PRESS RELEASE

Intelligence across childhood in relation to illegal drug use in adulthood: 1970 British Cohort Study

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ABSTRACT

Background Recent reports have linked high childhood IQ scores with excess alcohol intake and alcohol dependency in adult life, but the relationship with illegal drug use in later life is relatively unknown.

Methods The authors used data from a large population-based birth cohort (1970 British Cohort Study) with measures of lifetime cannabis and cocaine use, parental social class and psychological distress at 16 years; cannabis, cocaine, amphetamine, ecstasy and polydrug use (more than three drugs) in the past 12 months; and social class, educational attainment and gross monthly income at 30 years. All members of the cohort with IQ scores at 5 or 10 years were eligible to be included in the analyses.

Results Of the 11 603 (at 5 years) and 11 397 (at 10 years) cohort members eligible, 7904 (68.1%) and 7946 (69.7%) were included in the analyses. IQ scores at 5 years were positively associated with cannabis (OR $_{\text{(bottom vs top tertile)}}$ =2.25, 95% CI 1.71 to 2.97) and cocaine use (OR 2.35, 95% CI 1.41 to 3.92) in women and with amphetamines (OR 1.46, 95% CI 1.03 to 2.06), ecstasy (OR 1.65, 95% CI 1.15 to 2.36) and polydrug use (OR 1.57, 95% CI 1.09 to 2.26) in men at 30 years. IQ scores at 10 years were positively associated with cannabis, cocaine (only at 30 years), ecstasy, amphetamine and polydrug use. Associations were stronger in women than in men and were independent from psychological distress in adolescence and life-course socioeconomic position.

Conclusion High childhood IQ may increase the risk of illegal drug use in adolescence and adulthood.

INTRODUCTION

Children and adolescents who score higher on standard tests of intelligence have lower rates of mortality in mid to late adulthood.[1–4] The mechanisms underlying this effect are unclear. Studies suggest that a higher child intelligence is linked to a lower likelihood of smoking,[1 2] increased rates of smoking cessation,[3] physical activity and fruit and vegetable intake[4 5] in later life. High childhood IQ is also associated with socioeconomic advantage in later life (as indexed by education,[6] occupational social class[7] or income[8]). These studies suggest that the skills captured by intelligence tests in childhood may influence how people manage their health, how they respond to public health messages concerning the risks and benefits of health-related behaviours (eg, high childhood IQ has been found to predict healthy literacy in old age[9]) and their social and economic circumstances in later life. However, few studies have examined the link between childhood intelligence and a major target of public health campaigns: illegal drug abuse.

The few studies investigating the link between childhood mental ability and future illegal drug use have revealed highly discrepant findings with positive,[10 11] inverse[12 13] and null associations[13 14] reported. In the most relevant 1966–1967 Woodlawn study,[10 11 13] higher IQ scores assessed at 6 years were associated with an earlier age of initiation into drug taking and more frequent drug use at 16 years,[10 11] but no associations were found between IQ at 6 years and drug use in the follow-up at 32 years of age.[13] In a field characterised by a paucity of studies, the few that do exist often sample only men, are small in scale and have utilised proxy measures of IQ (eg, metropolitan school readiness test[10 13]), which lack validity. Accordingly, we used the 1970 British Birth Cohort Study to investigate whether higher childhood IQ (assessed at both 5 and 10 years) is associated with the illegal drug use in adolescence and adult drug and polydrug use. Additionally, given the interrelatedness of IQ and socioeconomic position[6] and drug use with psychological distress,[15] we sought to determine whether associations between childhood IQ and drug use are explained by socioeconomic position (origin and achieved) and/or psychological distress.

METHODS

Study participants and procedure

The 1970 British Cohort Study is an ongoing longitudinal study of children born in Great Britain between the 5th and 11 th April 1970. A total of 16 571 babies born in England, Scotland and Wales were enrolled at birth and have been followed up at the ages of 5, 10, 16, 26 and 29–30 years.[16] Participants were tracked using contact with local health authorities, schools and the annual mailing of birthday cards.[16]

At the age of 10 (in 1980), 15 995 members of the original birth cohort were traced and invited to participate, with information being obtained from 14 874. A national teachers strike and school examinations reduced participation on specific parts of the survey at 16 years,[17] with 11 622 of an invited 15 999 cohort members responding. In 2000, when participants were 29–30 years of age, 14 087 were traced and invited to participate, of which 11 261 (68%) responded.

