The Effect of Provincial Physician Supply on Health Status in the NPHS

Emmanuelle Piérard

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June 9th, 2010
Research question

Does physician supply have an impact on health status?

Measures of health status while living are explored
1994 cutbacks in enrollment in medical school in Ontario and in federal transfers for health care

The effects of physician supply on the health of a population in general have not been explored in Canada
Results

- Lagged Health Status is a strong predictor of future health
- A higher supply of generalists has a positive effect on health status
- A higher supply of specialists has a negative effect on health status
- Having a chronic condition has a negative effect on the HUI
- No consistent differing effect of physician supply for different age groups
- We observe similar patterns for both measures of health status used
Previous Literature

- Jollis et al. (1996) examined the relationship between 1-year survival of AMI patients and specialty of admitting physicians: patients of cardiologists were 12% less likely to die.

- Roetzheim et al. (1999) studied the relationship between supply of specialists and primary care physicians and early detection of colorectal cancer. Increase of 10% of primary care physicians supply is correlated with 5% reduction in the odds of late stage diagnosis, but the same increase in the supply of specialists is correlated with a 3% increase in late-stage diagnosis.

- Roetzheim et al. (2000) studied the relationship between supply of dermatologists and stage of melanoma detection: earlier detection for specialists and family physicians than for internists.
Previous Literature

- Ferrante et al. (2000) find that a higher supply of primary care physicians is associated with earlier stage at diagnosis of breast cancer.

- Starfield et al. (2005) and Shi et al. (2003) find that primary care physicians have a positive effect on mortality rates (aggregate and from heart disease and cancer separately) while specialists have a negative effect, using US data. Starfield et al. show that some of these effects disappear when controlling for socio-demographic correlates.


- Jarman et al. (2008) find a negative association between Hospital Standardized Mortality Ratios and the supply of general practitioners in Dutch hospitals.
Potential problems of the existing literature

- No control for potential endogeneity
- Usually studies individuals with specific health problems
Physician supply data

- Comes from the Canadian Institute for Health Information
- Number of general practitioners/Family Practitioners
- Number of specialists (all specialties merged)

Data transformed to per capita (per 1,000) terms.
GPs/FPs per capita (per 1,000) over time by Province

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Specialists per capita (per 1,000) over time by Province

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The National Population Health Survey (NPHS)

- Includes individuals living in a household in any of the 10 provinces. Population living on Army bases, native reserves and remote areas in Québec and Ontario are excluded.
- One individual aged 12 or older per household was selected to answer questions on health status, health care utilization, etc. Note that we select individuals who were at least 18 years old in 1994.
- The same individuals are followed every other year to answer questions on the survey.
- Four waves of the data are used (1994, 1996, 1998 and 2000)
## Sample Characteristics

<table>
<thead>
<tr>
<th>SAHS</th>
<th>Cycle 1</th>
<th>%</th>
<th>Education</th>
<th>Income</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>151.966</td>
<td>1.60</td>
<td>Less than HS</td>
<td>$0-$19999</td>
<td>22.99</td>
</tr>
<tr>
<td>Fair</td>
<td>691.408</td>
<td>7.27</td>
<td>HS Grad</td>
<td>$20k-$39999</td>
<td>16.54</td>
</tr>
<tr>
<td>Good</td>
<td>2485.590</td>
<td>26.14</td>
<td>Some Post-sec.</td>
<td>$40k-$59999</td>
<td>44.86</td>
</tr>
<tr>
<td>Very Good</td>
<td>3635.630</td>
<td>38.24</td>
<td>Uni./Coll. Grad</td>
<td>$60k-$79999</td>
<td>15.61</td>
</tr>
<tr>
<td>Excellent</td>
<td>2542.405</td>
<td>26.74</td>
<td></td>
<td>$80k and over</td>
<td></td>
</tr>
<tr>
<td>Mean HUI</td>
<td>0.875</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Chronic C.</td>
<td>56.280</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>42.930</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Ind. Smoke</td>
<td>31.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Ind. Binge D.</td>
<td>12.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>~9500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Dependant variables

Self-assessed health status
In general, how would you say your health is?

- Excellent
- Very good
- Good
- Fair
- Poor
Dependant variables

Health Utility Index (HUI)

- Vision;
- Hearing;
- Speech;
- Mobility;
- Dexterity;
- Feelings;
- Cognition;
- Pain & discomfort.
These do not measure the same outcomes and we get quantitatively different results from the estimations

The HUI is a controversial measure in the literature
HUI Distribution Across the sample
Example 1: HUI of perfectly healthy individual (1.00)

Vision (1.00): Able to see well enough to read ordinary newsprint and recognize a friend on the other side of the street, without glasses or contact lenses.

