White Paper
January 2022

Sleepio in a large Fortune 50 workforce: a health care cost evaluation

Sponsored by Big Health Inc.
The research was led by Dr. Michael Darden, Associate Professor of Economics at the Carey Business School at Johns Hopkins University, who designed the study, conducted all analyses, and provided the results for this study. Drs. Christopher Miller and Jenna Carl contributed to editing and final approval of the report.

Michael Darden, PhD
Associate Professor of Economics at the Carey Business School at Johns Hopkins University.

Christopher B. Miller, PhD
Research Lead at Big Health Inc. and Honorary Senior Research Fellow at the University of Oxford

Jenna R. Carl, PhD
Chief Medical Officer at Big Health Inc.

Big Health

Contents

Key points

- Poor sleep and insomnia are common and can also be symptoms of other mental health disorders. Both are associated with increased health care claim costs, which employers and health plans pay for.
- Digital therapeutics can be effectively delivered to all employees to improve sleep and employer costs.
- Employees who used Sleepio, an evidence-based digital therapeutic for poor sleep and insomnia available via web and mobile applications, had 19.6% lower overall health care costs compared to a matched sample of employees who did not use the therapeutic.
- Those with greater sleep difficulty and insomnia symptoms had an even larger reduction in overall health care claim costs than those with less sleep difficulty and insomnia symptoms.

Executive Summary

Sleep difficulty and insomnia are common and affect nearly one third of adults in the US (Roth et al., 2011). Recently, 56% of adults have reported sleep disturbances since the start of the pandemic (AASM, 2021). This is a serious concern because sleep is fundamentally important for physical health, well-being and mental health (Kyle & Henry, 2017). Sleep is also important for employee work performance and is known to impact employer costs because of increased absenteeism and impaired productivity in employees with insomnia. If unaddressed, sleep difficulty and insomnia can result in significant costs for self-funded and fully insured employer-based health plans. This is because employees with sleep difficulty have been found to have increased health care claim costs than employees who do not have problems with sleep (Sarsour et al., 2011).

Cognitive behavioral therapy (CBT) for insomnia is recommended by the American College of Physicians as the first-line treatment for sleep difficulty associated with insomnia (Qaseem et al., 2016). Access to CBT, however, is difficult because of a lack of trained therapists (Thomas et al., 2016). Sleepio(™) is a fully automated and evidenced-based digital therapeutic for poor sleep and insomnia available via web and mobile applications, and does not require trained therapists to deliver it. In previous work, Sleepio has been found to be a cost-effective solution for insomnia (Darden et al., 2021) with reductions in employee health care costs for employees who used Sleepio (Miller et al., 2020). The aim of this study was to replicate these previous results in a new and large sample of employees from one of the biggest retailers in the United States.

In this study, Big Health partnered with a large retailer and Professor Michael Darden of Johns Hopkins University, who designed this study, analyzed the data and provided the study results. The study included medical claims information from over 8,000 employees across two years and compared health care claim costs for those who used Sleepio with a similar group of employees who did not use Sleepio. Those who used Sleepio had 19.6% lower overall health care claim costs compared with a matched sample of employees who did not, and this was statistically significant ($p=0.041$), at $58.30/month or $699.60/year per person. Additionally, health care savings for those who used Sleepio accelerated over time. Those with greater sleep difficulty and symptoms of insomnia were found to have greater reductions in health care costs. This is the second real-world study of Sleepio to evaluate differences in health care costs in a large number of employees. Together, these results further support the hypothesis that Sleepio use leads to reductions in health care claim costs relative to similar employees who do not use Sleepio.

Introduction

Background

Sleep difficulty is common in the US and impacts 30% of the population (Roth et al., 2011). Sleep is a national public health concern because 56% of adults have recently reported disturbances to sleep since the start of the pandemic (AASM, 2021). Sleep is important because it is fundamental to physical health, well-being and mental health (Kyle & Henry, 2017). If left untreated, sleep difficulty and insomnia are associated with increased risk of and worsening of physical and mental health conditions that are expensive and difficult to treat. Conditions include cardiovascular disease (Javaheri et al., 2017), Type-2 diabetes (Lin et al., 2018), and mental health disorders including depression and anxiety (Hertenstein et al., 2019). Indeed, employees with sleep difficulty and insomnia exhibit higher health care claim and productivity costs compared to those without sleep problems (Sarsour et al., 2011). Ozminkowski and colleagues (2007) found that those with insomnia have increased overall direct medical expenditures and higher absenteeism costs compared with similar people who do not have insomnia. Sleep difficulty has also been found to be expensive to employers because of reduced workplace performance, work errors and an increased risk of work-related accidents and motor vehicle collisions (Sarsour et al., 2011; Shahly et al., 2012; Morin et al., 2020). Employers pay for these costs through impaired employee work performance (increased absenteeism and impaired productivity), and through higher employee health care claim costs in self-funded and fully insured employer-based health plans.

