Neglected burden of obstructive sleep apnoea: workplace productivity loss in the USA and UK

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To cite: Rehman U, Ahn Y, Yerushalmi E, *et al*. *Thorax* Epub ahead of print: [*please include* Day Month Year]. doi:10.1136/thorax-2025-223550

ABSTRACT

This study estimates the prevalence and workplace productivity burden of obstructive sleep apnoea (OSA) syndrome in the UK and USA, using self-reported breathing pauses and excessive daytime sleepiness as a proxy. The prevalence of OSA syndrome was 22.8% in the USA and 19.5% in the UK. Annual productivity losses were estimated at US$180.2 billion in the USA and £4.22 billion in the UK. In the UK and USA, individual-level productivity losses exceeded the cost of continuous positive airway pressure (CPAP) treatment, suggesting that improved identification, access to treatment and adherence could yield significant economic benefits in both countries.

BACKGROUND

Over the past 30 years, shifts in demographics, lifestyle and healthcare have driven a growing burden of non-communicable diseases, particularly obesity—a major risk factor for obstructive sleep apnoea (OSA), a serious but under-recognised sleep disorder.[1] According to Benjafield *et al*,[2] OSA affects an estimated 1 billion adults worldwide, with prevalence rates of 24.5% in the UK and just over 30% in the USA.[2] In the UK the Sleep Apnoea Trust (2024) acknowledges there is a lack of accurately reported prevalence estimates specific to the UK working-age population[3] and the diagnosis and treatment rates of OSA remain low.[1–3]

The burden of OSA is further exacerbated by poor adherence to treatment. Recent research shows that 62% of patients discontinue CPAP therapy, compounding both the health and economic impacts.[4] This non-adherence has also been linked to increased absenteeism due to sick days.[5]

This study aims to estimate the prevalence of OSA in representative samples of the UK and USA populations using self-reported symptom data aligned with diagnostic criteria. It also assesses the societal costs of untreated OSA among working-age adults by applying a productivity-based approach that accounts for both absenteeism (missed work) and presenteeism (reduced on-the-job performance). This pragmatic, policy-relevant perspective complements traditional health economic models and addresses key evidence gaps in both countries to support informed policy reforms.

METHODS

In this study, 4218 subjects from the 2021 US census and 1378 subjects from the 2021 UK census belonging to the non-institutionalised population aged 18 years and above were used as the standard population. An electronic interview was conducted with this sample of individuals' representative of the USA and UK population via Dynata (Connecticut, USA) during November 2021. Overall, 695 US entries and 538 UK entries were excluded from analysis due to lack of data. This resulted in a total sample of 3523 US and 840 UK subjects for analysis.

OSA syndrome definition

Respondents who reported experiencing breathing pauses at night, along with excessive daytime sleepiness on three or more nights, were used as a proxy for an OSA syndrome diagnosis, as both symptoms form the core criteria for OSA syndrome diagnosis according to the International Classification of Sleep Disorders, Third Edition.[6]

Economic impact analysis

To assess the USA and UK specific workplace productivity burden associated with OSA, a computable general equilibrium (CGE) macroeconomic model was applied. Such models are increasingly applied to estimate the economy-wide burden of health conditions.[7] The model's technical details are explained in Hafner *et al*.[8] The CGE model simulates the workplace productivity burden of OSA syndrome associated with workplace productivity among individuals in the workforce, defined here as those aged 18–64 years. It uses the prevalence of breathing pauses coupled with excessive daytime sleepiness from the survey as a proxy for OSA syndrome (see online supplemental methods, references 1-10). The productivity impairment inputs to the model are based on Stepnowsky *et al*.[67]

RESULTS

The prevalence of OSA syndrome was 22.8% in the USA and 19.5% in the UK. Nearly 30% of the US working population and 7% of the UK working population aged 18–64 met the study criteria for OSA syndrome (table 1, online supplemental tables 1–3, online supplemental results).

Based on the estimated prevalence of OSA syndrome in the working population, the total annual productivity loss in the USA was calculated at US$180.2 billion (table 2). At the individual level, this corresponds to an estimated productivity loss of US$3727.40 per worker with OSA syndrome per year, measured in terms of gross domestic product (GDP). In comparison, the

