Five-year trends in patterns of drug use among people who use stimulants in dance contexts in the United Kingdom

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ABSTRACT

Aims To describe and evaluate trends in the use of stimulant drugs over a 5-year period using an under-studied data collection method.
Design Repeated-measures cross-sectional survey.
Setting and participants Annual magazine-based survey targeting people who use stimulant drugs in dance contexts.
Measurements Life-time use prevalence (ever used), age of first use, current use prevalence (any use within the last month) and extent of use within the last month (number of days used) for a range of stimulant drugs. Additional measures of quantity of ecstasy used were also collected.
Findings Trends in life-time and current prevalence over time have been detected and comparisons made between different stimulant drugs. Evidence is obtained of broad stability in patterns of stimulant use in respect of age of first use and frequency of use among ongoing users. Despite an apparent reduction in the current prevalence of ecstasy use, the proportion of heavy users (usually >4 pills per session) has more than doubled between 1999 and 2003.
Conclusions This purposively sampled population study has yielded time trend data broadly consistent with other indicators, where they exist, and also has demonstrable potential to identify new drug trends. Further comparisons of purposive samples and randomly formed samples are needed.

KEYWORDS: Amphetamines, cocaine, ecstasy, stimulants.

INTRODUCTION

In Britain and elsewhere, the rise in the use of stimulant drugs among young people over the last 15–20 years has been a considerable epidemiological and a cultural phenomenon (Measham *et al.* 2001). In many countries, ecstasy (MDMA), cocaine and amphetamines are the most widely used illicit drugs after cannabis (Smart & Ogborne 2000). Nation-wide representative prevalence studies with the capacity for detailed examination of patterns of stimulant drug use are now well established throughout Europe, North America and in Australia.

The wealth of epidemiological and cultural studies illustrates how fundamental a transition has taken place in patterns of drug use in the general youth population. For example, the diffusion of ecstasy from subcultural to mainstream use has reached the point whereby ecstasy users are, in most social respects, difficult to distinguish from non-users in the general population (Pedersen & Skrondal 1999; Degenhardt *et al.* 2004). This transition has been conceptualized influentially in Britain as the 'normalization' of youth recreational drug use (Parker *et al.* 1998; Measham *et al.* 2001; Parker & Williams 2004).

These trends are certainly not uniform, however, and detailed epidemiological attention reveals significant variation over shorter periods of time and between places. In Britain, in recent times, amphetamines and ecstasy use have reduced, while according to the British Crime

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Survey, the national representative prevalence resource, cocaine use has increased (Condon & Smith 2003). In some countries stimulant drugs are less popular than hallucinogens (Smart & Ogborne 2000), and apparently idiosyncratic country-specific variations are evident. For example, in South Africa methaqualone ('Mandrax') appears to be the second most commonly used illicit drug after cannabis (Parry *et al.* 2004).

Perhaps the most distinguishing feature of the users of any one stimulant drug is the likelihood of other stimulant and other drug use (Pedersen & Skrondal 1999; Degenhardt *et al.* 2004). Today's young drug users are polydrug users, both internationally and in Britain (Ramsey *et al.* 2001). As with other forms of drug use, there is a general relationship between consumption and harm, with heavier consumption associated with increasing harm (Williamson *et al.* 1997; Degenhardt *et al.* 2001). As with previous generations of drug users (Kandel & Logan 1984), longitudinal studies reveal that most young stimulant drug users discontinue their use during their 20s (VonSydow *et al.* 2002).

Prior to the current era of formal epidemiological study of stimulant drug use based upon randomly drawn samples of young people, the emergence of this phenomenon was studied in purposively sampled studies of populations of interest (Degenhardt *et al.* 2004). These studies, conducted throughout the 1990s in Britain and elsewhere, provided detailed descriptions of patterns of stimulant use, related harms and other experiences (see Solowij *et al.* 1992; Williamson *et al.* 1997; Topp *et al.* 1999 for examples). The generalizability of these studies was inherently problematic: it was not known precisely to what extent their findings might be applied to other populations given their non-random sampling methods.

