National Programme on Substance Abuse Deaths
International Centre for Drug Policy
St George's Medical School, University of London

Fatalities and other key cocaine/crack cocaine indicators for the United Kingdom, 1990-2004

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Cocaine: the available formulations

- The cocaine powder (hydrochloride) can be snorted; low bioavailability levels. It can be injected as well but…..
- ….can't be smoked (because it decomposes at high temperatures). The alkaloid part is freed from the base through the use of ether. The result of this process is known as 'free-basing'…..
- …and another form of 'free-basing' is called 'crack'. The HCl powder is heated with baking soda and water. Pure cocaine crystals are obtained. Both a quicker and a stronger 'high' and a shorter duration of action are reported
- I.V. use of crack: use of citric acid

Cocaine/crack cocaine ph.kinetics

- The rate and the relative amount of cocaine entering systemic circulation depend greatly on the route of administration.
- Cocaine absorption from nasal mucosa is much slower than after smoking or after intravenous administration.
- Rapid absorption of smokable cocaine through the lungs, presumably because of the large surface area of the alveoli and small airways, probably accounts for the appeal of that route of administration.

Cocaine epidemiology

The second half of the 1990s saw a global trend of escalating cocaine use across a number of countries.

Last year's use of cocaine:between 3 and 3.5 million people in Europe.

Rates of last month's use: 1.5 million users.

Within the EU, lifetime experience among 15 to 34 year-olds ranges from 1% to 11.6%, with the highest levels being found in the UK.

Stimulants' deaths: the np-SAD findings (Ghodse, Schifano et al 2003; 2004; 2005; 2006)

- In England and Wales, an upward trend (+ 98%) in cocaine related deaths reported by coroners in Jan-June 2003 with respect to the previous year was observed

Cocaine deaths double in one year……..

The Observer, May 23, 2004

Cocaine settings of use

Most cocaine consumption takes place at clubs, raves and other such venues.

The smoking of crack cocaine remains restricted to some of the larger cities in Europe, where use appears to be most common in marginalised groups.

Epidemiology of use

- Over the last few years, cocaine (including crack) increased from 4% in 1995/6 to 6% in 2001/02 as a main drug of use in the UK.
- In England in 2001, 8% of clients reported cocaine (including crack) as their main problem drug, compared to 3% in Northern Ireland, 2% in Wales and 1% in Scotland.

Cocaine hazards

US DAWN report: cocaine alone or in combination was reported in 39% of drug misuse deaths in metropolitan areas

- Cocaine seems to have played a determinant role in 1% - 15% of drug-related deaths in countries that were able to distinguish between drug types causing death.

