Insurance Choice and Demand for Prescription Drugs among Individuals with Chronic Conditions

Chunyang Feng
Ph.D. Candidate in Economics
Wayne State University
Introduction

• Rising Expenditures for Prescription Drugs
  o Spending in the U.S. for prescription drugs was $259.1 billion in 2010, over 6 times the $40.3 billion spent in 1990, and is projected to double over the next decade (Keehan, SP et al. 2012).

• Although expenditures for prescription drugs represent a relatively small proportion of overall health spending, prescription drugs are vital to preventing and treating chronic and in helping to avoid more costly medical problems.
Introduction

• Health Insurance may influence individuals’ use of prescription drugs by lowering their out-of-pocket (OOP) expenditures, so
  o the enrollee have limited incentives to economize on costs for prescription drugs
  o the enrollee are motivated to consume more
• However, insurance plans have responded to the rising prescription drug costs by
  o demand oriented instruments: user fees and multi-tiered formularies
  o physician-oriented instruments: prior authorization, step therapy, physician education and financial incentive
  o inducing favorable self-selection: plans are designed to attract lower-risk individuals
• Therefore, health insurance may lead to paradoxical outcome of individuals’ consumption behavior.
Motivation: Difficulty in Modeling

• The previous literature has well documented adverse selection and moral hazard issues in the health insurance setting (e.g. Nyman 2004; Shin and Moon 2007).
  o Individuals who purchase health insurance do not constitute a random part of the population.
  o The insured are likely to have a higher rate of utilization than their counterparts.
  o The unobserved individual characteristics may upwardly bias the estimate of the association between health insurance and prescription drug utilization, known as ‘endogeneity’ in econometric terms.
Motivation: Needs for New Empirical Models of Insurance Choice and Demand for Prescription Drugs by Chronically Ill

Most traditional studies of the association between health insurance and demand for prescription drugs fail to

• perform the analyses at the individual level
• control the severity of the target condition
• control the therapeutic classes of drugs
• disaggregate prescription drugs into generic and brand-name components

New contribution of the present study

• detangles the association between health insurance and demand for prescription drugs by chronic condition
• examines whether individuals covered by HMO plans are more likely to purchase generic substitutes than their counterparts covered by non-HMO plans with drug coverage
Research Questions

• What factors are associated with a chronically ill individual’s insurance choice, out-of-pocket (OOP) prescription drug expenditures and utilization?
• How is private health insurance associated with OOP prescription drug expenditures and utilization among the chronically ill?
• Does the association between private health insurance and prescription drug utilization differ by type of chronic condition?
The Model

The present study uses a set of several equations to examine the determinants of healthcare decision: insurance, utilization and spending. The model consists of

- a discrete insurance choice from four exclusive categories
  - HMODC: HMO with drug coverage
  - HIWDC: non-HMO plans with drug coverage
  - HINDC: non-HMO plans without drug coverage
  - Uninsured: no insurance

- two types of outcome equations
  - expenditure equation
    - binary and expenditure dependent variable measuring OOP expenditures
  - utilization equation
    - binary and count dependent variable measuring utilization.
The Model

Insurance Choice Equation

Let $V_j$ be the latent utility associated with the corresponding $j^{th}$ insurance category. Then, for individual $i$, his/her insurance choice of $j$ is modeled as:

$$d_{ij} = 1 \text{ if } V_{ij} = \max (V_{i0}, ..., V_{i3})$$

(1)

where

$$V_j = (x_i, z_i)\alpha_j + u_{ij}, j = 0, ..., 3$$

Vector $x_i$: a constant term, socio-demographic and health status variables

Vector $z_i$: instrumental variables that affect insurance choice but has no direct impacts on the use of prescription drug.

$\alpha_i$: coefficient varying across insurance choice

$u_{ij}$: error term

The probability that individual $i$ chooses insurance $j$ is

$$\Pr(j) = \Pr(V_j - V_{ik} > (x_i, z_i)\alpha_j, \forall k \neq j)$$

(1)’

which is specified as a multinomial logit model.
The Model

Total Expenditure Equation

- For simplicity, the two-part expenditure model can be specified as
  \[
  \Pr(\text{Exp}_i > 0) = x_i'\gamma + d_i'\gamma + u_{2i} \quad (2)
  \]
  \[
  \ln[\text{Exp}_i | \text{Exp}_i > 0] = x_i'\beta + d_i'\eta + u_{3i} \quad (3)
  \]

- Vector $x_i$ is similar to the indicators in the insurance choice equation
  Here $d_i = (d_{i0},...,d_{i3},)'$ is the vector of insurance choice.

