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Short communication

Should anyone be riding to glory on the now-descending limb of the crack-cocaine epidemic curve in the United States? *



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ABSTRACT

Background: Many pre-clinical and clinical researchers do not appreciate the recent decline in United States (US) population-level incidence of crack-cocaine smoking. At present, no more than about 200 young people start using crack-cocaine each day. Ten years ago, the corresponding estimated daily rate was 1000. This short communication looks into these trends, surrounding evidence on this important public health topic, and checks whether duration-reducing treatment interventions might be responsible, versus selected alternatives.

Methods: Via analyses of standardized computer-assisted self-interview data from the US National Surveys on Drug Use and Health (NSDUH, 2002–2011; *n* > 500,000), we evaluated change in incidence estimates, perceived difficulty to acquire crack, risk of using cocaine, treatment entries, and persistence once crack use has started.

Results: We draw attention to a marked overall decline in year-specific incidence rates for crack-cocaine smoking from 2002 to 2011, especially 2007–2011. There is some variation in estimates of difficulty to acquire crack (p < 0.001) and observed risk of using cocaine among 'at risk' susceptibles (p < 0.001), but no appreciable shifts in duration of crack smoking among active users (p > 0.05) or in proportion of crack users receiving treatment (p > 0.05).

Conclusions: Changing epidemiology of crack-cocaine smoking may rest largely on reductions in newly incident use with no major direct effects due to US cocaine treatment, incarceration, or interdiction. Concurrently, we see quite modest declines in survey-based estimates of cocaine-attributed perceived risk and cocaine availability. As such, we posit that no specific US agency should claim it is 'riding to glory' on the descending limb of this epidemic curve.

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1. Introduction

This is a 'short communication' stimulated by growing awareness that prevalence proportions for use of cocaine hydrochloride (HCl) have dropped in the United States (US), with an estimated prevalence proportion of about 2.5% in 2002 shifting downward to 1.5% by 2011 [Substance Abuse and Mental Health Services Administration (SAMHSA), 2012]. Contributing to this prevalence trend is a drop in year-specific population incidence rates for crack-cocaine

http://dx.doi.org/10.1016/j.drugalcdep.2014.02.005 0376-8716/© 2014 Elsevier Ireland Ltd. All rights reserved. 'smoking' specifically, from which each day's estimated tally of newly incident crack users can be derived. Estimated at 1000 newly incident crack users per day 10 years ago, the corresponding estimate for 2011 is about 200 per day (SAMHSA, 2012). Our intent is to add a selection of US community survey-based details about declining trends in estimated annual incidence for crack-cocaine, observed during years epidemiologists generally call 'the descending limb of the epidemic curve,' including potential influence of cocaine-attributable harms (e.g., see Johnston, 2003). This 'short communication' format is too constrained for thesis-length coverage of interesting concurrent trends from other data sources, ethnographies, and anecdotes from outside the US.

Given this report's constrained focus on crack-cocaine and the numbers of newly incident crack users, any evaluation of its scientific or public health importance must be based upon a clear distinction between the individual-level risk of becoming a newly incident user and the population-level 'incidence rate' on one side (reflecting risk of *becoming* a user for the first time), versus a drug's

[☆] Online supplementary material is provided to provide details on the National Surveys on Drug Use and Health (NSDUH), including survey items used to ask about crack-cocaine specifically and can be found by accessing the online version of this paper. Please see Appendix A for more information.

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'prevalence proportion' (reflecting probability of *being* a user at any point in time). As is taught in every introductory course on epidemiology, any condition's prevalence is influenced by the composite of (i) its incidence rate, and (ii) the duration or persistence of the condition once it has started (Gordis, 2009).

Effective treatment or incarceration of persistent cocaine users might account for recent constraints on prevalence (because effective treatment or incarceration shortens duration, essentially terminating or reducing cocaine use, with potential secondary indirect effects on person-to-person spread of drug use). Accordingly, Behrens et al. (1999) argue that these control approaches are especially useful tools in drug epidemic end-stages. Nevertheless, there is reason to be uncertain about whether anyone should be claiming that members of the US cocaine treatment community or its criminal justice system now are 'riding to glory on the descending limb' of this crack epidemic curve. Perhaps the US survey evidence will support an assertion that "Whatever the drug, 'the real front line in [curbing] these epidemics is treatment..."' (Khadaroo, 2013).

This new contribution has a specific focus on incidence rate estimation for crack-cocaine, which helped sustain US cocaine prevalence into the 1980s and beyond (but had not been important in the first North American cocaine epidemic of the early 20th century; Musto, 1987). Lillie-Blanton et al. (1993), as well as Hatsukami and Fischman (1996), challenged popular misconceptions about crack during the recent mid-epidemic years. They noted that crack smoking might be differentiated from nasal insufflation of cocaine powder in relation to likelihood of developing cocaine dependence in the first years after onset of cocaine use (Chen and Anthony, 2004), but found little basis for claiming that crack-cocaine is inherently more harmful than cocaine HCl powder (Hatsukami and Fischman, 1996). Working from an ethnographic perspective, Golub and Johnson (1999) wondered whether seeds of a decline in crack-cocaine use were planted with an increased US domestic cultivation and increased availability of cannabis products (e.g., blunts) during the 1990s.

