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Impact of antisocial lifestyle on health: chronic disability and death by middle age

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ABSTRACT

Background An antisocial lifestyle is associated with injury but also with less organic illness up to the age of 32. It is not known if these associations persist into the fifth decade.

Methods Injury and illness data were collected prospectively in the longitudinal Cambridge study in delinquent development at age 43–48. Hypotheses were that childhood predictors of antisocial behaviour and offending and antisocial behaviour at ages up to 32 would be associated with poorer health at age 48.

Results Childhood and parental predictors of offending, self-reported delinquency at age 32 and convictions were significantly associated with death and disability by age 48. A model comprising three factors: any antisocial behaviour and any parental risk factor at age 8–10 and any antisocial behaviour at age 27–32 best discriminated death or disability. Two factors: conviction between ages 10–18 and any antisocial behaviour at age 8–10 discriminated almost as well.

Conclusions Death and disability by age 48 were strongly associated with antisocial behaviour at ages 8–10 and 27–32, convictions and impulsivity during adolescence and parental predictors of offending at age 8–10. Preventing childhood and adolescent antisocial behaviour and offending may also prolong life and prevent disability among those who would otherwise offend.

Keywords antisocial lifestyle, illness, injury, mortality, longitudinal study

Introduction

Although longitudinal investigations of associations between offending and health outcomes are rare, important new knowledge has emerged from the Cambridge study in delinquent development (CSDD), which provides prospective longitudinal data on injury and illness as well as offending, self-reported delinquency and childhood predictors of antisocial behaviour. These data have already been studied in men at ages between 16–18 and 27–32,[1,2] and although positive associations predominated, some negative associations also emerged. For example, convictions up to age 18 were found to be associated with fewer respiratory illnesses and fewer illnesses overall at age 16–18 and fewer organic illnesses at age 27–32. Furthermore, concurrent antisocial behaviour was inversely related to respiratory infections at age 16–18 and also to hospital admission at age 27–32. Further inverse relations were found between antisocial behaviour at age 18 and health outcomes at age 27–32—principally between heavy alcohol consumption and infections and organic illness. Self-reported delinquency at 32 was negatively related to hospital admission at the same age; this may be because delinquent people are less likely to seek treatment.[1–3] It is possible that some of these inverse relationships may reflect the multiplicity of comparisons. Nevertheless, by age 32 earlier antisocial behaviours, such as fighting after drinking and heavy smoking, had become linked to illness, particularly psychological disorders, and low job status was positively related to hospital

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admission. Overall, a consistent finding up to age 32 in the CSDD has been links between childhood precursors of antisocial behaviour and injury, convictions and concurrent antisocial behaviour.

Prospective longitudinal data on both offending and morbidity are now available from the CSDD for the age range 43–48 years, extending this longitudinal study by a further 16 years. The principal hypotheses that underpinned this research were that an antisocial lifestyle and its precursors, particularly childhood risk factors for offending, are associated with poor health outcomes by age 48.

Methods

The Cambridge study in delinquent development

Research methods used in this study are described in detail in reports of investigations of links between offending, injuries and illness up to age 32.[1,2] In summary, the CSDD is a prospective longitudinal survey of the development of offending and antisocial behaviour in 411 London males. At the time they were first contacted in 1961/62 they were all living in a homogenous, working class urban area of South London. The sample included all the boys then aged 8–9 and on the registers of six state primary schools within a 1 mile radius of a research office that had been established. Hence, the most common year of birth of these males was 1953. In nearly all cases (94%), the family breadwinner at that time, usually the father, had a working class occupation (skilled, semi-skilled or unskilled manual worker). Most of the males were white (97%) and of British origin. The original aim of the study was to describe the development of delinquent and criminal behaviour in inner city males, to investigate how far it could be predicted in advance, and to explain why juvenile delinquency began, why it did or did not continue into adult crime, and why adult crime usually ended as men reached their 20s. A major aim in the CSDD was to measure as many factors as possible that might be causes or correlates of offending. Reflecting this, injury and illness data were only studied 10 years after data collection because previously, no hypotheses relating to health outcomes had been considered.[1]