Measures

Data collected at 5-year follow-up

Written informed consent was given by parents of study participants before the start of data collection. All assessments took place in children's homes. Four tests of cognitive function were utilised: the Human Figure Drawing Test, a Copying Designs Test, the

English Picture Vocabulary Test and the Profile Test. In the Human Figure Drawing Test, children were asked to 'make a picture of a man or lady' and to draw a whole person. When they had finished, they were asked what the drawing was, what parts of the drawing were and to label them. They were then requested to draw another picture of the opposite sex depicted in the first drawing, and the same process was repeated. These drawings were then scored using an adapted version of the Harris–Goodenough scale, based on 30 developmental items.[18] The Copying Designs Test is measure of visual–motor coordination.[19] Children were asked to make two copies of eight designs. The English Picture Vocabulary Test is an adaptation of the American Peabody Picture Vocabulary Test.[20] It is a series of 56 sets of four different pictures with a particular word associated with each set of four pictures. The children were asked to point out the one picture that corresponds to the given word. In the Profile Test, children were shown an incomplete profile of a head, asked what it was and then requested to complete the drawing and to identify and label the various parts. Results from the Human Figure Drawing Test have been found to correlate moderately with conventional IQ tests (approximately r=0.5).[21] The reliability of coding was checked on a random sample of 273 tests and showed that the original code was not replicated on recoding for only ≤1% of all tests.

A principal components factor analysis of the sum in each of these four tests was carried out to test for the presence of a general cognitive ability factor (typically referred to as *g*).[22 23] Examination of the scree plot suggested the presence of a single component. The first unrotated principal component accounted for 45% of the total variance among the four tests. Scores were saved for each subject on the first unrotated principal component, which is an indicator of each person's general cognitive ability.[22 23] For ease of interpretation, this *g* score was transformed to the widely used IQ distribution (mean=100, SD=15).[24]

Occupational social class was based on mother's and father's occupation. Occupations were collapsed into two groups: using the Registrar General's classification system[25]: professional, skilled occupations or IeIII non-manual and manual professions (III manual-V) or students.

Data collected at 10-year follow-up

IQ was assessed at the age of 10 using a modified version of the British Ability Scales.[26] The British Ability Scale has four subscales: word definition (define 37 words), word similarities (identifying the dissimilar word from 42 word triplets), recall of digits (recall 34 different numbers) and matrices (fill in 28 incomplete patterns). Responses were scored by trained coders and a random 5% were checked for inaccuracies. The percentage of tests in which the original score was not replicated was low: 4.7% for word definitions, 1.9% for word similarities, 0.8% for recall of digits and 2.3% for matrices.[27] All discrepancies in coding were subsequently corrected.

A principal components factor analysis of these four tests suggested one unrotated principal component accounted for 57% of the variance among the four tests, and this first unrotated principal component was transformed to the standard IQ distribution.[24 28]

Data collected at 16-year follow-up

At 16 years, study members reported their level of psychological distress, use of cannabis (including the street names: marijuana, dope, joints and grass), cocaine, uppers (speed and wizz), downers (blues, tranks and barbituates), Lysergic acid diethylamide (LSD) (acid), heroin (smack) and a fictitious drug (semeron).

Psychological distress was assessed at the age of 16 using the 12-item General Health Questionnaire (GHQ12). This measure is a valid and reliable self-report measure of psychological distress over the previous month.[29] Responses are made on a Likert scale (range 0–3); scores were summed (range 0–12) with a higher score indicating a higher level of distress. We used the validated cut-point of a score ≥3 to define significant levels of psychological distress.[30]

The use of cannabis was assessed at the age of 16: "Have you ever tried taking cannabis? (yes/no)" (the same enquiry was used for all other drugs).

Data collected at 30-year follow-up

At 30 years, similar enquiries to those described above were used but for a wider range of illicit drugs during the prior year: cannabis (also known as blow, draw, puff, grass, skunk, weed, black, hash or red seal), cocaine (coke or charlie), amphetamines (speed, Whizz, uppers, Billy, Billy Whizz or sulph), ecstasy (E, pills, dove, rhubarb or callys), LSD (acid or trips), amyl nitrate (poppers), magic mushrooms, temazepam, ketamine, crack (rock, stone, sand or pebbles), heroin (smack), methadone and a fabricated drug (semeron). Response options were yes; yes in past 12 months and no. Participants were defined as polydrug users if they used three or more of the above drugs.

Study respondents also reported their highest educational achievement, monthly gross salary (in Great British Pounds) and own occupational social class. Social class was assessed at 30 years using participant's occupation, which, again, was assigned to the Registrar General's classification system.[25] Highest educational achievement was extracted from enquiries about the qualifications a participant had obtained. Significant psychological distress was assessed by applying ≥3 cut-point on the GHQ12.

