Insuring heat-not-burn e-cigarette smokers

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Agenda

• Introducing “heat-not-burn” (HNB) products
• Pricing HNB products: the challenges.
• Evidence: In the absence of long-term cohort studies, what do we do?
• Is a “one size fits all” approach appropriate?
• First-mover advantage or dangerous leap into the unknown?
• Moral considerations
• Conclusions
Introducing “heat-not-burn” products
Common features and some examples

The “heat-not-burn” idea

Conventional cigarette
High temperatures (1000°) = combustion/pyrolysis
Produce large number of harmful constituents
Inhalation of smoke results in smoking-induced harm

Heat-not-burn
Avoid combustion by controlled heating (200°)
Reduce harmful constituents of the inhaled aerosol
Potential to reduce smoking-induced harm
Example products

Consumer interest

'The inhale has a good amount of "impact."'

'It is, phenomenologically, very, very similar to smoking. It feels like smoking.'

Satisfaction: 'I found IQOS did the job …'

https://vaping.com/blog/comment/whats-better-iqos-or-vape/
How do they work?

Filament heats tobacco (e.g. resin) to controlled temperature

Nicotine (etc.) distils out of this forming an aerosol

User inhales the aerosol

Differences between HNB products and e-cigarettes

• E-cigarettes use an “e-liquid” which is vaporised by heating.
  – Liquids can contain nicotine, but also flavourings.
  – Flavourings may introduce different constituents to the aerosol – not clear how these relate to smoke.
  – Temperature of operation may differ.

• Different user characteristics
• Different ‘sourcing’ (i.e. quality control)
• Different history – e-cigarettes in use for some years now, very almost no history for HNB
Pricing HNB products: the challenges…

How would we like to price products?

- Long-term cohort studies
  (Large number of subjects over a period of 20 years)
- Past experience
  (For a large insured population of relevant subjects)
- Lots of data for all pricing assumptions
- Academic studies
  Independent behavioural studies for reversion and quitting rates
- Evidence of consistency between different types of product
  (e.g., between various types of HNB)
However, the reality is…

- **New products**
  - No possibility of long-term cohort data

- **New "smoker" classification(s)**
  - No relevant past experience

- **Marketing data**
  - Reversion rates only really studied by HNB producers in the short-term

- **Lack of the data which an insurer would like to use**

- **No reason to believe risks from different HNB products are consistent**

Evidence

In the absence of cohort studies, what do we do?
The evidential journey – obtaining “MRTP” status

- Useful source of data for insurers: applications to designate HNB products as MRTPs. (MRTP = Modified Risk Tobacco Product)

- Example of the approach taken by producers:

<table>
<thead>
<tr>
<th>Aerosol chemistry</th>
<th>Toxicology (in vitro studies)</th>
<th>Animal (in vivo) studies (e.g. mice)</th>
<th>Human clinical trials</th>
<th>Human ambulatory trials</th>
</tr>
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<tbody>
<tr>
<td>What’s in the aerosol? How harmful is it to cells?</td>
<td>To what extent are users exposed to the harmful constituents?</td>
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Looking at (3-12 month) impacts of reduced exposure

What makes up conventional tobacco smoke?

- Vast number of constituents: many are harmful or potentially harmful
Aerosol chemistry – what’s in a HNB aerosol?

- Aerosols generated using cigarettes and HNB products under identical conditions
- Range of relevant constituents identified in the smoke and aerosol.
- Amounts of each constituent (absolute or per mg nicotine) measured both in smoke and aerosol.
- Aerosol content expressed as a proportion of conventional cigarette smoke content.

Example of aerosol chemistry findings

Aerosol content as % of smoke content

Aerosol chemistry may show a reduction in most aerosol constituents in excess of 80%.
In some cases over 95%.
Interpretation of aerosol chemistry findings

- If most of the harmful compounds are reduced by (say) 80%...
  - Harm caused also c. 80% lower?
  - Linear "dose-response" relationships?
  - Translation to \( q_x \) values?
  - Compounding of exposure?
  - Cellular repair and recovery?
  - Not clear that reduction in mortality risk is proportional

Cytotoxicity and mutagenicity

- Next piece in the puzzle:
  - Compare effect of aerosol particulate matter on cells in vitro
  - Look for evidence of toxicity to cells
  - Look for evidence that aerosols cause mutagenic responses in cells
- Example might show concentration of aerosol required to cause toxicity or mutagenicity is much higher than that for conventional smoke.
Biomarkers of exposure (1)

What are biomarkers?
Chemicals produced in our bodies in response to exposure to particular chemicals measurable via carefully validated methods.