Interviews and tests

Details of interviews and tests involving the males, teachers, parents and peers have been published, including in this journal.[1,2] The tests measured individual characteristics such as intelligence, attainment, personality and psychomotor impulsivity (Porteous and spiral maze and tapping tests) while the interviewers collected information about such topics as living circumstances, employment histories, relationships with females, offending behaviour and activities such as drinking and fighting. The men were also interviewed in a research office at about 16, 18 and 21 and in their homes at about 25 and 32 by young male social science graduates. At age 48, 365 men were interviewed, 343 (94%) in person at the London research office, while the remainder were interviewed by telephone or post or (in two cases) through interviews with relatives.[4] The age of the men at interview varied between 45.9 and 51.5 years (average: 48 years).[4] The aim was to interview the whole sample at all ages except 21 and 25, and it was always possible to trace and interview a high proportion, for example, 389 of 410 who were still alive at age 18 (95%), 378 of 403 who were still alive at age 32 (94%) and 365 of 394 who were still alive at age 48 (93%).[4] Of the 394 living men in the original sample, 5 could not be traced and 24 did not agree to be interviewed at age 48.

For the analyses in this and the previous two studies, each predictor variable was dichotomized as far as possible into the most adverse quarter (e.g. the quarter with lowest income or lowest intelligence) versus the remainder. This was done in order to compare the importance of different variables and also to permit a risk factor approach. Because most variables were originally classified into a small number of categories and because fine distinctions between categories could not be made very accurately, this dichotomizing did not usually involve a great loss of information. The one-quarter/three-quarters split was chosen to match the prior expectation that about one-quarter of the sample would be convicted as juveniles.[5]

Searches were also conducted in the central Criminal Record Office (National Identification Bureau) in London, and later in the Police National Computer records, to try to locate findings of guilt of the males, their siblings and their parents.

Health data

Injury and illness data for the 5 year period at age 43–48 were recorded similarly to data at age 27–32.[1,2] Interviewers recorded all chronic illnesses and disabilities, visits to hospital in the last five years, illnesses that led to absences from work of a week or more in the last five years and whether the man was registered disabled under the Disabled Persons Employment Act, with a Local Authority or other organisation. In each case, interviewers noted the nature of the illness and cause of injury, when it occurred and how many days off work or in hospital it caused. Accounts of these illnesses and injuries were amplified by the interviewers in free

text. The illnesses recorded by the interviewers were categorized precisely as they had been at age 16–18 and 27–32 as psychological/neurological, respiratory tract, cardiovascular, musculoskeletal, skin, allergic, gastrointestinal or infective illnesses.[1,2] Data regarding registered disability and elective surgery were recorded in the interviews at age 48. As previously, injuries were categorized by their cause as accidental (comprising work, home and sport injuries), assault or road injury. Information about deaths was obtained from relatives during attempts to interview and subsequently from death certificates from the Public Record Office.

Statistical methods used, and the rationale for them

The CSDD longitudinal dataset, comprising data at baseline and several follow-ups, was designed to produce a rich multifaceted representation of the life courses of the men included in the cohort. The fact that the dataset comprised 225 variables is a weakness as well as a strength: in a dataset with such large numbers of both outcome and explanatory variables, there is a severe multiple comparison issue (a substantial number of statistically significant associations would be expected simply by chance), and many of the variables included in the dataset were logically as well as statistically inter-related. The statistical methods used for the analyses were chosen in cognisance of this: to reduce dimensionality, a greatly reduced subset of variables was selected for consideration for the final analyses. For example, three parental risk factors were recorded at baseline, separation from a parent, poor supervision and conviction of a parent. These were combined to form a more informative binary predictor variable. Variables, which were *prima facie* closely and logically related to others or felt to be less important, were discarded, leaving 21 potentially predictive variables.

Potential predictor variables recorded at the baseline assessment, and those relating to convictions, were recorded for all 411 men. Three hundred and eighty-nine men had follow-up data at age 18 and 378 had follow-up data at age 32. Seventeen men had died by age 48; information on other outcomes at age 48 was available for 365 men followed up at that age. Statistically, most of the strongest associations related to the variables that identified the 17 men who had died and the 17 who had become registered as disabled by age 48, and the predictive factors for these two outcomes were similar. Accordingly, the main outcome was identified as a composite variable indicating death or disability by age 48. Six of the 21 potentially predictive variables showed, in bivariate analyses, statistically significant positive associations with this primary outcome. None of the 21 variables was inversely related to it. Similarly, in the dataset overall, a very substantial majority of associations between health outcomes at age 48 and antecedent antisocial behaviour were positive. Accordingly, only these six variables were considered for inclusion in the final model. This procedure guards against the (fairly remote) possibility that the algorithm will select an implausible combination of variables, including those not related to the outcome in the bivariate analyses.