Statistical analysis

We used χ^2 and analysis of variance to examine the relationship of childhood IQ with drug use in adolescence and adulthood. Analysis of variance was used to examine the mean IQ score at 10 years in those who used each type of drug at 16 and 30 years. We used multivariate logistic regression to estimate the relation of childhood IQ scores with likelihood of ever having used drugs at 16 years and having used drugs in the past 12 months at 30 years. In preliminary regression analysis, we modelled IQ as a linear term with ORs expressed per 1 SD increase in IQ score; to explore non-linear relationships, we repeated all models with tertiles of IQ scores. We also fitted an interaction between IQ and sex to examine whether the effect of IQ on drug use differed across men and women. Participants who responded they had taken the fictitious drug semeron at 16 years (N=17) and 30 years (N=3) were removed from all analyses. we conceptualised parental social class as a potential confounding variable, whereas psychological distress at 16 years and current social class, educational attainment and gross monthly income were regarded as potential intermediary factors because they temporally followed the measurement of IQ in the relationship between IQ and drug outcomes.

A series of sensitivity analyses were conducted to explore: (1) selective attrition by examining whether drug use at age 16 predicted participation at age 30 and also (2) by adding an interaction between IQ and participation at age 30 (did vs did not attend) to models of IQ with drug use at age 16; (3) a possible threshold in the association between IQ and drug use by modelling IQ in sextiles; (4) a modification of the association between IQ and drug use in participants with higher levels of psychological distress by modelling GHQ in quartiles, with the top tertile representing scores ≥6, double the established ≥3 cut-point[30]; and (e) effect modification of the IQ—drug use relation by significant psychiatric morbidity by adjusting for scores on the Rutter's Malaise Inventory between the 11th–90th and above the >90th centile.

The use of some drugs was rare at 16 years (uppers, downers, LSD and heroin: prevalence <1.5%) and 30 years (LSD, amyl nitrate, magic mushrooms, temazepam, ketamine, crack, heroin and methodone: prevalence <1.7%), such that estimates on the influence of IQ would not be precise. We therefore focused on the remaining drugs, and participants were defined as polydrug users at 30 years if they use three or more of the following in the past 12 months: cannabis, cocaine, amphetamines and ecstasy. All subsequent analyses involve those with IQ data or 5 and 10 years and any of the remaining drugs at 16 and 30 years (see figure 1 in online supplement). The size of the analytical sample ranged from 4986 (IQ at 10 years with cannabis use at 16 years) to 7946 participants (IQ at 5 years with polydrug use).

Compared with cohort members with IQ data at 5 years (N=11 603) and 10 years (N=11 397), men and women who did not provide any drug use data in the 16 and 30-year follow-up had slightly lower IQ scores (eg, for cannabis use at 16 years: 2.8 IQ points difference at 5 years and 4.6 difference at 10 years; all p's for differences <0.05). Those participants who did not provide drug use data at 16 years were also more likely to have parents at 5 years who were from a manual social class or students (vs professional, skilled occupations; all p's for differences <0.05). Non-significant differences were found in the social class of parents in comparisons between those who provided and did not provide drug use data at 30 years.

RESULTS

Data on the prevalence of self-reported drug use and the potential confounding and intermediary variables are shown by childhood IQ assessed at age 10 in table 1. As expected, mean IQ scores were higher in participants whose parents were in higher social classes, in those who had a professional occupation, had achieved an advanced level or higher degree and had a high gross monthly income.

Of the 3818 male and 4128 female study members, 7.0% and 6.3% had used cannabis at 16 years old, respectively. Cocaine use was much less common with only 0.7% boys and 0.6% girls reporting lifetime use at 16 years. Both boys and girls who reported using cannabis had statistically significantly higher mean childhood IQ scores at 10 years than those who reported never using cannabis. There was a non-significant difference in mean child IQ scores by cocaine use at 16 years.

In our analysis of illegal drug use at 30 years, 35.4% of men and 15.9% of women reported using cannabis in the past 12 months. Cocaine use had also become more common with 8.6% of men and 3.6% of women reporting use in the past 12 months. A similar pattern of drug use was found with other drugs, with use around twice as common among men than among women: amphetamines (8.1% vs 2.6%), ecstasy (6.8% vs 2.3%) and polydrug use (5.2% vs 2.0%). Across most drugs (except amphetamine in men), men and women who reported using in the past 12 months had a significantly higher childhood IQ score than those who reported no use.

Multivariate logistic regression

Preliminary analysis suggested modelling IQ as a linear term was inappropriate, so we modelled IQ as tertiles (with the lowest IQ tertile as the reference group) at each age (see tables 1–4 in online supplement for linear association per 1 SD IQ). The interaction term between IQ (at 5 and 10 years) and participant sex with cannabis and cocaine use at 16 years of age was non-significant. The interaction term between IQ (at 5 and 10 years) and participant sex with cannabis and cocaine use at 16 years of age was non significant, but, interactions between sex and IQ with drug 7 use outcomes at 30 years were. The relations between IQ at 10 years and the likelihood of using cannabis (p for interaction =0.002), cocaine (p for interaction=0.001), amphetamines (p for interaction=0.011), ecstasy (p for interaction=0.01) and polydrug use (p for interaction=0.001) differed such that the magnitude of the relation was strongest in women. As consistent sex differences were found for all drug use outcomes at 30 years, results are presented separately by participant sex to enable a comparison of associations across 16- and 30-year follow-ups.

