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ANNEXES

The societal and economic burden of insomnia in adults

An international study

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Annex A. Steering committee members

Pam Alfonso-Miller, PhD, Northumbria University, UK

Dr Alfonso-Miller is Clinical Director of Northumbria Sleep Research at Northumbria University. Her work focuses on better living through sleep by observing sleep in the waking world, particularly at the intersection of mind, body, environment, and lifestyle and by plotting these intertwined relationships, translating science into solutions that seek to improve physical health, psychological health and quality of life in the general population. As a trained paediatrician she has applied these concepts to the development of interventions that support healthy sleep development in babies and parental education and is named inventor on patents for one such collaboration. Dr Alfonso-Miller is also trained in CBT-I and has been part of a team of collaborators working with different organisations consulting on sleep and health in the UK and the US.

Ellemarije Altena, PhD, Université de Bordeaux, France

Dr Altena is an Associate Professor at the Université de Bordeaux, France. Her research programme focuses on the interaction between sleep disruption and daytime functioning using affective, cognitive and physiological tests as well as neuro-imaging techniques (fMRI). The goal of this research is to uncover the pathophysiological mechanisms behind co-morbid disorders involving sleep disruption, affective and cognitive symptoms and physiological malfunctioning. Dr Altena received her PhD from the Netherlands Institute for Neuroscience and completed a postdoctoral fellowship at the University of Cambridge.

Christoph Nissen, MD, University of Geneva, Switzerland

Prof. Christoph Nissen works as full professor at the Faculty of Medicine at the University of Geneva and medical director of the clinic for psychiatric specialties at the Geneva University Hospitals (HUG). He is chair of the sleep section of the German Society for Psychiatry and Psychotherapy (DGPPN), former chair of the Scientific Committee of the European Sleep Research Society (ESRS) and board member of the Sleep Section of the World Psychiatric Association (WPA). He is also Associate Editor of the *Journal of Sleep Research*. His work is or has been funded by the German Research Foundation (DFG), the Swiss National Science Foundation (SNSF), the Sleep Research Society Foundation and others. He has published over 150 original papers in international journals.

Saverio Stranges, MD, PhD, Western University, Canada

Dr Stranges is Professor and Chair of the Department of Epidemiology and Biostatistics within the Schulich School of Medicine & Dentistry at Western University in London, Ontario, Canada. His research focuses on the epidemiology and prevention of chronic disease and ageing, specifically regarding the role of lifestyles, nutritional and psychosocial factors such as dietary patterns,

sleep behaviours and social determinants of health. Throughout his career Dr Stranges has been involved in several international epidemiological projects, clinical trials, secondary data analyses and systematic review work and has published extensively in the area of chronic disease epidemiology, with over 270 publications including scientific articles, reviews and book chapters. Dr Stranges received his medical degree and specialty training in Preventive/Public Health Medicine at the University of Naples Federico II in Italy. He subsequently completed his PhD in Epidemiology and Environmental Health at the State University of New York in Buffalo, US.

Annex B. Literature search strategy

Search terms

((insomnia[tw] OR "sleep disturbance"[tw] OR "sleep initiation and maintenance disorders"[MeSH Terms]) AND (chronic[tw] OR persist*[tw] OR longterm[tw] OR long-term[tw] OR "long term"[tw] OR endur*[tw] OR protract*[tw] OR longlasting[tw] OR long-lasting[tw] OR "long lasting"[tw] OR habitual[tw] OR recur*[tw] OR constant[tw] OR consistent[tw] OR frequent*[tw] OR established*[tw])) AND (inciden*[tw] OR prevalen*[tw] OR burden[tw] OR economic[tw] OR cost*[tw] OR "gross domestic product"[tw] OR GDP[tw] OR "gross-domestic product"[tw] OR "societal burden"[tw] OR "social burden"[tw] OR "societal cost" OR "social cost"[tw] OR wellbeing[tw] OR well-being[tw] OR "well being"[tw] OR parent*[tw] OR carer*[tw] OR "care giver"[tw] OR care-giver*[tw] OR caregiver*[tw] OR famil*[tw] OR "years lost"[tw] OR "life years"[tw] OR "life-years"[tw] OR "sick leave"[tw] OR "sick day"[tw] OR "sick days"[tw] OR "days sick"[tw] OR "medical leave"[tw] OR "quality of life"[tw] OR QOL[tw] OR education*[tw] OR school*[tw] OR academi*[tw] OR work*[tw] OR nurser*[tw] OR "early year"[tw] OR "early-year"[tw] OR childcare*[tw] OR "child care*"[tw] OR child-care*[tw] OR labour*[tw] OR labor*[tw] OR absent*[tw] OR presenteeism[tw] OR "missed work"[tw]) OR ((day[tw] OR days[tw] OR wage*[tw] OR pay[tw] OR productivit*[tw] OR employ*[tw] OR income*[tw] OR earning*[tw] OR salar*[tw] OR earning*[tw] OR revenue[tw] OR resourc*[tw] OR work*[tw] OR staff*[tw] OR personnel[tw] OR professional*[tw]) AND (loss[tw] OR lost[tw] OR miss*[tw] OR delay* OR disrupt*[tw] OR impact*[tw] OR influence*[tw]))

Annex C. Risk-of-bias assessment methodology

For articles on the prevalence of insomnia we rated the risk of bias based on **threats to external validity** using the following criteria:

1. Sampling procedure: study participants were drawn from a random sample of the general population or from a representative cohort (sampling bias);
2. Response rate: ≥70% of the target sample participated in the study (sampling bias);
3. Insomnia definition: the study applied a clear definition of insomnia (misclassification bias);
4. Insomnia measurement: insomnia was measured using a validated instrument (measurement bias).

We used the following rubric to assess the overall risk of bias for each study[1]:

For (1) if participants were drawn from a random sample, then no points were applied; if participants were from a representative sample of the underlying population, then one point was assigned; if participants were neither from a random nor representative sample (e.g. from a convenience sample), then two points were applied. For (2)–(4) one point was applied for each statement that was not true. We considered studies to have a relatively low risk of bias if they had a total score of 0 to 1, moderate risk of bias if they had a total score of 2 to 3 and high risk of bias if they had a total score of 4 or 5.