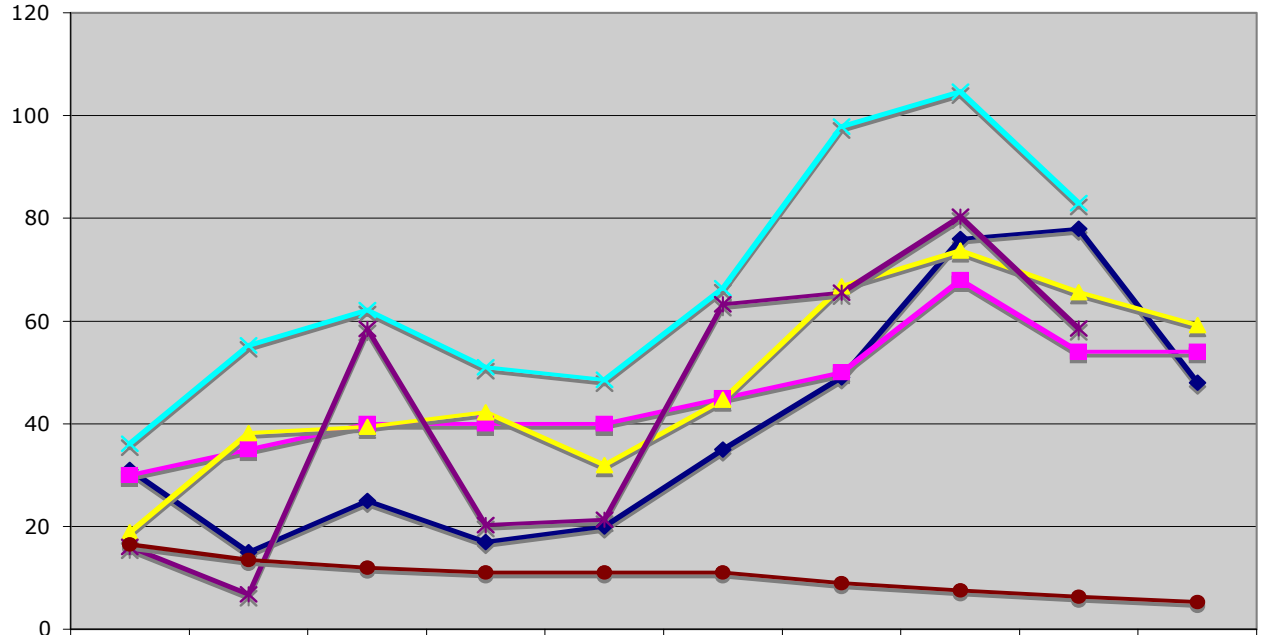
Cocaine and price issues

Increasing the price of commonly available psychoactive compounds, such as tobacco and alcohol, is likely to reduce demand for them amongst young people.

The Australian heroin 'drought' of 2000-1 was associated with increased prices, and decreases in injecting and heroin-related ambulance calls and overdoses

The price of cocaine is reported to have fallen during the last few years in most EU countries.

Stimulant deaths; the case of XTC (1994-2003; UK) (Schifano et al, J Psychopharmacol, 2006)



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Death mentions	31	15	25	17	20	35	49	76	78	48
BCS (%) x10	30	35	40	40	40	45	50	68	54	54
Offenders (100s)	18.810	38.210	39.370	42.210	31.960	44.700	66.700	73.700	65.600	59.200
No. seizures (100s)	36.140	55.210	62.160	50.980	48.500	66.370	97.840	104.600	83.000	
Doses seized (100,000s)	15.982	6.775	58.480	20.290	21.273	63.296	65.500	80.300	58.520	
Price (£)	16.5	13.5	12	11	11	11	9	7.5	6.33	5.3

Cocaine: the clinical picture

- **Binge**
- **Crash**: begins 15-30 minutes after the binge and lasts for a period of 9 hours-4 days. It is characterised by dysphoria and by different levels of craving.
- **Withdrawal properly called**: lasts approximately for 1–10 weeks; craving, anxiety and dysphoria levels are very high; considerable relapse risk.
- **Extinction phase**: both behaviour and mood level are gradually going back to normality. However, environmental stimuli can trigger sudden peaks of craving. Indefinite duration.

Polypharmacy use

- Alcohol is taken with ecstasy at the beginning of the night to get a stronger/better high (MDMA, whilst in the presence of alcohol, shows more significant physiopathological effects. Other options: pre-party packages containing SSRIs; moclobemide
- Cocaine, amphetamines and/or additional ecstasy tablets are taken to maintain arousal and a state of alertness (the MDMA entactogenic effects fade away in 2 – 4 hours).
- Finally, opiates and/or high (i.e. sedatives) dosages of alcohol are taken in the last part of the night to calm down before going home since the untoward after-effects of ecstasy (namely: irritability and restlessness) persist well beyond the end of the empathogenic and entactogenic pleasurable effects.

Methods

Seven key indicator data sources were taken into account:

number of mentions on death certificates;
treatment demand;
last year use;
number of drug offenders;
seizures;
price;
average purity levels

Fatalities' data sources

Death figures were obtained from the 3 General Mortality Registers covering the UK:

- Office of National Statistics (ONS) - England & Wales;
- General Register Office for Scotland (GROS);
- General Register Office for Northern Ireland (GRONI).

The figures are total mentions of cocaine on death certificates for fatalities occurring in the years 1990-2004.

