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Age–period–cohort influences on trends in past year marijuana use in the US from the 1984, 1990, 1995 and 2000 National Alcohol Surveys

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Abstract

Background: Previous studies have described trends in marijuana use in the US and examined age–period–cohort (APC) effects finding increased lifetime use among cohorts born after 1945. However, no studies have utilized data on current consumption in multiple cross-sectional surveys to estimate these factors.
Methods: Age–period–cohort models including demographic factors are estimated using logistic regressions in four US National Alcohol Surveys (NAS) conducted between 1984 and 2000. Trends in past year marijuana use are also evaluated.
Results: Marijuana use declined over the study period from 10% to 7.2% of the population. Declines were mainly seen among men, resulting in a degree of gender convergence, particularly for those aged 18–25. Significant effects of age, period and cohort were found, with steep declines in use by age from the early 20s to the 40s. All male cohorts born after 1945 and female cohorts born between 1945 and 1960 showed elevated prevalence compared to earlier cohorts.
Conclusions: Trend results from the NAS differ from those in other surveys and indicate decreased prevalence of past year marijuana use and gender convergence. APC results confirm past findings of age effects and cohort differences between those born before and after 1945. Marijuana use presents many measurement difficulties and future research to understand differences across surveys is needed.

Keywords: Marijuana; Trends; Age; Period; Cohort

1. Introduction

Modeling the determinants of trends in substance use in the US offers insight into the underlying cultural, political, economic and demographic forces that shape these behaviors. The age–period–cohort (APC) concept was developed in the area of disease epidemiology and has most commonly been applied to mortality data. In one of the first applications of this concept Frost (1939) found that plotting age-specific death rates for tuberculosis by birth cohort identified an age profile that had been obscured by cohort differences, offering insight into the importance of human resistance to infection for this disease. Subsequent APC research has developed statistical models aimed at addressing the fundamental confounding of the three effects, cohort = period − age (Mason et al., 1973) and has extended these concepts to the study of social behavior (Glenn and Zody, 1970). Disentangling the apparent influences of aging, birth cohort effects and period effects, can be a difficult task, but essential to identifying the sources of change. We do not propose that age, birth year or survey year themselves have causal influence on marijuana use. Rather, factors associated with the maturational effects of aging such as increasing responsibilities or declining health, shared influences of "coming of age" in a particular birth cohort such as lifetime exposure to and attitudes towards marijuana and other drugs, and shared period influences such as economic conditions or media focus on drug issues can be generally identified as age, period or cohort effects, guiding future studies into the mechanisms behind these effects.

The APC problem has typically been addressed in the literature using retrospective data on initiation of marijuana use (e.g. Johnson and Gerstein, 2000) or in one case, longitudinal and retrospective data (Holdcraft and Iacono, 2004). Our study differs

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by focusing on current marijuana use in four cross-sectional general population surveys of the US conducted over 16 years. Each birth cohort (defined in 5-year groups) is observed in four age groups and four periods allowing the identification of these three effects while controlling for demographic differences. In this case, cohort effects identify groups whose marijuana use persists across changes in age and period rather than groups more likely to have ever used, though in practice these may be the same. Our research on age, period and cohort effects on beverage-specific alcohol use found that cohort and period effects were the main sources of change over the 1979–2000 period (Kerr et al., 2004). The aging of the heavier spirits and wine drinking cohorts born in the 1920s and 1930s were an important source of change for those beverages and a large period effect for men in the late 1980s was the major source of declining beer consumption.

Estimating consumption trends for illegal substances, such as marijuana, present special difficulties beyond those for legal behaviors, such as alcohol or tobacco use. The political and social climate could influence subjects' willingness to report use confounding both time trends and cross-sectional comparisons (Johnson and Fendrich, 2005). Reporting may also be especially sensitive to survey characteristics such as interview mode, interviewer characteristics, subject matter preceding marijuana questions, perceived purpose and source of the survey, payment of incentives, convincingness of confidentiality assertions, use of skip patterns and other factors (Gfroerer et al., 1997). Nevertheless, measures of marijuana prevalence and trends and cross-sectional variation in these measures are of great importance and general population surveys are the only source of these.