In an exploratory mode, we shed light on three specific facets of crack-cocaine epidemiology within the US, as can be illuminated via analyses of the NSDUH data: (a) whether the difficulty of getting a supply of crack-cocaine might have increased among subgroups 'at risk' for becoming newly incident users, (b) the duration of use among recently active users (a potential direct effect of treatment or incarceration), and (c) perceived cocaine-attributable risk of harm. We also seek out variations in incidence rates across population subgroups that might differentially benefit from public health interventions. Once published, this preliminary evidence from the NSDUH community surveys can be integrated in a future more comprehensive thesis-length coverage of other facts from US school surveys, treatment admissions, ethnographic observations, and drug law enforcement laboratory evidence (e.g., price, purity, and a potential role for recently introduced adulterants such as the antihelminthic agent levamisole), as well as non-US evidence about increased cocaine demand elsewhere.

2. Materials and methods

Data are from Institutional Review Board-approved NSDUH surveys, 2002–2011, which involved annual independently drawn nationally representative probability samples of US citizens aged 12+ years (*n* = 559,311). As previously described in this journal (Seedall and Anthony, 2013), data are made available via the Substance Abuse and Mental Health Data Archive (SAMHDA) public use datasets: Survey Documentation and Analysis (SDA), and Restricted-use Data Analysis System (R-DAS, http://dx.doi.org/10.3886/ICPSR32101.v1). An online supplement offers more detail (e.g., survey items).

In brief, the NSDUH research design is cross-sectional with large multi-stage area probability samples that encompass community-dwelling US civilian residents, but with exclusion of active military personnel and institutional residents. Typically, 70–75% of NSDUH eligible participants agree to complete its self-report confidential computer-assisted assessment.



Fig. 1. Estimated incidence of crack-cocaine use in the United States. 2002–2011. with 95% confidence intervals. Data on newly incident crack-cocaine users in US communities from complementary SDA and R-DAS public use datasets of the National Surveys on Drug Use and Health (NSDUH). ●NSDUH ■ R-DAS. NSDUH public use datasets are available in two forms: (1) the Survey Documentation and Analysis System (SDA), and (2) the Restricted-Data Analysis System (R-DAS). SDA provides analysis weights and variance estimation tools for both online analyses and downloadable datasets, year by year. R-DAS provides analysis weights and variance estimation tools strictly for contingency table analyses, with no downloadable datasets, with analysis weights constructed for (a) pairs of years, as shown above (2002-2003, 2004-2005, etc.), and (b) 4-year and 8-year aggregates. The SDA and R-DAS samples for these public use datasets can be considered in terms of a Venn diagram. Many participants in the SDA sample also are members of the R-DAS sample set. Nonetheless, some members of the SDA set are not members of the R-DAS set. It is possible to state specific unweighted numbers for each cell in an SDA analysis, but this possibility does not exist for the R-DAS analyses. Instead, it is necessary to derive approximate unweighted R-DAS cell sizes; exact unweighted cell counts are not provided.

Year-specific incidence of crack use, 95% confidence intervals (CI), and difference tests were derived via analyses with weighting and Taylor series linearization for variance estimates as required to probe for variations across years.

3. Results

Fig. 1 clearly depicts a 'descending limb' of the crack-cocaine epidemic curve via time-specific estimates of the ratio of newly incident users to the total 'at risk' susceptible US population from complementary SDA and R-DAS data. Here, the 'at risk' concept means that past crack-cocaine users (initiates in prior years) have been removed from each ratio's denominator; past users are no longer at risk to become newly incident users. Table 1 describes characteristics of newly incident crack users.

NSDUH items ask about cocaine-attributable harmfulness, but nothing specific about crack. Gauged for cocaine products overall (including crack), in 2002–2003, an estimated 89.8% of 'at risk susceptibles' judged a 'great risk' of harm when cocaine is used 1–2 times each week (CI = 89.5%, 90.1%), while 71.2% judged 'great risk' when cocaine is used once per month (CI = 71.6%, 72.6%). Corresponding estimates for 2010–2011 are 88.4% (CI = 88.1%, 88.7%) and 70.7% (CI = 70.2%, 71.2%). Given the large survey samples, these attitudinal shifts have statistical significance (p < 0.001), even if they are judged to be modest relative to the observed sharp decline in crack-cocaine incidence. (We also note that the pool of 'at risk susceptibles' in the US is huge, such that a relatively small drop in an estimated proportion can refer to an important attitudinal shift for millions of individuals.)

A somewhat greater decline is seen when 'at risk susceptibles' are asked about difficulty to get crack (p < 0.001). In 2002–2003, just under 33% of these 'at risk susceptibles' said it was 'probably impossible' to get crack (CI=31.9%, 33.0%), while 11.2% said that it was 'very easy' to get crack (CI=10.8%, 11.5%); corresponding

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