Table 1 Demographic characteristics of sample

	Total, USA (n=3625)	Total, UK (n=840)
Age in years		
18–24	155 (4.3%)	109 (13.0%)
25–34	665 (18.3%)	131 (15.6%)
35–44	464 (12.8%)	135 (16.1%)
45–54	613 (16.9%)	120 (14.3%)
55–64	516 (14.2%)	110 (13.1%)
65–74	701 (19.3%)	119 (14.2%)
75 or older	511 (14.1%)	116 (13.6%)
Gender		
Female	1895 (52.3%)	434 (51.7%)
Male	1730 (47.7%)	406 (48.3%)
Marital status		
Single	1000 (27.6%)	289 (34.4%)
Married	1975 (54.5%)	445 (53.0%)
Separated or divorced	418 (11.5%)	70 (8.3%)
Widowed	232 (6.4%)	36 (4.3%)
Ethnicity		
White	2847 (78.5%)	764 (91.0%)
American Indian/Alaska Native	30 (0.8%)	0 (0.0%)
Asian	230 (6.3%)	32 (3.8%)
Hispanic/Latino	111 (3.1%)	0 (0.0%)
Black/African American/black British	294 (8.1%)	27 (3.2%)
Middle Eastern	12 (0.3%)	0 (0.0%)
Native Hawaiian or other Pacific Islander	9 (0.2%)	0 (0.0%)
Mixed race	0 (0.0%)	14 (1.7%)
Prefer not to answer	59 (1.6%)	2 (0.2%)
Unknown	23 (0.6%)	1 (0.1%)
Missing	10 (0.3%)	0 (0.0%)
Smoking status		
Current smoker/chewing tobacco	1062 (29.3%)	246 (29.3%)
Never smoked/chewed tobacco	1845 (50.9%)	353 (42.0%)
Ex smoker/previous tobacco chewing	718 (19.8%)	241 (28.7%

Table 2 Workplace productivity burden of OSA in the USA (US$, 2022)

	GDP			Tax revenue		
Prevalence	US$ (2022), billion	%	US$ (2022), per person	US$ (2022), billion	%	US$ (2022), per person
1%	6.03	0.03	3739.4	2.02	0.03	1252.9
2%	12.05	0.06	3739.0	4.04	0.06	1252.8
3%	18.07	0.09	3738.6	6.06	0.08	1252.6
4%	24.09	0.13	3738.1	8.07	0.11	1252.5
5%	30.11	0.16	3737.7	10.09	0.14	1252.4
6%	36.13	0.19	3737.3	12.11	0.17	1252.2
7%	42.15	0.22	3736.9	14.12	0.19	1252.1
8%	48.17	0.25	3736.5	16.14	0.22	1252.0
9%	54.18	0.28	3736.1	18.15	0.25	1251.8
10%	60.19	0.31	3735.7	20.17	0.28	1251.7
11%	66.21	0.34	3735.2	22.18	0.30	1251.5
12%	72.22	0.38	3734.8	24.20	0.33	1251.4
13%	78.23	0.41	3734.4	26.21	0.36	1251.3
14%	84.24	0.44	3734.0	28.22	0.39	1251.1
15%	90.24	0.47	3733.6	30.24	0.41	1251.0
16%	96.25	0.50	3733.2	32.25	0.44	1250.8
17%	102.25	0.53	3732.8	34.26	0.47	1250.7
18%	108.25	0.56	3732.3	36.27	0.50	1250.6
19%	114.26	0.59	3731.9	38.28	0.52	1250.4
20%	120.26	0.62	3731.5	40.29	0.55	1250.3
21%	126.26	0.66	3731.1	42.30	0.58	1250.2
22%	132.25	0.69	3730.7	44.31	0.60	1250.0
23%	138.25	0.72	3730.3	46.32	0.63	1249.9
24%	144.24	0.75	3729.9	48.33	0.66	1249.7
25%	150.24	0.78	3729.4	50.34	0.69	1249.6
26%	156.23	0.81	3729.0	52.35	0.71	1249.5
27%	162.22	0.84	3728.6	54.35	0.74	1249.3
28%	168.21	0.87	3728.2	56.36	0.77	1249.2
29%	174.20	0.90	3727.8	58.37	0.80	1249.0
30%	180.19	0.94	3727.4	60.37	0.82	1248.9

GDP, gross domestic product; OSA, obstructive sleep apnoea.

annual cost of CPAP treatment per patient in the USA is estimated at US$1660.97 (online supplemental reference 11).

The total annual productivity loss due to OSA syndrome in the UK was estimated at £4.22 billion, representing 0.2% of the national GDP (table 3). On an individual level, the annual productivity cost per worker with OSA is approximately £1840. In comparison, the cost of CPAP treatment, including associated healthcare resources and supportive care, is estimated at £1363 per patient (online supplemental reference 12).

