Economic cost of smoking in people with mental disorders in the UK
Qi Wu,1 Lisa Szatkowski,2 John Britton,2 Steve Parrott1

ABSTRACT
Background Smoking is the largest preventable cause of death in the UK and imposes a huge economic burden on society. Both the prevalence and extent of smoking are significantly higher among people with mental disorders than among the general population.
Aims To estimate the economic costs of the health effects of cigarette smoking among people with mental disorders in the UK from a societal perspective.
Methods This study uses the WHO’s economics of tobacco toolkit to assess the 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, of which, about £719 million (31% of the total cost) was spent on treating diseases caused by smoking. Productivity losses due to smoking-related diseases were about £823 million (35%) for work-related absenteeism and £797 million (34%) was 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 healthcare systems. At any time in the UK about one in six adults has a mental health disorder, typically anxiety, depression or schizophrenia, while 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 the total national tobacco consumption.3

In 2009/10 the economic cost to society of mental health disorders in the UK was about £105 billion.3 Mental health services account for about 14% of the total annual National Health Service (NHS) budget and are 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 about £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,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 a historical smoking culture within mental healthcare settings, smoking being used as a form of self-medication by patients and control by staff, and a lack of awareness of smoking as a concern among professionals working with, or caring for, people with mental disorders.7 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, little research into the economic burden has been carried out. Improved understanding of the economic cost of smoking and its major determinants helps to inform policymakers and to motivate decisions to reduce smoking. This study aimed at estimating the economic costs of the health effects of cigarette smoking among people with mental disorders in the UK. It 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
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 This study focuses on UK adults aged ≥16 with any mental health diagnosis. Costs were assessed from the NHS and Personal Social Services perspective. All costs were estimated in UK pounds (£) in the 2009/10 financial year. The Hospital and Community Health Services 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 and psychotic disorders. Neurotic disorders (common mental disorder)
consist of mixed anxiety/depressive disorder, generalised anxiety disorder, depressive episodes, any phobia, obsessive compulsive disorder and panic disorder. Psychotic disorders (severe mental health disorder (SMD)) include schizophrenia and affective psychosis, such as bipolar disorder.

Table 1 summarises the prevalence of mental disorders and the prevalence of current, ex-smoking 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, and the prevalence of current smoking and ex-smoking for those with neurotic disorders from the study by Coulthard et al. 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 men diagnosed with schizophrenia.

Smoking-attributable proportion
To estimate the ensuing economic costs for smoking-related diseases we have used the attributable risk approach devised by Levin, and widely used in estimation of smoking-attributable health outcomes in the literature. The smoking-attributable proportion (SAP) of disease in current and ex-smokers compared with never smokers can be estimated from the relative risks of disease and prevalence of exposure using equation (1)

\[
SAP = \frac{p_{\text{cur}}(r_{\text{cur}} - 1) + p_{\text{ex}}(r_{\text{ex}} - 1)}{1 + p_{\text{cur}}(r_{\text{cur}} - 1) + p_{\text{ex}}(r_{\text{ex}} - 1)}
\]

where
- \( SAP \) = smoking-attributable proportion
- \( p_{\text{cur}} \) = proportion who are current smokers
- \( r_{\text{cur}} \) = relative risk for current compared with never smokers
- \( p_{\text{ex}} \) = proportion who are ex-smokers
- \( r_{\text{ex}} \) = relative risk for ex-smokers 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 costs 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. The costs of each healthcare service attributable to smoking were calculated using equation (2).

\[
SAC_i = \sum SAP_{ijkl} \times THQ_{ijl} \times UC_i
\]

where
- \( SAC_i \) = smoking-attributable costs of healthcare service type \( i \)
- \( SAP_{ijkl} \) = smoking attributable proportion of healthcare service \( i \) utilisation for treating smoking-related disease \( j \) among people with mental disorder \( k \) by gender \( l \)