Why do we care?
Excretion of biomarkers indicates the extent to which the body is actually being exposed to certain (potentially) harmful chemicals.

What testing is carried out?
Variety of tests, but perhaps most useful is comparison between HNB users and abstinent ex-smokers immediately after “quitting”.

Biomarkers of exposure (2)

Animal tests ➔ Biomarker evidence of reduced exposure ➔ Post-mortem evidence of reduced pathogenicity
Overall exposure reductions of the order of 80-90% of that seen for abstinent ex-smokers

Clinical and ambulatory trials ➔ Biomarker evidence of reduced exposure ➔ Infer consistent reduction in harm?
More complex human physiology?
Short-term animal studies vs. long-term human impacts?
Interpretation of biomarker evidence

Is biomarker evidence consistent with aerosol chemistry?

Evidence will probably vary by product; in papers seen by the authors, the reduction in aerosol content is broadly of the same magnitude as the reduction in biomarkers of exposure.

Suggests proportional reduction in harm

If the chemicals are the cause of the harm associated with smoking, then an X% reduction in exposure to these chemicals should be consistent with an X% reduction in the rate of harm.

Probable linear/sublinear harm response

If cellular repair applies, perhaps a lower rate of harm could result in a larger overall reduction in harm.

Animal studies not conclusive, but pathology findings are useful.

What to do about nicotine?

• The arguments above do not consider nicotine:
  – A key selling point of HNB products is that they deliver nicotine similar to that from a normal cigarette
  – Therefore the proportional reduction in aerosol content does not apply to nicotine.

• Question arises: does nicotine directly cause harm?
  – Academic research:
    • No research on nicotine in isolation.
    • NRT research inconclusive – and can be affected by other chemicals in NRTs.
    • On balance, probably not harm-free, but relatively low harm.
Who uses HNB products?

**Socioeconomic spectrum**

- Conventional cigarette users
- Heat-not-burn users?

- Price positioning of HNB products in the market → probably wealthier users.
- Marketing strategy? Makes sense to target those who can afford the product.
- Additional social pressures to switch from conventional cigarettes?
- If higher socioeconomic group, *mortality also expected to be lower*?

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**Behavioural aspects of pricing: lapse / reversion**

- If product is **specific** to HNB users, does this imply lower lapse risk? (Less competition at present)
- Will lapse rates change as a result of **new market entrants**?
- If products are pharmokinetically similar to conventional cigarettes, does this imply lower reversion rates?
- How should insurers deal with **dual-use**, conversion between different HNB products and fraudulent declarations?
Example approach to pricing

Linear dose-response assumption

% reduction in exposure + Nicotine allowance?

Behavioural evidence

Policyholders e.g. socioeconomic profile

Margins for risk and profit loadings

One-size-fits-all pricing?

“Are all HNB products created equal?”
Short-term and long-term considerations:

• If basing pricing on evidence of aerosol constituents and exposure in people:
  – Are two aerosols from different HNB products consistent?
  – What is the threshold for considering something to be in the “HNB” pricing category?

• In the longer term:
  – Cohort evidence will become available on various HNB products.
  – Also experience on insurance products written will emerge.
  – Dual-use? Reversion? Switching between HNB products post-underwriting?

Overriding concerns:

• Complexity of underwriting:
  - Easier to sell / police policies if they cover a whole class of HNB products
  - Depends on variation in product-specific risk.

• Predicting product innovation:
  - Not feasible to price and market policies for every possible product
  - Allow for new HNB developments with lower harm reduction.
First-mover advantage
Or dangerous leap into the unknown?

Price optimisation allowing for uncertainty

Lower competition risk but more-
risk of loss per policy.

→ Short-term larger profits lost to
competitors undercutting.

Significant uncertainty around
future claim rates.

Indicative curves only
Moral considerations

Moral considerations?

- If HNB premiums close to (or less than) ex-smoker premiums, does this reduce the motivation for people to quit smoking?
- If HNB premiums are too close to current-smoker premiums, does this undermine the argument for health benefits on switching?
- Could the insurance industry's approach to pricing for HNB users affect take-up rates of HNB or other nicotine products amongst non-smokers?
Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenters.