The economic cost of smoking in people with mental disorders in the UK

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ABSTRACT

Background and Aims Smoking is the largest preventable cause of death in the UK and imposes a huge economic burden on society. Both smoking prevalence and the heaviness of smoking are significantly higher among people with mental disorders than among the general population. The aim of this study is to estimate the economic costs of the health effects of cigarette smoking amongst people with mental disorders in the UK from a societal perspective.

Methods This study follows the World Health Organization's economics of tobacco toolkit to assess the economic costs of the health effects of cigarette smoking among people with mental disorders in 2009/10 in the UK. Based on the cost of illness approach, direct healthcare costs, indirect morbidity costs and indirect mortality costs due to smoking-related diseases were calculated to estimate the avoidable economic burden of smoking in people with mental disorders.

Results The estimated economic cost of smoking in people with mental disorders was £2.34 billion in 2009/10 in the UK. About £719 million (31% of the total cost) was spent in this time period on treating diseases caused by smoking amongst people with mental health disorders. Productivity losses due to smoking-related diseases were about £823 million (35%) for work-related absenteeism and £797 million (34%) associated with premature mortality.

Conclusions Smoking in people with mental disorders in the UK imposes significant economic costs. The development and implementation of smoking cessation interventions in this group should therefore be a high economic and clinical priority.

INTRODUCTION

Treatments for mental health disorders and smoking-related diseases account for substantial expenditure in all health care systems. At any time in the UK about one in six adults has a mental health disorder, typically anxiety, depression or schizophrenia, whilst the prevalence of smoking in this group, at 33% in 2007, is around 50% higher than in the general population [1]. Since people with mental health disorders are also more likely to smoke heavily,[2] this group accounts for as much as 42% of total national tobacco consumption.[1]

In 2009/10 the economic cost to society of mental health disorders in the UK was approximately £105 billion.[3] Mental health services account for about 14% of the total annual National Health Service (NHS) budget and is the largest single category of NHS expenditure. Smoking is the leading avoidable cause of ill-health and premature mortality in the UK, and the cost of smoking-related ill-health to the NHS is approximately £5.17 billion, or 5.5% of the total NHS budget.[4] The high prevalence of smoking among people with mental health disorders makes the most common smoking-related illnesses, especially lung cancer, cardiovascular disease and chronic obstructive pulmonary disease (COPD),[5] particularly prevalent in this group, and these conditions account for much of the reduced life expectancy of people with mental health disorders.[6] This morbidity and mortality, and the economic costs that ensue, are entirely avoidable.

The high prevalence of smoking among people with mental health disorders, and the significant contribution that smoking makes to the increased morbidity and mortality

in this group, has been extensively documented and reflects the effects of an historical smoking culture within mental healthcare settings, smoking being used as a form of self-mediation by patients and control by staff, and a lack of awareness of smoking as an issue among professionals working with or caring for people with mental disorders.[6] The economic disadvantage experienced by many people with mental disorders as a result of unemployment and dependence on state benefits is also exacerbated by expenditure on smoking, which may further exacerbate ill-health.

Despite the significant health and financial impacts of smoking in this population there has been little research with regard to the economic burden. Improved understanding of the economic cost of smoking and its major determinants helps to inform policymakers and to motivate decisions to reduce the smoking rate and burden. The aim of this study is to estimate the economic costs of the health effects of cigarette smoking amongst people with mental disorders in the UK. This study was carried out as part of a wider assessment of the health effects of smoking among people with mental health disorders commissioned by the Royal College of Physicians.[6]

METHOD

Based on the cost of illness approach, the avoidable economic burden of smoking in people with mental health disorders comprises three components: direct healthcare costs, indirect morbidity costs and indirect mortality costs due to smoking-related diseases.[7] The target population in this study focuses on UK adults aged 16 and over with any mental health diagnosis. Costs were assessed from the NHS and Personal

Social Services (PSS) perspective. All costs were estimated in UK pounds (£) in the 2009/10 financial year. The Hospital and Community Health Services (HCHS) Pay and Prices Index was used to inflate cost estimates from other time periods.[8]

Prevalence of mental disorders and smoking rates

Mental health disorders are usually categorised into two groups. Neurotic disorders (common mental disorder/CMD) consist of mixed anxiety/depressive disorder, generalised anxiety disorder, depressive episodes, any phobia, obsessive compulsive disorder and panic disorder. Psychotic disorders (severe mental health disorders/SMD) include schizophrenia and affective psychosis, such as bi-polar disorder.