- Similar model was used to estimate the conditional level of OOP expenditures on generic drugs only, on brand name drugs only and on both generic and brand name drugs.
The Model

Utilization Equation

• For the total utilization equation, the two-stage model is estimated again with the same independent variables used in total expenditure equations.

• The dependent variable of Eq. (2) equals 1 if the individual used any prescription of selected therapeutic classes to treat the target condition during the interviewed year; otherwise, the variable equals 0.

• The dependent variable of Eq. (3) equals count of prescription fills, conditional on any positive use of prescription drugs of selected therapeutic classes to treat the target condition during the interviewed year.
The Model

• Further, the outcome of prescription utilization is classified into three exclusive cases that are similar to the analyses of conditional expenditures.

• Eq.(2) and (3) are used to estimate:
  o conditional on any use, the probability of
    • generic drug use only
    • brand name drug use only
    • both generic and brand name drug use
  o counts of prescription fills in three cases mentioned above, conditional on any use during the interviewed year.
Data

- Three files from Medical Expenditure Panel Survey (MEPS), 2003-2007
  - Household consolidated file: personal characteristics, health care utilization and expenditures.
  - Medical condition file: diagnose code (ICD-9-CM)
  - Prescribed medicine file: drug characteristics, OOP, third party payment, national drug code
- Red Book file included in the MarketScan Medstat Database

Study Sample

- Inclusion criteria
  - working aged population (18-64) with hypertension, diabetes, depression or asthma
  - no public health coverage
- Final eligible observations for hypertension = 10,595, for diabetes=4,191, for depression=5,924, for asthma=6,533.
- Each sample is treated as cross-sectional data.
Summary Statistics of Individuals’ Annual OOP Expenditure for Prescription Drugs to Treat the Target Chronic Conditions, Conditional on any Expenditure (2003-2007, $ in 2007)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Hypertension</th>
<th>Diabetes</th>
<th>Depression</th>
<th>Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HINDC</strong></td>
<td>377.079 (12.701)</td>
<td>566.197 (47.739)</td>
<td>464.813 (34.076)</td>
<td>110.786 (11.353)</td>
</tr>
<tr>
<td><strong>HIWDC</strong></td>
<td>197.392* (5.139)</td>
<td>249.251* (8.420)</td>
<td>199.881* (8.057)</td>
<td>65.870* (2.981)</td>
</tr>
<tr>
<td><strong>HMODC</strong></td>
<td>171.239* (6.198)#</td>
<td>223.156* (14.347)</td>
<td>179.433* (10.691)#</td>
<td>66.575* (2.936)</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>8,545</td>
<td>2,727</td>
<td>3,220</td>
<td>1,371</td>
</tr>
</tbody>
</table>

Note: *indicates that the estimate is significantly different from the reference group (Uninsured) (Adjusted Wald, p<0.01). #indicates that the estimate is significantly different from the reference group (HIWDC) at the 1 percent level.
Regression Results

Research Question 1:

What factors are associated with a chronically ill individual’s insurance choice, out-of-pocket (OOP) prescription drug expenditures and utilization?

• Income related variables have significantly greatest association with health insurance choice across conditions, compared to other explanatory variables.
  o The poor are generally over 100% more likely to be uninsured than others with higher income level.

• No consistent pattern is evident between individuals’ health status and insurance choice.

- Coronary Heart problem
- Other heart problems
- Lower score for mental health component summary (MCS)

- Excellent self-reported health
- No Kidney or eye problem caused by diabetes
Research Question 1 (continued):

- Self-reported health status is among one of the most significantly important predictors in both parts of the expenditure equations (p<.001).
  - Individuals indicating fair or poor health are 1.2% - 7.1% more likely to spend on prescription drugs, and are expected to have much higher level of conditional expenditures.

- While the presence of multiple conditions may increase the probability of any expenditure, it might also affect individuals’ prescription utilization pattern.
  - Examples could be found in the hypertension and diabetes sample for individuals with comorbidity such as heart attack, angina, and hyperlipidemia.
Regression Results

Research Question 2: How is private health insurance associated with OOP prescription drug expenditures and utilization among the chronically ill?