Results for the logistic regressions (table 2) showed that among men and women, higher IQ scores at 5 years were positively associated with an increased use of ever using cannabis at 16 years but not cocaine; and cannabis and cocaine in the past 12 months at 30 years of age. IQ scores at 5 years were associated with amphetamine, ecstasy and polydrug use at 30 years in men but not in women. The largest ORs were found in comparisons between participants with IQ scores at 5 years in the highest versus lowest tertile. After adjustment for mothers' and fathers' social class and significant psychological distress, associations between IQ at 5 years and cannabis use at 16 years remained significant. For significant drug use outcomes at 30 years, further adjustment for social class, monthly income and highest level of education did not materially change any of the associations.

Table 3 shows ORs (95% CI) for IQ assessed at 10 years with the likelihood of ever using cannabis and cocaine at 16 years and cannabis, cocaine, amphetamines, ecstasy and polydrug use in the past 12 months at 30 years. There was a positive association between IQ at 10 years and the likelihood of ever using cannabis but not cocaine at 16 years and with cannabis, cocaine, amphetamines, ecstasy and polydrug use in the past 12 months at 30 years of age. Again, the largest estimates were derived for comparisons of children with IQ scores in the highest versus lowest tertile, with stronger associations found in women than in men. Results were materially unchanged after adjustment for significant levels of psychological distress, mothers' and fathers' social class, monthly income and highest level of education.

Sensitivity analysis

A comparison between the ORs in the main and sensitivity analysis showed no substantial differences in estimates (eg, 95% CIs in main and sensitivity analyses overlapped). Analyses into selective attrition showed that the use of cannabis (OR 0.88, 95% CI 0.68 to 1.14) or cocaine (OR 1.04, 95% CI 0.46 to 2.36) at age 16 did not predict participation at the follow-up at 30 years of age, and we found no material difference in the other sensitivity estimates compared with those from the main analysis (see etables 5–10 in the online content).

DISCUSSION

In this longitudinal population-based sample, children with a higher IQ were more likely to use illegal drugs use in adolescence and as an adult. These findings were independent of the effects of parent social class, significant psychological distress during adolescence and adult socioeconomic advantage. In the

Table 1 Descriptive characteristics at 16 years (1985–1986) and at 30 years (1999–2000) in 7946 men and women by mental ability scores at 10 years

	Mental ability score (measured at 10 years)					
	Men			Women		
	N (%)	Mean	SD	N (%)	Mean	SD
Variables at 16 years						
Lifetime prevalence of cannabis use						
Smoked	161 (7.0)	109.65	13.43	169 (6.3)	107.74	12.72
Never smoked	2144 (93.0)	103.86*	14.77	2512 (93.7)	101.42*	14.23
Lifetime prevalence of cocaine use						
Used	17 (0.7)	108.34	14.23	15 (0.6)	99.65	16.21
Never used	2283 (99.3)	104.23	14.78	2664 (99.4)	101.82	14.22
Psychological distress						
High score (≥3)	22 (1.6)	102.13	15.04	65 (3.2)	103.42	13.70
Normal	1370 (98.4)	105.53	14.28	1945 (96.8)	99.0	15.34
Mothers' social class at 16 years						
I–III (highest)	3915 (82.2)	102.33	15.07	3619 (81.4)	101.27	14.26
IV-student	846 (17.8)	95.77*	14.22	125 (18.6)	93.92*	13.71
Fathers' social class at 16 years						
I–III (highest)	1015 (53.0)	103.87	14.66	970 (54.8)	102.75	14.20
IV-student	899 (47.0)	98.40*	14.09	800 (45.2)	96.74*	13.52
Variables at 30 years						
Prevalence of cannabis use						
Used in past 12 months	873 (35.4)	104.65	14.21	459 (15.9)	105.73	13.98
Not used in past 12 months	1592 (64.6)	99.04*	15.05	2429 (84.1)	98.10*	14.36
Prevalence of cocaine use						
Used in past 12 months	302 (8.6)	105.80	14.27	144 (3.6)	108.10	13.10
Not used in past 12 months	3208 (91.4)	101.38*	14.97	3834 (96.4)	100.05*	14.41
Prevalence of amphetamines use						
Used in past 12 months	243 (8.1)	103.20	13.66	95 (2.6)	104.17	12.63
Not used in past 12 months	2763 (91.9)	101.39	15.28	3511 (97.4)	100.00†	14.50
Prevalence of ecstasy use						
Used in past 12 months	224 (6.8)	104.57	13.71	88 (2.3)	106.85	12.72
Not used in past 12 months	3092 (93.2)	101.48†	15.10	3757 (97.7)	100.04*	14.43
Prevalence of polydrug use (>3 drugs)						
Used in past 12 months	200 (5.2)	104.72	13.83	82 (2.0)	108.57	12.22
Not used in past 12 months	3618 (94.8)	101.69†	14.93	4046 (98.0)	100.31*	13.00
Social class						
I–III (highest)	664 (20.5)	106.92	14.12	1197 (43.5)	101.18	13.09
IV	2055 (65.3)	102.72	14.42	1190 (43.3)	104.88	13.89
V	345 (11.0)	95.18	13.91	302 (11.0)	96.38	13.55
Student and other	103 (3.3)	96.90‡	15.27	60 (2.2)	93.95‡	15.99
Monthly gross earnings (£)						
≥1361	1058 (34.2)	107.64	13.77	429 (14.8)	110.16	12.13
−1360	873 (28.2)	103.09	14.02	572 (19.8)	105.69	12.87
−1000	820 (26.5)	98.43	14.60	727 (25.1)	101.05	13.07
<700	347 (11.2)	96.62‡	16.15	1168 (40.3)	97.30‡	13.48
Highest educational achievement						
Degree +/NVQ5 OR 6 (highest)	438 (15.6)	115.43	12.28	509 (15.9)	113.50	11.84
Higher Qual/NVQ4	244 (8.7)	110.71	13.26	201 (6.3)	107.36	12.65
A level/NVQ3	221 (7.9)	109.54	12.47	324 (10.1)	107.46	11.50
O level/NVQ2	971 (34.5)	102.81	12.37	1266 (39.5)	100.84	11.75
CSE 2-5/NVQ1	802 (28.5)	98.07	12.77	763 (23.8)	95.33	12.79
No qualifications	135 (4.8)	93.44‡	14.73	141 (4.4)	91.31‡	13.46