Table 1 summarises the prevalence of mental disorders and the prevalence of current, ex- and never smoking among adults in the UK with these conditions. The prevalence of each mental health disorder was taken from the 2007 Adult Psychiatric Morbidity Survey (APMS),[1] and the prevalence of current smoking and ex-smoking for those with neurotic disorders from the study by Coulthard et al.[9] It is more difficult to obtain data for people with psychotic disorders in national surveys of the general population as many live in institutions or are homeless; however, a survey of residents in psychiatric institutions conducted by Meltzer and colleagues in 1996 reported that over 70% of residents were smokers and the highest smoking rates (78%) were found among males diagnosed with schizophrenia.[2]

Table 1: Prevalence of mental disorders and associated smoking status

Diagnosis of Mental health illness	Prevalence of condition [a]	Current Smokers[b,c]	Former Smokers[b,c]
Male			
Neurotic disorder / Common mental disorders (CMDs)			
Mixed anxiety and depressive disorder	6.9%	45%	23%
Generalised anxiety disorder	3.4%	43%	24%
Depressive episode	1.9%	55%	17%
All phobias	0.8%	67%	7%
Obsessive compulsive disorder	0.9%	52%	23%
Panic disorder	1.0%	12%	8%
Any Neurotic disorder	**12.5%**	46%	23%
Psychotic disorder / Severe mental health disorders (SMDs)			
Schizophrenia delusional	0.4%	78%	9%
Affective psychosis	0.4%	70%	5%
Female			
Neurotic disorder / Common mental disorders (CMDs)			
Mixed anxiety and depressive disorder	11.0%	39%	14%
Generalised anxiety disorder	5.3%	45%	15%
Depressive episode	2.8%	53%	16%
All phobias	2.0%	45%	19%
Obsessive compulsive disorder	1.3%	56%	19%
Panic disorder	1.2%	40%	23%
Any Neurotic disorder	**19.7%**	**42%**	**15%**
Psychotic disorder / Severe mental health disorders (SMDs)			
Schizophrenia delusional	0.4%	62%	9%
Affective psychosis	0.4%	70%	5%

a. Source of prevalence of mental disorders: Adult psychiatric morbidity in England, 2007.[1]

b. Source of smoking prevalence for CMDs: Tobacco, alcohol and drug use and mental health in Social Survey Division of the Office for National Statistics.[9]

c. Source of smoking prevalence for SMDs: Office of Population Censuses and Surveys (OPCS) Surveys of Psychiatric Morbidity in Great Britain, Report 6.[2]

Smoking-attributable proportion

To estimate the ensuing economic costs for smoking related diseases we have used the attributable risk approach originally devised by Levin,[10] and widely used in estimation of smoking-attributable health outcomes in the literature. The smoking-attributable proportion (SAP) of disease in current and former smokers compared to never-smokers can be estimated from the relative risks of disease and prevalence of exposure using the formula (I):

$$SAP = \frac{p_{cur}(r_{cur}-1)+p_{ex}(r_{ex}-1)}{1+ p_{cur}(r_{cur}-1)+p_{ex}(r_{ex}-1)} \quad (I)$$

Where:

SAP = smoking attributable proportion

p_{cur} = proportion who are current smokers

r_{cur} = relative risk for current compared with never smokers

p_{ex} = proportion who are ex-smokers

r_{ex} = relative risk for ex compared with never smokers

SAP quantifies the fraction of total costs incurred as a consequence of smoking. The SAP is used to compute both direct medical costs and indirect productivity losses in the following sections.