Research Question 3: Does the association between private health insurance and prescription drug utilization differ by type of chronic condition?
### Marginal Effects of Insurance Status on the Prob. Of Any Expenditure

<table>
<thead>
<tr>
<th></th>
<th>Hypertension</th>
<th>Diabetes</th>
<th>Depression</th>
<th>Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>HINDC</td>
<td>0.074</td>
<td>0.011</td>
<td>0.156</td>
<td>0.032</td>
</tr>
<tr>
<td>HIWDC</td>
<td>0.111</td>
<td>0.097</td>
<td>0.211</td>
<td>0.046</td>
</tr>
<tr>
<td>HMODC</td>
<td>0.097</td>
<td>0.067</td>
<td>0.183</td>
<td>0.073</td>
</tr>
<tr>
<td>HINDC*</td>
<td>0.037</td>
<td>0.037</td>
<td>0.011</td>
<td>0.071</td>
</tr>
<tr>
<td># of physician visits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIWDC*</td>
<td>0.013</td>
<td>0.028</td>
<td>0.005</td>
<td>0.046</td>
</tr>
<tr>
<td># of physician visits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HMODC*</td>
<td>0.014</td>
<td>0.023</td>
<td>0.010</td>
<td>0.037</td>
</tr>
<tr>
<td># of physician visits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uninsured*</td>
<td>0.029</td>
<td>0.031</td>
<td>0.022</td>
<td>0.073</td>
</tr>
<tr>
<td># of physician visits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Probability</td>
<td>0.810</td>
<td>0.656</td>
<td>0.542</td>
<td>0.208</td>
</tr>
</tbody>
</table>

Note: ‘Uninsured’ is the reference group
Marginal Effects of Insurance Status on the Conditional Expenditure and Utilization

<table>
<thead>
<tr>
<th></th>
<th>Hypertension</th>
<th>Diabetes</th>
<th>Depression</th>
<th>Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expenditure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HINDC</td>
<td>0.176</td>
<td>-0.010</td>
<td>0.112</td>
<td>-0.317</td>
</tr>
<tr>
<td>HIWDC</td>
<td>-0.329</td>
<td>-1.065</td>
<td>-0.850</td>
<td>-0.693</td>
</tr>
<tr>
<td>HMODC</td>
<td>-0.460</td>
<td>-1.136</td>
<td>-0.883</td>
<td>-0.672</td>
</tr>
<tr>
<td><strong>Utilization</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HINDC</td>
<td>1.737</td>
<td>4.212</td>
<td>-0.322</td>
<td>0.576</td>
</tr>
<tr>
<td>HIWDC</td>
<td>1.320</td>
<td>0.637</td>
<td>0.718</td>
<td>0.324</td>
</tr>
<tr>
<td>HMODC</td>
<td>0.801</td>
<td>-0.115</td>
<td>0.880</td>
<td>0.760</td>
</tr>
</tbody>
</table>
Main points

• Individuals with health insurance coverage have greater probability of positive expenditures on prescription drugs.
• Drug benefit really matters for the chronically ill population.
• The association between health insurance coverage and the probability of any expenditure on prescription drugs varies across conditions.
  o therapeutic importance
  o perceptibility of the symptom
• While health insurance with drug coverage significantly lowers OOP expenditures, it increases the conditional level of prescription drug utilization.
Main points

• In addition, the overall ratio of annual generic and total number of prescriptions filled per individual conditional on any drug use is significantly greater in HMO plans across three conditions.
  
  o HIWDC vs. HMODC in hypertension is 0.81:0.86; diabetes, 0.73:0.80; depression: 0.77:0.82

• However, it is less clear whether individuals under HMO plans are more likely to use generic drugs than their counterparts under non-HMO plans with drug coverage.
  
  o Involved factors: availability of generic substitutes, price differential in ties of formulary, severity of conditions as well as physicians’ prescribing behavior
Study Conclusions and Implications

• Health related factors are less important in predicting individuals’ health insurance status than usually expected (Koc, 2005).
  o conflicting selection bias
  o individuals might not freely make their own choices in reality
• The pattern of prescription drug utilization among the chronically ill across insurance plans is unclear.
  o The observed decrease in OOP expenditures could be hardly interpreted into higher ratio of generic drug use among the insured with drug coverage relative to others without drug coverage.
  o The market-level and individual-level effects would jointly complicate the outcome of individuals’ prescription utilization pattern in filling behavior.
Study Conclusions and Implications

• Individuals’ demand response to health insurance is condition specific.
  o Such findings provide useful thoughts for plan designers and policy makers to rationalize drug formulary decisions and better match the needs of the chronically ill, especially the needs of those with multiple conditions.
  o To ensure medication adherence and adequate drug utilization for coexisting conditions, an optimal insurance plan should impose differential cost-sharing on prescription drugs, based on the therapeutic importance to the health outcome.
Research Limitations

The present results can make predictions regarding individuals’ insurance choice and demand for prescription drugs.

However,

- not possible to assess the clinical necessity, adequacy or quality of drug treatment received by the chronically ill
- can not determine the appropriateness of the level of OOP expenditures and utilization by the chronically ill
- nor whether they are actually better off with drug coverage
Questions?
Reference