For articles on QoL and workplace-related outcomes in which at least two groups were compared (e.g. those with insomnia vs those without) we used the same rubric to assess risk of bias related to external validity. For risk of bias related to **threats to internal validity** we rated each article using the following criteria:

1. Insomnia definition: insomnia and comparator groups were defined appropriately, with little risk for misclassification (misclassification bias);
2. Outcome definition: outcomes were defined in a way with little risk for misclassification (misclassification bias);
3. Outcome measurement: outcomes were measured in a way to ensure that the exposure preceded the outcome (measurement bias);
4. Statistical methods: statistical adjustment or matching was performed on a number of variables that are likely to be associated with insomnia and the outcome of interest (confounding bias).

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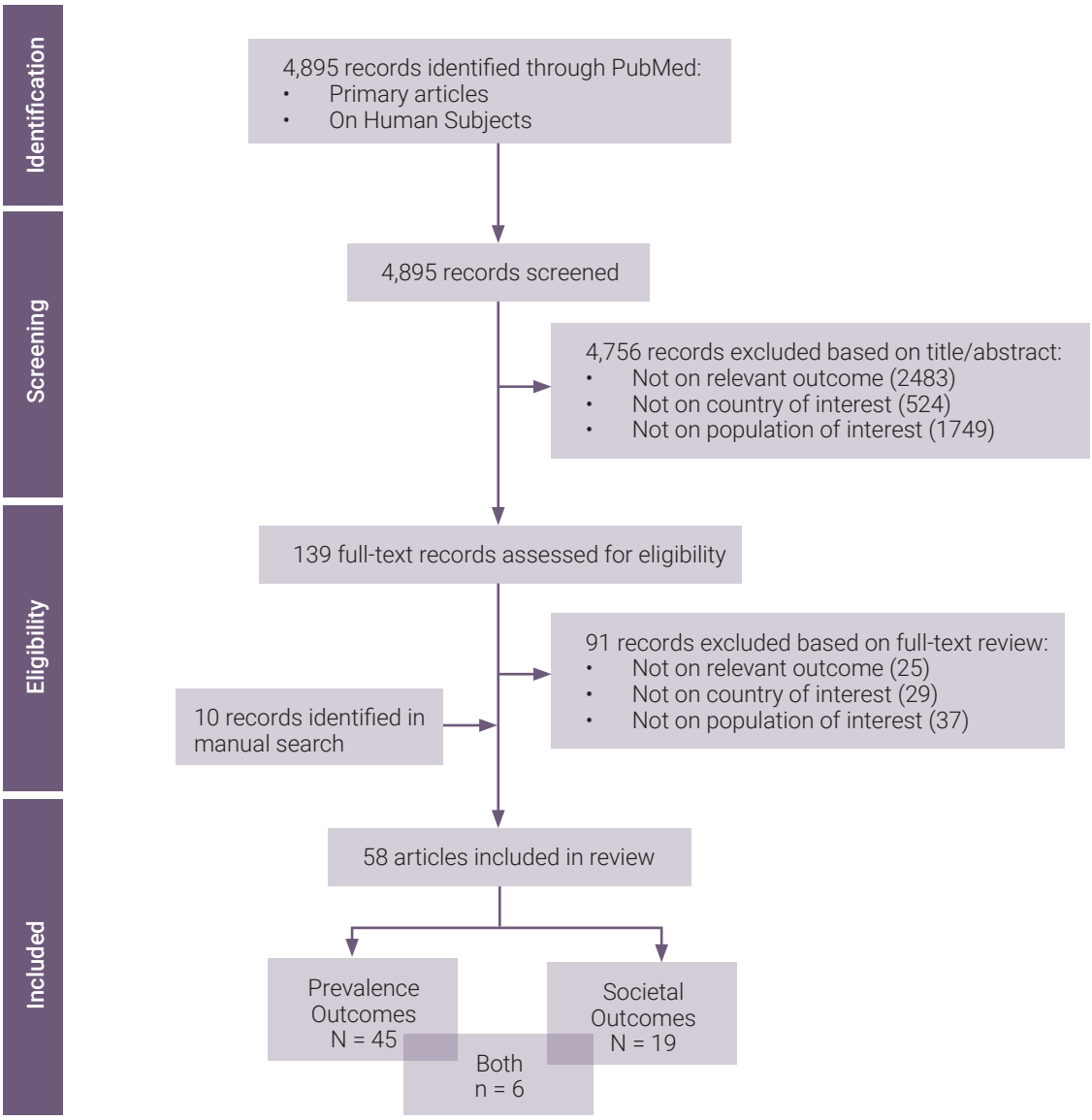
1 This rubric was developed specifically for this study as a systematic and replicable process to assess risk of bias, but it is broadly consistent with validated approaches developed elsewhere.

We used the following rubric to assess the overall risk of bias for each study:

For (1) and (2) if the statement was true, then no points were assigned; if the statement was potentially true, then one point was assigned; and if the statement was not true, then two points were assigned. For (3), if the study design was longitudinal (and exposure preceded the outcome) then no points were assigned and if the study design was cross-sectional or case-control then one point was assigned. For (4) if matching or statistical adjustment was performed on many important variables, no points were assigned; if matching or statistical adjustment was performed on a restricted set of important variables, two points were assigned; and if matching or statistical adjustment was not performed, then three points were assigned. We considered studies to have relative low risk of bias if they had a total score of 0 to 1, moderate risk of bias if they had a total score of 2 to 3 and high risk of bias if they had a total score of 4 or greater.

