



## Original Article

## Monitoring the sleep health of adults: a scoping review of routine national surveillance systems

Joshua A. H. Way<sup>1,2</sup>, Seren Ucak<sup>1,2</sup>, Chloe-Anne Martinez<sup>1,2</sup>, Kate Sutherland<sup>1,2</sup>, Kristina M. Cook<sup>1,2</sup>, Peter A. Cistulli<sup>1,2,3</sup> and Yu Sun Bin<sup>1,2,\*</sup>

<sup>1</sup>Sleep Research Group, Charles Perkins Centre, University of Sydney, Sydney, NSW, Australia,

<sup>2</sup>Northern Clinical School, Faculty of Medicine and Health, University of Sydney, Sydney, NSW, Australia and

<sup>3</sup>Department of Respiratory and Sleep Medicine, Royal North Shore Hospital, Sydney, NSW, Australia

\*Corresponding Author: Yu Sun Bin, 3E68 Sleep Research Group, D17 Charles Perkins Centre, The University of Sydney, NSW 2006 Australia. Email: [yusun.bin@sydney.edu.au](mailto:yusun.bin@sydney.edu.au).

## Abstract

**Study Objectives:** The aims of this review were to identify existing national surveillance systems monitoring one or more domains of sleep health in adults, and to describe the specific sleep health indicators used.

**Methods:** We systematically searched the gray and peer-reviewed literature for routinely conducted cross-sectional and longitudinal nationally representative health surveys that included the assessment of at least one domain of sleep health. The methodology involved: (1) targeted searches of the websites of national and international health agencies and statistics departments for 199 countries, (2) country-specific customized internet searches, and (3) country-specific electronic database searches of PubMed.

**Results:** A total of 19 762 records were identified from both the gray and peer-reviewed literature. Sleep health surveillance at the national level was conducted by 51 countries (25.6%) across 69 national health surveys. Sleep quality (96.1% of countries that surveilled sleep) was the most frequently assessed followed by sleep duration (27.5%), sleep medication use (25.5%), sleep disorders (17.6%), daytime alertness (15.7%), sleep satisfaction (15.7%), and sleep timing (7.8%). Additionally, 34.8% of the surveys utilized multiple sleep health indicators.

**Conclusions:** This study identified three significant gaps in the coverage of sleep health within national surveillance systems. Limited population sleep data in low- and middle-income countries, inconsistent use of sleep-related items in surveys and questionnaires, and substantial variability in the definitions of sleep health indicators. Advocacy for the inclusion of sleep health within national surveillance systems may be warranted given the important role sleep plays in public health.

**Key words:** sleep health; epidemiology; public health surveillance; population health

## Statement of Significance

Sleep not only contributes to overall health but has implications for social outcomes. Our results reveal inadequate adult population data on sleep health worldwide and highlight a lack of standardization in its assessment. The lack of routine surveillance is key to understanding why sleep is not a public health priority in many countries. There is an opportunity to advocate for the integration of sleep health surveillance into existing public health frameworks, as well as the development of targeted interventions and policies aimed at promoting healthy sleep behaviors and addressing sleep-related issues on a global scale.

Public health surveillance plays an essential role in helping inform public health action through the ongoing systematic collection, analysis, and interpretation of health-related data [1]. Health surveys are tools used within surveillance systems to routinely monitor the prevalence and trends of various health risk factors responsible for increases in mortality and morbidity. This process provides critical insights into the health status of a

population, and decisions can then be made regarding the allocation of resources to guide public health initiatives and implement efforts aimed at reducing the impact of these risk factors [2]. Surveillance systems at the national level have an extensive track record of successfully monitoring leading modifiable risk factors associated with noncommunicable diseases including unhealthy diet, alcohol consumption, tobacco use, and physical activity [3].

Submitted for publication: June 18, 2024; Revised: August 5, 2024

© The Author(s) 2024. Published by Oxford University Press on behalf of Sleep Research Society.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs licence (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial reproduction and distribution of the work, in any medium, provided the original work is not altered or transformed in any way, and that the work properly cited. For commercial re-use, please contact [reprints@oup.com](mailto:reprints@oup.com) for reprints and translation rights for reprints. All other permissions can be obtained through our RightsLink service via the Permissions link on the article page on our site—for further information please contact [journals.permissions@oup.com](mailto:journals.permissions@oup.com).

There is now growing recognition that poor sleep also presents a significant challenge to population health [4]. It is well established that short sleep duration is associated with a range of adverse health consequences, including increased risk of cardiovascular disease, diabetes, obesity, vehicular and workplace accidents, and premature mortality [5–8]. Long sleep duration has also been shown to be associated with health risks in adults [9]. This has led to the observation of a U-shaped relationship between sleep duration and health outcomes, suggesting that there might be an optimal period of sleep needed to maintain health, well-being, and quality of life [10]. In addition, there is substantial evidence that sleep quality, a broad concept that indicates how well an individual is sleeping [11], has been causally linked to mental health [12], and associated with behavioral [13] and social outcomes [14]. There are significant disparities in sleep duration and sleep quality across racial/ethnic and socioeconomic groups that contribute to health inequities in society [15, 16]. Therefore, there has been a shift towards recognizing multiple sleep characteristics in the general population as a more comprehensive way to predict health outcomes, rather than focusing on specific sleep characteristics alone [17]. This has led to the development of the sleep health framework that encompasses multiple measurable domains of sleep, including duration, quality, and timing [18, 19].

However, despite the emerging scientific evidence emphasizing the importance of sleep health, sleep has only recently been included in some national surveillance systems [20–22]. Access to large, nationally representative sleep data is important for a comprehensive assessment of sleep patterns and habits across the entire population, including among specific subpopulations. This would provide an overview of how national governments prioritize sleep health, the methods used to assess it in the general population, and whether current surveillance approaches adequately capture the contribution of sleep to population health. Therefore, the aims of the present scoping review are: (1) to identify the existing national surveillance systems monitoring one or more aspects of sleep health in adults and (2) to describe the sleep health indicators used in the national health surveys.

## Methods

This scoping review was reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews guidelines (PRISMA-ScR) [23] (Supplementary Figure S1).

The Population, Concept, and Context (PCC) framework recommended by the Joanna Briggs Institute for Scoping Reviews [24] was used to form the eligibility criteria.

### Eligibility criteria

#### Population.

Participants were adults. This included surveys which targeted participants as part of the adult (aged  $\geq 18$  years) or the working-aged (aged  $\geq 15$  years) population.

#### Concept.

National health surveys were used within national surveillance systems that included any sleep health items. This included but was not limited to questions on sleep duration, sleep quality, sleep efficiency, sleep timing, sleep disturbance, usage of sleep medications, and sleep disorders.

#### Context.

Routinely conducted national health surveys were included. To be considered routine, surveys needed to be conducted at regular intervals (e.g. annually and biennially) or designed with the intention of being repeated over time to monitor health trends. National health surveys could be either (repeat) cross-sectional or longitudinal, and conducted at an individual level; part of a nationally representative surveillance system; conducted by either the government (including relevant health and statistical agencies, and affiliated research institutes) or by the intergovernmental organization, United Nations, and in particular, the World Health Organization (WHO). No language restrictions were applied.

We excluded national health surveys that were not part of an ongoing or planned national surveillance system, that is surveys that were only conducted once. National health surveys that focused on international, subnational (e.g. local, regional, and provincial), or non-governmental sources were excluded. National health surveys were also excluded if they were conducted before 1990 to focus on recent surveillance and to reduce the likelihood of including defunct surveillance systems.

### Search strategy

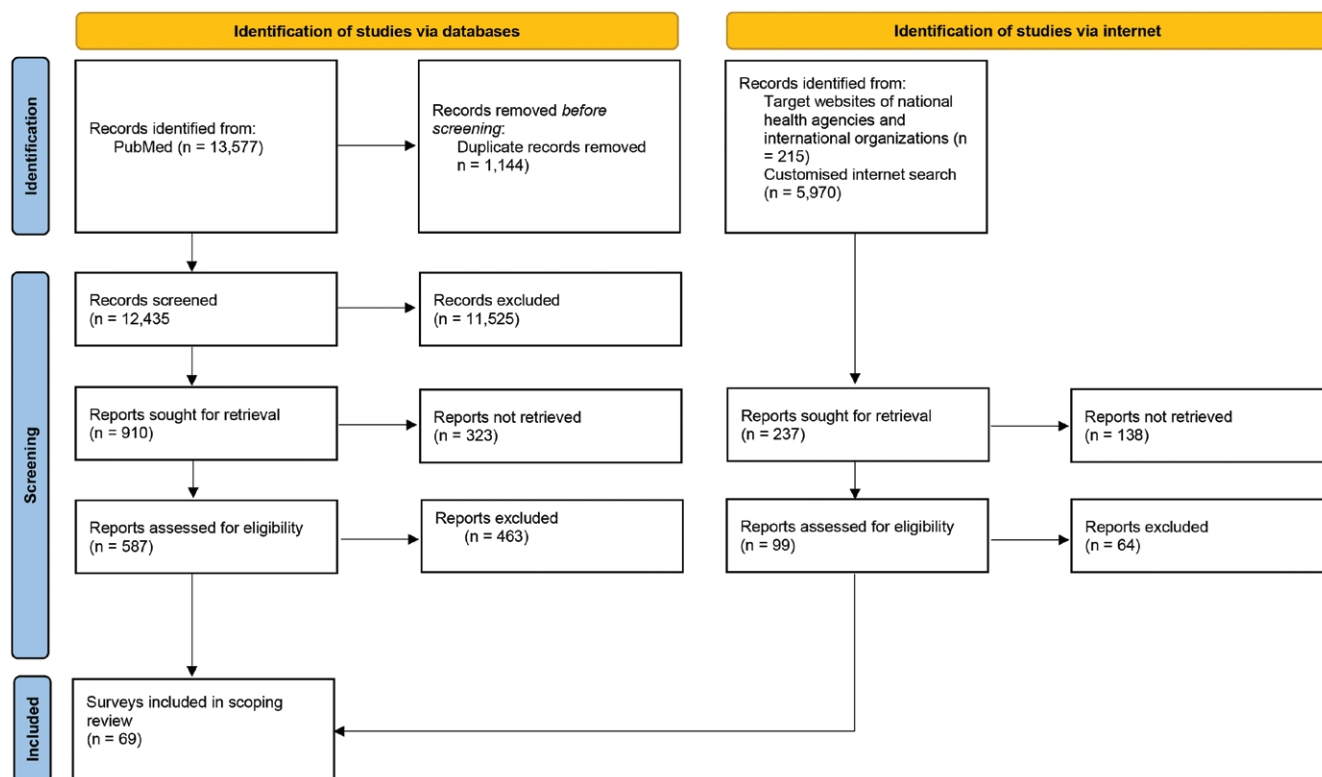
We employed a two-phase search strategy which included (1) searching the gray literature and (2) searching the peer-reviewed literature, to identify instances of ongoing national sleep surveillance systems. We used the 194 Member States of the WHO as our list of countries, divided into six regions: African Region; Region of the Americas; South-East Asian Region; European Region; Eastern Mediterranean Region; and Western Pacific Region [25]. Two WHO Associate Members (Puerto Rico and Tokelau) [26], two United Nations nonmember State Observers (Palestine and Holy See) [27], and Taiwan were also included in the search strategy to comprehensively cover the global population. This brought the total number of countries to 199. We note that, although the United Kingdom is classified as a single WHO Member State, it typically conducts its national health surveys based on its four home countries: England, Wales, Scotland, and Northern Ireland. For the purposes of this review, however, we have listed the United Kingdom as one country.

