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Tracing the cigarette epidemic: An age-period-cohort study of education, gender and smoking using a pseudo-panel approach

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ABSTRACT

This study examined if temporal variations in daily cigarette smoking and never smoking among groups with different levels of education fit the pattern proposed by the theory of diffusion of innovations (TDI), while taking into account the separate effects of age, period and birth cohort (APC). Aggregated data from nationally representative interview surveys from Norway from 1976 to 2010 was used to calculate probabilities of smoking using an APC approach in which the period variable was normalized to pick up short term cyclical effects. Results showed that educational differences in smoking over time were more strongly determined by birth cohort membership than variations in smoking behavior across the life course. The probability of daily smoking decreased faster across cohorts among higher compared to lower educated. In contrast, the change in probability of never having smoked across cohorts was similar in the two education groups, but stronger among men compared to women. Moreover, educational differences in both daily and never smoking increased among early cohorts and leveled off among late cohorts. The results emphasizes the importance of birth cohort for social change and are consistent with TDI, which posits that smoking behavior diffuse through the social structure over time.

1. Introduction

The negative effects of smoking on public health are indisputable. Smoking is one of the largest causes of preventable death in most developed countries, and because many smoking-related diseases have a delayed onset, smoking will continue to be a major health problem in decades to come, even though smoking prevalence has declined steadily throughout the second half of the 20th century (Danaei et al., 2009; Peto and Lopez, 2001; Vollset et al., 2006).

The popularity of cigarettes has changed dramatically over time. From being almost non-existent in the late 1800s, cigarette consumption in the United States rose exponentially, peaking in the early 1960s with yearly per capita consumption of cigarettes just under 4000, before declining sharply (Pampel, 2004: 293). The pattern was similar in Norway, although peak cigarette consumption was lower and occurred more than 10 years later (around 2100 cigarettes per year in 1975). Given the shape of the cigarette consumption and the cigarette smoking prevalence curves over time, the rise and fall of cigarette smoking has typically been described as an epidemic (Lopez et al., 1994; Thun et al., 2012).

In most developed countries, there has been a persistent relationship between smoking, gender and various measures of socio-economic position (SEP). Cigarettes first became popular among urban male elites in the late 1800s. However, at some point the positive socioeconomic gradient reversed and in more recent decades, cigarette smoking has been increasingly

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concentrated among groups with low education, manual laborers and those with low incomes (Layte and Whelan, 2009; Pampel, 2005; Schaap et al., 2008).

In the case of education, differences between groups are evident in North America (de Walque, 2010) and most European countries, although most noticeable in Northern Europe (Huisman et al., 2005). Norwegian figures from 2012 showed that 25% of men and women whose formal education ended in primary school smoked daily, whereas only 6% of those with high school or university education were smokers (Statistics Norway, 2013). The figures in the United States were similar (Centers for Disease Control and Prevention, 2013).

In this article, I use an age-period-cohort approach developed by Deaton (1985) to investigate whether educational differences in smoking behavior are produced by smoking decisions thought the life course (related to ageing) or, instead, a product of social forces shaping smoking decisions at the time when people pick up smoking (related to birth cohort). At the center of the analysis lies the question whether differences in the likelihood of smoking between men and women with different levels of education fit the pattern predicted by the theory of diffusion of innovations (Rogers, 2003).

In many ways, Norway can be regarded as a particularly interesting case. A comprehensive ban on advertising of cigarettes and other tobacco products has been in place from 1975, and from 1989 introduction of new products containing nicotine or tobacco has been banned. The Norwegian tobacco market has traditionally been, and still is, dominated by a handful of brands, including a few local brands. It is therefore possible to examine social variations in smoking behavior without having to be very concerned about changes in the tobacco market.

In addition, the Norwegian population is fairly homogenous and smoking behavior has yet only been modestly affected by immigration. One important consequence of this is that having low education is not (strongly) confounded with immigration, as may be the case in British or U.S. data.

2. Diffusion of cigarette smoking behavior

What can explain the rise and fall of cigarette smoking and the sequential adoption and rejection of smoking among men and women with different levels of SEP? As discussed by Ferrence (1989), the explosive growth in cigarette smoking fits the pattern predicted by the theory of diffusion of innovations (TDI), outlined by Rogers (2003).

TDI predicts that certain new social phenomena, or innovations, spread through the social structure in a predictable pattern. The innovation can be a product, norm, habit, belief, etc. In the beginning only a few people will adopt the innovation (early adopters), but if a sufficient number of people take up the innovation (early majority), the phenomenon gains critical mass and spreads through the social structure and, with time, most of the group members will adopt the innovation (late majority and laggards).

The success of diffusion depend on several factors, such as the availability, likability or usefulness of the innovation and the distance and quality of communication between those who first discover the innovation (innovators) and the rest of the social system.

In most cases of diffusion, the different adopter categories are closely linked to socio-economic position. Studies have shown that earlier adopters tend to have higher social status and more years of education than do later adopters. Early adopters are also more cosmopolitan, more socially active and have greater exposure to mass media (Ferrence, 1989; Rogers, 2003). If successful, diffusion creates a cycle of adoption in which the social phenomenon spreads from the highest educated and most cosmopolitan groups to those in lower social positions (Pampel, 2002).

Much like the increased popularity of cigarette smoking in the first half of the 20th century, it has been argued that the decline in smoking in the second half is the result of diffusion of a new phenomenon displacing smoking, a "smoke-free lifestyle", driven by health concerns, but also by social class distinction processes (Pampel, 2002). Some authors have hypothesized that through strategies such as changing the nicotine content of the cigarettes or limiting possibilities of profiting from selling cigarettes, an endgame for cigarettes may be within reach (U.S. Department of Health and Human Services, 2014).

Yet, there are some signs that smoking among low-SEP groups is more resilient to anti-smoking measures than previously predicted (Thun et al., 2012). Even though smoking has decreased among all socio-economic groups, some studies have found that differences between groups have remained stable or even increased over time (Escobedo and Peddicord, 1996; Giskes et al., 2005; Peretti-Watel et al., 2009), which suggest that that diffusion has been blocked or delayed. Following this line of thought, Dixon and Banwell argued that the smoking epidemic model should include a fifth stage marked by "sedimentation of smoking in successive low SES cohorts" (Dixon and Banwell, 2009).

3. Age, period and cohort, and social change

From a TDI perspective, the process in which new birth cohorts adopt already existing cigarette smoking patterns can be regarded as an example of diffusion between cohorts (inter-cohort diffusion). This differs from most phenomena examined by TDI which focus on intra-cohort diffusion, that is, how individuals adopt behavior from other similarly aged individuals (see, for example Coleman et al., 1957). To determine the nature of SEP differences in smoking over time and whether they follow the pattern predicted by TDI, it is therefore necessary to take into account the reciprocal relationship between the three temporal dimensions age, period and cohort membership (APC).