Annex D. Study-eligibility flow diagram

Figure D.1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram



Annex E. Summary of prevalence studies

Table E.1: Prevalence study characteristics

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Morin (2022)	Canada (*n*=594) Mean age: 48 Female: 64.0%	2018/2020	Longitudinal cohort study	ISI	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes	42.2% in 2018 51.2%in 2020 16.8% in 2018 19% in 2020	Moderate
Morin (2020)	Canada (*n*=3073) Mean age: 48.1 Females:62.2%	2007–2014	Longitudinal cohort study	ISI	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes	44.1% (at baseline) 17.5% (at baseline)	Moderate
Maire (2020)	Switzerland (*n*=2,432) Mean age: 58.0 Female: 51%	2018	Cross-sectional cohort	Generic questionnaire	Insomnia symptoms Chronic insomnia: DSM-5 consistent	36% 11%	High
Perlis (2020)	United Kingdom (*n*=1,248) Mean age: 53.2 Female: 67.4%	Not reported	Longitudinal study	Generic questionnaire	Chronic insomnia: DSM-5 consistent	6.8%	High

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Jansson-Frojmark (2019)	Sweden (*n*=1,638) Mean age: 41.4 Female: 53.6%	Not reported	Longitudinal study	BNSQ	Chronic insomnia: DSM-5 consistent	8.1% at baseline	Low
Adams (2017)	Australia (*n*=1011) Mean age: 49.8 Female: 50.2%	2016	Cross-sectional	Australian Sleep Survey in Adults	Insomnia symptoms	20%	Moderate
Ford (2015)	US (*n*=88,823) 2002 (*n*=30,970) Mean age: 45.2 Female: 56.5% 2007 (*n*=23,344) Mean age: n/a Female: 55.7% 2012 (*n*=34,509) Mean age: 46.6 Female: 55.8%	2002, 2007, 2012	Serial cross-sectional survey	Generic questionnaire	Insomnia symptoms	17.5% in 2002 18.1% in 2007 19.2% in 2012	Moderate
Uhlig (2014)	Norway (*n*=42,024) Mean age: 44.5 Female: 56.1%	2006–2008	Cross-sectional study	General questionnaire	Chronic insomnia: DSM-V consistent	7.1%	Moderate

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Haaramo (2014)	Finland (*n*=6,477) Mean age: n/a Female: 78.5%	2000–2002	Cross-sectional study	JSQ	Clinical insomnia: ≥15x over the past 4 weeks + daytime interference	20%	Moderate
Talala (2012)	Finland (*n*=13,793) Mean age: 45.0 Female: 53.6%	1998–2002	Cross-sectional	Generic questionnaire	Insomnia symptoms	20.8%	Moderate
Olfson (2018)	United States (*n*=34,712) Mean age: n/a Female: n/a	2012–2013	Cross-sectional study	Generic Questionnaire	Insomnia symptoms	27.3%	Moderate
Hagg (2015)	Sweden (*n*=4,320) Mean age: n/a Female: 100%	2000/2010	Longitudinal study	Uppsala Sleep Inventory	Clinical insomnia	11.2% in 2000 13.4% in 2010	Low
Silvertsen (2006)	Norway (*n*=37,308) Mean age: 42.2 Female: 53.4%	1995–1997	Longitudinal	Generic questionnaire	Clinical insomnia: DSM-IV consistent, regardless of underlying conditions.	10.2%	Moderate

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Daley (2009)	Canada (*n*=948) Mean age: 43.7 Female: 60.0%	Not reported	Cross-sectional study	ISI	Insomnia symptoms Clinical insomnia: ISI ≥15; DSM-IV consistent, excluding presence of other sleep disorders.	47.7% 15.4%	Moderate
Kessler (2011)	United States (*n*=7,428) Mean age: n/a Female: n/a	2008–2009	Cross-sectional study	Brief Insomnia Questionnaire	Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	23.2%	Moderate
Morin (2011)	Canada (*n*=2000) Mean age: 48.6 Female: 51%	2007	Cross-sectional study	ISI	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	40.2% 13.4%	Low
Leger (2000)	France (*n*=12,778) Mean age: n/a Female: 53.0%	Not reported	Cross-sectional study	Generic questionnaire	Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	19%	Moderate
Aernout (2021)	International (*n*=52,200) France (*n*=48,600) Spain (*n*=900) Italy (*n*=1800) Belgium (*n*=900) Mean age: 44.5 Female: 53.1%	Not reported	Cross-sectional study	Mini International Neuropsychiatric Interview	Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	11.3% overall 10.8% – Spain 11.2% – France 8.7% – Italy 17.9% – Belgium	Moderate

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Torrens (2019)	Spain (*n*=467) Mean age: 40 (i) Female: 56.7%	2010–2011	Cross-sectional study	ISI	Insomnia symptoms Clinical insomnia: ISI ≥15; DSM-IV consistent, regardless of underlying causes.	28% 6.9%	Moderate
Ohayon (2002)	Italy (*n*=3,970) Mean age: 44 (i) Female: 52% Age range: 15-90	1996–1997	Cross-sectional study	Sleep-EVAL	Insomnia symptoms Clinical insomnia: DSM-IV consistent, excluding other sleep disorders.	27.6% 7%	Low
Calem (2012)	England, UK (*n*=20,503) 1993, *n*=8903 Mean age: 38.2 Female: 49.5% 2000, *n*=6,175 Mean age: 39.2 Female: 50.0% 2007, *n*=5,425 Mean age: 39.7 Female: 50.4%	1993, 2000, 2007	Cross-sectional study	Clinical Interview Schedule	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	35% in 1993 38% in 2000 38.6% in 2007 12.6% in 1993 13.3% in 2000 13.9% in 2007	Moderate
Ohayon (2010)	Spain (*n*=4,065) Mean age: 42 (i) Female: 51.5%	1998–1999	Cross-sectional study	Sleep-EVAL	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	20.8% 6.4%	Low

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Mallon (2014)	Sweden (*n*=1,128) Mean age: 47.8 Female: 52.1%	Not reported	Cross-sectional study	Generic questionnaire	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	24.6% 10.5%	Moderate
Schlack (2013)	Germany (*n*=7,988) Mean age: n/a Female: n/a	Not reported	Cross-sectional study	Generic questionnaire	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	30.3% 5.7%	Low
Morin (2006)	Canada (*n*=2,001) Mean age: 44.7 Female: 51%	2001	Cross-sectional study	Generic questionnaire	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	29.9% 9.5%	Moderate
Leger (2011)	France (*n*=1004) Mean age: 30 (i) Female: 51%	2008	Cross-sectional study	Sleep Disorder Questionnaire-French Version	Clinical Insomnia: DSM-IV consistent, regardless of underlying causes	12.0%	Low
Ohayon (1997)	France (*n*=5622) Mean age: 40 (i) Female: 52.1%	1993	Cross-sectional study	Sleep-EVAL	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	18.6% 12.7%	Low