### Gray literature search and screening

The lead author (JAHW) searched the gray literature using (1) targeted websites of national health agencies (ministries of health, national statistical agencies, and affiliated research institutions) and international organizations and (2) a customized internet search using the Google search engine conducted between April 5, 2021, and May 10, 2021 [28]. An updated search of targeted websites was performed between February 8, 2024, to February 20, 2024.

For each country, the targeted websites were retrieved with the term “[country name] health agency.” Once an official governmental health agency was identified, the website was hand-searched to find any documents or links to health surveys performed at a national level. Any other documents or links that might potentially be relevant were noted.

A customized internet search was then conducted using the search query “[country name] AND health surveys AND/OR surveillance AND sleep.” The first 3 pages of search results were screened (30 total results per country) and any relevant results were investigated.



**Figure 1.** PRISMA flow diagram of the combined search and study selection process [23].

## Peer-reviewed literature search and screening

We conducted country-specific PubMed database searches using the search terms “(sleep OR insomnia) AND ((country name)/epidemiology).” Filters were applied to focus on studies of human adults. No language filters were applied. Country-specific searches of the 194 WHO Member States and five Non-WHO Member States were performed over the period from July 27, 2021, to August 20, 2021 [28]. An updated search was performed between April 15, 2024, and April 29, 2024.

Search results were exported to Covidence for abstract screening, full-text review, and data extraction. Two reviewers (JAHW, SU, CM, KS, KMC, or YSB) independently screened each title/abstract and full text. A third reviewer resolved conflicts either independently or through discussion with another reviewer at each stage of the screening process. National health surveys conducted prior to 1990 were excluded in the abstract screening stage.

## Data extraction

All relevant information was extracted and entered into a pre-defined spreadsheet that included national characteristics (WHO Region, name of the country, name of the health, or statistical agency), and survey characteristics (survey name, year of latest survey, objective of the survey, study design, target population, data collection method, measure[s] of sleep health, and sleep-related item[s]).

Data extraction for the gray literature search was carried out by one reviewer (JAHW). For the peer-reviewed literature search, one reviewer (SU, CM, KS, KMC, or YSB) was responsible for a specific WHO Region and extracted data, which was then cross-checked by another reviewer (JAHW). Once data extraction was completed for both the gray literature and the peer-reviewed literature, the data were combined, and duplicates were removed.

## Data synthesis

Across national health surveillance systems, we grouped sleep health categories captured based on a combination of Buysse’s multidimensional framework of sleep health [15] and the sleep health categories developed by the National Healthy Sleep Awareness Project (NHSAP) [20] (Supplementary Data Set S1). We also included sleep disorders (e.g. obstructive sleep apnea) and sleep medications as additional categories to comprehensively identify sleep-related items that fall outside these frameworks but which are useful measures in determining the sleep health of the general population. We also considered the surveillance of sleep stratified by low-income; lower-middle-income; upper-middle-income; and high-income countries using the World Bank’s list of economies [29].

## Results

In total, we identified and screened 19 762 documents and publications (Figure 1). From these results, 69 nationally representative health surveys that contained at least one sleep-related item were identified in 51 countries (25.6% of all countries searched; Table 1 and Supplementary Table S1). Figure 2 is a map indicating which countries have collected surveillance data on sleep at a national level. The majority of countries with sleep surveillance were high-income economies (80.4%) while no low-income economies had eligible data (Supplementary Table S2). We were unable to gain access to questionnaires from five countries (Andorra, Algeria, Colombia, Costa Rica, and Libya), accounting for 2.5% of our total sample. This lack of access was due to the absence of publicly available questionnaires, nonfunctional links, or restrictions on accessing the survey materials.

**Table 1.** Sleep Health Domains Reported in the National Surveillance Systems of WHO Member States and Non-WHO Member States

Country	Year <sup>a</sup>	Survey	Duration	Sleep health measures					
				Quality	Satisfaction	Timing	Alertness	Sleep disorders	Sleep medication
AMR									
Brazil	2019	Brazilian National Health Survey		X			X		X
Canada	2020	Canadian Community Health Survey		X	X	X			
Canada	2019	Canadian Health Measures Survey		X			X	X	
Chile	2016–2017	Chilean Health Survey		X	X		X	X	X
Mexico	2016	Mexican National Halfway Health and Nutrition Survey	X	X	X				X
United States	2020	Behavioral Risk Factor Surveillance System	X						
United States	2022	National Health Interview Survey	X	X	X				X
United States	2021–2022	National Health and Nutrition Examination Survey		X		X			
EMR									
Bahrain	2018	Bahrain National Health Survey		X			X		
United Arab Emirates	2017–2018	United Arab Emirates National Health Survey		X					
EUR									
Albania	2020	European Health Interview Survey <sup>b</sup>		X					
Austria	2019	Austrian Health Interview Survey <sup>b</sup>		X					
Belgium	2018	Belgian Health Interview Survey <sup>c</sup>		X					
Bulgaria	2019	European Health Interview Survey <sup>b</sup>		X					
Croatia	2019	European Health Interview Survey <sup>c</sup>		X					
Cyprus	2019	European Health Interview Survey <sup>b</sup>		X					
Czech Republic	2019	European Health Interview Survey <sup>c</sup>		X					
Denmark	2021	Danish National Health Survey						X	
Denmark	2019	Danish Health and Well-being Survey <sup>b</sup>		X					
Estonia	2019	Estonian Health Interview Survey <sup>c</sup>	X	X					X
Finland	2017	National FinHealth Survey	X	X	X		X	X	X
Finland	2019	National FinSote Survey <sup>c</sup>		X					
France	2019	European Health Interview Survey <sup>b</sup>		X					
France	2017	Public Health Barometer		X		X		X	
Germany	2008–2011	German Health Interview and Examination Survey for Adults	X	X	X			X	X
Germany	2019–2020	German Health Update <sup>c</sup>		X					
Greece	2019	European Health Interview Survey <sup>b</sup>		X					
Greece	2013–2015	Hellenic National Nutrition and Health Survey	X	X					
Hungary	2019	European Health Interview Survey <sup>c</sup>		X					
Iceland	2019	European Health Interview Survey <sup>b</sup>		X					
Israel	2013–2015	Israeli National Health Interview Survey		X					
Ireland	2019	Healthy Ireland Survey	X	X	X		X		
Ireland	2019	Irish Health Survey <sup>c</sup>		X					

Table 1. Continued

Country	Year <sup>a</sup>	Survey	Duration	Sleep health measures					
				Quality	Satisfaction	Timing	Alertness	Sleep disorders	Sleep medication
Italy	2019	European Health Interview Survey <sup>b</sup>		X					
Lativa	2019	European Health Interview Survey <sup>b</sup>		X					
Latvia	2022	Health Behavior Among Latvian Adult Population						X	
Lithuania	2019	European Health Interview Survey <sup>b</sup>		X					
Luxembourg	2019	European Health Interview Survey <sup>b</sup>		X					
Malta	2020	European Health Interview Survey <sup>b</sup>		X					
Netherlands	2019	Health Interview Survey <sup>c</sup>		X					
Norway	2019	Living Condition Survey on Health <sup>c</sup>		X					
Poland	2019	European Health Interview Survey <sup>b</sup>		X					
Portugal	2019	European Health Interview Survey <sup>c</sup>		X					
Romania	2019	European Health Interview Survey <sup>b</sup>		X					
Serbia	2019	Serbian National Interview Survey <sup>c</sup>		X					
Slovakia	2019	European Health Interview Survey <sup>b</sup>		X					
Slovenia	2019	European Health Interview Survey <sup>c</sup>		X					
Spain	2020	European Health Interview Survey <sup>b</sup>		X					
Spain	2017	Spanish National Health Survey		X					X
Sweden	2019	European Health Interview Survey <sup>b</sup>		X					
Sweden	2022	National Public Health Survey, Health on Equal Terms		X					
Switzerland	2017	Swiss Health Survey		X				X	X
Turkey	2019	Turkey Health Survey <sup>c</sup>		X					
United Kingdom	2021	Health Survey for England		X					
United Kingdom	2021–2022	Health Survey Northern Ireland	X	X					X
United Kingdom	2021	Scottish Health Interview Survey		X					
United Kingdom	2019	European Health Interview Survey <sup>b,d</sup>		X					
SEAR									
Bhutan	2015	Gross National Happiness Survey	X	X					
Bhutan	2012	Bhutan National Health Survey		X					
WPR									
Australia	2011–2013	Australian Health Survey				X			X
Australia	2020–2021	National Study of Mental Health and Well-being	X	X					X
China	2015–2017	China Nutrition and Health Surveillance	X						
Japan	2019	National Health and Nutrition Survey	X	X	X		X		
Malaysia	2019	National Health and Morbidity Survey		X					
New Zealand	2021–2022	New Zealand Health Survey	X	X					X
Singapore	2016	Singapore Mental Health Survey		X					
South Korea	2020	Korean Community Health Survey	X						
South Korea	2016–2017	Korean National Health and Nutrition Survey	X	X			X	X	