Table 1  Prevalence of mental disorders and associated smoking status

| Diagnosis of mental health illness                  | Prevalence of condition (%)* | Current smokers (%)†‡ | Former smokers (%)†‡ |
|----------------------------------------------------|-----------------------------|-----------------------|----------------------|
| **Male**                                           |                             |                       |                      |
| Neurotic disorder/MDMs                              |                             |                       |                      |
| 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/SMDS                             |                             |                       |                      |
| Schizophrenia delusional                            | 0.4                         | 78                    | 9                    |
| Affective psychosis                                 | 0.4                         | 70                    | 5                    |
| **Female**                                         |                             |                       |                      |
| Neurotic disorder/MDMs                              |                             |                       |                      |
| 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/SMDS                             |                             |                       |                      |
| Schizophrenia delusional                            | 0.4                         | 62                    | 9                    |
| Affective psychosis                                 | 0.4                         | 70                    | 5                    |

*Source of prevalence of mental disorders: Adult psychiatric morbidity in England, 2007.
†Source of smoking prevalence for CMDs: Tobacco, alcohol and drug use and mental health in Social Survey Division of the Office for National Statistics.
‡Source of smoking prevalence for SMDs: Office of Population Censuses and Surveys Surveys of Psychiatric Morbidity in Great Britain, Report 6.
The indirect costs of smoking among people with mental disorders were estimated using the human capital approach. Cigarette smokers are more likely to be absent from work owing to various smoking-related diseases compared with never smokers. 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 (3).

$$\text{SAI} = \sum \text{SAP}_{jk} \times \text{TWLD}_{jk} \times \text{ERN}$$

where
- $\text{SAI} =$ smoking-attributable indirect morbidity costs from the productivity losses due to smoking-related diseases
- $\text{SAP}_{jk} =$ smoking attributable proportion of indirect morbidity costs for smoking-related disease $j$ among people with mental disorder $k$ by gender $l$
- $\text{TWLD}_{jk} =$ total yearly work-loss days due to disease $j$ among population subgroup $k$ by gender $l$
- $\text{ERN} =$ average national daily earnings.

Smoking-attributable costs of work days lost were calculated by multiplying the number of these days by average income. The Office for National Statistics reported that the employment rate for people with a common mental disorder was 57% in 2000, including 40% 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. The mean number of days absent from work in the past year for people with common and severe mental disorders was reported to be 19 days and 67 days, respectively. 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 to 1.41) and the relative risk of absenteeism for ex-smokers versus never smokers was 1.14 (95% CI 1.08 to 1.21). Average earnings in the UK were used to assess productivity losses due to smoking-related diseases as reported in an annual survey of hours and earning by the Office for National Statistics.

Indirect mortality costs

A further aspect of the economic cost of smoking is the value of lost productivity from premature death. In this study, years of potential life lost owing to smoking were estimated. Years of potential working life lost and years of potential total life lost for smokers with mental disorders were estimated based on data obtained from the mortality statistics in 2010 reported by the Office of National Statistics (2010). Studies have reported higher mortality in people with mental disorders than in the rest of the population. The relative risks of mortality for different causes of death (by ICD-10 categories) for people with mental disorders compared with the general population were obtained from a mental health minimum dataset report. Furthermore, NHS England reports life expectancies around 10 years shorter in people with mental disorders than in the general population, particularly in those with severe mental disorders where life expectancy may be up to 25 years shorter. However, owing to a lack of UK-specific data, the longevity difference reported by Lawrence et al was used in this study.

Indirect mortality costs of lives lost due to smoking-attributable premature death among people with mental disorder were calculated by taking the net present value of future productivity using equation (4).

$$\text{SAM} = \sum \text{SAP}_{jkml} \times \text{NDEATH}_{jml} \times \text{PVLE}_{ml}$$

where
- $\text{SAM} =$ smoking-attributable mortality cost
- $\text{SAP}_{jkml} =$ 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 $l$
- $\text{NDEATH}_{jml} =$ number of deaths from disease $j$ for population subgroup, by different age group $m$ and gender $l$
- $\text{PVLE}_{ml} =$ 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 men and women 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 according to present values, adopting a discount rate of 3.5% according to National Institute for Health and Care Excellence (NICE) guidelines.