These studies did, however, employ a wide range of innovative recruitment methods including convenience, intercept, site, snowballing and quota sampling procedures (Watters & Biernacki 1989; Spooner *et al.* 1993). One approach, known as privileged access interviewing, was developed to enable the rapid recruitment of large numbers of drug users for epidemiological study (Griffiths *et al.* 1993). The question now arises: do non-random sampling methods have any ongoing value in the era of randomly drawn nationally representative household surveys of young drug users?

One of the limitations of household surveys is that they usually exclude populations living in institutional settings. In addition to those in the custody of the criminal justice system, students living away from parental homes are missed (Parker & Williams 2004). Even if household surveys were to attain complete population coverage, some subpopulations may have a level of interest requiring in-depth data collection not compatible with general population surveys.

The very nature of the diffusion of new forms and patterns of drug use, as with other cultural innovations (Rogers 2003), involves relatively small numbers of innovators and early adopters who have the capacity to provide early warning of new drug trends (Griffiths *et al.* 2000; Winstock *et al.* 2002). Unfortunately, formal research study has not yet developed to the point where it can provide effective early warning (Griffiths *et al.* 2000). There is a dearth of epidemiological studies in which increasing incidence has been identified in sentinel populations. Such populations are, almost by definition, likely to be already heavily involved in drug use, and so provide opportunities for detailed study of risk and harms, even where the patterns of use are not themselves novel (Winstock *et al.* 2001).

Other populations may also be of specific interest as a result of opportunities for targeted intervention, in particular settings or cultural domains. For example, Bellis *et al.* 2003) using a repeated-measures cross-sectional design compared patterns of drug use in an international nightlife resort with UK patterns of use, and observed change over time in both places. This study captured data successfully both on the initiation of new drugs and on transitions in patterns of previously used drugs, particularly in heavy drug-using contexts.

Winstock *et al.* (2001) provided an initial account of the methodology, year 1 data, strengths and weaknesses of a survey in a specialist dance music magazine. This survey has been conducted on an annual basis since 1999. The purpose of this paper is to consider change over time in patterns of stimulant drug use over the period 1999–2003 inclusive, and to provide a preliminary evaluation of the validity of this method of monitoring trends in stimulant drug use over time.

METHOD

Annual survey details

Since 1999 an annual survey of people who use stimulant drugs in dance contexts has been conducted in conjunction with *Mixmag*, a specialist dance music magazine. This magazine was chosen because it has prominently published articles about drug use, and was judged to be a highly credible vehicle for encouraging study participation among the target population. Winstock *et al.* (2001) reported UK circulation figures of approximately 50 000, with an additional 10 000 readers in other countries. Enquiry about location enabled the exclusion of non-UK study participants. This report is restricted to data from UK respondents only.

Readers have been invited to return by freepost a questionnaire printed over two pages in the September

edition of the magazine. As a result of falling levels of response, this postal option was supplemented by online access to the questionnaire (at http://www.mixmag.uklinux.net) in 2003. This innovation apart, data collection procedures have been identical across the years, permitting cross-sectional comparisons over time. Between 1999 and 2003, 1151, 795, 988, 491 and 1134 UK responses have been received, respectively (total $n = 4559$). Of the 2003 responses 736 self-completed the questionnaire online (65%), with 398 postal responses received (35%).

Approximately 15% ($n = 686$) of the total have reported prior study participation and have been excluded from analyses. In year 2 these data were not collected, so the entire sample was included. This has yielded samples of 1151, 795, 787, 335 and 805 UK responses in each of the 5 years, respectively, for analysis.

Sampling considerations

Prior to the initial survey in this series, advertisements in magazines had previously been a prominent feature of the targeted cross-sectional studies of stimulant drug users throughout the 1990s (see Degenhardt *et al.* 2004; Topp *et al.* 2004 for recent overviews). The use of magazines or other media to contact drug users for research purposes is one example of purposive sampling in this area (Topp *et al.* 1999). Other methods used for stimulant users have included attendance at nightclubs, raves, parties and other dance events and privileged access interviewing (Forsyth 1996; Williamson *et al.* 1997; Gross *et al.* 2002).