Table 1. Continued

Country	Year <sup>a</sup>	Survey	Duration	Sleep health measures					
				Quality	Satisfaction	Timing	Alertness	Sleep disorders	Sleep medication
<i>Non-WHO member</i>									
Taiwan	2013–2016	Nutrition and Health Survey in Taiwan	X						X

AMR, Region of the Americas; EHIS, European Health Interview Survey; EMR, Eastern Mediterranean Region; EUR, European Region; WHO, World Health Organization; WPR, Western Pacific Region.

<sup>a</sup>Most recent year the national health survey contained at least one sleep-related item.

<sup>b</sup>Stand-alone EHIS.

<sup>c</sup>Existing national health survey integrated with the EHIS.

<sup>d</sup>The United Kingdom was still a Member State of the European Union in 2019 when the most recent EHIS was conducted.

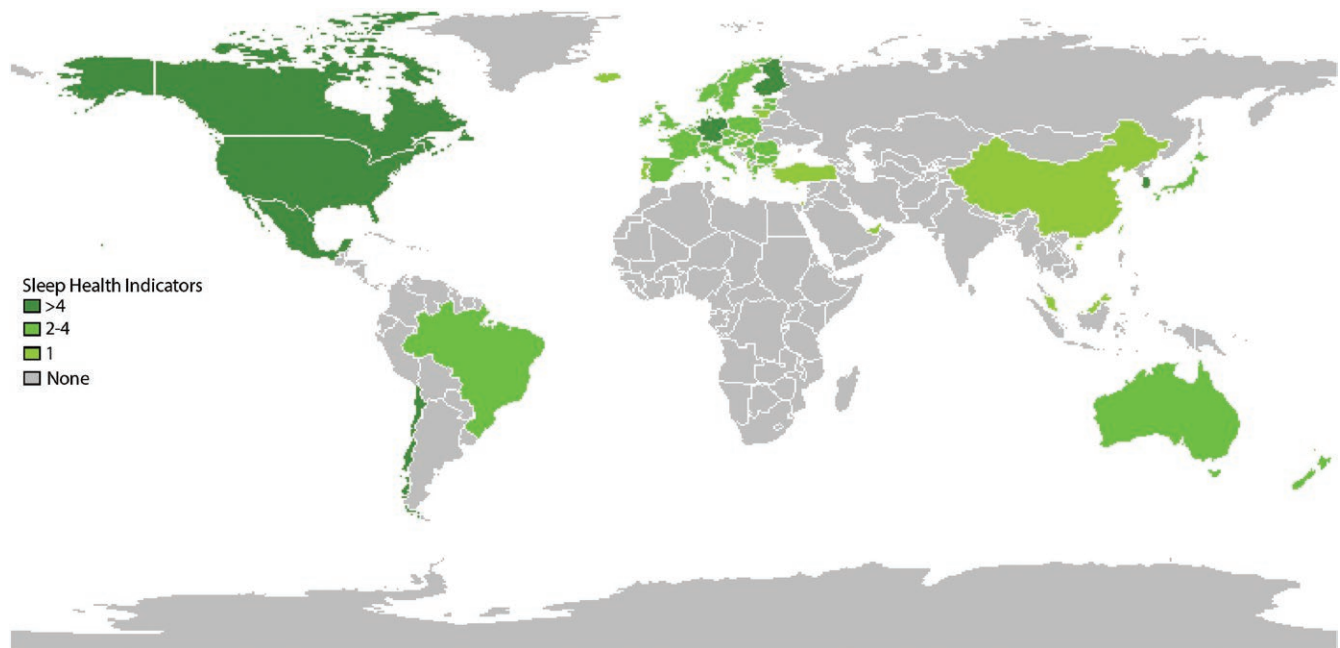


Figure 2. Geographical distribution of countries with at least one sleep health indicator at a national level.

### Sleep quality

Forty-nine countries (96.1% of countries that surveilled sleep) included a question on sleep quality in 62 surveys (Table 2). The majority of surveys assessing sleep quality ( $n = 49$ ) used standardized questionnaires that assessed mental health problems and included an item related to sleep disturbance. These were the eight-item Patient Health Questionnaire (PHQ-8;  $n = 33$ ), the nine-item Patient Health Questionnaire (PHQ-9;  $n = 6$ ), the 12-item General Health Questionnaire (GHQ-12;  $n = 6$ ), the WHO World Mental Health—Composite International Diagnostic Interview 3.0 “Depression” Module (CIDI 3.0;  $n = 2$ ), and the 15-item Patient Health Questionnaire (PHQ-15;  $n = 1$ ). One survey contained both the PHQ-9 and the Emotional State Questionnaire (EST-Q). 12 surveys used similar questions in the context of mental health about “trouble falling asleep” within various timeframes (e.g. a week, 30 days). One survey asked about the frequency of participants waking up at least three times during the night in the past week.

### Sleep duration

Fourteen countries (27.5%) included a question on sleep duration from 17 surveys (Table 3). Among the surveys that measured

sleep duration, 10 surveys asked participants to report their sleep in a 24-hour period, two surveys asked about sleep during a weekday or workday, two surveys asked about sleep between Sun and Thursday and Friday and Saturday, one survey asked about sleep during the weekday and during the weekend, one survey asked about sleep in the past 4 weeks and one survey asked about sleep during a sad, discouraged or uninterested episode within the last 12 months.

### Sleep medications

Thirteen countries (25.5%) included questions on the use of medications to aid in sleeping from 14 surveys (Table 4). Nine surveys asked about the frequency of taking sleeping medications over a period of 12 months ( $n = 3$ ), 1 month ( $n = 3$ ), 2 weeks ( $n = 1$ ), 1 week ( $n = 1$ ), or at any time ( $n = 2$ ). Three surveys asked a combination of whether the sleep medication was prescribed by a doctor and the frequency of use. One survey asked about the last time sleep medication was used.

### Sleep disorders

Nine countries (17.6%) included questions on sleep disorders in nine surveys (Table 5). Four surveys included questions on sleep

apnea with two directly asking about whether a doctor has diagnosed or treated the participants for sleep apnea and two surveys asking about whether the participants or someone they know noticed loud snoring or breathing that had stopped. Four surveys asked participants about a diagnosis of insomnia with one survey using the International Classification of Sleep Disease criteria, one survey using either the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) or International Classification of Diseases (ICD-10) categories, and two surveys asking about the presence of insomnia. One survey asked participants if they had been bothered by either insomnia or sleep problems within the last four weeks.

### Daytime alertness

Eight countries (15.7%) included a question on the ability to maintain wakefulness during the day in eight surveys (Table 6). All eight surveys asked how often participants felt tired during the daytime with variations in the timeframe being within the last 12 months ( $n = 1$ ), 30 days ( $n = 2$ ), 2 weeks ( $n = 1$ ), at least 3 days a week ( $n = 1$ ), and a 24-hour period ( $n = 3$ ).

### Sleep satisfaction

Eight countries (15.7%) included a question on the participant's subjective assessment of their sleep satisfaction in eight surveys (Table 7). Five surveys asked participants about their subjective quality of sleep. One survey asked about whether the participants woke up feeling as tired as they were before sleeping for at least 3 days a week, one survey asked how well-rested the participants felt in the past 30 days, and one survey asked a general question about whether the participants thought they received enough sleep.

### Sleep timing

Four countries (7.8%) included questions on the placement of sleep within a 24-hour period and assessed bedtimes and wake times in four surveys (Table 8).

## Discussion

Our scoping review found that most countries (74.4%) are not monitoring the sleep health of their populations. In the national surveillance systems that did include at least one sleep-related item, the most common sleep health indicator was sleep quality (62 surveys from 49 countries) followed by sleep duration (17 surveys from 14 countries). Additionally, 34.8% of the surveys identified utilized multiple sleep health indicators. We identified three significant gaps in the current global sleep health data: (1) limited population sleep data in low- and middle-income countries (LMICs), (2) inconsistent utilization of sleep-related items in surveys and questionnaires, and (3) substantial variability in the definition of the sleep health indicators. The overall findings indicate that despite its significant role in health and social outcomes, sleep is either not adequately captured within existing surveillance systems or is not well integrated into public health systems.

As demonstrated in the results, there is a large disparity between high-income countries (HICs) and LMICs concerning the inclusion of sleep data in their surveillance systems. Only 10 middle-income countries were identified while no sleep health surveillance was found in low-income countries. The marked difference between HICs and LMICs can be attributed to various factors, including the availability of funding sources [30], healthcare

priorities [31], and healthcare logistics [32]. In fact, there is generally very little high-quality epidemiological research available on sleep health in LMICs [33]. The scarcity of sleep data in LMICs is a notable concern, given the role sleep health plays in shaping overall health outcomes. Comprehensive health assessments require the inclusion of sleep data due to their close interconnection with other key health indicators. With the rapid change in demographics and the growing costs of noncommunicable diseases present in low-income countries [34, 35], understanding the sleep health trends of these populations will become increasingly important to guide public health responses aimed at mitigating the adverse consequences associated with poor sleep health. In recognizing this gap in global sleep health coverage, efforts are needed to incorporate and expand sleep data within all national surveillance systems.

