects
▷ \( x_{it} \): 5 years age bins
▷ Coefficient of interest: \( \gamma^k \)
▷ Event-time \( \tau \): time away from the relative loss
▷ Main outcomes: Benzodiazepine Prescriptions, Healthcare Expenditures, Income, employment, social assistance
Benzodiazepine Take Up

Years away from relative's death

Red flags

(15/25)
Healthcare Costs

Years away from relative's death

Breakdown

(16/25)
Main results: benzodiazepine and health expenditure

<table>
<thead>
<tr>
<th></th>
<th>Benzo prescription</th>
<th>Any red flag prescription</th>
<th>Health expenditure</th>
<th>Mental health expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short (0–1 years)</strong></td>
<td>0.0304*** (0.0036)</td>
<td>0.0072*** (0.0011)</td>
<td>144.91** (67.11)</td>
<td>22.68 (30.62)</td>
</tr>
<tr>
<td><strong>Medium (2–3 years)</strong></td>
<td>0.0247*** (0.0035)</td>
<td>0.0102*** (0.0016)</td>
<td>139.40* (84.53)</td>
<td>40.91 (37.16)</td>
</tr>
<tr>
<td><strong>Long (≥ 4 years)</strong></td>
<td>0.0268*** (0.0040)</td>
<td>0.0075*** (0.0017)</td>
<td>218.21** (103.30)</td>
<td>36.92 (52.69)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N</th>
<th>760’087</th>
<th>760’087</th>
<th>760’087</th>
<th>760’087</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Period Mean</td>
<td>0</td>
<td>0</td>
<td>2061.32</td>
<td>184.53</td>
</tr>
</tbody>
</table>
We find a clear increase in benzodiazepine prescription of patients treated by lenient GPs relative to their counterparts treated by strict physicians.

- The difference in prescription rates is remarkably stable over time.
- A large share of these prescriptions are against current guidelines.

People treated by lenient GPs also experience a large increase in health care expenditure that increase over time.

Such increase is mainly driven by hospital expenditure (both inpatient and outpatient care).
Individual income and employment
Probability of social assistance and disability benefits
## Main results: labor market outcomes

<table>
<thead>
<tr>
<th></th>
<th>Income</th>
<th>Employment</th>
<th>Social Ass.</th>
<th>Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short (0–1 years)</strong></td>
<td>152.42</td>
<td>-0.0017</td>
<td>0.0011</td>
<td>0.0021</td>
</tr>
<tr>
<td></td>
<td>(201.51)</td>
<td>(0.0022)</td>
<td>(0.0026)</td>
<td>(0.0014)</td>
</tr>
<tr>
<td><strong>Medium (2–3 years)</strong></td>
<td>-136.31</td>
<td>-0.0052*</td>
<td>0.0064*</td>
<td>0.0024</td>
</tr>
<tr>
<td></td>
<td>(312.82)</td>
<td>(0.0029)</td>
<td>(0.0033)</td>
<td>(0.0017)</td>
</tr>
<tr>
<td><strong>Long (≥ 4 years)</strong></td>
<td>-759.01**</td>
<td>-0.0091**</td>
<td>0.0107**</td>
<td>0.0061***</td>
</tr>
<tr>
<td></td>
<td>(366.51)</td>
<td>(0.0043)</td>
<td>(0.0042)</td>
<td>(0.0023)</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>533'264</td>
<td>533'264</td>
<td>533'264</td>
<td>533'264</td>
</tr>
<tr>
<td><strong>Pre Period Mean</strong></td>
<td>37'552</td>
<td>0.8673</td>
<td>0.1037</td>
<td>0.0402</td>
</tr>
</tbody>
</table>
Individuals treated by lenient GPs also experience a gradual deterioration of their labor market trajectories

- Negative effects on income start to materialize after three years from the shock
- This is partially driven by a decrease in employment probabilities
- Social assistance benefits increase significantly after 2 years
- We also find a remarkable increase of people ending up in disability schemes
Results interpretation