Direct medical costs

Direct medical costs are defined as the monetary value of resources consumed as a result of treating smoking-related disease. In this study, direct healthcare costs included costs of hospital admissions, outpatient visits, general practitioner (GP) and practice nurse consultations and prescriptions related to smoking-related diseases among people with mental disorders. The costs of each healthcare service attributable to smoking were calculated using the following equation (II).

$$SAC_i = \sum SAP_{ijkl} * THQ_{ijl} * UC_i \text{ (II)}$$

Where

SAC_i = smoking-attributable costs of healthcare service type *i, which includes inpatient hospitalizations, outpatient visits, GP and practice nurse consultations and prescriptions.*

SAP_{ijkl} = smoking attributable proportion of healthcare service *i* utilisation for treating smoking-related disease *j* among people with mental disorder *k* by gender *l*

THQ_{ij} = the quantity of total healthcare utilisation for treating a disease *j* on healthcare service type *i* by gender *l among people with mental disorders*

UC_i = Unit cost of the healthcare service type *i*

The first component of direct medical costs caused by smoking was hospital admission costs. Tables A1 and A2 in the appendix list fatal and non-fatal diseases caused by smoking, their International Classification of Diseases (ICD -10) codes, and the relative risks for developing each disease for current and former smokers compared with never smokers, by gender.[11] The number of hospital inpatient episodes was measured by the number of hospital admissions (finished consultant episodes, FCEs) derived from the Hospital Episode Statistics (HES) for England during the period April 2009 to March 2010.[12] Average costs for finished consultant episodes by types of smoking-related diseases were taken from the relevant Healthcare Resource Groups (HRG4) in 2009-10 NHS Reference Costs.[13]

Similarly, relative risks of outpatient and primary care utilisation by current smokers and ex-smokers compared to never smokers are listed in Table A3 (Appendix). The data were obtained from reports of health service use and the UK General Household Survey in 2006.[14]

There were 926.7 million prescription items dispensed in 2010 and the average net ingredient cost (NIC) per prescription item was £9.53.[15] It is reported that 62% of consultations were conducted by GPs and 34% were undertaken by practice nurses [16]. Unit costs of GP and nurse visits were sourced from the Personal Social Services Research Unit (PSSRU) Unit Costs 2010, with a cost of £32 per GP consultation and £10 per practice nurse consultation [8]. In 2009/10, the number of outpatient attendances for adults aged 16 and over was 27 million for males and 21 million for females. The average cost of an adult outpatient visit in 2009/10 was £98[13].

The cost of outpatient and primary care utilisation for other UK jurisdictions were extrapolated from the estimates for England using 2010 population estimates where published data were not available [17, 18].

Indirect morbidity costs

The indirect costs of smoking among people with mental disorders were estimated using the human capital approach [7]. Cigarette smokers are more likely to be absent from work due to various smoking-related diseases compared to never-smokers [19]. In this study, the indirect morbidity costs of smoking were estimated as the economic

value of lost productivity from increased rates of absenteeism associated with smoking using equation (III).

$$SAI = \sum SAP_{jkl} * TWLD_{jk} * ERN \text{ (III)}$$

Where

SAI = smoking-attributable indirect morbidity costs from the productivity losses due to smoking-related diseases

SAP_{ikl} = smoking attributable proportion of indirect morbidity costs for smoking-related disease *j* among people with mental disorder *k* by gender *l*

$TWLD_{jk}$ = total yearly work-loss days due to disease *j* among population subgroup *k* by gender *l*

ERN = average national daily earnings

Smoking-attributable costs of work days lost were calculated by multiplying smoking-attributable work days lost by average income. The Office for National Statistics report that the employment rate for people with a common mental disorder was 57% in 2000, in which 40% are working full time and a further 17% working part time. Among people with severe mental disorders, only 9% work full time and 19% work part time.[20] The mean number of days absent from work in the past year for people with common and severe mental disorders were reported as 19 days and 67 days respectively.[20] A recently-published systematic review reported that the relative risk of absence for current smokers versus never-smokers was 1.33 (95% CI: 1.25 – 1.41) and the relative risk of absenteeism for ex-smokers versus never-smokers was 1.14 (95% CI: 1.08 – 1.21) [21]. Average earnings in the UK were used to value productivity losses due to smoking-related diseases as reported in an annual survey of hours and earning by the Office for National Statistics [22]

