

Dynamic Simulation of Smoking Control Environment in the USA 1990-2010

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Longitudinal studies of smoking session are scarce. Understanding of patterns of smoker behaviour over time and in response to policy initiatives is curtailed. Detailed low level modelling approaches are not holistic and ignore key dynamic effects of feedback and delayed responses to changes in the smoking control environment. In an attempt to redress these deficiencies and to assess possible future smoker behaviour with the advent of new smoking control products, such as NRT, a high level computer based model was constructed using the principles of System Dynamics (SD).

Method: An SD model of the USA smoking control environment was constructed with a core structure based on classic stages of contemplating quitting: Pre-contemplation, Contemplation, Ready for Action and Action, and further states representing Sustained Abstinence and Never Smokers. A population sector was developed to represent demographics. The rates of flow of people between stages were calibrated to reflect observed behaviour from 1990 to 1997. Flows not observed from real data were interpreted and adjusted to maintain an initial steady state. During an iterative ideation phase at the beginning of the project, dynamic feedback influences were identified and these were subsequently added to the model structure using non linear graphical relationships where appropriate.

Results: The model reflects the considerable flows which occur to and from each contemplative stage. Data obtained from using the model suggests that each year in the USA, with an adult and teen smoking population of some 52 millions, there are 50 million occasions when smokers move from a stage of Pre-contemplation to Contemplation; further, there are some 26 million occasions where people return from Contemplation to Pre-contemplation without making a commitment to quit. In addition to flows, the model also indicates the number of people in each stage of contemplation at any point in time.

Conclusion: In its current form, the model is valuable as a tool for understanding the key influences in the smoking control environment and graphically displaying the flow of people through stages of contemplation. With further calibration of dynamic influences, it will be possible to simulate the implied responses of smokers over time to a range of alternative initiation and cessation policies. The model can also be adapted for other countries or regions.