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Jansson-Frojmark (2008)	Sweden (*n*=1,746) Mean age: 42 Female: 53%	Not reported	Longitudinal study	BNSQ and Uppsala Sleep Inventory	Chronic insomnia- DSM-5 consistent	9.7% (at baseline)	Moderate
Phillips & Mannino (2005)	United states (*n*=13563) Mean age: 57 (i) Female: 55.2%	1990–1992	Cross-sectional study	Maastricht Questionnaire	Insomnia symptoms	23%	Moderate
Paparrigopoulous (2010)	Greece (*n*=1,005) Mean age: 46 (i) Female: 51.9%	2006	Cross-sectional study	AIS	Clinical insomnia: AIS >=6	25.3%	Low
Pallesen (2014)	Norway (*n*=4,001) 1999-2000 (*n*=2,001) Mean age: 47.7 Female: 45.5% 2009-2010 (*n*=2,001) Mean age: 48.0 Female: 48.0%	1999–2000 2009–2010	Serial cross-sectional	Generic questionnaire	Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	11.9% (1999-2000) 15.5% (2009-2010)	Low
Ohayon (2002)	Finland (*n*=982) Mean age: 46 (i) Female: 51.8%	2000	Cross-sectional study	Sleep-EVAL	Insomnia symptoms Clinical insomnia: DSM-IV consistent, regardless of underlying causes.	37.6% 11.7%	Low

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Ohayon & Roth (2003)	Overall (*n*=5,973) Germany (*n*=4,115) Portugal (*n*=1858) Mean age: n/a Female: 52.1%	Not reported	Cross-sectional study	Sleep-EVAL	Insomnia symptoms	21.1% Germany 17.3% Portugal	Low
Ohayon & Paiva (2005)	Portugal (*n*=1858) Mean age: 43 (i) Female: 52.5%	1998	Cross-sectional study	Sleep-EVAL	Insomnia symptoms	28.1%	Low
Sutton (2001)	Canada (*n*=10,702) Mean age: n/a Female: n/a	1991	Cross-sectional study	Generic questionnaire	Insomnia symptoms	24%	Moderate
Ohayon & Bader (2010)	Sweden (*n*=1209) Mean age: 46 (i) Female: 49.8%	2001	Cross-sectional	Generic questionnaire	Insomnia symptoms	32.1%	Low
Hartescu & Morgan (2019)	UK (*n*=2,838) Mean age: 44.5 (i) Female: 79.5% Australia (*n*=2,052) Mean age: 44.5 (i) Female: 73.6%	2016	Cross-sectional study	Generic questionnaire	Chronic insomnia: DSM-5 consistent	14.8% in the UK 10.7% in Australia	Moderate

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Hajak (2001)	Germany (*n*=1,913) Mean age: 46 (i) Female: 53%	1997	Cross-sectional study	Generic questionnaire	Clinical insomnia: at least 2 sleep complaints at least 3 x per week during the past month	6%	Moderate
Sweetman (2021)	Australia (*n*=2,044) Mean age: 46.6 Female: 51.3%	2019	Cross-sectional study	Generic questionnaire	Insomnias symptoms Chronic insomnia: ICSD-3 consistent, excluding obstructive sleep apnoea.	39.4% 13.3%	Moderate
Soldatos (2005)	Austria (*n*=490) Mean age: 39.0 Female: 50.2% Belgium (*n*=6,832) Mean age: 44.3 Female: 48% Germany (*n*=2,016) Mean age: 36.1 Female: 53.5% Portugal (*n*=784) Mean age: 44.5 Female: 51.8% Spain (*n*=1,999) Mean age: 47.7 Female: 31.3%	2002	Cross-sectional survey	AIS	Insomnia symptoms Clinical insomnia: AIS >=6	32% in Austria 49.9% in Belgium 32.9% in Germany 42.8% in Portugal 37.6% in Spain 19% in Austria 36% in Belgium 17.4% in Germany 21.1% in Portugal 22.4% in Spain	Moderate

Author (year)	Country (population)	Timeframe	Study type	Insomnia instrument	Insomnia definition	Prevalence	Risk of bias (external validity)
Bardel et al. 2009	Sweden (*n*=2,991) Mean age: 49.6 Female: 100%	Not specified	Cross-sectional study	Gothenburg QoL Instrument	Insomnia symptoms	33.1%	Moderate
Hoglund (2020)	Sweden (*n*=3,406) Mean age: 54.5 (i) Female: 51%	2010	Cross-sectional study	Karolinska Sleep Questionnaire	Insomnia symptoms	28.6%	Low
Cunningham (2015)	United States (*n*=33,865) Mean age: 46 (i) Female: 55.7%	2012	Cross-sectional study	Generic questionnaire	Insomnia symptoms	18.8%	Moderate
Leger & Poursain (2005)	France (*n*=1,003) Mean age: 49.5 (i) Female: 52% Italy (*n*=1,068) Mean age: 55 (i) Female:53% United States (*n*=2,062) Mean age: 50 (i) Female: 52%	2002–2003	Cross-sectional Survey	Generic questionnaire	Insomnia symptoms	37.2% in France 27.1% in Italy 27.6% in US	Moderate
Di Bonaventura (2015)	United States (*n*=75,000) Mean age: 48.8 Female: 48%	2013	Cross-sectional survey	Generic questionnaire	Chronic insomnia: DSM-5 consistent	6.0%	Low

Notes: N/A=not available. (i) imputed value based on reported age distribution. DSM=Diagnostic and Statistical Manual of Mental Disorders. QoL=quality of life. ISI=Insomnia Severity Index. AIS=Athens Insomnia Scale. BNSQ=Basic Nordic Sleep Questionnaire. JSQ=Jenkins Sleep Questionnaire. ICSD=International Classification of Sleep Disorders.