No distinction is usually made on death certificates between cocaine and crack cocaine.

Sources for cocaine-related offences, seizures and use

- The number of persons dealt with for drug offences involving cocaine and crack cocaine in the UK and the number of cocaine/crack cocaine seizures in the UK were taken from the Home Office Statistical Bulletins.

- Information on seizures is reported to the Home Office by: Police forces, the National Crime Squad, and Revenue and Customs.

- Regional Drug Misuse Database data, which provide information on rates of cocaine/crack cocaine use amongst those presenting for treatment for drug dependence, were taken from Department of Health publications.

Sources for last year use of cocaine

Information on last year use of cocaine/crack cocaine recorded by the British Crime Survey (BCS) was taken from Home Office.

Figures relate to general household surveys conducted in England and Wales only and were the results for respondents aged 16-29 for the sweeps in 1992, 1994, 1996 and 1998, and of 16-24 year olds in 2000/1 to 2004/5

Cocaine/crack cocaine price and purity

Prices related to average UK street-level prices per dose of cocaine (1 gram) or crack cocaine (rock – 0.2 gram) as reported by police forces to the National Criminal Intelligence Service.

Info on price were based on police officers asking dealers how much they charged and in some areas from test purchases and were reported to the National Criminal Intelligence Service.

Purity data were supplied by the Drugs Intelligence Unit of the Forensic Science Service – now a UK Government owned company, formerly a Home Office executive agency.

Results: deaths

The total number of fatalities where cocaine/crack cocaine was mentioned in UK death certificates rose from 5 in 1990 to 171 in 2002, but dropped to 142 in 2003, before increasing to a new peak of 185 in 2004.

Between 1990 and 2004 cocaine/crack cocaine was involved in a total of 1,022 UK deaths.

Deaths related to cocaine, alone or with alcohol

- Between 1993 and 2004, cocaine/crack cocaine was mentioned in 865 fatalities in England & Wales; in 310 (35.8%) of them it was mentioned on its own (i.e. without any other drugs or alcohol).
- Alcohol was identified in combination with cocaine in 182 (21%) of the total number of English & Welsh cases.

Cocaine/crack cocaine consumption over the years

According to the BCS results, last year use of cocaine rose from 1% in 1992 to a peak of 5.2% in 2000, before falling back to 4.9% in 2003.

Crack cocaine consumption rose from 0.2% in 1992 to a peak of 0.9% in 2000, but dropped back to 0.4% in 2004.

Results; cocaine-related offences and seizures

- In 2003, some 7,230 individuals were cautioned by the police or dealt with by the courts for drug offences involving cocaine; an 8-fold increase on 1990
- Crack cocaine offences rose some 6-fold
- The number of cocaine seizures within the UK by law enforcement agencies rose 5-fold
- The number of crack cocaine seizures increased by 52%

Cocaine/crack cocaine price over the years

The price of cocaine in the UK has fallen rapidly over the past decade.

In 1990, the average price per gram of powder was £87 (€122), but by 2004 this figure had reduced by about 39% to £53 (€74).

In the same period, the average price of a 0.2g ‘rock’ fell by about 25% - from £25.4 (€36) to £19 (€27).

If the effects of inflation are taken into account, the falls in real terms have been even greater.

Rates of problematic cocaine use over the years

- Rates of problematic cocaine use amongst those presenting for treatment for drug dependence showed an almost 4-fold increase between 1993 and 2001