*Value for a difference p<0.001.
†Value for a difference p<0.01.
‡Value for a trend p<0.001.

analyses of drug use at 30 years, associations with IQ at both 5 and 10 years were stronger among women than among men.

As previously described, the small number of studies that have investigated the relationship of childhood IQ with adolescent and adult drug use have reported mixed results.[10 11 13 14] Mainly based on a small US prospective cohort with African–American children, they found that high IQ (measured at 6 years) was associated with more frequent drug use in adolescence (N=705)[10 11] and a null effect on cannabis at 32 years (N=952).[13] In contrast to the present findings, these studies suggest that high child IQ is a risk factor for experimentation with drugs that is limited to adolescence. Part of this inconsistency may be due to our more comprehensive adjustment for parental and adult social class, which have shown positive[31 32]

Table 2 ORs (95% CI) for illegal drug use at 16 and 30 years by childhood mental ability scores at the age of 5 (tertiles 1: 42.66−94.65; 2: 94.46−107.32; 3: 107.33−158.28) in 3791 men and 4113 women

	Adjustments							
	Men				**Women**			
Illegal drug	**Unadjusted OR (95% CI)**	**Confounding* OR (95% CI)**	**Intermediary† OR (95% CI)**	**All‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Confounding* OR (95% CI)**	**Intermediary† OR (95% CI)**	**All‡ OR (95% CI)**
At 16 years of age								
Cannabis	2354 (62.0%)				2707 (65.8%)			
	1.0 (ref)				1.0 (ref)			
	1.03 (0.65 to 1.61)	1.04 (0.66 to 1.65)	1.05 (0.67 to 1.65)	1.06 (0.67 to 1.67)	1.84 (1.12 to 3.00)	1.86 (1.14 to 3.06)	1.94 (1.19 to 3.19)	1.98 (1.20 to 3.26)
	1.82 (1.22 to 2.72)	1.85 (1.23 to 2.79)	1.88 (1.26 to 2.81)	1.90 (1.26 to 2.86)	2.92 (1.83 to 4.64)	2.87 (1.79 to 4.61)	3.20 (2.00 to 5.11)	3.16 (1.96 to 5.10)
Cocaine	2348 (61.9%)				2703 (65.7%)			
	1.0 (ref)				1.0 (ref)			
	2.20 (0.58 to 8.33)	1.98 (0.52 to 7.52)	2.27 (0.60 to 8.61)	2.04 (0.54 to 7.81)	1.22 (0.34 to 4.33)	1.30 (0.36 to 4.66)	1.31 (0.37 to 4.67)	1.42 (0.39 to 5.15)
	1.63 (0.42 to 6.33)	1.43 (0.36 to 5.57)	1.71 (0.44 to 6.65)	1.49 (0.38 to 5.83)	0.80 (0.20 to 3.20)	0.91 (0.22 to 3.72)	0.89 (0.22 to 3.60)	1.03 (0.25 to 4.31)
At 30 years of age								
Cannabis	2412 (63.6%)				2889 (70.2%)			
	1.0 (ref)				1.0 (ref)			
	1.03 (0.84 to 1.26)	1.04 (0.84 to 1.28)	1.14 (0.91 to 1.41)	1.14 (0.92 to 1.42)	1.52 (1.16 to 1.99)	1.52 (1.16 to 2.00)	1.50 (1.14 to 1.99)	1.52 (1.14 to 2.01)
	1.66 (1.35 to 2.03)	1.66 (1.35 to 2.04)	1.84 (1.48 to 2.30)	1.83 (1.46 to 2.29)	2.47 (1.91 to 3.18)	2.43 (1.88 to 3.14)	2.25 (1.71 to 2.96)	2.25 (1.71 to 2.97)
Cocaine	3488 (92.0%)				3969 (96.4%)			
	1.0 (ref)				1.0 (ref)			