Annex F. Meta-regression methods and results

The fractional logit model can be expressed by the following linear equation:

$$logit(y) = \beta_0 + \beta_1 X_1 \quad (1)$$

Where:

1. logit(y) = the natural log of the outcome *y* (i.e. proportion of individuals with insomnia in a given study)
2. X_1 = value of a given study-level variable
3. β_1 = parameter representing the mean change in logit(y) per unit change in variable X_1
4. β_0 = the y-intercept (i.e., value of *y* when X_1 or $\beta_1 = 0$)

Linear equation (1), above, can be extended to include multiple study-level variables (X_2 through X_k) and can be expressed as follows (i.e. multivariable fractional logit model):

$$logit(y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k \quad (2)$$

While the interpretation of parameter β_1 is not straightforward, as it is on a logarithmic scale, we were interested in whether this parameter was statistically significantly associated with the outcome (i.e. logit of insomnia prevalence) and the direction of the relationship (i.e. a negative estimate for β_1 indicates that each unit increase in X_1 is associated, on average, with a lower prevalence of insomnia, while a positive estimate for β_1 indicates that each unit increase in X_1 is associated, on average, with a higher prevalence).

Annex Table F.1: Estimates for the relationship between study characteristics and insomnia prevalence from bivariate fractional logit models

	Insomnia symptoms *n*=41	Clinical insomnia *n*=37	Chronic insomnia *n*=8
Mean Age	-.0055302	.0194067	-.0130178
Mean Age (no impute)	-.0136016	.0156157	.0096383
% Female	-.0041941	-.0008306	.0239755***
% Female (no impute)	-.0042126	-.0011212	.0239755***
Year	.005625	.0002463	.0297785
Year (no impute)	.0042357	.0149462	.0809691
Region			
United States	Ref	Ref	Ref
Canada	.7311001**	-.5614494***	--
Northern Europe	.3489187	-.7411047***	--
Western Europe	.6413043***	-.6459735***	--
Southern Europe	.3514426	-.8770741 **	--
Australia	.5168717	-.6663788***	--
Definitions			
Simple	Ref	Ref	Ref
DSM	0.3329378	-.5744653	--
Other	.3037653	-.1349195	--
Instruments			
Generic	Ref	Ref	Ref
AIS	.8629984***	.9157648***	--
Sleep-EVAL	.0097353	-.3219934	--
ISI	.919517***	.2494205	--
Other	.4138523*	.0644005	.1729998
Imputed age (y/n)	-.1947763	-.0224943	.3689904
Imputed gender (y/n)	.0047914	-.1542707	--
Imputed Year (y/y)	-.0202368	-.027686	.0779894
Risk of Bias			
Low	Ref	Ref	Ref
Moderate	.0464497	.3748257	.4892521*
High	.4671344***	--	.3988967*

*Notes: AIS=Athens Insomnia Scale. DSM=Diagnostic and Statistical Manual of Mental Disorders. ISI=Insomnia Sleep Index. n=study observations. *=p<0.05; **=p<0.01; ***=p<0.001*

Annex G. Demographic information on countries of focus

Table G.1: Demographic information on countries of focus

	Population (2020)[2]	% aged 15–64 years (2021)[3]	Population aged 15–64 years[4]	Median age (2020)[5]	% female (2020)[6]
Australia	25,499,884	64.0%	16,319,926	37.9	50.2%
Austria	9,006,398	66.0%	5,944,223	44.4	50.7%
Belgium	11,589,623	63.0%	7,301,462	41.8	50.4%
Canada	37,742,154	66.0%	24,909,822	41.4	50.4%
Finland	5,540,720	61.0%	3,379,839	42.8	50.7%
France	65,273,511	61.0%	39,816,842	42	51.6%
Germany	83,783,942	64.0%	53,621,723	46.6	50.6%
Greece	10,423,054	64.0%	6,670,755	45.3	50.9%
Italy	60,461,826	64.0%	38,695,569	47.9	51.3%
Norway	5,421,241	65.0%	3,523,807	39.7	49.5%
Portugal	10,196,709	64.0%	6,525,894	46.2	52.7%
Spain	46,754,778	65.0%	30,390,606	45.5	50.8%
Sweden	10,099,265	62.0%	6,261,544	41	49.9%
Switzerland	8,654,622	66.0%	5,712,051	43.1	50.4%
United Kingdom	67,886,011	64.0%	43,447,047	40.8	50.6%
United States	331,002,651	65.0%	215,151,723	38.3	50.5%

2 As of 20 October 2022: https://www.worldometers.info/world-population/population-by-country/

3 As of 20 October 2022: https://data.worldbank.org/indicator/SP.POP.1564.TO.ZS?end=2021&name_desc=false&start=2021&view=map&year=2021

4 Calculated based on the total population shown in the second column and the percentage of working-age people in the third column.