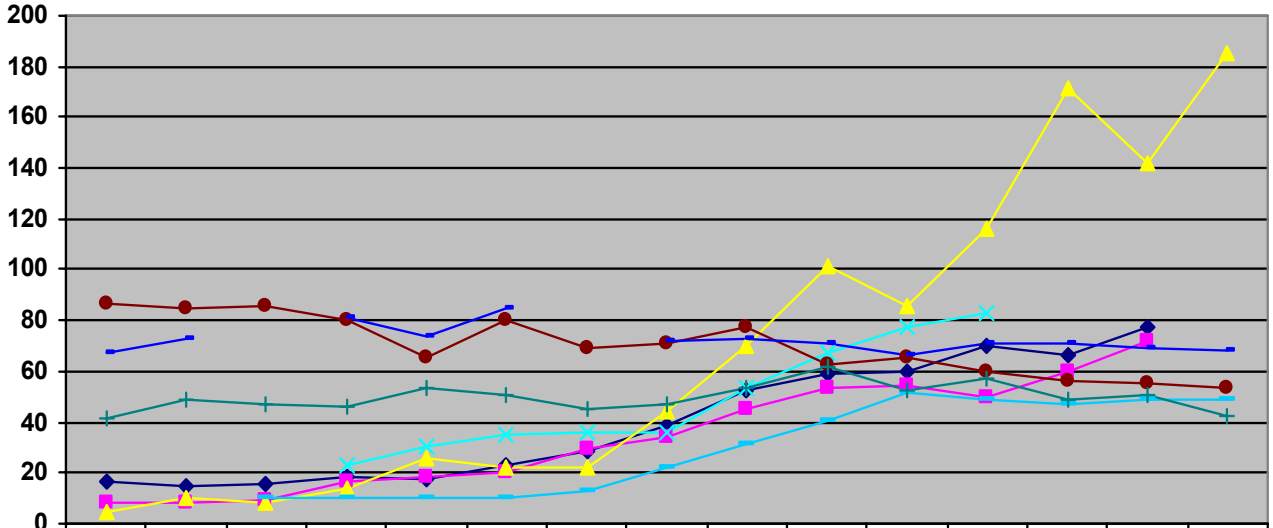
Cocaine/crack cocaine purity

According to both Police and Customs data, the purity of cocaine powder has remained fairly stable in the 1990-2004 time-frame.

Crack cocaine purity levels as reported by Customs (which may reflect what is illegally imported into the UK) remained fairly stable, at about 80%, over the years.

Conversely, the purity of crack cocaine material seized by the Police (which may conceivably reflect what is available in the street market) showed a 30% decrease: from 91% in 1991 to 64% in 2004.