Hearing (1.00): Able to hear what is said in a group conversation with at least three other people, without a hearing aid.

Speech (1.00): Able to be understood completely when speaking with strangers or friends.

Ambulation (1.00): Able to walk around the neighbourhood without difficulty, and without walking equipment.

Dexterity (1.00): Full use of two hands and ten fingers.

Emotion (1.00): Happy and interested in life.

Cognition (1.00): Able to remember most things, think clearly and solve day to day problems.

Pain (1.00): Free of pain and discomfort.
Example 2: HUI of PhD student in an Economics Department (-0.338)

Vision (0.61): Unable to see at all. (6)
Hearing (0.61): Unable to hear at all. (5)
Speech (0.68): Unable to be understood when speaking to other people (or unable to speak at all). (6)
Ambulation (0.93): Able to walk around the neighbourhood with difficulty; but does not require walking equipment or the help of another person. (2)
Dexterity (0.95): Limitations in the use of hands or fingers, but does not require special tools or help of another person. (2)
Emotion (0.46): So unhappy that life is not worthwhile. (5)
Cognition (0.42): Unable to remember anything at all, and unable to think or solve day to day problems. (6)
Pain (0.55): Severe pain that prevents most activities. (5)
Relationship between self-assessed health and HUI

Distribution of HUI across Self-Assessed Health Status

Self-assessed health status

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Model

Health Status  \rightarrow  Physician Supply
Smith-Blundell test of exogeneity for probit regressions
We can reject exogeneity in some of the regressions
Specification of the sample

1. Use two samples:
   - All individuals who were present in all cycles of the NPHS
   - Individuals who did not have a chronic condition

2. Lag of the effect of physician supply on health status
   Physician supply has an impact on health status 2 periods (years) after they occur and the effect carries on for the following 2 years.
In all slides

- a means statistically significant at the 1% level of statistical significance
- b means statistically significant at the 5% level of statistical significance
- c means statistically significant at the 10% level of statistical significance
## Relationship between Physician Consultations, Having a Regular Physician and Physician Supply

<table>
<thead>
<tr>
<th></th>
<th>Cons. Specialist</th>
<th>Cons. GP</th>
<th>Regular MD</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPs per cap.</td>
<td>1.32 a</td>
<td>0.40 a</td>
<td>0.79 a</td>
</tr>
<tr>
<td>Specialists per cap.</td>
<td>1.32 a</td>
<td>0.40 a</td>
<td>0.79 a</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.53 a</td>
<td>0.10</td>
<td>2.57</td>
</tr>
</tbody>
</table>

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Estimation Methods

For the Self-assessed health status:
- Random effect ordered probits

For the HUI:
- Quantile regressions evaluated at the 10th, 20th and 30th percentiles
Baseline Case

- Male, 18 to 39 years old, born in Canada and single
- Lives in Ontario in an urban area but does not own his dwelling
- Does not smoke or binge drink
- Earns $20,000-39,999 (household income)
- High School graduate
- Is in Very Good Health
Results - Socioeconomic variables

- Being married or widowed is correlated with better health outcomes for women.
- Age is correlated with worse health outcomes.
- Income and wealth (ownership of the dwelling) are correlated with better health outcomes.
- Education is correlated with better health outcomes.
- Smoking and binge drinking are correlated with worse health outcomes.
Physician Supply - SAHS

<table>
<thead>
<tr>
<th></th>
<th>poor</th>
<th>fair</th>
<th>good</th>
<th>vg</th>
<th>exc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spec. per cap</td>
<td>-0.74</td>
<td>0.0003</td>
<td>0.011</td>
<td>0.123</td>
<td>0.155</td>
</tr>
<tr>
<td>GPs per cap</td>
<td>0.49</td>
<td>-0.0002</td>
<td>-0.007</td>
<td>-0.082</td>
<td>-0.103</td>
</tr>
</tbody>
</table>

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Physicians per capita by age group - SAHS

<table>
<thead>
<tr>
<th></th>
<th>poor</th>
<th>fair</th>
<th>good</th>
<th>vg</th>
<th>exc</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPs * 40-60</td>
<td>0.26</td>
<td>-1E-4</td>
<td>-0.004</td>
<td>-0.044</td>
<td>-0.055</td>
</tr>
<tr>
<td>GPs * 60-80</td>
<td>0.72 a</td>
<td>-3E-4</td>
<td>-0.011</td>
<td>-0.120</td>
<td>-0.151</td>
</tr>
<tr>
<td>GPs * 80p</td>
<td>-0.07</td>
<td>3E-5</td>
<td>0.001</td>
<td>0.011</td>
<td>0.014</td>
</tr>
<tr>
<td>Spec. * 40-60</td>
<td>-0.22 b</td>
<td>9E-5</td>
<td>0.003</td>
<td>0.037</td>
<td>0.047</td>
</tr>
<tr>
<td>Spec. * 60-80</td>
<td>-0.19</td>
<td>8E-5</td>
<td>0.003</td>
<td>0.033</td>
<td>0.041</td>
</tr>
<tr>
<td>Spec. * 80p</td>
<td>-0.363</td>
<td>1E-4</td>
<td>0.005</td>
<td>0.061</td>
<td>0.077</td>
</tr>
</tbody>
</table>