Indirect mortality costs

A further aspect of the economic cost of smoking is the value of smoking-attributable lost productivity from premature death. In this study, years of potential life lost (YPLL) were estimated to present the years lost that a smoker would have lived had they not smoked. Years of potential working life lost (YPWLL) and years of potential total life lost (YPTLL) for smokers with mental disorders were estimated based on data obtained from the mortality statistics in 2010 reported by the Office of National Statistics (2010b) [23]. Studies have reported higher mortality in people with mental disorders compared to the rest of the population.[24] (Thompson, 2013) The relative risks of mortality for different causes of death (by ICD-10 categories) that compare people with mental disorders to the general population were obtained from a Mental Health Minimum Data Set (MHMDS) report.[24] Furthermore, NHS England report life expectancies around 10 years shorter in people with mental disorders compared to the general population, particularly in those with severe mental disorders where life expectancy may be up to 25 years shorter. However, due to the lack of UK-specific data the longevity difference reported by Lawrence et al was used in this study.[25]

Indirect mortality costs were calculated to present the monetary value of lives lost due to smoking-attributable premature death among people with mental disorder. The indirect mortality cost was calculated by taking the net present value of future productivity (PVFP) using the following equation (IV) [7].

$$\text{SAM} = \sum SAP_{j\text{kml}} * \ NDEATH_{jml} * \text{PVLE}_{ml} \text{ (IV)}$$

Where

SAM = smoking-attributable mortality cost

SAP_{jkml} = smoking attributable proportion of indirect morbidity costs for smoking-related disease *j* among people with mental disorder *k*, by different age-group *m* and gender *l*

$NDEATH_{jml}$ = number of death from disease *j* for population subgroup, by different age-group *m* and gender *l*

$PVLE_{ml}$ = total discounted present value of lifetime earnings for population subgroup, by different age-group *m* and gender *l*

The number of deaths from smoking-attributable diseases was estimated for males and females separately using 10-year age groups. The number of deaths was then used to estimate residual years of working life by subtracting age at death from retirement age (65 years). The next step was to attach the average earnings to the remaining working years and adjust the income into present values, adopting a discount rate of 3.5% following National Institute for Health and Care Excellence (NICE) guidelines.[26]

RESULTS

An estimated 3 million adults aged 16 and over with mental disorders were smokers in the 2009/10 financial year in the UK.[6] The total smoking-attributable costs were estimated at £2.34 billion in 2009/10 in the UK (Table 2). Costs are distributed approximately equally between the three cost components. Approximately £719 million (31%) was spent each year on treating diseases caused by smoking amongst people with mental health disorders. Productivity losses due to smoking-related diseases were estimated to be £823 million (35%) for work-related absenteeism and

£797 million (34%) associated with premature mortality.

Table 2 Total economic costs of smoking in people with mental disorders, UK, 2009/10 (£ million)

Cost component	Male	Female	All Adults
Direct medical costs	£319 (30%)	£400 (31%)	£719 (31%)
Indirect morbidity costs	£333 (31%)	£490 (38%)	£823 (35%)
Indirect mortality costs	£415 (39%)	£383 (30%)	£797 (34%)
Total costs	£1,066 (100%)	£1,273 (100%)	£2,340 (100%)

Direct medical costs

Table 3 lists the cost components of NHS direct medical costs for treating diseases caused by smoking among people with mental health disorders in 2009/10. The overall estimated cost to the NHS was £719 million; approximately half (£352 million) was due to hospital admissions. The majority (90%) of excess expenditure of hospital admissions due to smoking were costs associated with treating malignant neoplasms (£111 million), cardiovascular diseases (£109 million) and respiratory diseases (£95 million). Smoking-attributable costs for hospital admissions for treatment of non-fatal diseases were approximately £28 million. Total hospital admission costs for males and females were £186 million (53%) and £166 million (47%), respectively.

Table 3: Health care expenditure attributable to smoking in people with mental disorder by type of service, UK 2009/10 Unit: £million

	Male	Female	All Adults
Total cost of hospital admission	**£186.46**	**£165.73**	**£352.19**
Malignant Neoplasms	*£46.13*	*£64.52*	*£110.66*
Cardiovascular Diseases	*£56.22*	*£52.48,*	*£108.70*
Respiratory Diseases	*£58.07*	*£36.88*	*£94.95*
Digestive Diseases	*£5.30*	*£4.96,*	*£10.23*

Non-fatal diseases	*£20.74*	*£6.92*	*£27.65*
Cost of GP consultations	**£41.07**	**£61.18**	**£102.26**
Cost of Practice nurse consultations	**£5.72**	**£8.28**	**£14.01**
Cost of GP prescriptions	**£70.71**	**£108.27**	**£178.98**
Cost of Outpatient attendances	**£35.18**	**£36.06**	**£71.24**
Total direct medical costs	**£318.42**	**£400.26**	**£718.68**

Consultations with GPs and practice nurses due to smoking in mental health cost the NHS £116 million in 2009/10. An estimated 18.8 million prescriptions were issued by GPs to treat smoking-related diseases among people with mental disorders and generated a cost of £179 million to the NHS. The estimated cost of outpatient attendances attributable to smoking was £71 million which accounted for 10% of all direct medical costs for people with mental health disorders.

