The accuracy of general practitioner workforce projections

Backtesting the Dutch GP-supply model

Presented by Lud van der Velden

Based on Van Greuningen et al.
Human Resources for Health 2013, 11:31
Main question

• How accurate is the Dutch model for predicting the supply of GPs?
Outline of the presentation

• The Dutch manpower planning model
• The Dutch supply model
  – headcount only
• Data analysis for the supply model
• Data requirement for the supply model
• Backtesting the supply model
• Results
• Conclusions
Present

Available supply in year T

Development available supply until T+X

Required supply in year T

Future

Available supply in year T+X

Development required supply until T+X

Required supply in year T+X

In between
### Supply

- Available supply in year T
- Development available supply until T+X
- Available supply in year T+X

### Demand

- Required supply in year T
- Development required supply until T+X
- Required supply in year T+X

### Balance
<table>
<thead>
<tr>
<th>Available supply in year T</th>
<th>Development available supply until T+X</th>
<th>Available supply in year T+X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required supply in year T</td>
<td>Development required supply until T+X</td>
<td>Required supply in year T+X</td>
</tr>
</tbody>
</table>

1. Number in stock (male/female)
<table>
<thead>
<tr>
<th>Available supply in year T</th>
<th>Development available supply until T+X</th>
<th>Available supply in year T+X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Number in stock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(male/female)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. FTE per person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(male/female)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required supply in year T</th>
<th>Development required supply until T+X</th>
<th>Required supply in year T+X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Number in stock (male/female)

2. FTE per person (male/female)

3. Available supply (total FTE)

Available supply in year T

Development available supply until T+X

Available supply in year T+X

Required supply in year T

Development required supply until T+X

Required supply in year T+X
<table>
<thead>
<tr>
<th>Available supply in year T</th>
<th>Development available supply until T+X</th>
<th>Available supply in year T+X</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current supply</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Number in stock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(male/female)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. FTE per person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(male/female)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Available supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(total FTE)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Required supply in year T
- Development required supply until T+X
- Required supply in year T+X
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)
4. Outflow (male/female & projection year)

Available supply in year T

Development available supply until T+X

Available supply in year T+X

Required supply in year T

Development required supply until T+X

Required supply in year T+X
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)
4. Outflow (male/female & projection year)
5. Inflow from abroad (male/female)
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)
4. Outflow (male/female & projection year)
5. Inflow from abroad (male/female)
6. Number in training (duration of training)
7. Return on training

Available supply in year T

Development available supply until T+X

Available supply in year T+X

Required supply in year T

Development required supply until T+X

Required supply in year T+X
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)
4. Outflow (male/female & projection year)
5. Inflow from abroad (male/female)
6. Number in training (duration of training)
7. Return on training
8. Labour market return
9. Labour market return

Available supply in year T

Development available supply until T+X

Available supply in year T+X

Required supply in year T

Development required supply until T+X

Required supply in year T+X
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)

4. Outflow (male/female & projection year)
5. Inflow from abroad (male/female)
6. Number in training (duration of training)
7. Return on training

8. Labour market return
9. Labour market return

Available supply in year T
Development available supply until T+X
Available supply in year T+X

Required supply in year T
Development required supply until T+X
Required supply in year T+X
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)
4. Outflow (male/female & projection year)
5. Inflow from abroad (male/female)
6. Number in training (duration of training)
7. Return on training
8. Labour market return
9. Labour market return
10. Number in stock (male/female)
11. FTE per person (male/female)
12. Available supply (total FTE)
13. Unfulfilled demand for care
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)
6. Number in training (duration of training)
5. Inflow from abroad (male/female)
4. Outflow (male/female & projection year)
7. Return on training
8. Labour market return
9. Labour market return
10. Number in stock (male/female)
11. FTE per person (male/female)
12. Available supply (total FTE)
13. Unfulfilled demand for care
14. Required supply (total FTE)

Available supply in year T

Development available supply until T+X

Available supply in year T+X

Required supply in year T

Development required supply until T+X

Required supply in year T+X
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)
4. Outflow (male/female & projection year)
5. Inflow from abroad (male/female)
6. Number in training (duration of training)
7. Return on training
8. Labour market return
9. Labour market return
10. Number in stock (male/female)
11. FTE per person (male/female)
12. Available supply (total FTE)
13. Unfulfilled demand for care
14. Required supply (total FTE)
15. Demographic developments