Trends in the prevalence of past-year marijuana use in the US population have been evaluated in a number of previous studies. The most recent data from the National Survey on Drug Use and Health (NSDUH) indicate a past year prevalence for those aged 18 and older of 10.1% (12.9% for men and 7.5% for women) in 2003 (SAMHSA, 2003). The figures for 2000, from the National Household Survey on Drug Abuse (NHSDA) are 7.7% for those 18 and older, with 5.7% among women and 10.0% among men (SAMHSA, 2000). However, a substantially lower prevalence was found in the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), which estimated a past year prevalence for those aged 18 and older to be only 4.1% (5.6% for men and 2.6% for women) for 2001–2002 (Compton et al., 2004). While much lower than the NSDUH estimates of 8.7% in 2001 and 10.4% in 2002 of those 18 and older (SAMHSA, 2001 and 2002), this rate is similar to the 4% past year prevalence found in the 1991–1992 National Longitudinal Alcohol Epidemiologic Survey (NLAES) conducted by the US Census Bureau (like NESARC) with similar design (Compton et al., 2004). There has been little comment on the observed discrepancies: while both NIDA and NIAAA studies are conducted with great professionalism, the differences are suggestive of the sensitivity to methodological differences that may influence prevalence estimates. For trend studies it may be important to use a consistent data source.

Rates for younger age groups are generally found to be much higher, for example in the NSDUH 2003 the past year prevalence was 28.5% (33% for men and 24% for women) in the 18–25 age group (SAMHSA, 2003). Similarly high rates are found in the Harvard College Alcohol Study (CAS) where past year prevalence was 23.2% in 1993, 28.4% in 1997, 27.6% in 1999, and 29.7% in 2001 (Mohler-Kuo et al., 2003). This rising trend in marijuana prevalence during the late 1990s can also be seen in the US National Household Survey on Drug Abuse (NHSDA), which preceded the NSDUH. From 1995 to 2000 the past year prevalence among those 18–25 increased from 24.7% to 27.6% for men and from 19% to 19.8% for women (SAMHSA, 1995; SAMHSA, 2000). One should note that the 2000 figures (and even the higher 2003 figures) are still substantially lower than the rates from the early 1980s. For example, in 1985 past year prevalence was 42.3% for men and 31.5% for women in this age group (NIDA, 1985).

Several studies have addressed the estimation of age, period and cohort (APC) effects in the US over the 20th century using different types of data from the current study. Johnson and Gerstein (1998) considered data on the age of initiation of marijuana use in the 1991–1993 NHSDA samples and found that the incidence of marijuana use before the age of 21 was rare in the cohort born before 1940 but increased rapidly to over 50% by the 1956 cohort, after which it was generally stable through the 1975 cohort. In a more detailed analysis, applying APC modeling procedures to age of incidence data from nine NHSDA samples, Johnson and Gerstein (2000) identified a more complex picture with increasing positive cohort effects for more recent cohorts balanced to some extent by declining period effects. Golub and Johnson (2001) also utilized incidence data from the NHSDA samples taken between 1979 and 1997 but used a different methodology. They found that the odds of progressing from alcohol/tobacco use to marijuana use by age 25 indicated a peak cohort effect around the 1960 birth year with a significant decline thereafter. They also found declining cohort effects over time but to a lesser degree than Johnson and Gerstein (2000). Using longitudinal data from the Minnesota Twin-Family Study (MTFS) Holdcraft and Iacono (2004) compared two birth cohorts in their sample: those born before 1954 and those born in 1954 or later. The 1954 and later birth cohort had higher lifetime prevalence of cannabis use, earlier age of onset, a larger number of dependence symptoms and a higher frequency of use during their heaviest period.

While previous research has clearly identified increased *lifetime* marijuana use in birth cohorts born after 1945 (Johnson and Gerstein, 1998) no studies have addressed the joint influences of age, period and birth cohort on the *current* consumption of marijuana in multiple cross-sectional nationally representative surveys. The National Alcohol Surveys (NAS) conducted in 1984, 1990, 1995 and 2000 include comparable measures of past year marijuana use, permitting both the estimation of national trends in the prevalence of past year use and the estimation of APC models. APC models attempt to disentangle the competing influences of individual aging, period effects on all individuals at a given time, and the enduring effects of birth cohort across period and ages, such as might occur if a particular group 'came of age' in a certain cultural climate, and tended to retain some tendency based on the cohort-shared conditions then prevailing (while maturation and later period influences might still also play