Indirect morbidity costs

The annual productivity loss due to excess absenteeism associated with smoking attributable morbidity in the UK was estimated at approximately £823 million among people suffering from mental health disorders in 2009/10. Table 4 lists employment status and average weekly earnings for people with and without mental disorders.

Table 4 Employment status and average weekly pay for people with and without mental disorders

	People with CMDs	People with SMDs	People without mental disorders
Employment status			
Working full time	40%	9%	50%
Working part time	17%	19%	19%

Unemployed	4%	2%	2%
Economically inactive	39%	70%	29%
Average weekly pay (at 2010 price)			
Full time male	£594	£441	£653
Full time female	£467	£347	£513
Part time male	£190	£141	£209
Part time female	£177	£131	£195

Table 5 Indirect morbidity costs attributable to smoking in people with mental disorders by type of mental disorders, UK 2009/10 Unit: £ million

Diagnosis of mental health illness	Male	Female	All
Neurotic disorder / Common mental disorders (CMDs)			
Mixed anxiety and depressive disorder	£156 (46.8%)	£207 (42.2%)	£363 (44.1%)
Generalised anxiety disorder	£75 (22.5%)	£112 (22.8%)	£187 (22.7%)
Depressive episode	£48 (14.4%)	£67 (13.7%)	£115 (14.0%)
All phobias	£22 (6.7%)	£43 (8.9%)	£66 (8.0%)
Obsessive compulsive disorder	£23 (6.8%)	£33 (6.7%)	£56 (6.7%)
Panic disorder	£7 (2.1%)	£25 (5.0%)	£32 (3.9%)
Psychotic disorder			
Schizophrenia delusional	£2 (0.5%)	£2 (0.4%)	£4 (0.4%)
Affective psychosis	£1 (0.3%)	£1 (0.2%)	£2 (0.2%)
Total	£333 (100%)	£490 (100%)	823 (100%)

Table 5 presents indirect morbidity cost estimates by diagnosis and gender. Costs incurred due to lost economic productivity attributable to smoking were £333 million for males and £490 million for females with mental illnesses. Of the total £823 million of indirect morbidity costs, about 44% (£363 million) are incurred by people with mixed anxiety and depressive disorder which is the most prevalent mental disorder in the population whilst generalised anxiety disorder and depressive episode cost £187 million (23%) and £115 million (14%) respectively. Only a very small

proportion (£6 million, 0.6%) of indirect costs was incurred by people with severe mental disorders as only 28% are able to maintain regular work (9% full time and 19% part time).

Indirect mortality cost

Table 6 summarises the years of potential working life lost (YPWLL) as a consequence of smoking for both males and females with mental disorders with a 'cut-off' age of 65 (retiring age), and years of potential total life lost (YPTLL) with a 'cut-off' age of 85. Overall, there were a total of 35,228years of potential working years of life lost in people with mental illness in the UK in 2010, 23,827for males and 11,400 for females. The estimated total life years lost due to smoking-related diseases were 192,005years (121,921for males and 70,085 among females).

Table 6 Smoking attributable years of potential life lost (YPLL) and indirect mortality cost among people with mental disorders in UK, 2009/10

Diagnosis of Mental health illness	Years of 'working life' lost			Years of 'total life' lost			Indirect mortality cost (£ million)		
	Male	Female	All	Male	Female	All	Male	Female	All
Neurotic disorder / Common mental disorders (CMDs)									
Mixed anxiety and depressive disorder	11,157	5,063	16,219	57,051	31,188	88,239	£195	£171	£366
Generalised anxiety disorder	5,430	2,612	8,042	27,793	16,048	43,841	£95	£88	£183
Depressive episode	3,235	1,532	4,767	16,480	9,383	25,863	£57	£52	£109
All phobias	1,425	618	2,043	7,236	3,800	11,035	£25	£21	£46
Obsessive compulsive disorder	1,521	739	2,260	7,752	4,523	12,275	£27	£25	£52
Panic disorder	876	751	1,628	4,677	4,628	9,306	£15	£25	£40
Psychotic disorder									