In purposive sampling, the sample is constructed according to predefined needs for data collection. These may or may not involve quotas or other internal targets for sample composition. There are two components to be borne in mind in consideration of representativeness in all applications of purposive sampling: first, the efforts of the research team to successfully locate, contact and include targeted drug users (Topp *et al.* 2004); and secondly, response or selection bias—the systematic response of the target population to these efforts. McKeganey (2001) draws attention to the need to consider very carefully the representativeness of study findings in which sampling has been undertaken in these ways. Indeed, while it may make for more straightforward recruitment of study participants in situations where it is otherwise difficult or impossible, purposive sampling requires additional attention to be given to the representativeness of the achieved study sample, in order to make valid inferences.

Response or selection bias is a profound threat to the validity of inferences drawn from all cross-sectional and longitudinal surveys. It is now well known that a 'volunteer effect' exists whereby survey respondents differ from non-respondents (Friedman & Wyatt 1997). Put simply, potential participants are more likely to respond to questionnaires if they see items which interest them, so almost by definition respondents will be different from non-respondents (Eysenbach & Wyatt 2002). For this reason, it would be especially problematic to seek to infer wider population generalizability from non-randomly formed cross-sectional data in the absence of other sources of external validation.

Topp *et al.* (2004) compared findings from nationally representative and purposively sampled studies of ecstasy users in Australia and found them to be very similar. These authors concluded that 'purposive sampling that seeks to draw from a wide cross-section of users and to sample a relatively large number of individuals, can give rise to samples of ecstasy users that may be considered sufficiently representative to reasonably warrant the drawing of inferences relating to the entire population'. Similar studies of other stimulant users are not yet available, and this study also contained a number of noteworthy limitations (Topp *et al.* 2004). These included a relatively small number of directly comparable questions on use, and the absence of investigation of harms in the nationally representative surveys. Purposive sampling may thus have the potential to generate samples equivalently representative to randomly formed samples, but further study is needed to demonstrate whether and how this may be achieved.

In this survey series, we make no claim that data from any one year are representative of wider population data. Indeed, having identified broad demographic similarity between respondents and other readers of the magazine, previous consideration of response bias identified that the sample 'represents the "harder end" of the drugs/dance music scene' (Winstock *et al.* 2001). These respondents are viewed more likely to be more involved in both stimulant drug use and the musical styles with which it is associated, and this is precisely why this particular magazine was selected.

Repeated measurements over time, however, potentially allow inferences to be made on time trends where data collection procedures and other threats to the reliability of data can be shown to be constant or be effectively controlled. The most significant threats to time trend inferences identified in the present study are understood to be the variation in data collection methods in 2003, the changing levels of response between different years of the survey and the implications of prior study participation.

There is now an emerging literature on online data collection, and preferences for electronic assessment data collection have been identified in alcohol studies among higher education students (Kypri *et al.* 2003). Gosling

et al. 2004) compared internet data collected from 361 703 study participants with the total population whose data were published in an entire year of a leading psychology journal, drawn from 510 separate samples. They found that the internet sample was appropriately socio-demographically diverse and that a number of widely held preconceptions about internet data collection from volunteer samples were unwarranted. Ritter *et al.* (2004) have recently reported a randomized trial in which internet data collection of 16 instruments was found to be as reliable as postal data collection. In this study it was also found that less recruitment and follow-up effort was required via the internet to achieve equivalent levels of response. Thus, while the internet is a promising vehicle for data collection for these reasons, this literature is at an early stage of development and the possibility of bias must be guarded against.

Analytical procedures

Following presentation of the drug use prevalence data, consideration of the statistical significance of the observed time trends has been undertaken with logistic and multiple regression for prevalence and continuous data, respectively. The main effect of time (years 1–5) has thus been the principal independent variable under study, with the following additional variables also included in these models to control for potential confounding: age, gender, data collection method (post/web), number of responses per year and potential prior study participation. From year 3 onwards, those reporting prior study participation have been excluded from analysis. In year 2 these data were not collected, so a dummy variable was created to control for potential prior study participation among year 2 participants. Non-exclusion of known prior study participants yielded very similar results to those reported here. The extent to which these analytical procedures successfully do assess the effects of these known potential confounders will be considered in light of the results obtained. Data were modelled using STATA version 8.