Available supply in year T

Development available supply until T+X

Available supply in year T+X
1. Number in stock (male/female)
2. FTE per person (male/female)
3. Available supply (total FTE)
4. Outflow (male/female & projection year)
5. Inflow from abroad (male/female)
6. Number in training (duration of training)
7. Return on training
8. Labour market return
9. Labour market return
10. Number in stock (male/female)
11. FTE per person (male/female)
12. Available supply (total FTE)
13. Unfulfilled demand for care
14. Required supply (total FTE)
15. Demographic developments
16. Required supply (total FTE)
The Dutch supply model: Headcount

Current supply

Future supply

Based on Past inflow

Based on Past outflow

Source: NIVEL
Methods for analysing in- and outflow

• “Simple” descriptive statistics
  – “Table” analysis with a minimum amount of data requirements

• “Complex” inferential statistics
  – Survival analysis
  – Event History analysis
  – Multilevel analysis

• The “Simple” method suits our needs far better than the “Complex” methods
Data requirements for the “Simple” in- and outflow analysis

• “Current” number of professionally active professionals by gender and 5-year registration period

• “Historical” number of professionally active professionals by gender and 5-year registration period, 5, 10 and 15 years ago
  – For calculating the % still active after 5, 10 or 15 years

• For simplicity: a 10-year registration period is now shown
  – With fictional data
“Current” number of active professionals by registration period

- 0-9 years before: 500
- 10-19 years before: 300
- 20-29 years before: 100
- 30-39 years before: 10
- 40-49 years before: 5
- 50-59 years before: 0

Still active now: 600
“Current” and “Historical” number of active professionals by registration period

Still active 10 years ago
Still active now
### Professionally active (number of active professionals, derived from current labour statistics)

<table>
<thead>
<tr>
<th>Recognition period</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9 years before</td>
<td>190</td>
<td>380</td>
<td>570</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>150</td>
<td>225</td>
<td>375</td>
</tr>
<tr>
<td>20-29 years before</td>
<td>100</td>
<td>75</td>
<td>175</td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>455</td>
<td>690</td>
<td>1.145</td>
</tr>
</tbody>
</table>

Now

<table>
<thead>
<tr>
<th>Recognition period</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9 years before</td>
<td>190</td>
<td>380</td>
<td>570</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>150</td>
<td>225</td>
<td>375</td>
</tr>
<tr>
<td>20-29 years before</td>
<td>100</td>
<td>75</td>
<td>175</td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>455</td>
<td>690</td>
<td>1.145</td>
</tr>
</tbody>
</table>

---

### Data for

**Outflow model using current % still active after 10 years**

### Pr. Act. 10 y. before (number of ever recognised professionals, derived from historical labour statistics, including persons not recognised any more)

<table>
<thead>
<tr>
<th>Rec. per. 10 y. before</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>not yet recognised</td>
<td>200</td>
<td>400</td>
<td>600</td>
</tr>
<tr>
<td>0-9 years before</td>
<td>190</td>
<td>285</td>
<td>475</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>113</td>
<td>113</td>
<td>226</td>
</tr>
<tr>
<td>20-29 years before</td>
<td>67</td>
<td>50</td>
<td>117</td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>385</td>
<td>458</td>
<td>843</td>
</tr>
</tbody>
</table>
### Professionally active

*(number of active professionals, derived from current labour statistics)*

<table>
<thead>
<tr>
<th>Recognition period</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9 years before</td>
<td>190</td>
<td>380</td>
<td>570</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>150</td>
<td>225</td>
<td>375</td>
</tr>
<tr>
<td>20-29 years before</td>
<td>100</td>
<td>75</td>
<td>175</td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>455</td>
<td>690</td>
<td>1,145</td>
</tr>
</tbody>
</table>

### % Still act. after 10 y.

*(% still active per year, derived from current and historical labour statistics)*

<table>
<thead>
<tr>
<th>Rec, per. 10 y. before</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>not yet recognised</td>
<td>95,0%</td>
<td>95,0%</td>
<td>95,0%</td>
</tr>
<tr>
<td>0-9 years before</td>
<td>78,9%</td>
<td>78,9%</td>
<td>78,9%</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>88,5%</td>
<td>66,4%</td>
<td>77,4%</td>
</tr>
<tr>
<td>20-29 years before</td>
<td>22,4%</td>
<td>20,0%</td>
<td>21,4%</td>
</tr>
<tr>
<td>30-39 years before</td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>68,8%</td>
<td>67,7%</td>
<td>68,2%</td>
</tr>
</tbody>
</table>