	1.10 (0.82 to 1.49)	1.11 (0.82 to 1.50)	1.24 (0.91 to 1.69)	1.23 (0.90 to 1.69)	1.32 (0.77 to 2.26)	1.26 (0.74 to 2.17)	1.17 (0.67 to 2.03)	1.14 (0.66 to 1.99)
	1.49 (1.13 to 1.98)	1.50 (1.13 to 1.99)	1.74 (1.28 to 2.37)	1.73 (1.27 to 2.35)	3.11 (1.94 to 4.99)	2.89 (1.79 to 4.65)	2.45 (1.47 to 4.07)	2.35 (1.41 to 3.92)
Ecstasy	3305 (78.4%)				3845 (93.4%)			
	1.0 (ref)				1.0 (ref)			
	1.04 (0.73 to 1.47)	1.08 (0.76 to 1.53)	1.21 (0.84 to 1.73)	1.22 (0.85 to 1.75)	1.13 (0.64 to 2.00)	1.08 (0.61 to 1.92)	1.08 (0.60 to 1.94)	1.06 (0.59 to 1.90)
	1.33 (0.96 to 1.85)	1.38 (0.99 to 1.92)	1.65 (1.15 to 2.35)	1.65 (1.15 to 2.36)	1.68 (0.99 to 2.85)	1.57 (0.92 to 2.67)	1.51 (0.86 to 2.67)	1.47 (0.83 to 2.61)
Amphetamines	2975 (78.4%)				3622 (88.1%)			
	1.0 (ref)				1.0 (ref)			
	0.90 (0.65 to 1.25)	0.93 (0.66 to 1.29)	1.09 (0.78 to 1.54)	1.10 (0.78 to 1.54)	1.21 (0.71 to 2.05)	1.26 (0.74 to 2.14)	1.25 (0.73 to 2.15)	1.28 (0.74 to 2.12)
	1.04 (0.76 to 1.43)	1.08 (0.79 to 1.49)	1.45 (1.03 to 2.04)	1.46 (1.03 to 2.06)	1.22 (0.72 to 2.07)	1.29 (0.75 to 2.20)	1.28 (0.73 to 2.25)	1.31 (0.74 to 2.31)
Polydrug use	3791 (100%)				4113 (100%)			
	1.0 (ref)				1.0 (ref)			
	0.79 (0.55 to 1.14)	0.82 (0.57 to 1.19)	0.93 (0.64 to 1.36)	0.94 (0.64 to 1.38)	1.37 (0.72 to 2.59)	1.32 (0.70 to 2.51)	1.25 (0.65 to 2.40)	1.24 (0.64 to 2.37)
	1.22 (0.88 to 1.70)	1.27 (0.91 to 1.77)	1.56 (1.09 to 2.24)	1.57 (1.09 to 2.26)	2.11 (1.17 to 3.81)	2.01 (1.11 to 3.64)	1.80 (0.96 to 3.37)	1.77 (0.94 to 3.32)

*Confounding variables: mothers' and fathers' social class at 5 years.
†Intermediary variables at 16 years: significant psychological distress. At 30 years: significant psychological distress (at 16), social class, monthly income, level of education (assessed at 30 years).
‡All: all confounding and intermediary variables.

and inverse associations[33] with adult drug use. Moreover, as all these findings come from the same US sample, drawn from a single deprived geographical locale with predominantly African−American residents,[13] it is difficult to compare these data with our own population-based cohort.

As there has been limited research into childhood IQ and drug use, we draw on evidence regarding adult alcohol misuse. Two prospective cohorts from the UK have found that childhood IQ is positively associated with alcohol dependency at ages 30[28] and 53.[34] In a previous analysis of the present cohort,[28] high IQ scores at 10 years were associated with an increased risk for excess alcohol intake and frequent drinking episodes as an adult. Consistent with the present findings, the investigators also reported associations which were stronger among women than among men. Our findings suggest that high IQ girls are also more likely than boys to use drugs in adolescence and adulthood.