Schizophrenia	112	50	162	566	306	871	£0.5	£0.4	£0.9
delusional									
Affective psychosis	72	34	106	365	209	574	£0.3	£0.3	£0.6
Total	23,827	11,400	35,228	121,921	70,085	192,005	£415	£383	£797

Table 6 also reports the economic cost of premature mortality caused by smoking-related diseases. Deaths from smoking in people with mental disorders were estimated to result in the loss of around £797 million in the UK in 2009/10 and over half (52%) of mortality costs were incurred by male smokers. Nearly 50% (£366 million) of indirect costs were associated with people who have mixed anxiety and depressive disorder, followed by smokers with generalised anxiety disorder (23%).

Table 7 shows the number of premature deaths caused by smoking and the indirect mortality cost among people with mental health disorders by smoking-attributable disease type. In the UK a total of 23,945 deaths of adults with mental disorders were attributable to smoking in 2010, 12,389 for men and 11,556 for women. It is estimated that 39% (9,280) of all deaths due to respiratory diseases and 31% (7,425) of all cancer deaths were attributable to smoking among people with mental disorders. In addition, an estimated 28% (6,758) of deaths from cardiovascular diseases and 2% (482) of deaths from diseases of the digestive system were attributable to smoking. Smoking increases the excess risk of cardiovascular death and some types of cancer among people with mental disorders, and results in a future productivity loss of £493 million and £111 million, respectively.

Table 7 Number of premature deaths and indirect mortality cost among people with mental disorders by type of smoking caused disease in UK, 2009/10 Unit of costs: £ million

	Male		Female		All Adults	
	Deaths	Costs	Deaths	Costs	Deaths	Costs
Malignant Neoplasms	4,267 (34%)	£73 (18%)	3,158 (27%)	£38 (10%)	7,425 (31%)	£111 (14%)
Cardiovascular Diseases	3,784 (31%)	£260 (63%)	2,974 (26%)	£233 (61%)	6,758 (28%)	£493 (62%)
Respiratory Diseases	4,101 (33%)	£73 (18%)	5,179 (45%)	£107 (28%)	9,280 (39%)	£180 (23%)
Digestive Diseases	2,37 (2%)	£8 (2%)	245 (2%)	£5 (1%)	482 (2%)	£13 (2%)
Total	12,389 (100%)	£415 (100%)	11,556(100%)	£383 (100%)	23,945(100%)	£797 (100%)

DISCUSSION

Smoking rates are substantially higher in disadvantaged groups, such as people with mental disorders, compared with the general population [2] resulting in a much greater incidence of smoking-related morbidity and mortality in these groups. Among people with mental health disorders, smoking has historically been widely considered to be a self-medication mechanism, which in part explains the sustained difficulties faced by medical services in preventing smoking in this group [6]. This paper is to our knowledge the first attempt to estimate the overall economic burden due to smoking and smoking-related diseases among people with mental health disorders in the UK.

We estimate that there are about three million people with mental disorders in the UK who also smoke and are hence susceptible to smoking related-disease. We estimate that the direct medical cost to the NHS in 2010 of treating these smokers for diseases caused by smoking was £719 million, and that smoking in this group also accounts for around 35% of work-related absenteeism due to smoking, costing £823 million in lost productivity, and about 34% of premature mortality, costing £797 million.

Since there is little research examining the economic burden of smoking among

people with mental illnesses, comparisons with other studies are largely limited to those involving the general population. A recent study by Callum and colleagues employed a similar method to estimate the direct medical cost to the NHS in the general population [14], and using the 1996 smoking prevalence of 28.5% estimated the direct cost of treating smoking-related diseases to the NHS at £2.7 billion in England. This equates to an average annual health care cost of approximately £200 per smoker, whilst in our study the cost amongst people with mental disorders was estimated around £320 per smoker. This suggests that the average direct medical costs were much higher in people with mental health disorders than in the general population.