As expected, we found that sleep duration and sleep quality were among the most common measures in national surveillance systems, consistent with the focus on these aspects of population sleep health in the wider literature [35–37]. These self-reported measures of sleep are inexpensive to assess and have been consistently shown to be linked to health outcomes [38, 39]. However, both sleep quality and duration are reported in the same survey only 13 times, reinforcing the suggestion that population data on these two sleep characteristics are often not available from the same source [40], let alone in multidimensional assessments of sleep health. Other domains of sleep health received significantly less attention or were not included at all. Among the 24 surveys that assessed other sleep health indicators, sleep duration or sleep quality was consistently included, with the expectation of three surveys. Regardless, the majority of surveys only included one sleep-related item. Therefore, an opportunity exists to capture more domains of sleep health in national health surveys across the world.

Many of the sleep quality questions we examined were part of validated questionnaires primarily designed to screen for mental health problems, rather than for assessing sleep health specifically [41, 42]. In many cases, without these mental health assessments, there would be no sleep-related items included in the surveys at all. Given the limited space available in most health surveys, it is often challenging to include a comprehensive range of sleep-related items. As a result, having existing sleep-related items within questionnaires, even if they are primarily designed for other purposes such as mental health screening, may be particularly useful. These items can serve dual purposes, providing valuable data on sleep health while also addressing the primary focus of the survey [43]. Furthermore, our study did include items directly related to sleep disorders, such as questions asking respondents if they have been diagnosed with a specific sleep disorder. However, it is important to recognize that sleep quality also encompasses issues related to disrupted sleep, which can be indicative of insomnia (e.g. difficulties with sleep initiation and maintenance) [44]. As a result, items categorized under sleep quality may also reflect underlying sleep disorders. This overlap suggests that our findings might include symptoms associated with insomnia and other related conditions, highlighting that reported poor sleep quality could also signify more specific sleep disturbances.

Some questionnaires, such as the 2022 National Health Interview Survey from the United States, have recently assessed several domains of sleep health together, in dedicated sleep modules on a rotating basis. Without the capability to identify population trends by utilizing multiple sleep health indicators,

**Table 2.** Sleep Quality Items

Survey	Language <sup>a</sup>	Mental Health Questionnaire	Sleep health item(s)
Brazilian National Health Survey	Portuguese		<i>In the last two weeks, how often have you had difficulty in falling asleep, woken up frequently during the night or slept more than usual?</i> 1. None; 2. Up to seven days; 3. More than seven days; 4. Almost every day.
Canadian Community Health Survey	English		<i>In the past 7 days, on how many days did you wake up 3 or more times during your sleep?</i> 1. 0; 2. 1; 3. 2; 4. 3; 5. 4; 6. 5; 7. 6; 8. 7.
Canadian Health Measures Survey	English		<i>Without the use of sleeping aids, how often do you usually have trouble going to sleep or staying asleep?</i> 1. Never; 2. Rarely; 3. Sometimes; 4. Most of the time; 5. All of the time.
Chilean Health Survey	Spanish		<i>In the last 30 days and without taking into account any kind of help: due to your health, how difficult has it been for you to sleep?</i> 1. None; 2. Mild; 3. Moderate; 4. Severe; 5. Extreme/Impossible. <i>During those two weeks, did you have more trouble than usual falling asleep?</i> 1. Yes; 2. No. <i>During those two weeks, did this happen to you: trouble sleeping.</i> 1. Every night?; 2. Almost every night?; 3. Less often? <i>How often have you felt stressed during the past year (irritable, full of anxiety, or not being able to sleep) due to situations at home or at work?</i> 1. Never felt stress; 2. Sometimes you have felt stressed at home or at work; 3. Several times you have felt stressed at home or at work; 4. You have constantly felt stressed at home or at work. <i>During the past 30 days, to what extent did you have problems, such as falling asleep during the day, waking up frequently at night, or waking up too early in the morning?</i> 1. None; 2. Little; 3. Moderate; 4. A lot; 5. Too much.
Mexican National Health and Nutrition Survey	Spanish		<i>In the last 3 weeks, have you had difficulty to sleep, to maintain sleep or keep awake sooner than you would like?</i> 1. Yes; 2. No.
National Health Interview Survey	English	PHQ-8	PHQ-8: <i>Over the last two weeks, how often have you been bothered by trouble falling or staying asleep, or sleeping too much?</i> 1. Not at all; 2. Several days; 3. More than half the days; 4. Nearly every day; 7. Refused; 9. Don't Know. <i>During the past 30 days, how often did you have trouble falling asleep?</i> 1. Never; 2. Some days; 3. Most days; 4. Every day. <i>During the past 30 days, how often did you have trouble staying asleep?</i> 1. Never; 2. Some days; 3. Most days; 4. Every day.
National Health and Nutrition Examination Survey	English	PHQ-9	<i>Over the last 2 weeks, how often have you been bothered by the following problems: trouble falling or staying asleep, or sleeping too much?</i> 1. Not at all; 2. Several days; 3. More than half the days; 4. Nearly every day.
Bahrain National Health Survey	English		<i>In the last 30 days, how much difficulty did you have with sleeping, such as falling asleep, waking up frequently during the night or waking up too early in the morning?</i> 1. None; 2. Mild; 3. Moderate; 4. Severe; 5. Extreme. <i>Did you notice any problems falling asleep?</i>
UAE National Health Survey	English		<i>With sleeping, such as falling asleep, waking up frequently during the night or waking up too early in the morning?</i> 1. None; 2. Mild to Moderate; 3. Severe to Extreme.
Belgian Health Interview Survey <sup>b</sup>	English	PHQ-15	<i>How have you been feeling the last few weeks? Have you lost much sleep over worry?</i> 1. Not at all; 2. No more than usual; 3. Rather more than usual; 4. Much more than usual. PHQ-15: <i>Over the last two weeks, have you been bothered by the following problems? Trouble falling or staying asleep, or sleeping too much.</i> 1. Not at all; 2. Several days; 3. More than half the days; 4. Nearly every day.
Estonian Health Interview Survey <sup>b</sup>	Estonian	PHQ-9, EST-Q	PHQ-9: <i>How often in the last 2 weeks have you had any of the following problems: You had difficulty falling asleep, intermittent sleep or an excessive need for sleep.</i> 1. Not at all; 2. Some days; 3. More than half a day; 4. Almost every day. EST-Q: <i>For each problem, please rate how much it affects you in the past 4 weeks: Difficulty falling asleep. Restless or intermittent sleep.</i> 1. Not at all; 2. Very rare; 3. Sometimes; 4. Often; 5. Very often.
National FinHealth Survey	English	PHQ-8	<i>Over the past month, how often have you had trouble sleeping?</i> 1. Often; 2. Sometimes; 3. Not at all.
Public Health Barometer	French		<i>Would you say that in the past eight days you have had sleep problems?</i> 1. Not at all; 2. A little; 3. A lot. <i>Do you ever wake up at night with difficulty falling back to sleep? If so, how long do you usually stay awake at night?</i>
German Health Interview and Examination Survey for Adults	German		<i>The frequency of occurrence of problems falling asleep and staying asleep in the last 4 weeks.</i> 1. Not at all in the last 4 weeks; 2. Less than once a week; 3. Once or twice a week; 4. 3 times a week or more.
Hellenic National Nutrition and Health Survey	English	PHQ-9	<i>Trouble falling or staying asleep, or sleeping too much?</i> 1. Not at all; 2. Several days; 3. More than half the days; 4. Nearly every day.
Israeli National Health Interview Survey	Hebrew, Arabic		<i>During these two weeks, did you find it difficult to sleep more than usual?</i> 1. Yes; 2. No. <i>Frequency of difficulty falling asleep.</i> 1. Every night; 2. Almost every night; 3. More rarely.