Odds ratios were calculated for each of these six associations, with 95% confidence intervals[6] (Table 1). Parsimonious multiple binary logistic regression models with main effects terms only using a forward step likelihood ratio criterion for variable selection were set up to model this outcome in relation to (i) conviction (either at any age 10–40 or specifically at age 10–18), antisocial behaviour at age 10 or any parental risk factor at 10, (ii) these factors plus impulsivity at age 18, (iii) these factors plus self-reported delinquency at age 32. Two of the models chosen were identified as optimal. Each model involved numerically very similar coefficients for the several factors involved and, consequently, was simplified to an equally weighted form without appreciable loss of predictive information, and sensitivity and specificity were calculated. Discrimination was quantified by the AUROC (area under receiver operating characteristic curve) measure.

The only variable relating to economic status, low family income at age 8, was not one of the variables selected for potential inclusion in the analyses, reflecting that the original sample was deliberately drawn from a homogenous, low socio-economic urban area. Analyses re-run to determine whether this variable might enhance the model showed that low family income correlates highly significantly with three of the surviving predictor variables, namely, antisocial behaviour at age 10, conviction at 10–40 and parental risk

Table 1 Odds ratios for statistically significant associations of death or disability by age 48 with six antecedent factors, with 95% confidence intervals calculated using the method of Miettinen and Nurminen[6]

Antecedent factor	*Odds ratio*	*95% Confidence limits*	
Self-reported delinquency at 32	4.34	1.87	10.10
Any antisocial behaviours at 10	3.53	1.63	7.64
Conviction 10–40	3.50	1.68	7.30
Any parental risk factors at 10	3.19	1.50	6.75
Conviction 10–18	3.01	1.49	6.08
Impulsive at 18	2.13	1.04	4.38

factors at 10, but not with antisocial behaviour at 32 or impulsivity at 18. More importantly, it was not related to the primary outcome variable, death or disability by age 48 (odds ratio 1.06) and did not contribute to discrimination available from the other variables.

Results

Seventeen men had died before age 48, 13 of whom had been convicted. Of the convicted men, three had died in accidents (one while intoxicated), two from cancer, one from cerebral haemorrhage, one from stroke, one from bronchopneumonia, one from motor neurone disease, one from drug overdose, one from suicide and two from unknown causes. Of the four remaining men, one had died from an industrial injury, one from a cerebral haemorrhage, one from a myocardial infarction and one from suicide.[4]

Of the 365 men followed at age 48, 17 (5%) were registered disabled, two because of injury (one car accident and one accident at home) and 15 as a result of illness, seven of which were psychological or neurological illnesses.

Table 1 shows odds ratios and confidence intervals for associations between six predictive variables and the composite variable indicating death or disability by age 48. A two-factor multiple logistic regression model relating to stage (i) that did not use any follow-up information at ages 18 or 32, but did include information on conviction 10–40 alongside any antisocial behaviour at age 10, resulted in an AUROC of 0.703 to predict death or disability. A three–factor model relating to stage (ii) which selected self-reported delinquency at 32 alongside any antisocial behaviour at age 10 and any parental risk factor at age 10 yielded an AUROC of 0.725. The ROC curves for these models are virtually indistinguishable. Unequally weighted models give very similar AUROCs and a less smooth relationship of score to outcome. The usual trade-off between sensitivity and specificity applies (Table 2): using a criterion of any of these three risk factors present leads to a sensitivity of 94% but a specificity of only 34%, whereas if they are all required to be present, the specificity becomes 96% but the sensitivity reduces to 15%. While these values indicate a moderate degree of discriminatory ability for death and disability combined, the main conclusion to be drawn is that the predictor variables selected here jointly have robust and substantial associations with adverse health outcome at age 48, in particular death or disability.

Table 2. Sensitivity and specificity of two-factor and three-factor models

Model	*Criterion for positivity*	*Sensitivity*	*Specificity*
Two-factor model	Either factor positive	30/34 (88)	155/377 (41)
	Both factors positive	18/34 (53)	292/377 (77)
Three-factor model	Any factor positive	32/34 (94)	130/377 (34)
	At least two factors positive	22/34 (65)	266/377 (71)
	All three factors positive	5/34 (15)	362/377 (96)

Data are represented as *n* (%).

Discussion

Main findings of this study

When a wide range of health outcomes at age 48 were examined in this longitudinal study in relation to a wide range of variables relating to previous antisocial lifestyle, a preponderance of positive associations emerged. The strongest relationships were with death and disability. The measures of antisocial lifestyle moderately and highly significantly discriminated between the 34 men who died or became disabled and the remaining 377 men.