Potential pathways linking high childhood IQ with later illegal drug misuse are likely to be varied and require further exploration. A possible pathway that emerges from the literature on personality is that high IQ individuals have also been shown to score highly on tests of stimulation seeking and openness to experience. Both of these traits have repeatedly been associated with high IQ across adolescent,[35] collegiate[36] and drug abuse populations.[37] Part of the reason high IQ has been positively associated with alcohol misuse and drug use and inversely with other health behaviours (eg, physical activity,[5] healthy diet[4 5]) may be that alcohol and illegal drugs are better at fulfilling a desire for novelty and stimulation. Alternatively,

Table 3 ORs (95% CI) for illegal drug use at 16 and 30 years by childhood mental ability scores at the age of 10 (tertiles 1: 40.96–93.60; 2: 93.61–106.64; 3: 106.65–150.92) in 3818 men and 4128 women

	Adjustments							
	Men				Women			
Illegal drug	Unadjusted OR (95% CI)	Confounding* OR (95% CI)	Intermediary† OR (95% CI)	All‡ OR (95% CI)	Unadjusted OR (95% CI)	Confounding* OR (95% CI)	Intermediary† OR (95% CI)	All‡ OR (95% CI)
At 16 years of age								
Cannabis	2305 (60.4%)				2681 (65.0%)			
	1.0 (ref)				1.0 (ref)			
	1.83 (1.07 to 3.16)	1.81 (1.08 to 3.22)	1.90 (1.10 to 3.28)	1.93 (1.12 to 3.33)	2.54 (1.50 to 4.33)	2.56 (1.50 to 4.37)	2.76 (1.62 to 4.71)	2.77 (1.62 to 4.74)
	2.72 (1.64 to 4.51)	2.88 (1.73 to 4.79)	2.92 (1.75 to 4.85)	3.07 (1.84 to 5.13)	4.14 (2.50 to 6.83)	4.09 (2.46 to 6.82)	4.65 (2.80 to 7.72)	4.62 (2.76 to 7.74)
Cocaine	2300 (60.2%)				2679 (64.9%)			
	1.0 (ref)				1.0 (ref)			
	2.49 (0.52 to 2.05)	2.33 (0.48 to 11.32)	2.56 (0.53 to 12.41)	2.33 (0.48 to 11.32)	0.85 (0.25 to 2.95)	0.92 (0.26 to 3.25)	0.96 (0.27 to 3.27)	0.92 (0.26 to 3.25)
	2.08 (0.44 to 9.84)	1.79 (0.37 to 8.59)	2.19 (0.46 to 10.43)	1.79 (0.37 to 8.59)	0.77 (0.22 to 2.66)	0.84 (0.23 to 3.05)	0.88 (0.25 to 3.12)	0.84 (0.23 to 3.05)
At 30 years of age								
Cannabis	2465 (64.6%)				2888 (70.0%)			
	1.0 (ref)				1.0 (ref)			
	1.44 (1.16 to 1.79)	1.44 (1.16 to 1.79)	1.57 (1.26 to 1.97)	1.58 (1.26 to 1.98)	1.90 (1.44 to 2.50)	1.88 (1.43 to 2.48)	1.94 (1.45 to 2.59)	1.92 (1.44 to 2.57)
	1.98 (1.61 to 2.45)	2.00 (1.62 to 2.47)	2.23 (1.76 to 2.82)	2.25 (1.78 to 2.85)	3.33 (2.55 to 4.35)	3.34 (2.56 to 4.36)	3.24 (2.40 to 4.38)	3.25 (2.41 to 4.40)
Cocaine	3510 (91.9%)				3929 (95.1%)			
	1.0 (ref)				1.0 (ref)			
	1.60 (1.15 to 2.23)	1.61 (1.16 to 2.24)	1.81 (1.28 to 2.54)	1.82 (1.29 to 2.56)	1.59 (0.93 to 2.71)	1.59 (0.93 to 2.71)	1.56 (0.90 to 2.70)	1.55 (0.90 to 2.69)
	1.83 (1.33 to 2.51)	1.84 (1.34 to 2.53)	2.32 (1.64 to 3.28)	2.34 (1.65 to 3.32)	3.95 (2.45 to 6.35)	3.96 (2.46 to 6.38)	3.42 (2.03 to 5.76)	3.42 (2.03 to 5.76)
Ecstasy	3316 (86.9%)				3845 (93.1%)			
	1.0 (ref)				1.0 (ref)			
	1.28 (0.91 to 1.79)	1.28 (0.91 to 1.79)	1.51 (1.07 to 2.15)	1.52 (1.07 to 2.15)	1.28 (0.91 to 1.79)	1.28 (0.91 to 1.79)	1.51 (1.07 to 2.15)	1.52 (1.07 to 2.15)
	1.13 (0.81 to 1.58)	1.14 (0.81 to 1.58)	1.56 (1.08 to 2.26)	1.57 (1.08 to 2.27)	1.13 (0.81 to 1.58)	1.14 (0.81 to 1.58)	1.56 (1.08 to 2.26)	1.57 (1.08 to 2.27)
Amphetamines	3006 (94.4%)				3606 (87.4%)			
	1.0 (ref)				1.0 (ref)			
	0.91 (0.52 to 1.61)	0.91 (0.52 to 1.61)	0.94 (0.52 to 1.68)	0.93 (0.52 to 1.67)	0.91 (0.52 to 1.61)	0.91 (0.52 to 1.61)	0.94 (0.52 to 1.68)	0.93 (0.52 to 1.67)
	1.88 (1.15 to 3.09)	1.16 (1.13 to 3.13)	1.92 (1.10 to 3.33)	1.94 (1.12 to 3.37)	1.88 (1.15 to 3.08)	1.91 (1.16 to 3.13)	1.92 (1.10 to 3.33)	1.94 (1.12 to 3.37)
Polydrug use	3818 (100%)				4128 (100%)			
	1.0 (ref)				1.0 (ref)			
	1.50 (1.02 to 2.20)	1.49 (1.02 to 2.19)	1.79 (1.20 to 2.65)	1.78 (1.20 to 2.65)	1.77 (0.86 to 3.70)	1.78 (0.85 to 3.70)	1.77 (0.84 to 3.74)	1.77 (0.84 to 3.73)
	1.44 (0.99 to 2.10)	1.46 (0.99 to 2.11)	1.98 (1.31 to 2.99)	1.99 (1.32 to 3.00)	4.44 (2.30 to 8.56)	4.45 (2.31 to 8.59)	4.28 (2.11 to 8.66)	4.27 (2.11 to 8.68)