Cocaine indicators,1990-2004

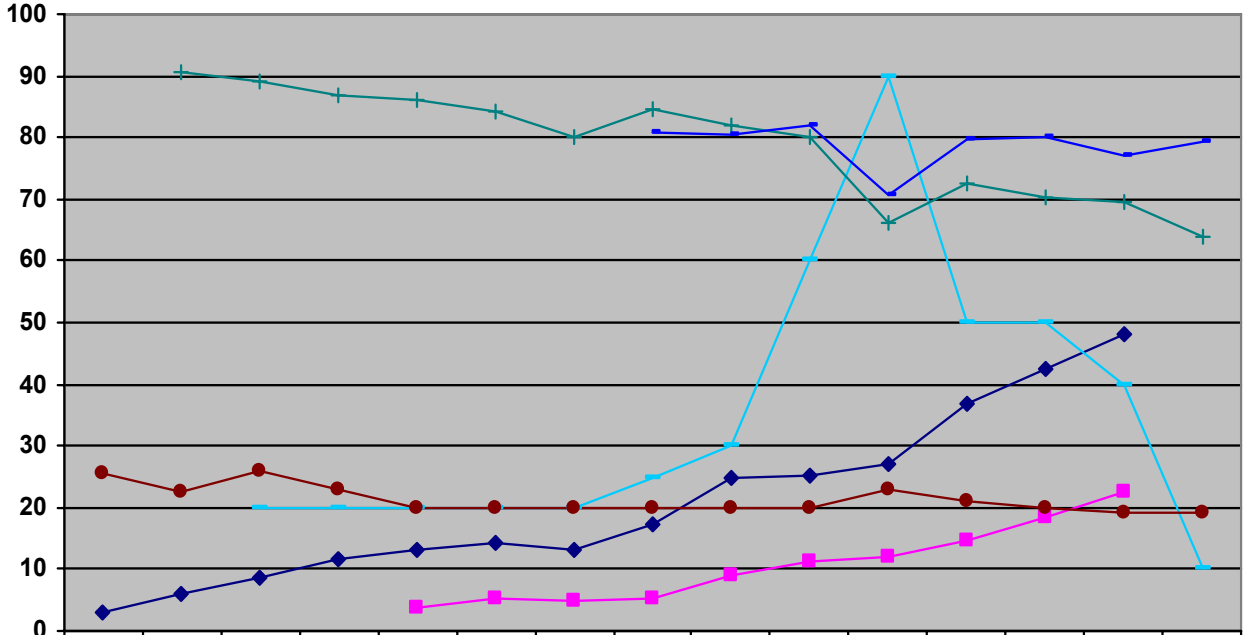


	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No of seizures (100s)	16.36	14.46	15.5	18.26	17.28	22.7	28.21	38.37	52.09	58.58	60.05	70	66.4	77.44	
No FG & caut (100s)	8.6	8.38	9.13	16.71	18.04	20.73	29.47	33.86	44.76	53.6	54.7	49.5	59.9	72.3	
RDMD episodes (100s)				23.31	30.28	35.48	35.93	36.13	53.87	67.56	77.47	83.27			
Deaths (UK)	5	10	8	14	26	22	22	44	70	101	86	116	171	142	185
BCS last year use (% x 100)			10	10	10	10	13	22	31	41	52	49	47	49	49
Price (£/gram)	87	84.6	86	80	65	80	69	71	77	63	65	60	56	55	53
Mean purity - police (%)	41.25	49.25	47	46.5	53.25	50.5	45.5	47.4	53.75	62	52.2	57.5	48.5	50.97	42.63
Mean purity - Customs (%)	67.5	72.5		81	74	85		71.57	72.8	71	66.6	70.9	70.9	69.16	68.19

Year

No of seizures (100s) | No FG & caut (100s) | RDMD episodes (100s)
Deaths (UK) | BCS last year use (% x 100) | Price (£/gram)
Mean purity - police (%) | Mean purity - Customs (%)

Crack indicators,1990-2004



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No of seizures (100s)	3.16	5.83	8.78	11.56	13.21	14.46	13.32	17.45	24.88	25.07	27.18	36.9	42.5	48.2	
No FG & caut (100s)					3.74	5.19	4.78	5.33	9.13	11.41	12.18	14.6	18.3	22.6	
BCS last year use (% x 1000)			20	20	20	20	20	25	30	60	90	50	50	40	10
Price (/rock - 0.2g)	25.4	22.4	26	23	20	20	20	20	20	20	23	21	20	19	19
Mean purity - police (%)		90.75	89	86.75	86.25	84.25	80	84.67	82	80	66	72.7	70.2	69.54	63.87
Mean purity - Customs (%)								80.67	80.4	82	70.8	79.6	80.2	76.95	79.33

Year

No of seizures (100s) | No FG & caut (100s) | BCS last year use (% x 1000)
Price (/rock - 0.2g) | Mean purity - police (%) | Mean purity - Customs (%)

Pearson correlation coefficients' results for cocaine

Number of death mentions correlated positively with:

- last year use of cocaine (powder) ($p < .001$);
- number of cocaine offenders ($p < .001$);
- number of cocaine seizures ($p < .001$);
- number of cocaine RDMD episodes ($p < .001$),
- but correlated negatively with cocaine price ($p < .001$).

Cocaine powder price correlated negatively with:

- last year use of cocaine (powder) ($p < .01$);
- number of offenders ($p < .001$);
- number of seizures ($p < .001$).