Table 2. Continued

Survey	Language*	Mental Health Questionnaire	Sleep health item(s)
Healthy Ireland Survey	English		<i>How often do you have trouble falling asleep?</i> 1. Most of the time; 2. Sometimes; 3. Rarely; 4. Never; 5. Don't know; 6. Refused. <i>How often do you have trouble with waking up too early and not being able to fall asleep again?</i> 1. Most of the time; 2. Sometimes; 3. Rarely; 4. Never; 5. Don't know. <i>Thinking about the last 12 months, how often are you bothered or disturbed by noise you when you are trying to sleep?</i> 1. Most of the time; 2. Sometimes; 3. Rarely; 4. Never; 5. Don't know.
Spanish National Health Survey	English	GHQ-12	<i>Making reference to the past few weeks, the person evaluates the frequency with which the following problems or situations have occurred: Worries made them lose a lot of sleep.</i>
National Public Health Survey, Health on Equal Terms	Swedish	GHQ-12	<i>Do you have any or some of the following problems or symptoms? Difficulty sleeping?</i> 1. No; 2. Yes, mild discomfort; 3. Yes, severe discomfort.
Swiss Health Survey	German, French	PHQ-9	<i>How often do you a) have difficulty falling asleep? b) have a restless sleep? c) wake up several times during the night? d) wake up too early in the morning?</i> 1. Often; 2. Sometimes; 3. Rarely; 4. Never. PHQ-9: <i>How often have the following problems bothered you? Difficulty falling or staying asleep, or sleeping too much.</i> 1. Never; 2. Several days; 3. More than half the days; 4. Almost every day. <i>Please indicate how often you have personally experienced each situation described below in the past 2 weeks: I lack sleep because of the internet.</i> 1. Never; 2. Rarely; 3. Sometimes; 4. Often; 5. Very often.
Health Survey for England	English	GHQ-12	<i>Have you recently lost much sleep over worry?</i> 1. Not at all; 2. No more than usual; 3. Rather more than usual; 4. Much more than usual.
Health Survey Northern Ireland	English	GHQ-12	GHQ-12: <i>We should like to know how your health has been in general over the past few weeks. Have you recently lost much sleep over worry?</i> 1. Not at all; 2. No more than usual; 3. Rather more than usual; 4. Much more than usual. <i>In the past week, how many times did you have trouble falling asleep?</i> 1. Did not have trouble falling asleep in the past week; 2. 1-2 times; 3. 3-4 times; 4. 5 or more times? <i>In the past week, how many times did you have trouble staying asleep?</i> 1. Did not have trouble staying asleep in the past week; 2. 1-2 times; 3. 3-4 times; 4. 5 or more times?
Scottish Health Interview Survey	English	GHQ-12	<i>Have you recently lost much sleep over worry?</i> 1. Not at all; 2. No more than usual; 3. Rather more than usual; 4. Much more than usual.
European Health Interview Survey <sup>c</sup>	English	PHQ-8	<i>Over the last 2 weeks, how often have you been bothered by any of the following problems: Trouble falling or staying asleep, or sleeping too much?</i> 1. Not at all; 2. Several days; 3. More than half the days; 4. Nearly every day.
Gross National Happiness Survey	English	GHQ-12	GHQ-12: <i>Please consider the last four weeks and circle one of the four response options for the following 12 questions. Lost much sleep over worry</i>
Bhutan National Health Survey	English		<i>During the past 12 months, how often have you been so worried about something that you could not sleep at night?</i>
National Study of Mental Health and Well-being	English	CIDI 3.0	<i>Whether had trouble sleeping most nights during worst sad/discouraged/uninterested episode. Problems falling asleep during most severe sad/discouraged/uninterested episode in last 12 months.</i> 1. Never took longer than 30 minutes to fall asleep; 2. Took at least 30 minutes to fall asleep, less than half the time; 3. Took at least 30 minutes to fall asleep, more than half the time; 4. Took more than 60 minutes to fall asleep, more than half the time. <i>Waking up at night during most severe sad/discouraged/uninterested episode in last 12 months.</i> 1. Did not wake up at night; 2. Had a restless, light sleep with few brief awakenings each night; 3. Woke up at least once a night, but got back to sleep easily; 4. Woke up more than once a night and stayed awake for 20 mins or more, more than half the time.
National Health and Nutrition Survey	English		<i>Proportion of those who responded:</i> 1. Have difficulty falling asleep; 2. Wake up at night; 3. Wake up too early and have the difficulty going back to sleep.
National Health and Morbidity Survey	English	PHQ-9	<i>Trouble falling asleep, or staying asleep, or sleeping too much.</i> 1. Not at all; 2. Several days; 3. More than half the days; 4. Nearly everyday.
New Zealand Health Survey	English	PHQ-9	<i>Over the last 2 weeks, how often have you been bothered by any of the following problems? C. Trouble falling or staying asleep, or sleeping too much sleep disturbances or excessive sleepiness nearly every day.</i> Not at all; Several days; More than half the days; Nearly everyday.
Singapore Mental Health Survey	English	CIDI 3.0	<i>Did you have a lot more trouble than usual either falling asleep, staying asleep or waking too early during that period of being (sad/empty/depressed) lasting several days/2 weeks or longer? If they say no,</i> <i>Did you sleep a lot more than usual during that period of being (sad/empty/depressed) lasting several days/2 weeks or longer?</i>
Korean National Health and Nutrition Survey	Korean	PHQ-9	<i>In the past 2 weeks, how often have you suffered from the symptoms listed below? Difficulty falling asleep; Waking up; or Sleeping too much.</i>

CIDI, Composite International Diagnostic Interview; EST-Q, Emotional State Questionnaire; EU, European Union; GHQ, General Health Questionnaire; PHQ, Patient Health Questionnaire.

\*Original language the sleep health items were written in before being translated.

<sup>b</sup>National health survey integrated with the European Health Interview Survey using measures other than PHQ-8.

<sup>c</sup>Consisting of Iceland, Norway, Serbia, Albania, Turkey and all EU Member States excluding Belgium and Estonia.

**Table 3.** Sleep Duration Items

Survey	Language <sup>a</sup>	Sleep health item(s)
Mexican National Halfway Health and Nutrition Survey	Spanish	<i>In general, how many hours do you sleep daily during the night from Monday to Friday?</i> [HH]
Behavioral Risk Factor Surveillance System	English	<i>On average, how many hours of sleep do you get in a 24-hour period?</i> [HH]
National Health Interview Survey	English	<i>On average, how many hours of sleep do you get in a 24-hour period?</i> [HH:MM]
Estonian Health Interview Survey <sup>b</sup>	Estonian	<i>What is the average length of your daily sleep time?</i> [HH:MM]
National FinHealth Survey	English	<i>How many hours do you sleep in 24 hours?</i> [HH:MM]
German Health Interview and Examination Survey for Adults	German	<i>How many hours do you sleep on average at night during the last 4 weeks?</i> [HH]
Hellenic National Nutrition and Health Survey	English	<i>Night sleep duration Sun–Thu.</i> [HH] <i>Night sleep duration Fri–Sat.</i> [HH]
Healthy Ireland Survey	English	<i>How many hours of sleep do you have on an average week night or work night?</i> [HH:MM]
Health Survey Northern Ireland	English	<i>On average, how many hours of sleep do you get in a 24-hour period?</i> [HH::MM]
Gross National Happiness Survey	English	<i>Time spent sleeping.</i> [HH:MM]
National Study of Mental Health and Well-being	English	<i>Amount of sleep each night during most severe sad/discouraged/uninterested episode in last 12 months.</i> [HH] 1. Slept no longer than 7–8 hours/night without napping during the day; 2. Slept no longer than 10 hours in a 24-hour period including naps; 3. Slept no longer than 12 hours in a 24-hour period including naps; 4. Slept longer than 12 hours in a 24-hour period including naps.
China Nutrition and Health Surveillance	Chinese	<i>Sleep duration including nighttime and daytime sleep.</i> [≥ 10 hours; 9 hours; 8 hours; 7 hours; < 6 hours.]
National Health and Nutrition Survey	Japanese	<i>Mean sleep duration per day.</i> [≥ 9 hours; 8 to < 9 hours; 7 to < 8 hours; 6 to < 7 hours; 5 to < 6 hours; ≤ 5 hours.]
New Zealand Health Survey	English	<i>How many hours of sleep do you usually get in a 24-hour period, including all naps and sleeps?</i> [HH]
Korean Community Health Survey	Korean	<i>How many hours do you usually sleep a day?</i> [HH]
Korean National Health and Nutrition Survey	Korean	<i>How many hours do you usually sleep per day?</i> [HH] <i>Weekday (or working day).</i> <i>Weekend (or non-working day, non-working day).</i>
Nutrition and Health Survey in Taiwan	Chinese	<i>Average sleep time on school or work days (Sunday to Thursday).</i> [HH] <i>Average sleep time on holidays (Friday and Saturday).</i> [HH]

HH, Hours in a day; MM, Minutes in an hour.

<sup>a</sup>Original language the sleep health items were written in before being translated.

<sup>b</sup>National health survey integrated with the European Health Interview Survey.

negative results in one sleep characteristic might not be indicative of overall poor sleep health or vice versa [45]. For instance, respondents might get an adequate amount of sleep but still report poor sleep quality. This is especially important in large health surveys where space for questions is limited and competitive. The selection of items in health surveillance is based on the priorities that national governments and health agencies place on what is most appropriate for their population and the funding resources available. For example, the NHSAP was confined to five sleep-related items and in the process of item selection, sleep timing was excluded [46].

Self-report instruments that measure sleep health have been developed and validated in population and community-based settings. Ru-SATED includes questions on sleep duration, satisfaction, alertness, timing, efficiency, and regularity [18] and has

already been validated in several languages [47–52]. Another instrument known as the Sleep Health Index (SHI) was developed by the National Sleep Foundation [53]. The SHI contains 12 questions that assess sleep duration, sleep quality, and sleep disorders. Further research should continue to investigate whether multiple measures are more helpful at predicting health outcomes than one or two indicators of poor sleep health and seek to validate these indicators.

