Actuaries Summit

Think Differently

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Data driven public policy: an actuarial journey in maternal health

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This presentation has been prepared for the Actuaries Institute 2017 Actuaries Summit. The Institute Council wishes it to be understood that opinions put forward herein are not necessarily those of the Institute and the Council is not responsible for those opinions.
Why maternal costs and adverse births?

because IT MATTERS...

"Premature birth rates are increasing in most countries and reflect the leading cause of death for newborns"
World Health Organisation, 2012

The AIHW in Australia reports...

9% Rate of premature births in 2014

$3.4B $'s spent by govt on maternal hospital costs in 2012/13

>90% are hospital costs...

the rest is largely out-of-hospital
Questions we will answer today

**Quantify cost differentials**
“Do women who have adverse births cost more than those who don’t?”

**Identify cost risk factors**
(hospital & out of hospital)
“What are the drivers of maternal health costs?”

**Inform maternal health policy**
“How do we transform this into practical public policy?”
LUCY
Aged 36
Smoker
Diabetic
Lives Sydney
Married
Has private health insurance

Premature birth (caesarean delivery)

GRACE
Aged 23
Non smoker
Not diabetic
Lives Goulburn
Not married
No private health insurance

No adverse birth (vaginal delivery)
What are major events in the perinatal period?

**Antenatal**
- Hospitalised during pregnancy
- Diagnosed Pre-eclampsia

**Delivery**
- Baby born prematurely via caesarean delivery
- Baby born healthy at term via vaginal delivery

**Postnatal**
- Diagnosed postnatal depression
- Diagnosed postnatal anxiety
How do we model costs?

Data: Australian Longitudinal Study for Women’s Health (ALSWH)
- For hospital study (1742 women in NSW only): ALSWH linked with NSW Admitted Patient’s Data Collection (APDC), NSW Perinatal Data Collection (PDC) + others
- For out-of-hospital study (2520 women): ALSWH linked with Medicare Data

Statistical Methods
- Two phase modelling methodology:
  - Exploratory: Classification and Regression Trees (CART)
  - Parametric modelling: Generalised Linear Models (GLM’s) & Generalised Linear Mixed Models (GLMM’s)
Results:
The hospital study
Hospital cost differential (all periods)

All costs inflated to December 2015

Hospital cost per baby ($)


- - No adverse births  ······ Adverse births

23% Cost differential
CART Delivery Period

Mode of delivery = Caesarean

Birthweight < 2380g
- 14661 (n=24)
  - Induction = No
    - 11128 (n=327)

Birthweight >= 2380g
- 11329 (n=416)
  - Induction = Yes
    - 12068 (n=89)

Mode of delivery ≠ Caesarean

Birthweight < 2380g
- 11511 (n=440)

Birthweight >= 2380g
- 5758 (n=1302)
Delivery period cost risk factors (GLM)

Lucy costs... **250%** more than Grace

Lucy costs:
96% more than a woman who has a **vaginal delivery**
12% more than a woman who does not have **diabetes**
8% more than a woman who does not have an **adverse birth outcome**
3% more than a woman who does not have **private health insurance**
1% more than a woman living in a **rural area**
1% more than a woman who does not **smoke**

GRACE

Aged 23
Non smoker
Not diabetic
Lives Goulburn
Not married
No PHI
No adverse birth (vaginal delivery)

LUCY

Aged 36
Smoker
Diabetic
Lives Sydney
Married
Has PHI
Premature baby (caesarean delivery)
Results: The out-of-hospital study
Out-of-hospital cost differential

All costs inflated to December 2015

Out-of-hospital cost per baby ($)


- - Total costs - No adverse birth

- - - - Total costs - Adverse birth

27% Cost differential
Out-of-hospital cost differential

All costs inflated to December 2015

Out-of-hospital cost per baby ($)

- Underlying costs - No adverse birth
- Underlying costs - Adverse birth
- Total costs - No adverse birth
- Total costs - Adverse birth
# Out-of-hospital cost risk factors (underlying GLM)

<table>
<thead>
<tr>
<th>Significant Factors</th>
<th>Antenatal</th>
<th>Postnatal</th>
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<tbody>
<tr>
<td></td>
<td>Public</td>
<td>Private</td>
</tr>
<tr>
<td>IVF (Yes)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Infertility (More infertile)</td>
<td>●</td>
<td></td>
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<tr>
<td>Specialist use (More use)</td>
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<td>●</td>
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<tr>
<td>GP use (More use)</td>
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<td>●</td>
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<tr>
<td>Anxiety (Yes)</td>
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<tr>
<td>Intense anxiety (Yes)</td>
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<td>●</td>
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<tr>
<td>Stress about own health (More stress)</td>
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<td>●</td>
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<tr>
<td>Postnatal depression (Yes)</td>
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<tr>
<td>Cancer (Yes)</td>
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<tr>
<td>Area (Less remote)</td>
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<tr>
<td>Adverse birth (Yes)</td>
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<tr>
<td>Type 1 diabetes (Yes)</td>
<td></td>
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<tr>
<td>Elective caesarean (Yes)</td>
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- **High cost impact**
- **Low cost impact**
How to transform this into **practical** policy?

**MENTAL HEALTH POLICY**

Initiative 1

Universal and improved screening for mental health in perinatal period

Outcomes

- High risk women identified through inclusion of additional risk factors in screening protocols (Chojenta, 2013)
- Offered appropriate support to reduce burden of poor mental health
How to transform this into **practical** policy?

**Initiative 2**
**Early intervention**

**Outcomes**

High risk women identified earlier in life (key predictor of poor perinatal mental health is history of mental health illness)

Re-allocating resources into early intervention may **reduce** costs over the life-course & improve maternal outcomes
How much could we save?

Consider postnatal depression (PND) out-of-hospital costs only…

- **15%**
  - Rate of PND (beyondblue)

- **$115**

- **308,000**
  - Women giving birth p.a. (AIHW, 2016)

**Estimated cost burden: $5.3M p.a.**

**Estimated saving: $1.1M p.a.**
for 3% reduction in PND rate

**Full cost benefit analysis required**
What’s next?
Lots of cost risk factors to explore further
Caesarean delivery & IVF
Interactions between public and private system
Mental health initiatives & more

Why should actuaries do this work?
It’s important
We can transfer knowledge and skills from traditional areas
We contribute with our multi-disciplinary mindset
and ability to think differently
We need to collaborate & communicate
with other disciplines to do it well

THE END?