Population Modeling Overview
A System Dynamics perspective
GFN Warsaw, 12\textsuperscript{th} June 2019
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AGENDA

GFN Warsaw

- System dynamics and model structure
- Data inputs
- Outcomes and interpretation
Population Modeling

Baseline comparator

- never smokers
- smoking initiation rate
- current smokers
Population Modeling

Baseline comparator

never smokers → current smokers → former smokers

- smoking initiation rate
- smoking cessation rate
- smoking relapse rate

never smoker risk → current smoker risk → former smoker risk

Morbidity/mortality

Cumulative projections over 50 to 100 years

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Population Modeling

Alternative scenario

- Never Smoker
- Current Smoker
- Former Smoker
- PRRP User (Never-Smoker)
- Former PRRP User (Never-Smoker)
- PRRP User (Smoking History)
- Former PRRP User (Smoking History)
- Dual User
- Dual User Relapse
- Birth Rate
- Quit PRRP
- Relapse to PRRP
- Quit PRRP
- Relapse to Dual Use
- Initiate PRRP
- PRRP to Dual Use
- Relapse to PRRP
- Dual Use to PRRP
- Revert to PRRP
- Relapse to Dual Use
- Dual Use to PRRP
- Quit PRRP
- Relapse to Dual Use
- Dual Use to PRRP
- Relapse to Dual Use
- Dual Use to PRRP
- Quit

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Population Modeling

...but it might not be sufficient

Risk Spectrum

Cigarettes

New PRRP

E-cigarettes

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Population Modeling

Alternative scenario
Population Modeling

...but it might not be sufficient
## Population Modeling

### Stock transition combinations

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<th>Transitions</th>
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- Flows: initiation rates, cessation, relapse rates, switching, mortality

- Gender, age specific

- Other factors may influence any of these parameters uniquely in US race/ethnicity?
**Data inputs**

**Smoking data**

- UK Office of National Statistics, Surveys
- Italy Istat
- US NHIS and NYTS. PATH

**E-cigarettes**

- Still scarce data
- PATH can provide some information about those transitions
- In other countries this data is still not so readily available as per smoking but the same sources are starting to collect e-cig prevalence data as well
Data inputs

Assumptions

Never Smoker → ?

Smoker → PRRP

Vaper

Pre-market studies could provide some estimates
Data inputs

Assumptions

Dual User
S+V

Dual User
V+PRRP

Vaper

All products

?
Data inputs

Assumptions

Overall makes sense?

Compared to similar products / other market behaviours, are the assumptions reasonable?

Do we need to assess several credible scenarios?
Tipping points

Key unknown parameters

Life Years Saved

Million Life Years

Excess Risk Ratio Compared to Smoking

TP
Population Modeling

Sensitivity assessment

Multivariate Sensitivity
50.0% 75.0% 95.0% 97.5%

Life Years Saved

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Time (Year)
1. Systems Dynamics is a graphical modeling technique formed of stocks and flows. Homogenous groups of people moving through time accordingly to their nicotine use behaviour.

2. Three product models multiply complexity and data requirements. Better representation of product landscape.

3. Models are useful in absence of data to test different scenarios. Importance of unknown parameters can be assessed through sensitivity testing.
Thank you

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