When examining the sleep health indicators within their respective dimensions, we found significant variations in their definitions. For example, sleep duration items estimating total sleep time had timeframes ranging from a 24-hour period up to 4 weeks as well as some items distinguishing between “weekdays” versus “weekends.” Sources for sleep-related items also varied, with validated mental health screening questionnaires asking

**Table 4.** Sleep Medication Items

Survey	Language <sup>a</sup>	Sleep health item(s)
Brazilian National Health Survey	Portuguese	<i>In the last two weeks, did you take any medication to sleep?</i> 1. Yes; 2. No. <i>The medicine that you use to sleep was prescribed by a doctor?</i> 1. Yes; 2. No. <i>In the last two weeks, how many days did you use the drug to sleep?</i>
Chilean Health Survey	Spanish	<i>During the last month, how many times have you taken medicines on your own or prescribed by the doctor for sleeping?</i> 1. Not once in the last month; 2. Less than once a week; 3. Once or twice a week; 4. Three or more times a week.
Mexican National Halfway Health and Nutrition Survey	English	<i>How frequently do you use medications for sleeping (prescribed or over-the-counter)?</i> 1. Never; 2. less than 1 per week.
National Health Interview Survey	English	<i>During the past 30 days, how often did you take any medication to help you fall asleep or stay asleep? Include both prescribed and over-the-counter medications.</i> 1. Never; 2. Some days; 3. Most days; 4. Every day; 7. Refused; 9. Don't know.
Estonian Health Interview Survey <sup>b</sup>	Estonian	<i>Please specify which medicines you have been taking to treat your emotional problems in the last 12 months: Sedatives/sleeping pills.</i> <i>If possible, specify the name of the sedative.</i> <i>How many days did you use sedatives?</i> <i>How many days did you use sleeping pills?</i>
National FinHealth Survey	English	<i>When was the last time you used the following medication (Sleeping pills/Tranquilizers)?</i> 1. During the past week; 2. 1-4 weeks ago; 3. 1-12 months ago; 4. Over a year ago; 4. Never.
German Health Interview and Examination Survey for Adults	German	<i>How often in the last 4 weeks were prescription drugs or over-the-counter sleeping pills taken?</i> 1. Not at all during the last 4 weeks; 2. Less than once a week; 3. 1 or 2 times a week; 4. 3 times a week or more.
Spanish National Health Survey	English	<i>Type of medication consumed in the past two weeks and whether it was prescribed by a doctor: Tranquillisers, relaxants, sleeping pills.</i>
Swiss Health Survey	German, French	<i>I'm going to read you a list of medications. Please tell me how often you took them in the past 7 days: Sleeping pills (e.g. Imovane, Sonata).</i> 1. Daily; 2. Several times; 3. Approximately 1 time in the last 7 days; 4. Never. <i>Were these sleeping pills prescribed to you by the doctor?</i> 1. Yes, prescribed by the doctor; 2. No, not prescribed by the doctor.
Health Survey Northern Ireland	English	<i>In the past week, how many times did you take medication to help you fall asleep or stay asleep.</i> 1. Did not take medication to help sleep in the past week; 2. 1-2 times; 3. 3-4 times; 4. 5 or more times?
Australian Health Survey	English	<i>Have you taken any of the following medication for these condition/s in the last 2 weeks?</i> 1. Yes 5. No 6. Don't know <i>Which ones?</i> Sleeping tablets or capsules. <i>How often did you take [name of medication] for your condition/s in the last 2 weeks?</i> 1. Every day and/or night; 2. More than 3 days and/or nights in a week; 3. 1 to 3 days and/or nights a week; 4. Less than once a week; 5. Varies/as required.
National Study of Mental Health and Well-being	English	<i>Drug category used—Sedatives.</i> <i>Age first time used sedatives.</i> <i>Whether used sedatives in last 12 months.</i> <i>Frequency used sedatives in last 12 months.</i> <i>Amount of sedatives used on a typical day in past 12 months.</i>
New Zealand Health Survey	English	<i>Looking at the Showcard, in the past 12 months, have you used any of the following substances? Please just read out the number next to the words.</i> 6. Sedatives or sleeping pills, for example, Valium, diazepam.
Nutrition and Health Survey in Taiwan	Chinese	<i>Self-reported drug history—sleeping pills.</i>

<sup>a</sup>Original language the sleep health items were written in before being translated.

about difficulties falling asleep accounting for the majority of sleep quality items. Without well-defined sleep health indicators, any comparisons in trends or prevalence rates between countries may be undermined. Consequently, there is a need for the standardization of sleep health indicators to allow for consistent and reliable assessments of sleep data across countries. This would not only facilitate cross-national comparisons but also enable international benchmarking [54].

### Strengths and limitations

The main strength of our review lies in its global perspective, encompassing not only the 194 WHO Member States but also

extending to other countries, including Taiwan. Our comprehensive approach involved searching both the gray literature and peer-reviewed literature, ensuring a systematic search of available data sources. We also highlighted the significant gaps in sleep health within national surveillance systems and provided suggestions for future research directions.

There are also several limitations to this scoping review that need to be considered. Firstly, the nature of the Google search in the gray literature review might have introduced some bias because of the personalized nature of the algorithms which favors search results within a certain geographical area or presents results tailored to the user based on previous searches. Secondly, the gray

**Table 5.** Sleep Disorders Items

Survey	Language <sup>a</sup>	Sleep health item(s)
Canadian Health Measures Survey	English	Has a health care professional ever diagnosed you with sleep apnea? Has a health professional prescribed you a treatment for sleep apnea? In the last 12 months, how often have you awakened suddenly with the feeling of gasping or choking? Do you usually snore? [How/According to what others have told you, how] loud do you usually snore? Would you say . . .? In the last 12 months, has anyone observed you stop breathing during your sleep?
Chilean Health Survey	Spanish	Have you been told that you snore every night or almost every night? Have you been told that when you sleep you stop breathing at times?
Danish National Health Survey	Danish	Have you been bothered by any of the types of pain and discomfort mentioned here within the past 14 days: Insomnia or sleep problems? 1. Yes, very bothered; 2. Yes, a bit bothered; 3. No.
Health Behavior Among Latvian Adult Population	Latvian, Russian	Self-reported symptoms and complaints during the last month: insomnia.
National FinHealth Survey	English	Has a doctor diagnosed or treated you for any of the following diseases during the past last 12 months? (Sleep apnea).
Public Health Barometer	French	Chronic insomnia based on the International Classification of Sleep Disease (ICSD) criteria.
German Health Interview and Examination Survey for Adults	German	Diagnosis of primary insomnia (DSM-IV-TR) or non-organic insomnia (ICD-10): People who in the last 4 weeks had reported difficulty falling asleep once or twice a week and difficulty sleeping through the night once or twice a week or had trouble falling asleep 3 times or more or trouble staying asleep 3 times or more as well as a fairly bad or very bad quality of sleep and had also stated that they had been “always” or “mostly” tired and/or exhausted in the last 4 weeks.
Swiss Health Survey	German, English	Now I am going to read to you different ailments. Please tell me each time if during the past 4 weeks you have not suffered from it at all, a little or a lot: difficulty falling asleep, or insomnia. 1. Not at all; 2. A little; 3. Many.
Korean National Health and Nutrition Survey	Korean	The following questions are related to the risk factors for obstructive sleep apnea. Please respond only if you are over 40 years of age. Is your snoring louder than conversation, or is it loud enough to be heard in the next room? Has anyone seen you stop breathing when you sleep?

<sup>a</sup>Original language the sleep health items were written in before being translated.

**Table 6.** Alertness Items

Survey	Language <sup>a</sup>	Sleep health item(s)
Brazilian National Health Survey	Portuguese	In the last two weeks, how often have you had problems because you did not feel rested and motivated during the day, feeling tired and lacking energy? 1. None; 2. Up to seven days; 3. More than seven days; 4. Almost every day.
Canadian Health Measures Survey	English	In the last 12 months, have you often felt tired, fatigued, or sleepy during the daytime? Using a scale from 0 to 10, where 0 means “no sleepiness” and 10 means “extremely sleepy,” how would you assess your sleepiness during a typical day? By “sleepiness,” I mean the strong tendency to doze off.
Chilean Health Survey	Spanish	Do you have trouble staying awake during the day at least three days a week?
Bahrain National Health Survey	English	In the last 30 days, how much difficulty did you have due to not feeling rested and refreshed during the day (e.g. feeling tired, not having energy)? 1. None; 2. Mild; 3. Moderate; 4. Severe; 5. Extreme.
National FinHealth Survey	English	Over the past month, how often have you felt excessively tired or sleepy during the daytime? 1. Often; 2. Sometimes; 3. Not at all.
Healthy Ireland Survey	English	How likely are you to doze off or fall asleep during the day? 1. Would never doze; 2. Slight chance of dozing; 3. Moderate chance of dozing; 4. High chance of dozing; 4. Don't know.
National Health and Nutrition Survey	English	Proportion of those who responded: Feel drowsy during the day.
Korean National Health and Nutrition Survey	Korean	Do you often feel tired or sleepy during the day? 1. Yes; 2. No.

<sup>a</sup>Original language the sleep health items were written in before being translated.

and literature search potentially excluded surveys that were not publicly available or accessible. In LMICs, the lack of resources, digital infrastructure, and centralized databases may hinder the online accessibility of surveys. Although our search strategy did not restrict searches to English-only results, it was conducted using English-language search terms. This approach meant that

surveys available exclusively in other languages might not have appeared in our search results. This limitation may have biased our results towards surveys in languages that are more similar to English (such as Germanic and Romance languages), which were easier to translate or interpret. We encourage readers to contact the corresponding author or submit a letter to this journal if

**Table 7.** Sleep Satisfaction Items

Survey	Language <sup>a</sup>	Sleep health item(s)
Canadian Community Health Survey	English	Overall, how would you rate your sleep quality over the past 7 days? 1. Excellent; 2. Good; 3. Fair; 4. Poor.
Chilean Health Survey	Spanish	Do you wake up feeling tired or almost as tired as before sleeping, for at least three days a week? 1. Yes; 2. No.
Mexican National Health and Nutrition Survey	Spanish	How do you qualify, in general, the quality of your sleep? 1. very good; 2. good; 3. regular; 4. bad; 5. very bad.
National Health Interview Survey	English	During the past 30 days, how often did you wake up feeling well-rested? 1 Never 2 Some days 3 Most days 4 Every day 7 Refused 9 Don't Know
National FinHealth Survey	English	Do you think you sleep enough? 1. Yes, nearly always; 2, Yes, often; 3. Rarely or hardly ever; 4. I can't say.
German Health Interview and Examination Survey for Adults	German	Overall, how would you rate the quality of your sleep over the last 4 weeks? 1. very good; 2. Fairly good; 3. Fairly bad; 4. Very bad.
Healthy Ireland Survey	English	During the past month, how would you rate your sleep quality overall? 1. Very good; 2. Fairly good; 3. Neither good nor bad; 4. Fairly bad; 5. Very bad; Don't know; 7. Refused.
National Health and Nutrition Survey	English	Proportion of those who responded: Dissatisfied with the quality of sleep.

<sup>a</sup>Original language the sleep health item were written in before being translated.

