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# A system dynamics modelling approach for assessing health effect impact as a result of launching a new nicotine product in a market

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**Conference proceedings summary**

Tobacco use is a major public health concern, and is linked to approximately 6 million deaths per year worldwide. In recent years, new products (next generation products; NGPs) have emerged, which have the potential to pose a reduced health risk to consumers. NGPs include tobacco heated products, smokeless tobacco and e-cigarettes. In 2012 the US Food and Drug Administration suggested the use of mathematical models as tools for assessing the impact, in terms of population health outcomes, of releasing new nicotine or tobacco products. British American Tobacco in collaboration with Ventana Systems UK, has developed a population model based on system dynamics methodology to project the potential health impact of launching a new nicotine or tobacco product in a market.

The quantified system dynamics model was constructed using Vensim® DSS version 6.3c (Ventana Systems Inc., MA, USA). Model development involved two phases. First, the Core Model, which models a situation in which only cigarettes exist, was defined to represent the structure of traditional smoking populations (including never smokers, current smokers and former smokers) and

calibrated using historical data. Second, the Core Model was extended to a two product model (the NGP Conceptual Model), in which both cigarettes and a single NGP exist, and included subpopulations of current and former NGP users. The model represents population groups characterised by smoking behaviour by gender and by age cohorts within a single stock, as transition rates between smoking statuses and relative risk (RR) for all-cause mortality are influenced by these parameters. The model simulates the effects of smoking status (including the effects of product initiation, product switching, dual use, and cessation) and relative risks for different smoking statuses on tobacco/NGP use and mortality in the UK population.

We simulated two scenarios for the period 2000–2050; a status quo scenario associated with use of cigarettes only; and a counterfactual scenario in which an NGP, e-cigarettes as case study, had been introduced to the market. The results of modelling each of these scenarios were compared to evaluate the effects on smoking prevalence and smoking-related mortality. In a sensitivity assessment, several parameters within the counterfactual scenario were varied to assess the effects on the potential of e-cigarettes to yield harm.

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