RESULTS

An estimated 3 million adults aged ≥16 with mental disorders were smokers in the 2009/10 financial year in the UK. The
total smoking-attributable costs were estimated at £2.34 billion in 2009/10 in the UK (table 2). Costs are distributed about equally between the three cost components. Approximately £719 million (31%) was spent each year on treating diseases caused by smoking among 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.

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; about 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 about £28 million. Total hospital admission costs for men and women were £186 million (53%) and £166 million (47%), respectively.

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, accounting 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 about £823 million among people with mental health disorders in 2009/10. Table 4 lists employment status and average weekly earnings for people with and without mental disorders.

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 men and £490 million for women with mental illnesses. Of the total £823 million of indirect morbidity costs, about 44% (£363 million) were incurred by people with mixed anxiety and depressive disorder, which is the most prevalent mental disorder in the population. Generalised anxiety disorder and depressive episodes cost £187 million (23%) and £115 million (14%), respectively. Only a small proportion (£6 million, 0.6%) of indirect costs was incurred by people with severe mental disorders as only 28% are in regular work (9% full time and 19% part time).

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

| Cost component               | Male   | Female  | All Adults |
|------------------------------|--------|---------|------------|
| Direct medical costs         | £319   | £400    | £719       |
| Indirect morbidity costs     | £333   | £490    | £823       |
| Indirect mortality costs     | £415   | £383    | £797       |
| Total costs                  | £1066  | £1273   | £2340      |

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

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% (9280) of all deaths due to respiratory diseases and 31% (7423) of all deaths from cancer were attributable to smoking among people with mental

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

| Employment status               | People with CMDs | People with SMDs | People without mental disorders |
|---------------------------------|------------------|------------------|---------------------------------|
| 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 prices) |                  |                  |                                 |
| Full-time male                  | £594             | £441             | £653                            |
| Full-time female                | £467             | £347             | £513                            |
| Part-time male                  | £190             | £141             | £209                            |
| Part-time female                | £177             | £131             | £195                            |

CMDs, common mental disorders; SMDs, severe mental health disorders.
disorders. In addition, an estimated 28% (6758) 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.

**DISCUSSION**

Smoking rates are substantially higher in disadvantaged groups, such as people with mental disorders, than in the general population, 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. 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 about three million people in the UK with mental disorders 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, 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, and using the 1996 smoking prevalence of 28.5% estimated the direct cost of treating smoking-related diseases to the NHS as £2.7 billion in England. This equates to an average annual healthcare cost of about £200 per smoker. In our study the cost for people with mental disorders was estimated to be 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 healthcare expenditure. A number of studies have shown that smokers in the general population have an increased level of absenteeism from work. 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, equivalent to about £280 per smoker. Results from our study show an estimated £823 million of productivity lost due to absenteeism caused by smoking-related diseases in people with mental health disorders.