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### Chronic Condition - SAHS

<table>
<thead>
<tr>
<th></th>
<th>poor</th>
<th>fair</th>
<th>good</th>
<th>vg</th>
<th>exc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Condition</td>
<td>-0.13</td>
<td>4.71E-5</td>
<td>0.002</td>
<td>0.021</td>
<td>0.028</td>
</tr>
<tr>
<td>Spec. * CC</td>
<td>-0.16</td>
<td>6E-5</td>
<td>0.002</td>
<td>0.027</td>
<td>0.034</td>
</tr>
<tr>
<td>GPs * CC</td>
<td>-0.19</td>
<td>7E-5</td>
<td>0.003</td>
<td>0.031</td>
<td>0.039</td>
</tr>
</tbody>
</table>
a means statistically significant at the 1% level of statistical significance
b means statistically significant at the 5% level of statistical significance
c means statistically significant at the 10% level of statistical significance
Physician Supply - HUI

<table>
<thead>
<tr>
<th></th>
<th>30th percentile</th>
<th>20th percentile</th>
<th>10th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPs per capita</td>
<td>0.064 a</td>
<td>0.091 a</td>
<td>0.317 a</td>
</tr>
<tr>
<td>Specialists per capita</td>
<td>-0.036 b</td>
<td>-0.062 b</td>
<td>-0.098 c</td>
</tr>
</tbody>
</table>

An improvement of 0.317 of the HUI is similar to going from experiencing moderate to severe pain that prevents some activities to perfect health.

A decrease of 0.10 of the HUI is similar to going from perfect health to walking around the neighbourhood with difficulty but without walking equipment.

A decrease of 0.06 of the HUI is similar to going from perfect health to being partially understood when speaking with strangers or friends.
### Physicians per capita by age group - HUI

<table>
<thead>
<tr>
<th></th>
<th>30th percentile</th>
<th>20th percentile</th>
<th>10th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPs per capita * 40-60</td>
<td>-0.018</td>
<td>-0.014</td>
<td>-0.027</td>
</tr>
<tr>
<td>GPs per capita * 60-80</td>
<td>0.045</td>
<td>0.041</td>
<td>0.100</td>
</tr>
<tr>
<td>GPs per capita * 80p</td>
<td>-0.056</td>
<td>0.148</td>
<td>0.025</td>
</tr>
<tr>
<td>Spec. * 40-60</td>
<td>0.003</td>
<td>0.001</td>
<td>-0.016</td>
</tr>
<tr>
<td>Spec. * 60-80</td>
<td>0.024</td>
<td><strong>0.048 c</strong></td>
<td>-0.015</td>
</tr>
<tr>
<td>Spec. * 80p</td>
<td>-0.191</td>
<td>-0.091</td>
<td>0.060</td>
</tr>
</tbody>
</table>

* c means statistically significant at the 10% level of statistical significance*
Chronic Condition - HUI

<table>
<thead>
<tr>
<th></th>
<th>30th percentile</th>
<th>20th percentile</th>
<th>10th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Condition</td>
<td>-0.046 b</td>
<td>-0.072 a</td>
<td>-0.154 b</td>
</tr>
<tr>
<td>Spec. * CC</td>
<td>-0.001</td>
<td>-0.016</td>
<td>0.053</td>
</tr>
<tr>
<td>GPs * CC</td>
<td>0.028</td>
<td>0.041</td>
<td>0.032</td>
</tr>
</tbody>
</table>

- **a** means statistically significant at the 1% level of statistical significance
- **b** means statistically significant at the 5% level of statistical significance

A decrease of 0.15 of the HUI is similar to going from perfect health to being able to read ordinary newsprint with or without glasses but unable to recognize a friend on the other side of the street, even with glasses.
Results and policy implications

- Lagged Health Status is a strong predictor of future health
- A higher supply of generalists has a positive effect on health status
- A higher supply of specialists has a negative effect on health status
- Having a chronic condition has a negative effect on the HUI
- No consistent differing effect of physician supply for different age groups
- We observe similar patterns for both measures of health status used
Future work

- Use data on full time equivalent physicians
- Add data on per capita hospital beds
- Evaluate the effect of physician supply on the consumption of health care services and the effect of the latter on health status