Table 1 – Pearson correlation coefficients for the UK cocaine indicators, 1990-2004
(Calculations related to seizures and offenders are for 1990-2003 data only, Regional Drug Misuse Database –RDMD- episodes for 1993-2001 only; and last year use for 1992-2004 data only)

		Number of death mentions	Last year use (England & Wales)	Number of offenders	Number of seizures	Number of RDMD episodes	Prices	Average purity of police seizures	Average purity of Customs seizures
f death	Pearson	1							
	Sig.	.							
use (England &	Pearson	.901***	1						
	Sig.	.000	.						
f offenders	Pearson	.935***	.939***	1					
	Sig.	.000	.000	.					
f seizures	Pearson	.946***	.971***	.977***	1				
	Sig.	.000	.000	.000	.				
f RDMD	Pearson	.961***	.974***	.928***	.960***	1			
	Sig.	.000	.000	.000	.000	.			
	Pearson	-.882***	-791**	-.868***	-.829***	-.665	1		
	Sig.	.000	.001	.000	.000	.051	.		
urity of police	Pearson	.198	.289	.530	.556*	.708*	-.297	1	
	Sig.	.480	.338	.051	.039	.033	.283	.	
urity of	Pearson	-.481	-.832**	-.440	-.488	-.705	.434	.049	1
eizures	Sig.	.096	.002	.153	.108	.051	.139	.875	-

*** Correlation is significant at the 0.001 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Pearson correlation coefficients' results for crack cocaine

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Number of cocaine/crack cocaine death mentions correlated positively with
- number of crack cocaine offenders ($p < .001$)
- number of crack cocaine seizures ($p < .001$),

but correlated negatively with
- crack cocaine purity, as reported by Police forces ($p < .001$)
- price ($p < .05$).

Crack cocaine price correlated negatively with
- number of crack cocaine seizures ($p < .05$).

Crack cocaine purity, as reported by Police forces, correlated negatively with
- number of crack cocaine offenders ($p < .01$)
- number of crack cocaine seizures ($p < .001$).

Table 2 – Pearson correlation coefficients for the UK 'crack' indicators, 1990-2004
(Calculations related to seizures and offenders are for 1990-2003 data only, last year use for 1992-2004 data only, Police and Customs purity data only for 1991-2004 and 1997-2004 respectively)

		Number of death mentions	Last year use (England & Wales)	Number of offenders	Number of seizures	Prices	Average purity of police seizures	Average purity of Customs seizures
f death mentions	Pearson	1						
	Sig.	.						
use (England &	Pearson	.332	1					
	Sig.	.268	.					
f offenders	Pearson	.945***	.515	1				
	Sig.	.000	.127	.				
f seizures	Pearson	.966***	.555	.989***	1			
	Sig.	.000	.061	.000	.			
	Pearson	-.569*	.122	-.060	-.569*	1		
	Sig.	.027	.693	.869	.034	.		
urity of police	Pearson	-.883***	-.491	-.823**	-.868***	.401	1	
	Sig.	.000	.089	.003	.000	.155	.	
rity of Customs	Pearson	-.040	-.619	-.212	-.135	-.690	.592	1
	Sig.	.925	.102	.648	.773	.058	.122	.

*** Correlation is significant at the 0.001 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Main findings

This report has provided a 15-year, UK-wide, set of official data for cocaine/crack cocaine.

The findings of this study have confirmed increases in cocaine/crack cocaine availability, consumption, offending and death rates for the UK over the period 1990-2004.

Main findings

- Cocaine powder availability figures correlated negatively with its price fluctuations over the years.

- An increase in cocaine/crack cocaine death mentions correlated negatively here with both cocaine powder price and crack cocaine purity

Why an increase in cocaine deaths?

Greater availability of cocaine/crack cocaine in the UK in comparison with most other EU countries.

Increase in cocaine consumption in a polydrug misuse context;

Higher reporting rates of cocaine on death certificates.

Huge media interest for high profile cases of cocaine-related incidents and increased awareness of the possible consequences of drug consumption.

Improved surveillance, monitoring and recording of cocaine in investigations of sudden and/or unexpected deaths.

Cocaine, alcohol and cocaethylene

Cocaine was the sole drug mentioned on death certificates in 36% of the total number of related fatalities in England and Wales.

Alcohol (either alone or together with further drugs) was identified here in combination with cocaine in about 21% of cases.