5 As of 20 October 2022: https://ourworldindata.org/age-structure

6 As of 20 October 2022: https://ourworldindata.org/gender-ratio

Annex H. Reported and predicted prevalence estimates of insomnia

Table H.1: Reported and predicted prevalence estimates of insomnia

	Insomnia symptoms *n*=41 study observations		Clinical insomnia *n*=37 study observations		Chronic insomnia *n*=8 study observations	
Country (*n*, total obs)	**Reported prevalence (*n*, obs)**	**Predicted prevalence (95% CI)**	**Reported prevalence (*n*, obs)**	**Predicted prevalence (95% CI)**	**Reported prevalence (*n*, obs)**	**Predicted prevalence (95% CI)**
Austria, *n*=2	32.0% (*n*=1)	24.4 (20.6, 28.2)	19.0% (*n*=1)	9.4 (7.7, 11.2)	n/a	5.3 (3.9, 6.6)
Australia, *n*=4	20.0%–39.4% (*n*=2)	41.2 (32.7, 49.6)	n/a	18.4 (12.9, 24.0)	10.7%-13.3% (*n*=2)	10.9 (8.6, 13.2)
Belgium, *n*=3	49.9% (*n*=1)	40.7 (35.4, 46.0)	17.9%–36.0% (*n*=2)	18.1 (16.0, 20.3)	n/a	10.7 (8.2, 13.1)
Canada, *n*=13	24%–51.2% (*n*=7)	35.8 (27.2, 44.4)	9.5%–19.0% (*n*=6)	15.2 (10.2, 20.3)	n/a	8.8 (5.6, 12.0)
Finland, *n*=4	20.8%–37.6% (*n*=2)	37.5 (29.2, 45.6)	11.7%–20.0% (*n*=2)	16.2 (11.6, 20.9)	n/a	9.4 (6.5, 12.4)
France, *n*=6	18.6%–37.2% (*n*=2)	35.6 (26.3, 44.9)	11.3%–19.0% (*n*=4)	15.2 (10.6, 19.7)	n/a	8.8 (5.6, 12.0)
Germany, *n*=6	21.1%–32.9% (*n*=3)	25.1 (21.0, 29.1)	5.7%–17.5% (*n*=3)	9.7 (8.0, 11.5)	n/a	5.5 (4.0, 6.9)
Greece, *n*=1	n/a	31.8 (17.3, 46.3)	25.3% (*n*=1)	13.1 (5.3, 20.9)	n/a	7.5 (2.8, 12.2)
Italy, *n*=6	20.8%–27.6% (*n*=3)	29.8 (22.7, 36.8)	6.4%–8.7% (*n*=3)	12.0 (8.8, 15.2)	n/a	6.8 (4.6, 9.0)
Norway, *n*=4	n/a	32.8 (23.9, 41.7)	10.2%–15.5% (*n*=3)	13.6 (9.5, 17.7)	7.1% (*n*=1)	7.8 (4.8, 10.8)
Portugal, *n*=4	17.3%–42.8% (*n*=3)	29.2 (21.9, 36.5)	21.1% (*n*=1)	11.7 (8.2, 15.3)	n/a	6.7 (4.3, 9.0)
Spain, *n*=5	28.0%–37.6% (*n*=2)	27.4 (22.7, 32.0)	6.9%–22.4% (*n*=3)	10.8 (8.5, 13.1)	n/a	6.1 (4.4, 7.8)
Sweden, *n*=9	24.6%–33.1% (*n*=4)	36.1 (25.8, 46.4)	10.5%–13.4% (*n*=3)	15.4 (9.4, 21.4)	8.1%–9.7% (*n*=2)	9.0 (6.1, 11.8)
Switzerland, *n*=2	36.0% (*n*=1)	36.8 (28.0, 45.6)	n/a	15.8 (10.8, 20.9)	11.0% (*n*=1)	9.2 (5.8, 12.5)
United Kingdom, *n*=11	35%–38% (*n*=3)	39.7 (32.4, 46.9)	12.6%–13.9% (*n*=3)	17.5 (13.1, 22.0)	6.8%–14.8% (*n*=2)	10.3 (6.8, 13.8)
United States, *n*=9	17.5%–27.6% (*n*=7)	32.3 (22.6, 42.2)	23.0% (*n*=1)	13.9 (7.9, 18.9)	6.0% (*n*=1)	7.7 (5.1, 10.2)

Note: CI=confidence intervals.

Annex I. Summary of societal impact studies

Table I.1: Characteristics of studies on quality of life (QoL)

Author (year)	Country (population)	Study design	Insomnia definition/ measurement	Outcomes measured	Findings	Risk of bias
Olfson (2018)	USA (*n*=34,712) Mean age: n/a Female: n/a	Cross-sectional, 2012–2013	Insomnia symptoms: self-reported problems falling asleep or staying in the past 12 months, confirmed by a doctor Measurement: generic questionnaire	Quality adjusted life years (QALYs) measured by the SF-6D	The annual loss of QALYs associated with insomnia (5.6m; 95% CI, 5.33–5.86m) was significantly larger than that associated with any of the other 18 medical conditions assessed in the paper including: • arthritis (4.94m; 95% CI, 4.62–5.26m), • depression (4.02m; 95% CI, 3.87–4.17m) • hypertension (3.63m; 95% CI, 3.32–3.93m).	Threat to external validity: moderate Threat to internal validity: high
Léger (2012)	International USA (*n*=1,298) Mean age: 51.6 Female: 59.4% France (*n*=1858) Mean age; 48.3 Female: 58.1%	Cross-sectional, 2005–2006	Insomnia symptoms: ISI score >8 or treated with insomnia for at least 6 months (note: the authors refer to this as chronic insomnia) Measurement: ISI	Health related quality of life: SF-36 Health Survey Utility scores: SF-6D	Individuals with insomnia had lower health-related quality-of-life scores than good sleepers ($p< 0.0001$), for each country Chronic insomnia was associated with significantly lower utility scores compared with good sleepers (mean scores 0.63 vs 0.72 in the US and 0.57 versus 0.67 in France ($p< 0.0001$ for each).	Threat to external validity: low Threat to internal validity: low

Author (year)	Country (population)	Study design	Insomnia definition/ measurement	Outcomes measured	Findings	Risk of bias
Bolge (2009)	United States (*n*=19,777) Mean age: n/a Female: 55%	Cross-sectional survey, 2005	Insomnia symptoms: insomnia classified as physician-diagnosed insomnia occurring at least a few times each month. Measurement: generic questionnaire	Health related quality of life (HRQOL): SF-8	Insomnia was associated with a lower physical HRQOL score than no insomnia (40.5 vs 50.9; adjusted difference of -5.40; $p<0.01$) and a lower mental HRQOL score than no insomnia (42.9 vs 53.3; adjusted difference of -4.39; $p<0.01$)	Threat to external validity: moderate Threat to internal validity: low
LeBlanc (2007)	Canada (*n*=948) Mean age: 43.8 Female: 60.2%	Longitudinal study	Clinical insomnia: insomnia defined per DSM-IV Measurement: ISI, PSQI	Health-related quality of life: SF-12 across 8 domains (physical functioning, role- physical, bodily pain, general health, vitality, social functioning, role- emotional and mental health)	Compared to good sleepers, insomnia was associated with lower adjusted odds of a SF-12 vitality score (adjusted OR: 0.99; 95% CI: 0.98, 1.00; $p=0.02$), but not other SF-12 measures.	Threat to external validity: low Threat to internal validity: moderate
Léger (2001)	France (*n*=1,053) Mean age: n/a Age range:18–64 Female: 75%	Cross-sectional study	Clinical insomnia: consistent with DSM-IV	Health-related quality of life: SF-36 Health Survey for 9 domains (physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, mental health and reported health transition)	Compared to matched good sleepers, mild and severe insomniacs had lower scores across all domains except for reported health transitions. Severe insomniacs had lower scores across all domains compared with mild insomniacs except for reported health transitions.	Threats to external validity: high Threats to internal validity: moderate
Katz (2002)	United States (*n*=3,268) Mean age: 54.0 Female: 61.9%	Cross-sectional study	Clinical insomnia: consistent with DSM-IV	HRQoL measured by the SF-36 for 8 domains (physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, mental health)	Mild and severe insomnia were associated with lower scores for all 8 domains compared to those within insomnia, after adjusting for various other factors.	Threats to external validity: moderate Threats to internal validity: low

Notes: DSM, Diagnostic and Statistical Manual of Mental Disorders.