Although age and gender did not vary substantially over the 5 years, these variables were included in these analyses as potential confounders as they are known to be highly relevant to stimulant drug use patterns. Mean age in years (and standard deviation) in each of the 5 years was: 23.9 (5.5), 23.9 (6.0), 24.1 (6.4), 24.5 (6.1) and 24.2 (6.1), respectively. The proportion of women participants in each of the 5 years was 39.1%, 38.0%, 37.6%, 47.9% and 35.9%, respectively. In both cases the 2002 data, the year in which participation levels fell markedly, is slightly discrepant. There is thus a heightened possibility that data from 2002 may be influenced by response bias, and this may provide an explanation for any unusual features of findings obtained for that year alone.

Likelihood ratio tests were employed to select appropriately complex models, for example, whether the time trend was in fact linear rather than quadratic (i.e. having a curve). Regression coefficients in models with quadratic terms are not presented due to the complexity of their interpretation, and likelihood ratio test results are considered unnecessary where linear models are supported.

Measures

Four key measures of use are considered here for a range of stimulant drugs; life-time use prevalence (ever used); age of first use; current use prevalence (any use within the last month); and extent of use within the last month (number of days used). These questions were asked in exactly the same format for the following drugs in all years; ecstasy (MDMA); cocaine powder; crack cocaine; amphetamine powder; amphetamine base/paste; 4-MTA (also known as 'flatliners'; Winstock *et al.* 2002). Additionally, secondary measures of the extent of ongoing ecstasy use—(a) usual quantity of pills per episode of use and (b) greatest number of pills per episode—were collected, due partly to the relative ease of reliable data collection for this drug in comparison with others (see also Bellis *et al.* 2003). Methamphetamine was added to this list of drugs in years 2–5 (2000–03). Use of other stimulant drugs enquired about has tended to be minimal, and will not be considered further here.

RESULTS

Life-time use prevalence

The proportions reporting ever having used any of the stimulant drugs under consideration are presented in Table 1. The time trends apparent in the table are found to be all statistically significant in the regression models except for methamphetamine [OR = 0.97 (0.74–1.27), $P > 0.1$]. The pattern of rise and fall over time is evident for both ecstasy and cocaine. Likelihood ratio tests identify the models with quadratic terms for time to fit the data better than linear models (ecstasy LRT = 17.11, $P < 0.0001$; cocaine LRT = 4.83, $P = 0.028$).

The increase in life-time prevalence for crack is statistically significant [OR = 1.11 (1.02–1.22), $P = 0.012$]. This time effect represents a best estimate of an increase of 11% per year upon previous prevalence levels, after controlling for all potential confounders. Linear reductions in prevalence levels over time are apparent for amphetamine powder and 4-MTA [amphetamines

Table 1 Life-time use prevalence.

	1999 (n = 1151)	*2000 (n = 795)*	*2001 (n = 787)*	*2002 (n = 335)*	*2003 (n = 805)*
Ecstasy	90.7%	96.4%	97.0%	94.6%	88.0%
Cocaine*	73.1%	76.4%	80.3%	76.7%	74.9%
Crack	13.1%	13.2%	14.9%	15.5%	13.4%
Amphetamines*	86.5%	88.6%	82.6%	82.7%	74.2%
Base amphetamine	58.8%	60.0%	47.5%	54.0%	48.7%
Methamphetamine	N/A	4.0%	7.4%	6.6%	7.1%
4-MTA	9.6%	8.6%	4.7%	2.1%	2.1%

*Powder.

Table 2 Mean age of first use (SD).

	1999	*2000*	*2001*	*2002*	*2003*
Ecstasy	19.6	19.5	19.9	19.7	19.5
	(4.7)	(5.0)	(5.1)	(4.8)	(4.9)
	n = 1106	*n* = 763	*n* = 744	*n* = 305	*n* = 716
Cocaine	20.7	20.7	20.7	20.5	20.4
	(4.0)	(4.5)	(4.8)	(4.5)	(4.3)
	n = 867	*n* = 604	*n* = 606	*n* = 245	*n* = 612
Crack	21.4	21.6	23.0	22.9	21.2
	(4.4)	(5.1)	(6.6)	(6.6)	(6.0)
	n = 150	*n* = 104	*n* = 105	*n* = 51	*n* = 102
Amphetamines	18.1	18.0	18.2	18.5	18.5
	(3.9)	(4.0)	(4.3)	(4.0)	(4.1)
	n = 1053	*n* = 695	*n* = 622	*n* = 265	*n* = 587
Base amphetamine	19.8	19.4	19.6	19.2	19.1
	(4.6)	(4.8)	(5.1)	(4.6)	(4.7)
	n = 700	*n* = 467	*n* = 351	*n* = 173	*n* = 384
Methamphetamine	N/A	22.2	20.1	23.3	22.0
		(5.2)	(6.4)	(6.4)	(7.9)
		n = 32	*n* = 51	*n* = 20	*n* = 52
4-MTA	20.8	21.5	20.7	20.0	18.6
	(4.4)	(6.0)	(5.7)	(3.5)	(2.7)
	n = 110	*n* = 68	*n* = 32	*n* = 5	*n* = 12

OR = 0.88 (0.81–0.95), $P = 0.002$; 4-MTA OR = 0.69 (0.57–0.83), $P < 0.001$]. The prevalence reduction for base amphetamine is non-linear (LRT = 22.02, $P < 0.0001$).

Age of first use

Data on mean age of first use of the various stimulant drugs are presented in Table 2. Stability in mean ages of first use is evident for the majority of drugs [ecstasy B = –0.05 (–0.15–0.04), $P > 0.1$; crack B = –0.21 (–0.44–0.03), $P = 0.083$; amphetamine powder B = –0.03 (–0.14–0.09), $P > 0.1$; 4-MTA B = –0.33 (–0.88–0.21), $P > 0.1$].

Small but statistically significant reductions in mean age of first use have been detected for cocaine powder [B = –0.14 (–0.25 to –0.03), $P = 0.016$] and for base amphetamine [B = –0.33 (–0.46 to –0.19), $P < 0.001$]. The trend in age of first use of methamphetamine was in the opposite direction, i.e. age of initiation was getting older [B = 1.38 (0.15–2.61), $P = 0.028$].

Current use prevalence

The proportions reporting any use of the stimulant drugs under study within the past month are presented in Table 3. The linear reduction in current ecstasy use prevalence is statistically significant [OR = 0.84 (0.78–0.90), $P < 0.001$]. The more complex patterns evident for cocaine and crack preclude any consistent effect of time [linear models – cocaine OR = 1.0 (0.94–1.07), $P > 0.1$; crack OR = 1.04 (0.84–1.29), $P > 0.1$].

Table 3 Current use prevalence.

	1999 (n = 1151)	*2000 (n = 795)*	*2001 (n = 787)*	*2002 (n = 335)*	*2003 (n = 805)*
Ecstasy	79.3%	77.7%	71.3%	68.7%	66.6%
Cocaine*	35.7%	28.3%	34.3%	34.3%	41.1%
Crack	2.1%	1.9%	2.4%	1.5%	1.2%
Amphetamines*	39.3%	23.8%	25.8%	27.2%	24.1%
Base amphetamine	22.9%	13.3%	13.0%	20.3%	18.1%
Methamphetamine	N/A	0.4%	0.8%	0.9%	1.6%
4-MTA	0.8%	0.4%	0.3%	0.0%	0.4%

*Powder.

Table 4 Mean number of days used among past month users (SD).

	1999	*2000*	*2001*	*2002*	*2003*
Ecstasy	4.6	4.6	4.3	4.0	4.4
	(3.9)	(3.4)	(3.3)	(3.2)	(3.8)
	n = 913	*n* = 618	*n* = 561	*n* = 230	*n* = 536
Cocaine	3.7	2.4	3.7	4.0	3.6
	(4.6)	(2.3)	(4.3)	(5.1)	(3.9)
	n = 411	*n* = 225	*n* = 270	*n* = 115	*n* = 331
Crack	2.8	3.8	3.3	2.8	3.3
	(4.2)	(5.2)	(4.8)	(2.5)	(2.3)
	n = 24	*n* = 15	*n* = 19	*n* = 5	*n* = 10
Amphetamines	4.7	3.4	4.0	3.7	4.4
	(5.6)	(4.1)	(5.4)	(4.1)	(5.1)
	n = 452	*n* = 189	*n* = 203	*n* = 91	*n* = 194
Base amphetamine	3.9	3.6	4.9	4.6	4.4
	(4.7)	(4.8)	(6.1)	(4.8)	(4.8)
	n = 263	*n* = 106	*n* = 102	*n* = 68	*n* = 146
Methamphetamine	N/A	2.7	9.7	1	4.0
		(1.5)	(9.2)	(0)	(6.0)
		n = 3	*n* = 6	*n* = 3	*n* = 13
4-MTA	1.4	1.3	10.5	0	1
	(0.7)	(0.6)	(9.2)	(0)	(0)
	n = 9	*n* = 3	*n* = 2	*n* = 0	*n* = 3

For both amphetamine powder and base amphetamine quadratic effects of time are detected (powder LRT = 10.78, $P = 0.001$; base LRT = 35.86, $P < 0.0001$) representing the observed fall and stabilization and fall and rise over time, respectively. The increase in the small numbers currently using methamphetamine is statistically significant [OR = 2.11 (1.03–4.32), $P = 0.041$], approximately a doubling of year-on-year prevalence, after controlling for potential confounders. The virtual disappearance of current 4-MTA users ($n = 3$ in 2003) precluded these data being modelled.

Extent of current use

Data on the extent of current use, measured in terms of number of days used within past month among past month users, are presented in Table 4. Stable use patterns are evident for ecstasy [B = 0.02 (–0.1–0.16), $P > 0.1$], cocaine [B = 0.06 (–0.2–0.27), $P > 0.1$], crack [B = 0.38 (–0.6–1.36), $P > 0.1$] and amphetamine base [B = 0.11 (–0.18–0.41), $P > 0.1$]. The small numbers involved make modelling redundant for methamphetamine and 4-MTA.

For amphetamine powder, the observed fall and rise over time is statistically significant (LRT = 4.2, $P = 0.04$).

In addition to these data on number of days used, data on the quantity of ecstasy used per usual episode of use are presented in Table 5. This upward trend in mean quantity is statistically significant, with the model containing the quadratic increase fitting the data better than a model with a linear increase (LRT = 17.2, $P < 0.0001$). A similar result is obtained in respect of the proportion

Table 5 Usual ecstasy pill consumption per episode of use.

	Mean (SD)	*% > 4*
1999 $n = 907$	2.91 (1.96)	16.1%
2000 $n = 617$	3.87 (2.42)	27.2%
2001 $n = 559$	3.31 (1.79)	19.5%
2002 $n = 228$	4.04 (3.06)	26.3%
2003 $n = 532$	4.15 (2.63)	35.5%

consuming five or more pills per session, with the quadratic increase preferred (LRT = 9.48, $P = 0.0021$).

In addition to these patterns of usual ecstasy consumption, study participants also reported the greatest number of pills taken in a single session. By 2003, on this measure the mean value was 8.9 (SD 5.6), median 8.0 and modal value 5. Of all current ecstasy users in 2003, 36% (189/532) reported consuming 10 or more pills in a single session, including 14% (75/532) who took 15 or more pills.

DISCUSSION

A series of time trends in various measures of use among people who use stimulant drugs have been identified. Before detailed examination of these findings and consideration of the issues they raise we will begin with an examination of the data collection and analysis methodology itself, and consider implications for the validity of the observed time trends. It is specifically the capacity to identify change over time that is the focus of this study, and therefore threats to the validity of these findings must themselves be time-dependent, i.e. operating inconsistently across the study period.

Changing levels of study participation warrant attention as they suggest the possibility of response bias. If such bias were to be random, the less likely it would be that any time trends would reach statistical significance. The possibility of systematic bias operates in the opposite direction, and should thus be the focus of concerns about the validity of these data. Are later study participants likely to be different in population characteristics than their earlier counterparts? In our view the substantial fall-off in 2002 does indeed pose a difficulty. The most likely explanation for this lower response would appear to be idiosyncratic handling of the survey in the magazine in that particular year. This year aside, there is a reasonable level of consistency of UK response levels (1151, 795, 787, 335 and 805, respectively). Data from 2002 do not appear, however, in any way exceptional.

Related to variability in levels of study participation is the question of how to deal with past participants. Our exclusion of those reporting prior study participation in later years may have served unwittingly to inflate the prevalence and ongoing use levels in year 1, and possibly also year 2, if repeat survey participants are heavier users of drugs, and they took these earlier opportunities to report their heavier use patterns. This interpretation is difficult to discount, and the life-time prevalence data are particularly vulnerable to this threat to the validity of the observed trend. However, the findings were similar regardless of whether past participants were included or excluded. There may also be information bias in respect of our treatment of prior study participation: we have relied upon self-report. Including participants who have in fact previously participated in the survey, without reporting so doing, would run counter to the previously described form of bias. In future years, we have addressed this limitation by including a unique identifier.

The possible effect of the introduction of online data collection was dealt with statistically via inclusion as a covariate in the models. While controlled for as a potential confounder in this way, the existence of some level of residual confounding cannot be ruled out and further study of this data collection method is indicated. The emerging literature on online data collection should be helpful in this regard, but it will also be necessary to study the specific features of data on drug use.

These considerations certainly deserve attention, but what of the trends themselves, and how do the data inform our appreciation of the strengths and weaknesses of the methodology? One strategy that may be valuable is to explore their coherence with evidence from other sources, where it is available. One surprising general trend was the reduction over time in life-time prevalence for most drugs, particularly in recent years. It seems possible that stimulant drug users are less inclined over time to experiment with all the drugs to which they have access. This could represent further evidence of the emergence of the more discerning, cost–benefit decision-making, drug consumer that has previously been described in the United Kingdom (Measham *et al.* 2001). The previous caution about the specific validity of the life-time prevalence data should however, be borne in mind.

Crack use is not well captured by general population surveys at current prevalence levels in the United Kingdom. The increase over time in life-time crack use is the exception to the general life-time prevalence trend. However, compared to other drugs life-time prevalence is relatively low and current use prevalence has declined substantially since 2001. The relatively small numbers of ongoing crack users appear to use this drug similarly or less frequently than other drugs. Crack use in this population appears to be largely ignored or, when experimented with, subsequently discontinued.

The long-heralded decline in the current use of both ecstasy and amphetamine powder in the United Kingdom

is reflected in clear downward trends over time. Interestingly, the British Crime Survey (BCS), the main general population prevalence survey used for policy purposes, has lacked comparable consistency over time in respect of ecstasy. In 2001–02, a statistically significant increase in last-year prevalence was reported (Aust *et al.* 2002), followed by a dramatic 21% reduction on this measure in 2002–03 (Condon & Smith 2003). It would not be surprising if the earlier decline in this sentinel population has foreshadowed the more recent wider reduction in prevalence.

For both ecstasy and amphetamine, in spite of reduced use prevalence, there is also evidence of patterns of higher consumption among ongoing users (mean usual number of ecstasy pills per episode and number of days used for amphetamine powder). The longer-term decline in current amphetamine powder use appears now to have ended. In light of the nature of the target population, this may suggest the possibility of wider diffusion of these trends in use.