### Pr. Act. 10 y. before

*(number of ever recognised professionals, derived from historical labour statistics, including persons not recognised any more)*

<table>
<thead>
<tr>
<th>Rec, per. 10 y. before</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>not yet recognised</td>
<td>200</td>
<td>400</td>
<td>600</td>
</tr>
<tr>
<td>0-9 years before</td>
<td>190</td>
<td>285</td>
<td>475</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>113</td>
<td>113</td>
<td>226</td>
</tr>
<tr>
<td>20-29 years before</td>
<td>67</td>
<td>50</td>
<td>117</td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>385</td>
<td>458</td>
<td>843</td>
</tr>
</tbody>
</table>

Data and calculations of chances of being still active for Outflowmodel using current % still active after 10 years
### Professionally active
(number of active professionals per year, derived from current labour statistics and assuming constant future % activity per age/sex group)

<table>
<thead>
<tr>
<th>Recognition period</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>&quot;Now&quot;</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Outflow</th>
<th>&quot;In 10 years&quot;</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Outflow</th>
<th>&quot;In 20 years&quot;</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Outflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9 years before</td>
<td>190</td>
<td>380</td>
<td>570</td>
<td>10-19</td>
<td>150</td>
<td>300</td>
<td>450</td>
<td>-21,1%</td>
<td>20-29</td>
<td>133</td>
<td>199</td>
<td>332</td>
<td>-41,8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-19 years before</td>
<td>150</td>
<td>225</td>
<td>375</td>
<td>20-29</td>
<td>133</td>
<td>149</td>
<td>282</td>
<td>-24,8%</td>
<td>30-39</td>
<td>30</td>
<td>30</td>
<td>60</td>
<td>-84,1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29 years before</td>
<td>100</td>
<td>75</td>
<td>175</td>
<td>30-39</td>
<td>22</td>
<td>15</td>
<td>37</td>
<td>-78,6%</td>
<td>40-49</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-100,0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
<td>40-49</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-100,0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>50-59</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-100,0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>455</td>
<td>690</td>
<td>1,145</td>
<td>305</td>
<td>464</td>
<td>769</td>
<td>32,8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### % Still act. after 10 y.
(% still active per year, derived from current labour statistics and assuming constant future % activity per age/sex group)

<table>
<thead>
<tr>
<th>Rec.per. 10 y. before</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>&quot;Now&quot;</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Outflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>not yet recognised</td>
<td>95,0%</td>
<td>95,0%</td>
<td>95,0%</td>
<td>0-9 years before</td>
<td>78,9%</td>
<td>78,9%</td>
<td>78,9%</td>
<td>10-19 years before</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>88,5%</td>
<td>66,4%</td>
<td>77,4%</td>
<td>20-29 years before</td>
<td>22,4%</td>
<td>20,0%</td>
<td>21,4%</td>
<td></td>
</tr>
<tr>
<td>20-29 years before</td>
<td>22,4%</td>
<td>20,0%</td>
<td>21,4%</td>
<td>30-39 years before</td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
<td></td>
</tr>
<tr>
<td>30-39 years before</td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
<td>40-49 years before</td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68,8%</td>
<td>67,7%</td>
<td>68,2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pr. Act. 10 y. before
(number of ever recognised professionals per year, derived from labour statistics, including persons not recognised any more)

<table>
<thead>
<tr>
<th>Rec.per. 10 y. before</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>not yet recognised</td>
<td>200</td>
<td>400</td>
<td>600</td>
</tr>
<tr>
<td>0-9 years before</td>
<td>190</td>
<td>285</td>
<td>475</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>113</td>
<td>113</td>
<td>226</td>
</tr>
<tr>
<td>20-29 years before</td>
<td>67</td>
<td>50</td>
<td>117</td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>385</td>
<td>458</td>
<td>843</td>
</tr>
</tbody>
</table>

Outflow model using current % still active after 10 years
### Professionally active
(number of active professionals per year, derived from current labour statistics and assuming constant future % activity per age/sex group)