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

### Table 6  Smoking attributable years of potential life lost and indirect mortality cost among people with mental disorders in the 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 |
| Mixed anxiety and depressive disorder | 11 157 | 5063 | 16 219 | 57 051 | 31 188 | 88 239 | £195 | £171 | £366 |
| Generalised anxiety disorder | 5430 | 2612 | 8042 | 27 793 | 16 048 | 43 841 | £95 | £88 | £183 |
| Depressive episode | 3235 | 1532 | 4767 | 16 480 | 9283 | 25 863 | £57 | £52 | £109 |
| All phobias | 1425 | 618 | 2043 | 7236 | 3800 | 11 035 | £25 | £21 | £46 |
| Obsessive compulsive disorder | 1521 | 799 | 2320 | 7752 | 4523 | 12 275 | £27 | £25 | £52 |
| Panic disorder | 876 | 751 | 1628 | 4677 | 4628 | 9306 | £15 | £25 | £40 |
| Psychotic disorder |
| Schizophrenia delusional | 112 | 50 | 162 | 566 | 306 | 871 | £0.5 | £0.4 | £0.9 |
| 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 |
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 that 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 for 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 interventions to stop smoking and reduce harm. Smoking cessation is one of the most cost-effective public health interventions, and an estimated incremental cost per quality-adjusted life-year of between £221 and £9515, which is considerably lower than the informal NICE threshold for cost effective NHS treatments (£20 000 per quality-adjusted life-year). Data based on NHS Stop Smoking Services suggests that the cost per Quitter was £220 in the UK in 2010/11, whereas the estimated average healthcare costs and productivity losses presented in this study were more than £650 per person annually due to smoking. However, the effectiveness of smoking cessation interventions may differ in people with mental disorders compared with the general population owing to heavy addiction to nicotine among people with mental disorders. 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 SMDs was obtained from a study conducted in 1996. Thus, we conducted a sensitivity analysis to test the impact of variation in the smoking rate among 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. 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 the increased metabolism of some psychotropic drugs in smokers. It is reported that the excess psychotropic medicine costs to the NHS due to smoking are £40 million. On the other hand, non-smokers live longer than smokers and impose a greater burden on healthcare resources, especially at older ages. However, there is evidence that in the general population smoking is an economic burden to the society even when considering non-smokers’ longer life expectancy. Further research is needed to examine more closely the long-term cost of smoking and smoking cessation among 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 interventions to stop smoking in this group should be a high priority. This economic case augments the ethical and clinical imperative of dealing with smoking more systematically and effectively in this group and is over and above the health benefits of improved quality and quantity of life after stopping smoking.

### What this paper adds

- This study estimated the economic costs of the health effects of cigarette smoking among 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 showed 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.

### Acknowledgements

This work 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. A less detailed version of the results was published in a report to the RCP. The paper is not being considered for publication elsewhere.

### Contributors

QW designed the method and conducted the analyses, drafted and revised the manuscript. She is guarantor. LS collected data and revised the draft. JB planned the study, drafted and revised the manuscript. SP planned the study, designed the methods, drafted and revised the manuscript.

### Funding

The study was undertaken within the UK Centre for Tobacco Control Studies, with funding from the British Heart Foundation, Cancer Research UK, the Economic and Social Research Council, the Medical Research Council and the Department of Health.

### Competing interests

The authors (QW, LS, JB and SP) are members of the UK Centre for Tobacco and Alcohol Studies. The Centre is a UK Clinical Research Collaboration (UKCRC) Centre of Public Health Research Excellence with funding...
REFERENCES

1 McManus S, Meltzer H, Brugha T, et al. Adult psychiatric morbidity in England, 2007. Results of a household survey. London: The NHS Information Centre for Health and Social Care, 2009.

2 Meltzer H, Gill B, Pettigrew M. Economic activity and social functioning of residents with psychiatric disorders (OPCS Surveys of Psychiatric Morbidity in Great Britain, Report 6). London: HMSO, 1996.

3 Centre for Mental Health. The economic and social costs of mental health problems in 2009/10. London: Centre for Mental Health, 2010.

4 Allender S, Balakrishnan R, Scarborough P, et al. The burden of smoking-related ill health in the UK. Tob Control 2009;18:262–7.

5 Callum C, White P. Tobacco in London: the preventable burden. London: SmokeFree London and The London Health Observatory, 2004.

6 The Royal College of Physicians. Smoking and mental health. London: RCP, 2013.

7 World Health Organization. Economics of tobacco toolkit: assessment of the economic costs of smoking. Geneva: World Health Organization, 2011.