The ecstasy consumption trends give particular cause for concern. Despite the uncertainty about the actual content of illicitly produced pills, and recent exploration of therapeutic uses of this drug, the potential for dose-dependent neurotoxicity in humans remains to be discounted (Check 2004). The observed increases in usual quantities used per episode replicate the recent findings of Bellis *et al.* (2003) among UK ecstasy users, even though there is some variation in the way these data were collected between the two surveys. In the international prevalence literature, the usual quantity reported is one to two pills per episode of use in most studies. In the Australian national survey, for example, only a minority of 10% reported taking three or more pills (Degenhardt *et al.* 2004). In this sample, more than one in three now report taking five or more pills in a typical session, and also taking 10 or more pills on at least one occasion. The prevalence of the former usual pattern measure has more than doubled within 5 years. Further attention to this area may potentially reveal previously overlooked ecstasy-specific harms (Schifano *et al.* 2003) or those attendant upon more recent increases in risk behaviour.

Much concern and 'hype' surrounds new drug trends and it is thus very encouraging that trends among newly emergent drugs in both directions have been captured over time by this survey. While it is possible to overstate the importance of proportionately large trends in small numbers, methamphetamine use is increasing, and 4-MTA use diminishing, in the population captured by his survey. Other stimulant drugs (e.g. ritalin), concern about which led to them being tracked specifically in more recent years, have yet to yield any substantial evidence of impact in this population. Future prevalence data will demonstrate whether or not this survey has provided successful 'early warning' (Griffiths *et al.* 2000) of wider methamphetamine use. Conversely, were 4-MTA or ritalin use to become established without first appearing in this series of surveys, this would raise questions as to its' early warning capacity.

While there is a general congruence of findings with evidence from multiple sources, and the findings of Topp *et al.* (2004) in particular are encouraging, further study of the external validity of purposive sampling strategies with drug users is required urgently. It is to be expected that different strategies will have their own advantages and disadvantages, and the relative performance of this magazine survey approach compared to, for example, privileged access interviewing or attendance in risk environments, is unknown. The literature has not yet matured to the point where comparisons can be made between these different approaches and randomly drawn samples cross-sectionally, nor how well they perform longitudinally.

In addition to the potential to generate large samples quickly, this magazine method is very inexpensive, a key advantage of the general approach of purposive sampling (Griffiths *et al.* 1993). Annual costs for the survey have been approximately £1500, largely comprising postage and data entry expenses (not including research staff time or advertising costs). With the near 2 : 1 preference for web-based rather than postal data collection in 2003, these small costs may be reduced further. International web-based surveys may thus have the potential to generate huge samples at low cost, with potential not only to examine further between-place prevalence differences, but also to explore the effects of different methods of sampling and recruitment. Introduction of elements of random selection within the obtained samples may also be helpful. However, the advantages to the rapid assessment of new drug trends must also be considered alongside the care in interpretation which it is necessary to apply to these data, given their very nature.

Without doubt, the nationally drawn household surveys remain the 'gold standard' evaluation of trends in established patterns of stimulant and other drug use. Attention to their limitations is also needed in relation to statistical power to detect particularly interesting new drugs being used and/or new patterns of use among specific groups of users. In the British Crime Survey, for example, since 2002/03 data have been collected on any use within the last month and frequent use defined as more than once in the last month, in addition to age of first use and life-time prevalence. Frequency data collected here on number of days used and ecstasy quantity measures are not collected, nor are any data on harms.

With this series of surveys we have successfully tracked changes in prevalence and patterns of use over a 5-year period in a population of potential wider

significance in relation to emerging trends, and who may benefit from intervention themselves. Indeed, it is an intriguing intervention prospect that successful intervention in sentinel populations may serve to alter the course of these wider trends.

We have successfully captured trends in ecstasy, methamphetamine and 4-MTA which give substance to concerns in some cases and diminish them in others. It is difficult at this stage, however, to draw firm conclusions about some of the more recent trends revealed by these analyses, such as in relation to amphetamine use, or whether complacency about crack use in the United Kingdom is warranted. If this survey, or indeed any other purposive method can be demonstrated to be an effective early warning system, then more detailed studies of those harms that are difficult to study at the general population level will be needed to help minimize stimulant-related problems.

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