Multivariate analyses showed that a model comprising three factors (any antisocial behaviour and any parental risk factor at age 8–10 and any antisocial behaviour at age 27–32) best discriminated death or disability by age 48. Two factors (conviction between ages 10–18 and any antisocial behaviour at age 8–10) discriminated almost as well. Impulsivity at age 18 was associated with death and disability in bivariate analyses.

What is already known on this topic

Several longitudinal studies have found strong links between conduct disorder and later health problems and offending. In the UK, Colman *et al.*[7] found that male adolescents who exhibit externalizing behaviour, particularly those with conduct disorder, go on to experience multiple social, economic and mental health difficulties (anxiety, depression, alcohol misuse) which adversely affect them throughout adult life. In Sweden, childhood-conduct problems were strongly associated with severe substance abuse and offending in adulthood, and, in males, with premature death by age 30 mainly but not exclusively from mental health causes including suicidal behaviours.[8] A concentration of negative outcomes in life course persistent offenders compared with adolescent limited offenders has been identified.[9] Conduct disorder has physical health consequences such as increased accidents and higher suicide rates.[10]

What this study adds

From a theoretical perspective, the excess of death and disability in men with childhood and adolescent offending risk

factors and behaviour histories might, in part, be explained by health problems brought about by alcohol misuse, smoking and substance use, the self-evident health risks of persistent antisocial behaviour and economic problems. The much wider range of causes of death found in this study compared with other longitudinal studies may reflect previous focus on mental health rather than physical health outcomes, shorter follow-up or the focus, almost exclusively in previous research, on conduct disorder. In any event, further work is necessary to understand the reasons for the strong associations between offending and its precursors with death and disability reported for the first time here.

Offenders have been categorized as either adolescence-limited or life-course persistent,[11] based on the known peak ages for antisocial behaviour and cessation of offending by about age 20 in most offenders. This study shows that, whilst offending rates decrease after adolescence, the impact on health of an antisocial lifestyle during adolescence persists and becomes more apparent in the fourth and fifth decades. Furthermore, premature death and disability were strongly linked with even earlier antisocial behaviour—at age 8–10.

In this study, the worst health outcomes at age 48 were strongly associated with a combination of parental risk factors for offending. This suggests that interventions that break the cycle of offending within families also improve health. Future research should seek to unravel the influence of individual parental risk factors, parental separation for example, since, compared with control groups, separation caused by parental imprisonment has been found to predict offending up to age 32 more powerfully than other causes, even after controlling for parental convictions and other childhood risk factors.[12,13]

It is possible that impulsivity, a known predictor of an antisocial lifestyle and offending,[14] and strongly linked with the most serious health outcomes by age 48 in this study as well as sensation seeking or other related psychological factors—whether they are innate or learned in childhood—underlie both offending and lifestyle health risks.

Although alcohol misuse has been identified as a major explanation for increased death rates among offenders,[15] causes of death of the 17 men who died prior to age 48 did not suggest that alcohol misuse was the only major factor. In this study, measures of alcohol misuse, drug use and sexual promiscuity in adolescence, though they were limited in scope, were not significantly linked with chronic illness, death and disability by age 48.

Overall, these findings suggest that addressing childhood risk factors for antisocial behaviour and offending, for example through early parent training and pre-school education delivered in nurse–family partnerships, which are known to be effective,[16] will improve health as well as social and criminal justice outcomes in middle age. Indeed, some evidence of these effects in childhood has already emerged.[16]

This study provides no evidence, however, to support the hypothesis that desistance from offending at the end of adolescence reduces the risk of adverse health outcomes. Death or disability by age 48 occurred in 12 (12%) of the 98 men who were convicted between 22 and 40, and in 11 (17%) of the 66 men who had been convicted between 10 and 21 but not subsequently. While this is not a statistically significant difference, it is in the opposite direction to that which would provide support for this hypothesis.

Limitations of this study

The CSDD relies on data mainly from British white, working class, inner city males born in 1953, which means that findings may not be generalizable to women, Black, Asian, suburban, rural, middle or upper class people, people born more recently than the 1950s or those who spent their childhood in other countries. Repeated interviewing of the men may have confounded results, but this is unlikely since brothers of the sample males showed the same percentages of convictions though they had never been contacted. The infrequency of the interviews means that accuracy and detail may have been lost as the men had to recall their health over a 5 year period.

Data on socio-economic status over the life course were not available. The economic variable available in this dataset, low family income at age eight, did not contribute materially to the analyses.

Overall, this study provides little information about causal paths from offending to poor health outcome. Intervention studies using designs that successfully adapt the traditional randomized controlled trial structure are necessary to clarify these.

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