Productivity lost due to smoking by people with mental health disorders imposes further economic costs in addition to direct health care expenditure. A number of studies have demonstrated that smokers have an increased level of absenteeism from work in the general population [27]. The most recent study has estimated the cost of productivity lost due to smoking related absence to be £2.5 billion in 2010 in the UK [27], equivalent to approximately £280 per smoker. Results from the current study show an estimated £823 million of productivity lost due to absenteeism caused by smoking-related diseases in people with mental disorders. The average smoking-related illness absence cost per smoker was around £260 in people with mental disorders. Research suggests that the indirect morbidity cost among mental health patients is not as high as those in the general population because of the comparatively lower employment rate and average earnings. For example, among those with severe mental health diseases such as schizophrenia, only 9% work full time and 19% work part time and the weekly pay was much lower than those who do not have any mental

disorders (Table 4).

The estimated deaths, years of life lost and economic costs of smoking in this population are potentially almost entirely preventable through smoking cessation and harm reduction interventions. Smoking cessation is one of the most cost-effective public health interventions, and an estimated incremental cost per quality-adjusted life-year (QALY) of between £221 and £9,515, which is considerably lower than the informal NICE threshold for cost effective NHS treatments (£20,000 per QALY) [28]. Data based on NHS Stop Smoking Services suggests that the cost per quitter was £220 in the UK in 2010/11[29], whereas the estimated average healthcare costs and productivity losses presented in this study was more than £650 per person annually due to smoking. However, the effectiveness of smoking cessation may differ in people with mental disorders compared to the general population due to heavy addiction to nicotine among people with mental disorders [6]. Further research is needed to explore the effectiveness and cost-effectiveness of smoking cessation in people with mental disorders.

In this study, the proportion of current and ex-smokers among people with SMD was obtained from a study conducted in 1996. Thus, we conducted a sensitivity analysis to test the impact of variation in the smoking rate amongst people with SMDs on the results. The Health Improvement Network (THIN) is an electronic dataset capturing GP medical records from around 8 million patients across the UK. THIN data report a smoking prevalence in people with schizophrenia and bipolar affective disorder of 44.6% and 36.7% respectively in 2009-10. [6] The recording of ex-smoking in THIN is incomplete and hence we assumed the smoking prevalence difference between the

1996 data used in the baseline calculation and the THIN data to be ex-smokers. The results of the sensitivity analysis show a slight decline in the three cost components: £692 million for direct medical costs, £806 million for indirect morbidity costs and £779 million for indirect mortality costs.

The economic costs estimated above do not include the cost of accidental fires caused by discarded cigarettes, costs due to diseases caused by second-hand smoke exposure in mental health settings, or excess costs for psychotropic drug dose due to increased metabolism of some psychotropic medications in smokers. It is reported that the excess psychotropic medicine costs to the NHS due to smoking was £40 million [6]. On the other hand, non-smokers live longer than smokers and impose a greater burden on health care resources especially in later ages. However, there is evidence that in general population smoking constitutes an economic burden to the society even when considering non-smokers longer life expectancy.[30] Further research is needed to examine more closely to the long-term cost of smoking and smoking cessation amongst people with mental disorders, incorporating the health benefits to the society as a whole.

It is clear that smoking in people with mental disorders in the UK imposes a significant economic burden and therefore that the development and implementation of smoking cessation interventions in this group should be a high priority. This economic case augments the ethical and clinical imperative of addressing smoking more systematically and effectively in this group and is over and above the health benefits in terms of quality and quantity of life which are enjoyed following smoking cessation.

WHAT THIS PAPER ADDS

This study estimated the economic costs of the health effects of cigarette smoking amongst people with mental disorders in the UK based on the cost of illness approach. The avoidable costs include direct healthcare costs, indirect morbidity costs and indirect mortality costs due to smoking-related diseases.

The result demonstrated that smoking in people with mental disorders in the UK imposes a significant economic burden and therefore that development and implementation of smoking cessation interventions in this group is a particularly high priority.

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COMPETING INTERESTS

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CONTRIBUTORSHIP STATEMENT

Qi Wu designed the methods and conducted the analyses, drafted and revised the manuscript. She is guarantor. Lisa Szatkowski collected data inputs and revised the draft. John Britton planned the study, drafted and revised the manuscript. Steve Parrott planned the study, designed the methods, drafted and revised the manuscript.

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