Cocaine is transesterified by liver esterases to cocaethylene, which has cocaine-like pharmacologic properties, in the presence of ethanol.

Both ethanol and cocaethylene reduce mean cocaine clearance by 47% and 26%, respectively.

The effect of cocaine is therefore prolonged and the 'comedown' following cocaine is diminished.

Cocaine deaths and cocaine price

The increase in the number of cocaine/crack cocaine-related deaths was positively correlated with levels of cocaine powder availability indicators.

Conversely, the price of cocaine powder was correlated negatively both with availability indicators and death figures.

Significant decrease over time in cocaine powder price observed here facilitated easier access to the drug and hence an increase in consumption levels.

Crack; Customs vs Police purity data

Purity levels of crack cocaine material seized by Customs, likely to reflect the purity levels of drugs *before* entering the street market, remained stable over the years.

Conversely, purity levels of crack cocaine material seized by Police forces, likely to reflect the purity levels of drugs *actually available* at the street market level, showed a consistent decrease over the years.

A higher level of dilution of crack cocaine over the years; a massive increase of crack cocaine availability (related seizures increased 16-fold between 1990 and 2003); and a decrease in its price conceivably involved a higher number of individuals being attracted to the drug.

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Increased cocaine availability and individual vulnerability

- More subjects taking cocaine means that the minority of those who are at higher risk of acute cocaine medical sequelae and fatalities (genetic causes, such as fully or partially expressed congenital long QT syndrome, may play a role) will be more likely to be self-administering the compound.

Cocaine and the CV system

Most deaths occur after prolonged drug use, which can induce a series of changes at the molecular, cellular, and tissue levels.

Potentially lethal myocardial alterations include hypertrophy, fibrosis, and microangiopathy and all of these changes favour sudden death, possibly through hypertension, arrhythmias, and cardiac infarction.

A study of the major autopsy findings of cocaine-related fatalities in New South Wales, Australia, between 1993 and 2002, noted cardiac pathology in 57% of cases, most commonly coronary artery atherosclerosis (39%) and cardiac hypertrophy (14%). Cerebrovascular pathology was noted in 22% of cases.

Cocaine ‘non linear’ pharmacokinetics

Easier access to cocaine powder might also mean that the consumer is more likely to binge with higher dosages of cocaine in a single session.

A decrease in crack cocaine concentration per rock can lead the consumer to increase the crack cocaine intake level per session.

In both instances, a disproportionate rise in drug plasma concentrations may be observed ('non linear' pharmacokinetics).

Limitations

The number of cases identified here were actually ‘mentions’ of cocaine on death certificates, i.e. no information was available in respect of cocaine and concomitant other drugs’ dosage; post mortem reports; toxicology results and setting characteristics.

The inclusion of cocaine on those documents submitted to GMRs did not necessarily mean that this drug directly ‘caused’ the death, but that cocaine was found at post mortem and/or was identified by toxicological screening.

On the other hand, when cocaine was mentioned on its own, one could assume that the substance recorded was somehow more directly implicated in the fatality.

Further limitations

Possible reporting biases over time.

Present figures on cocaine/crack cocaine deaths should be seen only as an under-estimate of the real number of related fatalities.

The number of offenders and number of seizures may reflect changes in policies, priorities and activities of law enforcement agencies.

The quantities of drugs seized over time may reflect both variations in intelligence-led activities of law enforcement agencies and a fluctuating availability of drugs on the black/illicit market.

Limitations; pricing estimates

Although reports on cocaine prices from the National Criminal Intelligence Service are the best available for the UK, these data have their own limitations.

Average prices are calculated from information submitted by individual officers from different police force areas, and at varying periods, on a non-systematic and non-stratified basis.

Most information is probably anecdotal in nature and is not based on routine ‘test purchases’, although these are sometimes carried out by the Metropolitan Police Service.

Need for future research studies

Further research should better describe the clinical implications of cocaine misuse in the context of polydrug intoxication and should also specifically address the issue of possible individual psychobiological/genetic vulnerability to deaths caused by cocaine.