- Are these “reduced form effects” due to differences in benzodiazepine prescription rates across GPs, or due to other GPs' differences correlated with prescribing leniency?
  - We check whether there are similar increases in other drugs: AD and opioid
  - We construct a leniency measures based on antibiotics: AB leniency
  - Placebo exercise using a different shock (tbd)
Heterogeneity and Robustness checks

- Heterogeneity by sex and age
  - mostly driven by the older subsample, not clear by gender
- TWFE bias: Sun and Abraham estimator
- More balanced cohorts
- Excluding cancer deaths
- Excluding one relative at time
Conclusions

- We find that doctors prescribing style strongly influences individual health and labor trajectories after a common mental health shock.
- This doctors are more like to prescribe benzodiazepine to their patients often for too long, out of current guidelines.
- We cannot exclude that some of the effect is also due to other treatments behaviors associated with their leniency to prescribe benzodiazepines.
- Future research will devoted to:
  - better pin down the exact mechanisms behind the health and labor market effects,
  - explain the determinants of the variation in prescribing behavior and its correlation with diagnosis skills.
Appendix
# Red flags (RF) benzodiazepine prescriptions

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>25&lt;sup&gt;th&lt;/sup&gt;</th>
<th>75&lt;sup&gt;th&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of patients with a benzo prescription</td>
<td>0.0815</td>
<td>0.0738</td>
<td>0.0096</td>
<td>0.1426</td>
</tr>
<tr>
<td>RF 1: 1&lt;sup&gt;st&lt;/sup&gt; prescription and no justifying diagnosis</td>
<td>0.0576</td>
<td>0.0302</td>
<td>0.0448</td>
<td>0.0683</td>
</tr>
<tr>
<td>RF 2: 1&lt;sup&gt;st&lt;/sup&gt; prescription and only light anxiety</td>
<td>0.0304</td>
<td>0.0166</td>
<td>0.0170</td>
<td>0.0416</td>
</tr>
<tr>
<td>RF 3: prolonged prescriptions (more than 3 months)</td>
<td>0.0978</td>
<td>0.0335</td>
<td>0.0763</td>
<td>0.1271</td>
</tr>
<tr>
<td>RF 4: 1&lt;sup&gt;st&lt;/sup&gt; prescription with anxiety but no therapy</td>
<td>0.0128</td>
<td>0.0101</td>
<td>0.0059</td>
<td>0.0192</td>
</tr>
<tr>
<td>RF 5: benzo and opioids in the same month</td>
<td>0.0625</td>
<td>0.0205</td>
<td>0.0506</td>
<td>0.0762</td>
</tr>
<tr>
<td>Any RF prescription</td>
<td>0.2204</td>
<td>0.0509</td>
<td>0.1892</td>
<td>0.2596</td>
</tr>
</tbody>
</table>

Notes: $N = 3,941$ practice × years. Red-flag 1-5 are always in relation to the total number of patients with benzodiazepine prescriptions in a year. Source: Nivel and Statistics Netherlands microdata.
Red Flag prescriptions

![Graph showing years away from relative's death vs. prescription frequency]
Decomposing health care expenditure

(a) Mental health care

(b) Hospital and specialists

(c) Drugs

(d) GPs
Antidepressants and Opioids prescriptions

(a) Antidepressants prescriptions  (b) Opioids prescriptions
(a) Benzodiazepine prescriptions  
(b) Health care expenditure  
(c) Income  
(d) Social assistance
Gender heterogeneity

(a) Benzodiazepine prescriptions

(b) Health care expenditure

(c) Income

(d) Social assistance
Age heterogeneity

(a) Benzodiazepine prescriptions
(b) Health care expenditure
(c) Income
(d) Social assistance
(a) Benzodiazepine prescriptions

(b) Health care expenditure

(c) Income

(d) Social assistance
Balancing cohorts (2011–2018)

(a) Benzodiazepine prescriptions

(b) Health care expenditure

(c) Income

(d) Social assistance
Excluding cancer

(a) Benzodiazepine prescriptions

(b) Health care expenditure

(c) Income

(d) Social assistance
Relative’s death heterogeneity: benzodiazepine

(a) No children

(b) No parents

(c) No spouse

(d) No siblings