**Table 8.** Sleep Timing Items

Survey	Language <sup>a</sup>	Sleep health item(s)
Canadian Community Health Survey	English	On weekdays, at what time did you usually fall asleep? [HH] On weekdays, at what time did you usually fall asleep? [MM] On weekdays, at what time did you usually fall asleep? a.m. or p.m. On weekdays, at what time did you usually wake up? [HH] On weekdays, at what time did you usually wake up? [MM] On weekdays, at what time did you usually wake up? a.m. or p.m. On weekend days, at what time did you usually fall asleep? [HH] On weekend days, at what time did you usually fall asleep? [MM] On weekend days, at what time did you usually fall asleep? a.m. or p.m. On weekend days, at what time did you usually wake up? [HH] On weekend days, at what time did you usually wake up? [MM] On weekend days, at what time did you usually wake up? a.m. or p.m.
National Health and Nutrition Examination Survey	English	What time do you usually fall asleep on weekdays or workdays? [HH:MM] What time do you usually wake up on weekdays or workdays? [HH:MM] What time do you usually fall asleep on weekends or non-workdays? [HH:MM] What time do you usually wake up on weekends or non-workdays? [HH:MM]
Public Health Barometer	French	Most often (excluding holidays and weekends), what time do you turn off your lamp to sleep? Most often (excluding holidays and weekends), how long does it take you to fall asleep? Most often (excluding holidays and weekends), what time do you wake up?
Australian Health Survey	English	What time did you go to bed and turn the lights out to go to sleep last night? [HH:MM] What time did you wake up today? [HH:MM] Is this a typical night's sleep for a [insert previous day e.g Monday—Sunday]? 1. Yes; 3. No, usually sleep more; 5. No, usually sleep less; 6. No typical sleep.

HH, hours in a day; MM, minutes in an hour.

<sup>a</sup>Original language the sleep health items were written in before being translated.

they are aware of national surveillance systems assessing sleep health that may have not been included in our review. Finally, we excluded non-health surveys. Although the review focused on traditional self-reported surveillance questions in national health surveys for population health monitoring over time, it is important to acknowledge the potential value of other data sources. Time-use data, one-off research surveys, and social surveys can also provide valuable insights into sleep assessment, which were not considered in this review.

## Conclusions

In summary, our findings demonstrated that sleep surveillance is largely limited to HICs. Where measured, sleep surveillance

is largely limited to a single sleep health indicator and mainly focused on either sleep duration or sleep quality. Notably, there is also a complete absence of sleep surveillance in low-income countries, and it remains lacking in lower-middle and upper-middle-income countries. Despite the sleep community's recognition of the significance of sleep health, the integration of sleep health into public health systems and policies is still in its early stages.

Public health surveillance plays an essential role in informing public health practice and advocating for sleep surveillance will facilitate the inclusion of sleep health into public health agendas. It is also essential to recognize the bidirectional relationship between research and advocacy in the context of sleep health surveillance. On one hand, as research provides insights into the associations between sleep and various health outcomes,

advocacy efforts can play an important role in promoting these findings and subsequently leading to more informed public health actions. Conversely, the advocacy-driven demand for improved sleep health surveillance can significantly impact research initiatives. Therefore, although the lack of sleep health surveillance has likely contributed to the neglect of sleep as an important public health priority, the lack of awareness of sleep health in the public health community has similarly prevented the prioritization of surveillance. This review should raise awareness about the lack of global sleep surveillance and the need to routinely monitor sleep health to improve health and social outcomes in the general population.

## Supplementary Material

Supplementary material is available at *SLEEP Advances* online.

## Funding

This research was supported by an Australian Government Research Training Program (RTP) Scholarship.

## Disclosure Statement

PAC has an appointment to an endowed academic Chair at the University of Sydney that was created from ResMed funding. He receives no personal fees and this relationship is managed by an Oversight Committee of the University. He has received research support from ResMed, SomnoMed, Zephyr Sleep Technologies, and Bayer. He is a consultant/adviser to Zephyr Sleep Technologies, Signifier Medical Technologies, SomnoMed, and ResMed. He has a pecuniary interest in SomnoMed related to a previous role in R&D (2004). All other authors declare no conflicts of interest.

## Author Contributions

Joshua Way (Data curation [lead], Formal analysis [equal], Investigation [equal], Methodology [equal], Project administration [lead], Writing—original draft [lead], Writing—review & editing [equal]), Seren Ucak (Formal analysis [equal], Investigation [equal], Writing—review & editing [equal]), Chloe-Anne Martinez (Formal analysis [equal], Investigation [equal], Writing—review & editing [equal]), Kate Sutherland (Formal analysis [equal], Investigation [equal], Writing—review & editing [equal]), Kristina Cook (Formal analysis [equal], Investigation [equal], Writing—review & editing [equal]), Peter Cistulli (Supervision [equal], Writing—review & editing [equal]), and Yu Sun Bin (Conceptualization [lead], Formal analysis [equal], Investigation [equal], Methodology [equal], Investigation [equal], Supervision [lead], Writing—review & editing [equal])

## Data Availability

The data underlying this article are available in the article and the sources for the dataset are available in [online supplementary material](#) Table S1.

## Ethics Approval

Not applicable.

## References

1. Thacker SB, Berkelman RL. Public health surveillance in the United States. *Epidemiol Rev*. 1988;**10**:164–190. doi: [10.1093/oxfordjournals.epirev.a036021](#)
2. Groseclose SL, Buckeridge DL. Public health surveillance systems: recent advances in their use and evaluation. *Annu Rev Public Health*. 2017;**38**:57–79. doi: [10.1146/annurev-publhealth-031816-044348](#)
3. Troiano RP, Stamatakis E, Bull FC. How can global physical activity surveillance adapt to evolving physical activity guidelines? Needs, challenges and future directions. *Br J Sports Med*. 2020;**54**(24):1468–1473. doi: [10.1136/bjsports-2020-102621](#)
4. Hale L, Troxel W, Buysse DJ. Sleep health: an opportunity for public health to address health equity. *Annu Rev Public Health*. 2020;**41**:81–99. doi: [10.1146/annurev-publhealth-040119-094412](#)
5. Colten HR, Altevogt BM, Institute of Medicine (US) Committee on Sleep Medicine and Research, eds. *Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem*. Washington (DC): National Academies Press (US); 2006.
6. Chattu VK, Manzar MD, Kumary S, Burman D, Spence DW, Pandi-Perumal SR. The global problem of insufficient sleep and its serious public health implications. *Healthcare (Basel)*. 2018;**7**(1):1. doi: [10.3390/healthcare7010001](#)
7. Perry GS, Patil SP, Presley-Cantrell LR. Raising awareness of sleep as a healthy behavior. *Prev Chronic Dis*. 2013;**10**:E133. doi: [10.5888/pcd10.130081](#)
8. Itani O, Jike M, Watanabe N, Kaneita Y. Short sleep duration and health outcomes: a systematic review, meta-analysis, and meta-regression. *Sleep Med*. 2017;**32**:246–256. doi: [10.1016/j.sleep.2016.08.006](#)
9. Jike M, Itani O, Watanabe N, Buysse DJ, Kaneita Y. Long sleep duration and health outcomes: a systematic review, meta-analysis and meta-regression. *Sleep Med Rev*. 2018;**39**:25–36. doi: [10.1016/j.smrv.2017.06.011](#)
10. Chapat JP, Dutil C, Sampasa-Kanyinga H. Sleeping hours: what is the ideal number and how does age impact this? *Nat Sci Sleep*. 2018;**10**:421–430. doi: [10.2147/NSS.S163071](#)
11. Ohayon M, Wickwire EM, Hirshkowitz M, et al. National sleep foundation's sleep quality recommendations: first report. *Sleep Health*. 2017;**3**(1):6–19. doi: [10.1016/j.sleh.2016.11.006](#)
12. Scott AJ, Webb TL, Martyn-St James M, Rowse G, Weich S. Improving sleep quality leads to better mental health: a meta-analysis of randomised controlled trials. *Sleep Med Rev*. 2021;**60**:101556. doi: [10.1016/j.smrv.2021.101556](#)
13. Van Veen MM, Lancel M, Beijer E, Rimmelzwaal S, Rutters F. The association of sleep quality and aggression: a systematic review and meta-analysis of observational studies. *Sleep Med Rev*. 2021;**59**:101500. doi: [10.1016/j.smrv.2021.101500](#)
14. Gordon AM, Carrillo B, Barnes CM. Sleep and social relationships in healthy populations: a systematic review. *Sleep Med Rev*. 2021;**57**:101428. doi: [10.1016/j.smrv.2021.101428](#)
15. Patel NP, Grandner MA, Xie D, Branas CC, Gooneratne N. "Sleep disparity" in the population: poor sleep quality is strongly associated with poverty and ethnicity. *BMC Public Health*. 2010;**10**:475. doi: [10.1186/1471-2458-10-475](#)
16. Grandner MA, Jackson NJ, Izci-Balserak B, et al. Social and behavioral determinants of perceived insufficient sleep. *Front Neurol*. 2015;**6**:112. doi: [10.3389/fneur.2015.00112](#)
17. Matricciani L, Bin YS, Lallukka T, et al. Rethinking the sleep-health link. *Sleep Health*. 2018;**4**(4):339–348. doi: [10.1016/j.sleh.2018.05.004](#)
18. Buysse DJ. Sleep health: can we define it? Does it matter? *Sleep*. 2014;**37**(1):9–17. doi: [10.5665/sleep.3298](#)