Cognitive behavioral therapy (CBT) for insomnia is recommended by the American College of Physicians as the first-line treatment for insomnia (Qaseem et al., 2016). CBT is, however, difficult for employees to access because of a lack of trained therapists (Thomas et al., 2016). Telehealth delivery has been suggested as a potential solution, however, trained therapists are still required to deliver treatment and there are not enough therapists to meet demand. Sleepio is a fully automated digital therapeutic solution and offers a scalable and evidence-based way to access cognitive and behavioral techniques through internet- and smartphone-delivered digital devices. Because Sleepio is fully automated and does not require a trained therapist, it is ideally placed to provide full and instant access to CBT for large populations of employees and health plans. Importantly, Sleepio has been extensively studied in 12 randomized controlled trials and results have consistently found it to be both safe and effective for those with sleep difficulty and insomnia (Barnes et al., 2017; Bostock et al., 2016; Cheng et al., 2019; Denis et al., 2020; Espie et al., 2012; Espie et al., 2019; Freeman et al., 2017; Felder et al., 2020; Kalmbach et al., 2020; Kyle et al., 2020; McGrath et al., 2017; Pillai et al., 2016). Studies show significant improvements to sleep difficulty and insomnia, which are clinically meaningful and may be as beneficial as traditional face-to-face therapy (Espie et al., 2019; Soh et al., 2020). Sleepio, therefore, allows employers to provide population level access to first line CBT treatment for sleep difficulty and insomnia for all employees.

Introduction cont.

Sleepio has the potential to be a cost-effective treatment solution. When the benefits and costs of providing Sleepio and further insomnia treatments were modelled at a population level, using a quantitative simulation model, Sleepio was found to be cost-beneficial. Relative to no treatment for insomnia, a common situation because of difficulty with treatment access, the dollar benefits from offering Sleepio were found to be greater than the cost of the therapeutic. Sleepio was also found to be more cost-effective than both therapist-delivered CBT and medications for insomnia and sleep difficulty (Darden et al., 2021). Results highlight that Sleepio may have the potential to generate a positive return on investment after only six months (Darden et al., 2021). It is therefore more cost effective to give access to Sleepio for those with sleep difficulty and insomnia than to do nothing. A previous report evaluated health care claim costs of employees of a large Fortune 500 insurance company who accessed Sleepio. Employees who used Sleepio were associated with overall lower costs compared with a group of matched employees who were similar and did not use Sleepio (Miller et al., 2020). The aim of this current report was to replicate previous work by further evaluating the potential for Sleepio to lower health care claim costs in a large sample of employees at a Fortune 50 retail company.

Study objective

The objective of this study was to evaluate health care cost savings in a large sample of employees who used Sleepio compared with similar employees who did not use Sleepio. This study examined health claims over a 24 month time period for both groups in order to provide payers with further real world evidence of health care cost savings with Sleepio.

Methodology

The present study aimed to compare health care claim costs for employees who used Sleepio versus a matched control group of similar employees who did not (controls). The hypothesis was that medical claim costs would show reductions over time in employees who used Sleepio relative to controls. To test this hypothesis, Dr Darden studied medical claims information from employees. Monthly claims data on over 8,000 employees were provided to Big Health. These data were processed into clinical and subclinical diagnoses and dollar expenditure data. Professor Michael Darden of Johns Hopkins University designed the study and conducted all empirical work.

Study participants

Big Health partnered with a large employer to offer Sleepio to its employees in April of 2019. De-identified medical claims information was obtained from employees between April of 2018 and March of 2020. The study focused on employees who were consistently employed throughout this period. For each employee, data consisted of 24 observations, one for each month over a two year period. In addition to health care information, data include demographic and socioeconomic characteristics. Sleepio was made available as a mental health benefit for employees from April 2019 onwards, and the characteristics of those who used Sleepio may be different from those who did not. To adjust for this, a weighting scheme was used to match people by demographic characteristics and claims (total, inpatient, and outpatient claims) information before Sleepio (April 2018–March 2019). This means that people who used Sleepio were closely matched to control employees who did not use Sleepio for health care claims, demographic and socioeconomic characteristics and Table 1 displays this information for both groups. In addition to the overall study sample, a sub-sample of those who indicated symptoms of insomnia and sleep difficulty, identified as those scoring less than or equal to 2.5 on the validated 2-item version of the Sleep Condition Indicator (SCI-2; Luik et al., 2019), with this score indicative of poor sleep and insomnia.

Methodology cont.

Health care cost outcomes

This study used de-identified health care expenditure and usage information from each employee. The study used information on the number of health care claims, the type of facility, the type of provider, and the net amount paid for each claim (see Table 2 for an overview). Data were aggregated into several health care domains at the monthly level. First, a measure of total spending was constructed by summing the full net payment amount for all claim costs for an individual in one month. Next, information on the type of facility and condition was used to construct domain level total spending with respect to inpatient, outpatient, emergency department and office-based checkup claim costs. Third, spending for a sub-sample of employees with symptoms of insomnia, determined by scores on the 2-item Sleep Condition Indicator (SCI-2), was also evaluated. Monthly expenditure data were evaluated by each employee for each month between April 2018 and March 2020. Employees had the option to use Sleepio from April 2019 onwards.

Statistical analysis

This study used a difference-in-differences (DiD) design, a common research design in the health economic literature, to identify the effect of Sleepio on health care expenditures. DiD recognizes that those who chose to use Sleepio may be different from those who did not use Sleepio (i.e., control individuals). This method also recognizes that the year after Sleepio was introduced may be different than the year prior with respect to health care prices or other factors determining expenditures. The DiD approach allows matching between those who use Sleepio to similar people who did not use Sleepio for demographic, health and health care spend information (see Table 1) before the start of Sleepio. The DiD estimator then compares the change in expenditures over time before and after Sleepio was introduced for those who used Sleepio to the same change for those who did not. The DiD design helps to construct the counterfactual trend in health care expenditures had Sleepio never been introduced. That is, DiD measures the deviation from the trend in expenditures for Sleepio users and non-users. If the DiD estimate is negative, it means that Sleepio likely caused expenditures to decline (or grow less quickly) relative to non-users. Because these data were at the individual/month level, the DiD estimate reflected the expected difference in expenditures per month for Sleepio users relative to non-users.

Results

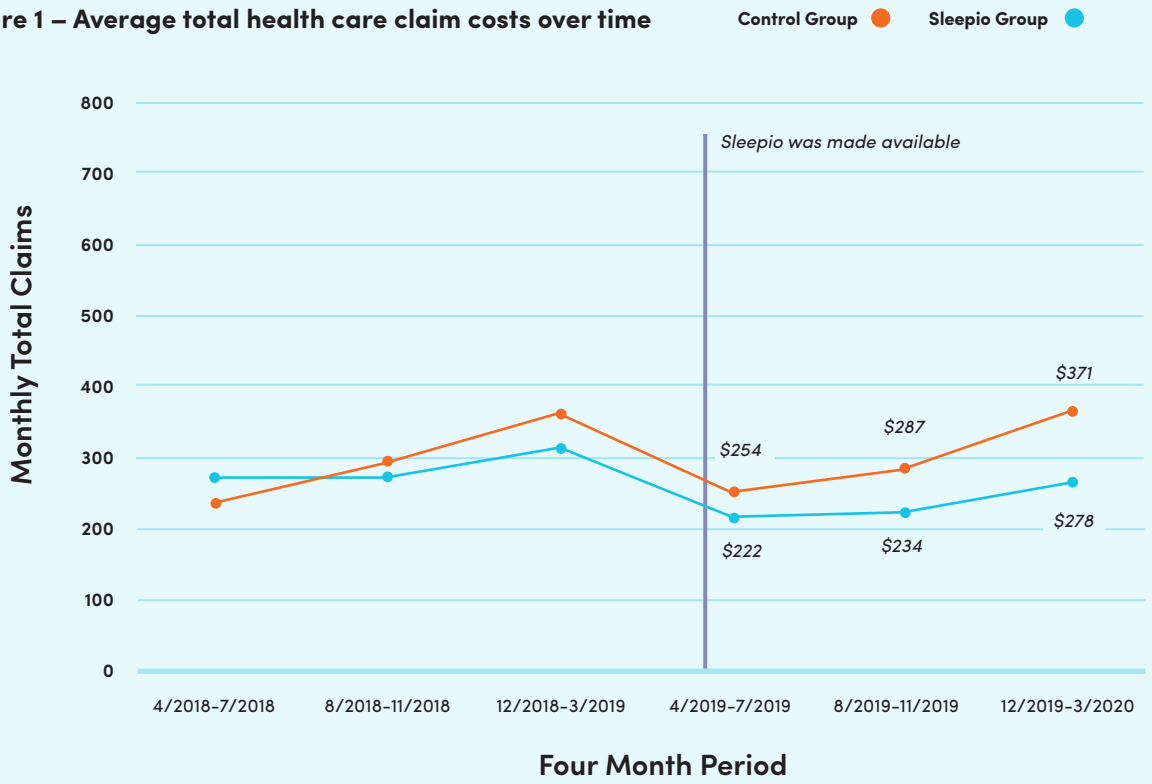
Sample population

Monthly medical claims records of 8,509 employees for two years were analyzed. Of these employees, 4,459 had information on the SCI-2 sleep score, and 1,494 enrolled and progressed in the Sleepio program. In addition to health care claims information, data included information on demographic (age and female gender) and socioeconomic characteristics (work experience, salary, health insurance option, etc.). Characteristics of the sample are shown in Table 1.

Sleepio was associated with reduced health care costs for users

Figure 1 displays the main average DiD results of total monthly claims in dollars over time. The blue line indicates when Sleepio was made available to employees in April 2019. Left of the blue line, the trend is similar for both groups and indicates comparable levels of monthly health claim costs suggesting that they were successfully matched. On the right-hand side, the group who use Sleepio had overall lower costs than those who did not (controls) with consistently lower total claim costs over time. Those in the control group, however, experience

Figure 1 – Average total health care claim costs over time



Results cont.

a trend increase in total monthly claims. Overall, this means that the Sleepio group had 19.6% lower total annualized claims after Sleepio and this was statistically significant (p=0.041), at $58.30/month or $699.60/year per person.

Cost savings associated with Sleepio accelerated over time

As displayed in Figure 1, results also showed that health care cost savings associated with Sleepio accelerated over time. Specifically, in the 4 month period starting 8 months after using Sleepio, and relative to the 12 month baseline, the Sleepio group had 31% lower total claims compared with controls, and this was statistically significant (p=0.034), at $87/month. These findings indicated that Sleepio may continue to achieve greater cost savings over time.

Lower costs and health care utilization across categories with Sleepio

The effects of Sleepio for subcategories of claims, including outpatient, inpatient, emergency, and office-based visit claim costs are presented in Table 3. Table 3 shows the average percent change for Sleepio users in the last four month period of the year after the introduction of Sleepio relative to the full 12-month period prior to Sleepio. Results show that both inpatient and outpatient claim costs were lower in those who used Sleepio than in controls and these cost categories contribute towards the overall reduction in total health care costs.

Those with greater sleep difficulty have larger cost savings

The study then looked to establish whether individuals who had greater levels of sleep problems, identified from a validated questionnaire assessment of sleep difficulty (SCI-2), had more to gain in terms of cost savings. Results are displayed in Table 3 and indicate that those who used Sleepio, and had greater sleep difficulty, experienced the largest reductions in total claims of $154/month or $1,848 if annualized.

Summary

Employees who use Sleepio have lower overall health care costs

Employees who used Sleepio, an evidence-based digital therapeutic for poor sleep and insomnia available via web and mobile applications, had 19.6% lower overall health claims costs after Sleepio and this was statistically significant (p=0.041), at $58.30/month or $699.60/year per person compared with similar employees who did not use Sleepio. Results suggest health care costs were driven by reductions in inpatient and outpatient spend in employees who used Sleepio. Cost benefits increased over time and the greatest cost benefit was found after eight months from the introduction of Sleepio. Employees with greater sleep difficulty exhibited the greatest gains in cost benefits.

This appears to be the largest study to evaluate the effects of a fully automated evidence-based digital therapeutic for poor sleep and insomnia on health care costs in a real world employer setting. The study replicated previous findings which observed similar savings in health care costs for employees who used Sleepio compared with matched controls (Miller et al., 2020). In UK health care settings, Sleepio also saved health care spending by reducing prescription medication costs (Sampson et al., 2021). These replicated real world results support findings from a quantitative model, which highlight the potential cost savings of Sleepio when delivered at a population scale in the US (Darden et al., 2021). Together, these studies provide strong evidence that Sleepio is associated with reductions to health care costs in employer settings. Maintaining good quality and healthy sleep is vital for physical health, well-being and mental health (Kyle & Henry, 2017) and results here reflect the cost benefit of better sleep.

Several study limitations should be considered. The durability of the study results should be evaluated for more than one year in future reports by including longer follow-up assessments. The study was unable to identify which type of specific health claims may have changed over time. In addition, the control group was matched from the overall employee population who were not assessed for their sleep difficulty with the SCI-2 sleep score assessment.

Summary cont.

Implications for future work

Health care costs are associated with sleep difficulty, insomnia, and further mental health disorders. Improvements to sleep with a fully automated digital therapeutic appear to lower employee health claim costs. Future work should now aim to evaluate which specific types of health care claims may change and whether there are different real-world cost savings in different occupational settings (knowledge workers, service providers and industrial workers). Employers are also impacted by further employee costs relating to sleep loss and this includes impaired work performance, absenteeism and risk of workplace accidents and errors (Sarsour et al., 2011; Shahly et al., 2012; Darden et al., 2021). The study does not report the effects for other important economic outcomes (e.g., employee productivity), and future work should also aim to evaluate these. From a previous health economic model, the impact on these further outcomes may significantly contribute to the total return on investment for those who use Sleepio (Darden et al., 2021). Together, identified health care cost savings and savings from better work performance, less absenteeism and fewer work-related accidents all have the potential to produce a substantial return on investment for payers.

Table 1 - Demographic and health outcomes between groups.

Group	Control Employees	Sleepio Employees
Number of Employees	n=7,015	n=1,494
Average Monthly Claim Costs ($)		
Total Claims	298.12	297.97
Inpatient Claims	84.11	84.01
Outpatient Claims	213.12	213.07
ER Claims	15.16	15.16
Office-based Checkup Claims	32.76	32.76
Mental Health Claims	8.97	8.97
Age (Years)	40.707	40.707
Female (Proportion)	0.588	0.588
Annual Salary ($10,000s)	11.267	11.267
Health Insurance Coverage		
Employee Only	0.435	0.435
and Family	0.309	0.309
and Spouse	0.100	0.100
and Children	0.156	0.156
Experience (Months)	10.840	10.840
Annual Salary (Proportion)	0.754	0.754
Health Insurance Type		
Kaiser HRA	0.008	0.008
United HRA	0.564	0.564
United HAS	0.425	0.425
Kaiser HSA	0.003	0.003

Table 2 - Descriptions of health care claim cost outcomes

Total Claim Costs	Represents the amount of submitted charges eligible for payment, for all services provided under medical coverage as well as any prescriptions filled. It is the amount eligible after applying pricing guidelines, but before deducting third party, copayment, coinsurance, or deductible amounts.
Inpatient (IP) Claim Costs	The amount of submitted charges eligible for payment for facility and professional services included in an acute inpatient admission. It is the amount eligible after applying pricing guidelines, but before deducting third party, copayment, coinsurance, or deductible amounts.
Outpatient (OP) Claim Costs	The amount of submitted charges eligible for payment for outpatient facility and professional service provided under medical coverage. It is the amount eligible after applying pricing guidelines, but before deducting third party, copayment, coinsurance, or deductible amounts.
Emergency Room (ER) Claim Costs	The number of emergency room facility visits provided under medical coverage. The number of visits is based on the count of unique patient and service date combinations. This includes both ER visits that resulted in an admission and those that did not.
Office-based Checkup Claim Costs	The amount of submitted charges for payment for facility and professional services included in an office-based visit.

Table 3 – Average percent difference for healthcare costs across categories for employees who used Sleepio compared with similar controls who did not.

Cost category	Full Sample (control and Sleepio employees) n=8,509	Poor Sleep and Insomnia (SCI-2≤2.5) n=986
Total Claim Costs	-31.0%	-38.4%
Inpatient Claim Costs	-60.8%	-58.3%
Outpatient Claim Costs	-17.0%	-12.3%
ER Claim Costs	20.7%	18.6%
Office-based Checkup Claim Costs	2.7%	-31.7%

Table 3 Note: This comparison includes data for the last four month period of the year in which Sleepio was introduced and is compared to the full twelve month baseline period prior to the introduction of Sleepio. The full sample in the table includes n=7,015 control and n=1,494 Sleepio employees.

References

AASM, Americans continue struggling for a good night's sleep during the pandemic. (2021). Retrieved 6 July 2021, from https://aasm.org/americans-struggling-good-nights-sleep-during-pandemic/

Barnes, C. M., Miller, J. A., & Bostock, S. (2017). Helping employees sleep well: Effects of cognitive behavioral therapy for insomnia on work outcomes. Journal of Applied Psychology, 102(1), 104.

Bostock, S., Luik, A. I., & Espie, C. A. (2016). Sleep and productivity benefits of digital cognitive behavioral therapy for insomnia: a randomized controlled trial conducted in the workplace environment. Journal of Occupational and Environmental Medicine, 58(7), 683-689.

Cheng, P., Luik, A. I., Fellman-Couture, C., Peterson, E., Joseph, C. L., Tallent, G., ... & Drake, C. L. (2019). Efficacy of digital CBT for insomnia to reduce depression across demographic groups: a randomized trial. Psychological Medicine, 49(3), 491-500.

Darden, M., Espie, C. A., Carl, J. R., Henry, A. L., Kanady, J. C., Krystal, A. D., & Miller, C. B. (2021). Cost-effectiveness of digital cognitive behavioral therapy (Sleepio) for insomnia: a Markov simulation model in the United States. Sleep, 44(4), zsaa223.

Denis, D., Eley, T. C., Rijsdijk, F., Zavos, H. M., Keers, R., Espie, C. A., ... & Gregory, A. M. (2020). Is digital cognitive behavioural therapy for insomnia effective in treating sub-threshold insomnia: a pilot RCT. Sleep Medicine, 66, 174-183.

Espie, C. A., Emsley, R., Kyle, S. D., Gordon, C., Drake, C. L., Siriwardena, A. N., ... & Luik, A. I. (2019). Effect of digital cognitive behavioral therapy for insomnia on health, psychological well-being, and sleep-related quality of life: a randomized clinical trial. JAMA Psychiatry, 76(1), 21-30.

Espie, C. A., Kyle, S. D., Williams, C., Ong, J. C., Douglas, N. J., Hames, P., & Brown, J. S. (2012). A randomized, placebo-controlled trial of online cognitive behavioral therapy for chronic insomnia disorder delivered via an automated media-rich web application. Sleep, 35(6), 769-781.

Felder, J. N., Epel, E. S., Neuhaus, J., Krystal, A. D., & Prather, A. A. (2020). Efficacy of digital cognitive behavioral therapy for the treatment of insomnia symptoms among pregnant women: a randomized clinical trial. JAMA Psychiatry, 77(5), 484-492.

Freeman, D., Sheaves, B., Goodwin, G. M., Yu, L. M., Nickless, A., Harrison, P. J., ... & Espie, C. A. (2017). The effects of improving sleep on mental health (OASIS): a randomised controlled trial with mediation analysis. The Lancet Psychiatry, 4(10), 749-758

Hertenstein E, et al. Insomnia as a predictor of mental disorders: a systematic review and meta-analysis. Sleep Medicine Reviews. 2019;43:96–105.

Kalmbach, D. A., Cheng, P., O'Brien, L. M., Swanson, L. M., Sangha, R., Sen, S., ... & Drake, C. L. (2020). A randomized controlled trial of digital cognitive behavioral therapy for insomnia in pregnant women. Sleep Medicine, 72, 82-92.

References

Kyle, S., & Henry, A. L. (2017). Sleep is a modifiable determinant of health: Implications and opportunities for health psychology. British Journal of Health Psychology, 22(4).

Kyle, S. D., Hurry, M. E., Emsley, R., Marsden, A., Omlin, X., Juss, A., ... & Sexton, C. E. (2020). The effects of digital cognitive behavioral therapy for insomnia on cognitive function: a randomized controlled trial. Sleep, 43(9), zsaa034.

Lin C-L, et al. Risk of type 2 diabetes in patients with insomnia: a population-based historical cohort study. Diabetes Metabolism Research Reviews. 2018;34(1):e2930.

Luik, A.I., Farias Machado, P., Siriwardena, A.N. & Espie, C.A. (2019). Screening for insomnia in primary care using a two-item version of the Sleep Condition Indicator. British Journal of General Practice, 69(679):79-80.

McGrath, E. R., Espie, C. A., Power, A., Murphy, A. W., Newell, J., Kelly, C., ... & O'Donnell, M. J. (2017). Sleep to lower elevated blood pressure: a randomized controlled trial (SLEPT). American Journal of Hypertension, 30(3), 319-327.

Miller, C.B., Carl, J.R., Henry, A.L., Baker, L. (2020). A health economic evaluation of Sleepio at a Fortune 500 company. White paper.

Morin, C. M., Altena, E., Ivers, H., Mérette, C., LeBlanc, M., Savard, J., & Philip, P. (2020). Insomnia, hypnotic use, and road collisions: a population-based, 5-year cohort study. Sleep, 43(8), zsaa032.

Ozminkowski RJ, et al. The direct and indirect costs of untreated insomnia in adults in the United States. Sleep. 2007;30(3):263–273.

Pillai, V., Anderson, J. R., Cheng, P., Bazan, L., Bostock, S., Espie, C. A., ... & Drake, C. L. (2015). The anxiolytic effects of cognitive behavior therapy for insomnia: preliminary results from a web-delivered protocol. Journal of Sleep Medicine and Disorders, 2(2).

Javaheri, S., & Redline, S. (2017). Insomnia and risk of cardiovascular disease. Chest, 152(2), 435-444.

Qaseem, A., Kansagara, D., Forciea, M. A., Cooke, M., & Denberg, T. D. (2016). Management of chronic insomnia disorder in adults: a clinical practice guideline from the American College of Physicians. Annals of Internal Medicine, 165(2), 125-133.

Roth, T., Coulouvrat, C., Hajak, G., Lakoma, M. D., Sampson, N. A., Shahly, V., ... & Kessler, R. C. (2011). Prevalence and perceived health associated with insomnia based on DSM-IV-TR; international statistical classification of diseases and related health problems, tenth revision; and research diagnostic criteria/international classification of sleep disorders, criteria: results from the America insomnia survey. Biological Psychiatry, 69(6), 592-600.

References

Sampson, C., Bell, E., Cole, A., Miller, C.B., Rose, J. (2021). Digital cognitive behavioural therapy for insomnia and primary care costs in England: An interrupted time series analysis. BJGP Open, DOI: 10.3399/BJGPO.2021.0146.

Sarsour, K., Kalsekar, A., Swindle, R., Foley, K., & Walsh, J. K. (2011). The association between insomnia severity and healthcare and productivity costs in a health plan sample. Sleep, 34(4), 443-450.

Shahly, V., Berglund, P. A., Coulouvrat, C., Fitzgerald, T., Hajak, G., Roth, T., ... & Kessler, R. C. (2012). The associations of insomnia with costly workplace accidents and errors: results from the America Insomnia Survey. Archives of General Psychiatry, 69(10), 1054-1063.

Soh, H. L., Ho, R. C., Ho, C. S., & Tam, W. W. (2020). Efficacy of digital cognitive behavioural therapy for insomnia: a meta-analysis of randomised controlled trials. Sleep Medicine, 75, 315-325.

Thomas, A., Grandner, M., Nowakowski, S., Nesom, G., Corbitt, C., & Perlis, M. L. (2016). Where are the behavioral sleep medicine providers and where are they needed? A geographic assessment. Behavioral Sleep Medicine, 14(6), 687-698.

Disclaimers

In accordance with FDA's Current Enforcement Discretion Policy for Digital Health Devices for Psychiatric Disorders, for patients aged 18 years and older, who are followed by and diagnosed with Insomnia Disorder by a medical provider, Sleepio is available as an adjunct to their usual medical care for Insomnia Disorder. Sleepio does not replace the care of a medical provider or the patient's medication. Sleepio has not been cleared by the U.S. Food and Drug Administration (FDA) for this indication. Users are directed to not make any changes to their prescribed medication or other type of medical treatment without seeking professional medical advice.

Big Health