8 Curtis L. Unit Costs of Health and Social Care 2010. Kent: Personal Social Services Research Unit (PSSRU), 2010.

9 Couthard M, Farrell M, Singleton N, et al. Tobacco, alcohol and drug use and mental health. London: TSO, 2002.

10 Levin ML. The occurrence of lung cancer in man. Acta Unio Int Contra Cancrum. 1953;9:531–41.

11 The NHS Information Centre. Lifestyles Statistics. Statistics on Smoking: England, 2010. London: The NHS Information Centre, 2010.

12 Hospital Episodes Statistics (HES), Hospital Episodes Statistics: primary diagnosis. London: The NHS Information Centre, 2011. http://www.hesonline.org.uk

13 Department of Health. NHS reference costs 2009–2010. London: Department of Health, 2011. https://www.gov.uk/government/publications/nhs-reference-costs-2009–2010 (accessed 4 Jun 2013).

14 Callum C, Boyle S, Sandford A. Estimating the cost of smoking to the NHS in England and the impact of declining prevalence. Health Econ Policy Law 2011;6:489–508.

15 The NHS Information Centre, Prescribing and Primary Care Services. Prescriptions Dispensed in the Community: England, Statistics for 2000 to 2010. London: The Health and Social Care Information Centre, 2011.

16 Hippisley-Cox J, Vinogradova Y. Trends in consultation rates in general practice 1995 to 2008: analysis of the QResearch database. Final Report to the NHS Information Centre and Department of Health. London: The NHS Information Centre, 2009.

17 ISD Scotland. Outpatient Activity, Hospital Care. 2011. http://www.isdscotland.org/Health-Topics/Hospital-Care/Outpatient-Activity/ (accessed 10 Jul 2013).

18 Welsh Government. NHS Outpatient Activity. 2011. http://wales.gov.uk/statistics-and-research/?lang=en (accessed 10th July 2013).

19 Bunn WB 3rd, Stave GM, Downs KE, et al. Effect of smoking status on productivity loss. J Occup Environ Med 2006;48:1099–108.

20 Meltzer H, Singleton N, Lee A, et al. The social and economic circumstances of adults with mental disorders. London: The Stationery Office, 2002.

21 Weng SF, Ali S, Leonard-Bee J. Smoking and absence from work: systematic review and meta-analysis of occupational studies. Addiction 2013;108:307–19.

22 Office for National Statistics. 2010 Annual Survey of Hours and Earnings. Newport: Office for National Statistics, 2010.

23 Office for National Statistics. Mortality Statistics: deaths registered in England and Wales (Series DR), 2010. http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77%23230730 (accessed 10th July 2013).

24 Thompson C. Mental Health Bulletin: Annual report from MHMDS returns—England 2011–12, initial national figures. London: Community and Mental Health team, Health and Social Care Information Centre, 2013.

25 Lawrence D, Hancock KJ, Kisely S. The gap in life expectancy from preventable physical illness in psychiatric patients in Western Australia: retrospective analysis of population based registers. BMJ 2013;346:f2539.

26 NICE. Guide to the methods of technology appraisal [online]. http://www.nice.org.uk. 2008

27 Nash R, Featherstone H. Cough up: Balancing tobacco income and costs in society. Policy Exchange, 2010. http://www.policyexchange.org.uk/images/attachments/cough%20up%20-%20march%202010.pdf (accessed 15 Jul 2013).

28 Woolacott N, Jones L, Forbes C, et al. The clinical effectiveness and cost effectiveness of bupropion and nicotine replacement therapy for smoking cessation: a systematic review and economic evaluation. Health Technol Assess 2002;6:1–245.

29 The Health And Social Care Information Centre. Statistics on Smoking: England, 2013. http://www.hscic.gov.uk/catalogue/PUB11454 (accessed 15 Oct 2013).

30 Rasmussen SR, Prescott E, Soerensen TI. The total lifetime costs of smoking. Eur J Public Health 2004;14:95–100.