19. Brindle RC, Yu L, Buysse DJ, Hall MH. Empirical derivation of cutoff values for the sleep health metric and its relationship to cardiometabolic morbidity: results from the Midlife in the United States (MIDUS) study. *Sleep*. 2019;**42**(9). doi: [10.1093/sleep/zsz116](https://doi.org/10.1093/sleep/zsz116)
20. Morgenthaler TI, Croft JB, Dort LC, Loeding LD, Mullington JM, Thomas SM. Development of the national healthy sleep awareness project sleep health surveillance questions. *J Clin Sleep Med*. 2015;**11**(9):1057–1062. doi: [10.5664/jcsm.5026](https://doi.org/10.5664/jcsm.5026)
21. Butler GP, Roberts KC, Kropac E, et al. At-a-glance - Conceptualizing a framework for the surveillance of physical activity, sedentary behaviour and sleep in Canada. Aperçu – Conceptualisation d'un cadre de surveillance de l'activité physique, du comportement sédentaire et du sommeil au Canada. *Health Promot Chronic Dis Prev Can*. 2019;**39**(5):201–204. doi: [10.24095/hpcdp.39.5.04](https://doi.org/10.24095/hpcdp.39.5.04)
22. Chaput JP. The integration of pediatric sleep health into public health in Canada. *Sleep Med*. 2019;**56**:4–8. doi: [10.1016/j.sleep.2018.06.009](https://doi.org/10.1016/j.sleep.2018.06.009)
23. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;**169**(7):467–473. doi: [10.7326/M18-0850](https://doi.org/10.7326/M18-0850)
24. Peters MDJ, Marnie C, Tricco AC, et al. Updated methodological guidance for the conduct of scoping reviews. *JBI Evid Synth*. 2020;**18**(10):2119–2126. doi: [10.11124/JBIES-20-00167](https://doi.org/10.11124/JBIES-20-00167)
25. Countries. *World Health Organization*. Accessed April 22, 2024. <https://www.who.int/countries>
26. World Health Organization. *Basic documents*. Geneva: World Health Organization; 2020.
27. Non-Member-States. *United Nations*. Accessed June 18, 2024. <https://www.un.org/en/about-us/non-member-states>
28. Way J, Cistulli P, Bin Y. P156 Global sleep health surveillance of adults: a scoping review. *SLEEP Adv*. 2021;**2**(suppl 1):A72. doi: [10.1093/sleepadvances/zpab014.196](https://doi.org/10.1093/sleepadvances/zpab014.196)
29. World Bank Country and Lending Groups. *The World Bank*. Accessed April 22, 2024. <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>
30. World Health Organization. *SCORE for Health Data Technical Package: Global Report on Health Data Systems and Capacity*, 2020. Geneva: World Health Organization; 2021.
31. Orach CG. Health equity: challenges in low income countries. *Afr Health Sci*. 2009;**9**(suppl 2):S49–S51.
32. Kroll M, Phalkey RK, Kraas F. Challenges to the surveillance of non-communicable diseases--a review of selected approaches. *BMC Public Health*. 2015;**15**:1243. doi: [10.1186/s12889-015-2570-z](https://doi.org/10.1186/s12889-015-2570-z)
33. Simonelli G, Marshall NS, Grillakis A, Miller CB, Hoyos CM, Glozier N. Sleep health epidemiology in low and middle-income countries: a systematic review and meta-analysis of the prevalence of poor sleep quality and sleep duration. *Sleep Health*. 2018;**4**(3):239–250. doi: [10.1016/j.sleh.2018.03.001](https://doi.org/10.1016/j.sleh.2018.03.001)
34. Bollyky TJ, Templin T, Cohen M, Dieleman JL. Lower-income countries that face the most rapid shift in noncommunicable disease burden are also the least prepared. *Health Aff (Millwood)*. 2017;**36**(11):1866–1875. doi: [10.1377/hlthaff.2017.0708](https://doi.org/10.1377/hlthaff.2017.0708)
35. Stranges S, Tigbe W, Gómez-Olivé FX, Thorogood M, Kandala NB. Sleep problems: an emerging global epidemic? Findings from the INDEPTH WHO-SAGE study among more than 40,000 older adults from 8 countries across Africa and Asia. *Sleep*. 2012;**35**(8):1173–1181. doi: [10.5665/sleep.2012](https://doi.org/10.5665/sleep.2012)
36. Krueger PM, Friedman EM. Sleep duration in the United States: a cross-sectional population-based study. *Am J Epidemiol*. 2009;**169**(9):1052–1063. doi: [10.1093/aje/kwp023](https://doi.org/10.1093/aje/kwp023)
37. Gao C, Guo J, Gong TT, et al. Sleep duration/quality with health outcomes: an umbrella review of meta-analyses of prospective studies. *Front Med (Lausanne)*. 2022;**8**:813943. doi: [10.3389/fmed.2021.813943](https://doi.org/10.3389/fmed.2021.813943)
38. Matricciani L, Bin YS, Lallukka T, et al. Past, present, and future: trends in sleep duration and implications for public health. *Sleep Health*. 2017;**3**(5):317–323. doi: [10.1016/j.sleh.2017.07.006](https://doi.org/10.1016/j.sleh.2017.07.006)
39. Bin YS. Is sleep quality more important than sleep duration for public health? *Sleep*. 2016;**39**(9):1629–1630. doi: [10.5665/sleep.6078](https://doi.org/10.5665/sleep.6078)
40. Lallukka T, Sivertsen B, Kronholm E, Bin YS, Øverland S, Glozier N. Association of sleep duration and sleep quality with the physical, social, and emotional functioning among Australian adults. *Sleep Health*. 2018;**4**(2):194–200. doi: [10.1016/j.sleh.2017.11.006](https://doi.org/10.1016/j.sleh.2017.11.006)
41. Kroenke K, Strine TW, Spitzer RL, Williams JB, Berry JT, Mokdad AH. The PHQ-8 as a measure of current depression in the general population. *J Affect Disord*. 2009;**114**(1-3):163–173. doi: [10.1016/j.jad.2008.06.026](https://doi.org/10.1016/j.jad.2008.06.026)
42. Goldberg DP, Gater R, Sartorius N, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med*. 1997;**27**(1):191–197. doi: [10.1017/s0033291796004242](https://doi.org/10.1017/s0033291796004242)
43. MacGregor KL, Funderburk JS, Pigeon W, Maisto SA. Evaluation of the PHQ-9 Item 3 as a screen for sleep disturbance in primary care. *J Gen Intern Med*. 2012;**27**(3):339–344. doi: [10.1007/s11606-011-1884-5](https://doi.org/10.1007/s11606-011-1884-5)
44. Sateia MJ. International classification of sleep disorders. *Chest*. 2014;**146**(5):1387–1394. doi: [10.1378/chest.14-0970](https://doi.org/10.1378/chest.14-0970)
45. Tighe CA, Brindle RC, Stahl ST, et al. Multidimensional sleep health and physical functioning in older adults. *Gerontol Geriatr Med*. 2021;**7**:23337214211016222. doi: [10.1177/23337214211016222](https://doi.org/10.1177/23337214211016222)
46. Jung Y, Junna MR, Mandrekar JN, Morgenthaler TI. The national healthy sleep awareness project sleep health surveillance questionnaire as an obstructive sleep apnea surveillance tool. *J Clin Sleep Med*. 2017;**13**(9):1067–1074. doi: [10.5664/jcsm.6724](https://doi.org/10.5664/jcsm.6724)
47. Brandolim Becker N, Martins RIS, Jesus SN, Chiodelli R, Stephen Rieber M. Sleep health assessment: a scale validation. *Psychiatry Res*. 2018;**259**:51–55. doi: [10.1016/j.psychres.2017.10.014](https://doi.org/10.1016/j.psychres.2017.10.014)
48. Ravyts SG, Dzierzewski JM, Perez E, Donovan EK, Dautovich ND. Sleep health as measured by RU SATED: a psychometric evaluation. *Behav Sleep Med*. 2021;**19**(1):48–56. doi: [10.1080/15402002.2019.1701474](https://doi.org/10.1080/15402002.2019.1701474)
49. Benítez I, Roure N, Pinilla L, et al. Validation of the Satisfaction, Alertness, Timing, Efficiency and Duration (SAT-ED) questionnaire for sleep health measurement. *Ann Am Thorac Soc*. 2020;**17**(3):338–343. doi: [10.1513/AnnalsATS.201908-628OC](https://doi.org/10.1513/AnnalsATS.201908-628OC)
50. Coelho J, Lopez R, Richaud A, et al. Toward a multi-lingual diagnostic tool for the worldwide problem of sleep health: The French RU-SATED validation. *J Psychiatr Res*. 2021;**143**:341–349. doi: [10.1016/j.jpsychires.2021.09.008](https://doi.org/10.1016/j.jpsychires.2021.09.008)
51. Furihata R, Tateyama Y, Nakagami Y, et al. The validity and reliability of the Japanese version of RU-SATED. *Sleep Med*. 2022;**91**:109–114. doi: [10.1016/j.sleep.2022.02.014](https://doi.org/10.1016/j.sleep.2022.02.014)
52. Meng R, Dong L, Dzierzewski JM, et al. The RU\_SATED as a measure of sleep health: cross-cultural adaptation and validation in Chinese healthcare students. *BMC Psychol*. 2023;**11**(1):200. doi: [10.1186/s40359-023-01203-5](https://doi.org/10.1186/s40359-023-01203-5)
53. Knutson KL, Phelan J, Paskow MJ, et al. The national sleep foundation's sleep health index. *Sleep Health*. 2017;**3**(4):234–240. doi: [10.1016/j.sleh.2017.05.011](https://doi.org/10.1016/j.sleh.2017.05.011)
54. Unim B, Mattei E, Carle F, et al. Health data collection methods and procedures across EU member states: findings from the InfAct Joint Action on health information [published correction appears in Arch Public Health. 2022 Feb 14;80(1):51]. *Arch Public Health*. 2022;**80**(1):17. doi: [10.1186/s13690-021-00780-4](https://doi.org/10.1186/s13690-021-00780-4)