Table I.2: Characteristics of studies on workplace-related outcomes

Author (year)	Country (population)	Study design	Insomnia definition/ measurement	Outcomes measured	Findings	Risk of bias
Lallukka (2014)	Finland (*n*=3,760) Mean age: 44.4 Female: 49.9%	Longitudinal study, 2000 with mean of 7.2 years of follow-up	Insomnia symptoms: bothered by disturbed sleep or insomnia in the previous 30 days Measurement: Symptom Checklist-90 questionnaire	Sick absence (of at least 10 days) derived from the Social Insurance Institution of Finland	Frequent insomnia-related symptoms vs no or rare symptoms were associated with sickness absences among men (RR: 1.92; 95% CI: 1.41–2.63) and women (RR:1.42; 95% CI: 1.08–1.86) respectively, with an adjusted mean absence of 9.4 (vs 5.31) and 10.0 (vs 6.73) working days annually.	Threat to external validity: moderate Threat to internal validity: moderate
Daley (2009)	Québec, Canada (*n*=953) Mean age: 43.7 Female: 60.0%	Cross-sectional	Clinical Insomnia: insomnia syndrome (IS) defined per DSM-IV Measurement: ISI	Absenteeism: number of hours absent from work Productivity loss: self-reported	Individuals with IS were more likely to be absent from work (25.0%) compared to good sleepers (17.1%) and had a significantly higher number of total hours missed from paid work (19.94 vs 5.94 in the prior 3 months). Estimated hours lost due to insomnia were 8.72 and 0.69 respectively. 40.6% of individuals with insomnia syndrome reported having experienced reduced productivity compared to 12.3% of good sleepers (OR: 4.8). Hours lost to productivity were 97.72 and 20.05 in the prior 3 months when subjects with insomnia symptoms were compared to good sleepers. Productivity lost specific to insomnia was 54.15 and 5.36 respectively.	Threat to external validity: moderate Threat to internal validity: high

Author (year)	Country (population)	Study design	Insomnia definition/ measurement	Outcomes measured	Findings	Risk of bias
Kessler (2011)	United States (*n*=7,428) Mean age: n/a Female: n/a	Cross-sectional study, 2008–2009	Clinical Insomnia: DSM-IV consistent Measurement: Brief Insomnia Questionnaire (BIQ)	Work performance: the WHO Health and Work Performance Questionnaire (HPQ)	Annually there were 7.8 days of work performance lost linked to insomnia, controlling for other factors. Insomnia was significantly associated with lost work performance due to presenteeism but not absenteeism.	Threat to external validity: moderate Threat to internal validity: moderate
Hägg (2005)	Sweden (*n*=4320) Mean age: n/a Age range: 20–67 Female: 100%	Serial cross-cohort study, 2000–2010	Insomnia symptoms Measurement: Uppsala Sleep Inventory	Occupational accidents	Individuals with persistent insomnia (i.e. presenting insomnia symptoms at both baseline and follow-up) had a higher risk of being involved in a self-reported occupational accident (adjusted OR: 1.5, 95% CIs 1.2–2.0, after adjusting for demographic measures such as age, life habits and work patterns. Persistent insomnia symptoms did not reach statistical significance as an independent predictor of register-reported occupational accident with sick leave (Adj OR: 1.4; 95% CI 0.99–2.1).	Threat to external validity: moderate Threat to internal validity: moderate
Sivertsen (2006)	Norway (*n*=37,308) Mean age: 42.2 Female: 53.4%	Longitudinal historical cohort study, 1995–1997, with 18–48 months of follow-up	Clinical Insomnia: insomnia based on DSM-IV criteria. Measurement: generic questionnaire	Awards of disability pension: as registered by the National Insurance Administration.	Insomnia with daytime work impairment was associated with subsequent permanent work disability (adjusted Adj OR=1.75; 95% CI: 1.40, 2.20).	Threat to external validity: moderate Threat to internal validity: low

Author (year)	Country (population)	Study design	Insomnia definition/ measurement	Outcomes measured	Findings	Risk of bias
Leger (2002)	France (*n*=631) Mean age: n/a Female: 68.4%	Cross-sectional study	Severe clinical insomnia (SI): at least 2 sleep complaints at least 3 x a week for at least 1 month Measurement: general questionnaire	Absenteeism due to sickness in the past 12 months Work-related errors	9% vs 4% with a leave of absence for severe clinical insomnia vs good sleepers (OR: 2.55; 95% CI: 0.69–9.65), with mean duration of 5.4 vs 3.6 days (difference not statistically significant) in the past 12 months. 15% of severe clinical insomnia subjects vs 6% of good sleepers made an error in the previous month that could have resulted in serious consequences (p<0.01) and 8% vs 1% had had an industrial accident (p=0.015) in the past 12 months.	Threat to external validity: moderate Threat to internal validity: high
Leger (2006)	France (*n*=738) Mean age: 43.8 Female: 63.7%	Case-control study	Clinical Insomnia: consistent with DSM-IV Measurement: physician assessment	Absences from work: Work Productivity Short Inventory	50% vs 34% with at least 1 work absence in the past 2 years (OR: 1.93; 95% CI:1.44–2.61) Mean duration of absenteeism 11.65 vs 4.84 days in the past 2 years (p<0.001)	Threat to external validity: high Threat to internal validity: high
Philip (2006)	France (*n*=1,570) Mean age: 51.0 Female: 35.9%	Longitudinal study	Chronic insomnia: consistent with DSM-5 Measurement: BNSQ	Absenteeism	Duration of absenteeism in the last 12 months was higher for insomniacs than for controls (9.6 +/- 31 days versus 5.8 +/- 9 days; p<0.01)	Threat to external validity: moderate Threat to internal validity: high