DISCUSSION

The economic costs we have estimated in the UK and USA are in accordance with similar reports from Australia which demonstrated a $A11 billion cost from productivity losses.[9] Effective identification and treatment of OSA syndrome among the UK and USA working population could yield substantial economic benefits. However, these benefits are unlikely to be fully realised without addressing the widespread issue of poor CPAP adherence, as highlighted by Dielesen *et al*.[3] Enhancing adherence through earlier and more frequent follow-ups after therapy initiation is essential to maximise treatment effectiveness and reduce productivity losses associated with undiagnosed or poorly managed OSA. However, achieving meaningful impact also depends on effective patient education and sustained CPAP adherence. Continued CPAP use has been associated with a reduced proportion of individuals requiring long-term sick leave, thereby reducing absenteeism and the risk of permanent work disability.[5]

It is important to note that the estimated workplace productivity burden does not account for the impact on healthcare systems due to increased medical expenditures, nor does it include the costs of road traffic or workplace accidents, which can result in elevated morbidity and mortality risks.[10] The exclusion of these additional cost elements likely leads to an underestimation of the true workplace productivity burden of OSA from a societal perspective. Our analysis, though

Table 3 Workplace productivity burden of OSA in the UK (£, 2022)

	GDP			Tax revenue		
Prevalence	£ (2022), billion	%	£ (2022), per person	£ (2022), billion	%	£ (2022), per person
1%	0.61	0.03	1847.0	0.22	0.03	684.0
2%	1.21	0.06	1846.8	0.45	0.06	683.9
3%	1.82	0.09	1846.6	0.67	0.09	683.8
4%	2.42	0.11	1846.4	0.9	0.11	683.8
5%	3.02	0.14	1844.8	1.12	0.14	682.4
6%	3.62	0.17	1842.4	1.34	0.17	680.2
7%	4.22	0.2	1840.6	1.56	0.2	678.6
8%	4.82	0.23	1839.3	1.78	0.23	677.4
9%	5.42	0.26	1838.1	2.00	0.25	676.4
10%	6.02	0.28	1837.2	2.21	0.28	675.7
11%	6.62	0.31	1836.4	2.43	0.31	675.0
12%	7.22	0.34	1835.7	2.65	0.34	674.4
13%	7.82	0.37	1835.1	2.87	0.36	674.0
14%	8.42	0.40	1834.6	3.09	0.39	673.5
15%	9.02	0.42	1834.1	3.31	0.42	673.2
16%	9.61	0.45	1833.6	3.53	0.45	672.8
17%	10.21	0.48	1833.2	3.75	0.48	672.5
18%	10.81	0.51	1832.8	3.97	0.50	672.3
19%	11.41	0.54	1832.4	4.18	0.53	672.0
20%	12.01	0.56	1832.0	4.40	0.56	671.8
21%	12.61	0.59	1831.7	4.62	0.59	671.5
22%	13.20	0.62	1831.4	4.84	0.61	671.3
23%	13.80	0.65	1831.0	5.06	0.64	671.1
24%	14.40	0.68	1830.7	5.28	0.67	671.0
25%	15.00	0.71	1830.4	5.50	0.70	670.8
26%	15.59	0.73	1830.2	5.71	0.73	670.6
27%	16.19	0.76	1829.9	5.93	0.75	670.5
28%	16.79	0.79	1829.6	6.15	0.78	670.3
29%	17.39	0.82	1829.4	6.37	0.81	670.2
30%	17.98	0.85	1829.1	6.59	0.84	670.0

GDP, gross domestic product; OSA, obstructive sleep apnoea.

limited to a small subset of OSA-related costs, highlights that the broader workplace productivity burden of OSA syndrome likely exceeds the direct costs of screening and effective treatment in both the UK and USA.

LIMITATIONS

This study has some limitations. OSA was identified using proxy measures, including breathing pauses and excessive daytime sleepiness, based on the International Classification of Sleep Disorders.[6] Without objective assessment such as the Apnoea-Hypopnoea Index, we cannot confirm OSA severity or exclude alternative causes of sleepiness. Hence, it relies on self-reported symptoms, which introduces potential for recall bias and misclassification. However, while based on estimates rather than confirmed diagnoses, the prevalence of OSA in our study aligns with that reported in the literature.[2]

CONCLUSION

Given the significant yet often-overlooked burden of OSA syndrome and its economic impact, we urge policymakers to allocate resources towards developing an effective screening strategy and implementing targeted public health campaigns and policies. Early identification and treatment of OSA syndrome, along with proactive early follow-up, could result in substantial savings, potentially amounting to billions of dollars/pounds annually in productivity costs.

Contributors UR, YA, ML, MH and EY conducted the data analysis, were involved in study design and conception, manuscript preparation and editing. NEL and MMO: involved in study design and conception, manuscript preparation and review. MA, NEL, JL, LS, FCH, RC, MLC, BK and RC prepared and reviewed the final manuscript. ML is the guarantor of the manuscript.

Funding We would like to acknowledge the Isackson Family Foundation and the Stanford H&N Surgery Research Fund for their support of this work.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants, but it was confirmed that ethical approval was not required for this study (because the survey population consisted of adults aged 18 years and over from non-vulnerable groups). Participation was entirely voluntary, and informed consent was obtained through the completion of the survey. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement The data that support the findings of this study are available from the corresponding author upon reasonable request.

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