*Confounding variables: mothers' and fathers' social class (assessed at 5 years).
†Intermediary variables at 16 years: significant psychological distress. At 30 years: significant psychological distress (at 16), social class, monthly income, level of education (assessed at 30 years).
‡All: all confounding and intermediary variables.

other studies suggest that intellectually 'gifted children' (IQ>130) report high levels of boredom[38] and being stigmatised by peers,[39] either of which could conceivably increase vulnerability to using drugs as an avoidant coping strategy. There is a clear need for future epidemiological and experimental studies to explore these and other pathways.

The present study has some advantages over previously published work. First, as the analytical sample is significantly larger than other studies examining the link between IQ and drug use, we benefited from high statistical power. Second, the multiple waves of data and long-term follow-up provided the opportunity to examine childhood IQ as a risk factor at multiple intervals across the life span. Third, the cohort had detailed measures on parental and adult socioeconomic position and drugs use, which allowed us to examine the independent effects of ability on specific drugs and polydrug use.

It is important that the limitations of this study are acknowledged. Unfortunately, information on drug use was not assessed between 16 and 30 years, such that some participants may have started and stopped drug use during this interval. Whether the associations we observed would have been different at ages between 16 and 30 is unclear.

As with most longitudinal studies, some attrition was inevitable. Only 46% of the participants at the 30-year follow-up had taken part in all earlier surveys, although 74% of these provided childhood IQ at the 10-year follow-up. The childhood IQ scores

What is already known on this subject

Recent reports have linked high IQ scores in childhood to excess alcohol intake and alcohol dependency in adult life. However, very little is known about the role of childhood IQ as a predictor of illegal drug use in later life.

What this study adds

In this, the largest study to date to examine the relationship between childhood IQ and illegal drug use, high IQ scores were associated with increased illegal drug use in adolescence and adulthood. These associations were independent from life-course social position, and associations were stronger in women than in men. High childhood IQ may increase the risk of substance abuse in early adulthood.

of participants at the 30-year follow-up have been found to be significantly higher than those who did not take part,[40] but the relative size of this difference is small (4.5 IQ points), and sensitivity analysis suggested that the IQ drug use relation did not change by participation status at age 30. As it is unlikely that the relationships between IQ and drug use would be found in the opposite direction in non-respondents, this pattern of attrition will have introduced little bias.

In conclusion, in our large population-based cohort study, IQ at 5 years was positively associated with illegal drug use 25 years later. This association was maintained when IQ was assessed at 10 years, and was independent from the effect of parental and adult social class, and other risk factors for adult drug use. Although most studies suggest that higher child or adolescent IQ prompts the adoption of a healthy lifestyle as an adult,[5] other studies have linked higher childhood IQ scores to excess alcohol intake and alcohol dependency in adulthood.[28 34] Given the paucity of studies in this area, further investigation into the associations between childhood IQ and adult drug use in different geographical and historical contexts is needed.

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