<table>
<thead>
<tr>
<th>Recognition period</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Then</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Outflow</th>
<th>Then</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Outflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9 years before</td>
<td>190</td>
<td>380</td>
<td>570</td>
<td>150</td>
<td>300</td>
<td>450</td>
<td>403</td>
<td>-21,1%</td>
<td>133</td>
<td>199</td>
<td>332</td>
<td>322</td>
<td>-41,8%</td>
</tr>
<tr>
<td>10-19 years before</td>
<td>150</td>
<td>225</td>
<td>375</td>
<td>20-29</td>
<td>133</td>
<td>149</td>
<td>282</td>
<td>-24,8%</td>
<td>30-39</td>
<td>30</td>
<td>30</td>
<td>60</td>
<td>-84,1%</td>
</tr>
<tr>
<td>20-29 years before</td>
<td>100</td>
<td>75</td>
<td>175</td>
<td>30-39</td>
<td>22</td>
<td>15</td>
<td>37</td>
<td>-78,6%</td>
<td>40-49</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-100,0%</td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
<td>40-49</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-100,0%</td>
<td>50-59</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-100,0%</td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>455</td>
<td>690</td>
<td>1,145</td>
<td></td>
<td>305</td>
<td>464</td>
<td>769</td>
<td>-32,8%</td>
<td></td>
<td>162</td>
<td>229</td>
<td>391</td>
<td>-64,3%</td>
</tr>
</tbody>
</table>

### % Still act. after 10 y.
(% still active per year, derived from current labour statistics and assuming constant future % activity per age/sex group)

<table>
<thead>
<tr>
<th>Rec. per. 10 y. before</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>0-9 years before</th>
<th>78,9%</th>
<th>78,9%</th>
<th>78,9%</th>
<th>10-19 years before</th>
<th>88,5%</th>
<th>66,4%</th>
<th>77,4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9 years before</td>
<td>78,9%</td>
<td>78,9%</td>
<td>78,9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-19 years before</td>
<td>88,5%</td>
<td>66,4%</td>
<td>77,4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29 years before</td>
<td>22,4%</td>
<td>20,0%</td>
<td>21,4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-39 years before</td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68,8%</td>
<td>67,7%</td>
<td>68,2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pr. Act. 10 y. before
(number of ever recognised professionals per year, derived from labour statistics, including persons not recognised any more)

<table>
<thead>
<tr>
<th>Rec. per. 10 y. before</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>0-9 years before</th>
<th>200</th>
<th>400</th>
<th>600</th>
<th>10-19 years before</th>
<th>113</th>
<th>226</th>
<th>339</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9 years before</td>
<td>200</td>
<td>400</td>
<td>600</td>
<td>10-19 years before</td>
<td>113</td>
<td>226</td>
<td>339</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-19 years before</td>
<td>113</td>
<td>226</td>
<td>339</td>
<td>20-29 years before</td>
<td>67</td>
<td>50</td>
<td>117</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29 years before</td>
<td>67</td>
<td>50</td>
<td>117</td>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-39 years before</td>
<td>15</td>
<td>10</td>
<td>25</td>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49 years before</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Total</td>
<td>385</td>
<td>458</td>
<td>843</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Outflow model using current % still active after 10 years
Backtesting the supply model

• Ex-post predictions of the supply in 1998-2011

• Starting from 5, 10 or 15 years before

• Based on 5, 10 or 15 year old data

• Comparison of the predictions with the actual supply

• Testing the models with the “Percentage Error” (PE) and “Mean Absolute Percentage Error” (MAPE)
“Horizon” and “Base”

• The horizon is about how far away we have to predict: 5, 10 or 15 years into the future

• The base is about how far back we look for our predictors: 5, 10 or 15 years into the past
All results
Main hypotheses

• The shorter the horizon period, the more accurate the prediction

• The longer the base period, the more accurate the prediction
The shorter the horizon, the better the prediction?

True for most 5-year-base-period projections
The shorter the horizon, the better the prediction?

True for most 5-year-base-period projections
True for all 10-year-base-period projections
The shorter the horizon, the better the prediction?

True for most 5-year-base-period projections
True for all 10-year-base-period projections
True for all 15-year-base-period projections
The longer the base, the better the prediction?
False for all 5-year-horizon projections
The longer the base, the better the prediction?

False for all 5-year-horizon projections
False for all 10-year-horizon projections
The longer the base, the better the prediction?

False for all 5-year-horizon projections
False for all 10-year-horizon projections
False for all 15-year-horizon projections
Main question and answers

• How accurate is the Dutch model for predicting the supply of GPs?

• Reasonably well!
  – Considering that an underestimation is less harmful than an overestimation
  – Better for the latest years
  – Better for the short term
  – Better with a short base
Main conclusions

• “More complex models” do not always lead to better predictions
  – So, countries can start with simple “Table”-analysis and Excel-models

• “More data” does not always lead to better predictions
  – So, countries with a short historical database can do predictions