Author (year)	Country (population)	Study design	Insomnia definition/ measurement	Outcomes measured	Findings	Risk of bias
Silvertsen (2009)	Norway (*n*=6,892) Mean age: n/a Age range: 40–45 Female: 59.1%	Longitudinal historical cohort (4-year follow-up), 1997–1999	Chronic insomnia: insomnia defined by DSM-IV experience for the past 3 months Measurement: Karolinska Sleep Questionnaire	Sickness absences beyond 14 days and disability pension awards	Odds of any absence ≥15 days were higher among insomniacs vs non-insomniacs, adjusting for other factors (adjusted OR: 1.51; 95% CIs: 1.19–1.94)	Threat to external validity: moderate Threat to internal validity: low
Silvertsen (2009)	Norway (*n*=6,599) Mean age: n/a Age range: 40–45 Female: n/a	Longitudinal historical cohort (4-year follow-up), 1997–1999	Clinical insomnia: insomnia defined as difficulty falling or staying asleep several times per with daytime impairment Measurement: Karolinska Sleep Questionnaire	Work disability	People with insomnia had a higher odds of disability pension (adjusted OR: 1.88; 95% CIs:1.00–3.55) after adjusting for other factors.	Threat to external validity: moderate Threat to internal validity: low
King (2010)	Canada (*n*=69,584) Mean age: n/a Age range: 15–64 Female: 48%	Cross-sectional survey, 2000–2001	Insomnia symptoms Measurement: generic questionnaire	Work injury in the past 12 months	Men with sleep trouble most of the time had a 1.25 x adjusted odds (95% CI: 1.01, 1.55) of having a work injury associated with sleep problems vs those who never had sleep problems. Women with trouble sleeping most of the time or sometimes had a 1.54 x (95% CI: 1.25, 1.91 and 1.25 x (95% CI: 1.03, 1.54) adjusted odds of work injury compared to those with no sleep trouble.	Threat to external validity: moderate Threat to internal validity: moderate

Author (year)	Country (population)	Study design	Insomnia definition/ measurement	Outcomes measured	Findings	Risk of bias
Bolge (2009)	United States (*n*=19,777) Mean age: n/a Female: 55%	Cross-sectional survey, 2005	Clinical insomnia: classified as physician-diagnosed insomnia occurring at least a few times each month. Measurement: generic questionnaire	Work productivity measured by the Work Productivity and Activity Impairment (WPAI) Questionnaire (% of work time)	Insomnia vs no insomnia WPAI absenteeism 10.7% vs 1.7% (adjusted beta=6.4%) WPAI presenteeism 29.2% vs 7.6% (adjusted beta=13.2%) Overall work productivity loss: 24.2% vs 7.1% (adjusted beta=10.3%)	Threat to external validity: moderate Threat to internal validity: low
DiBonaventura (2015)	United States (*n*=75000) (matched, ^=36,959) Mean age: 48.8 Female: 48% European Union (*n*=62,000) (matched, *n*=31,661) Mean age: 47.2 Female: 50.0%	Cross-sectional, 2013	Chronic insomnia: insomnia defined per DSM-5 criteria Measurement: generic questionnaire	Work productivity measured by the Work Productivity and Activity Impairment (WPAI) Questionnaire (% of work time)	Insomnia vs no-insomnia matched group WPAI absenteeism 8.2% vs 3.2% in US (diff.=5.0%) 12.3% vs 4.4% in EU (diff.=7.9%) Presenteeism 28.0% vs 10.7% In US (diff.=17.3%) 32.1 vs 12.1% in EU (diff.=20.0%) Overall work impairment: 32.2% vs 12.8% in US (diff.=19.4%) 38.7% vs 14.9% in EU (diff.=23.8%)	Threat to external validity: moderate Threat to internal validity: low
Rosekind (2010)	United States (*n*=4188) Mean age: 39.9 Female: 46.6%	Cross-sectional survey, 2006–2007	Clinical insomnia: consistent with DSM-IV	Productivity loss	Mean productivity loss was 6.1% vs 2.5% among individuals with insomnia compared to good sleepers ($p<0.05$).	Threat to external validity: high Threat to internal validity: high

Note: DSM=Diagnostic and Statistical Manual of Mental Disorders.

Annex J. Detailed methods and findings for well-being costs

Step 1: Estimate the association between insomnia and subjective well-being

In more technical terms, the empirical analysis first tests the relationship between subjective well-being (i.e., life satisfaction) and insomnia, keeping other factors constant that could also affect well-being. This **first step** is based on estimating the following baseline (linear) empirical equation:

$$LS_{it} = \beta_0 + \beta_I Insomnia_{it} + \beta_M M_{it} + \beta_3 X_{it} + \delta_i + Y_t + \mathcal{E}_{it} \qquad (1)$$

In this equation, the variables are defined as follows:

- LS_{irt} denotes the self-reported subjective well-being (i.e. life satisfaction) of individual i at time t. It serves as a measure of the individual utility or welfare.
- $Insomnia_{it}$ denotes an indicator measuring whether an individual reports suffering from insomnia. Note that if we expect insomnia to have has a negative impact on an individual's life satisfaction, we expect the parameter β_I to be negative.
- M_{it} denotes the (log) level of (equivalised) household income for individual *i* at time *t*. Note that household income is usually entered into the model in log form to account for a marginal decrease in the effect of income on subjective well-being. If the level of income has an expected positive impact on an individual's subjective well-being, we would expect the parameter β_M to be positive.
- X_{it} represents a vector of control variables usually applied in measuring determinants of happiness or life satisfaction including, among others, personal characteristics of individual *i*, such as education level, sex, age, job situation and marital status. It also contains control variables which are correlated both with life satisfaction and income and/or the risk of developing insomnia We elaborate in more detail below on which control variables have been included in the analysis.
- δ_i are time-invariant individual-specific effects, controlling for factors that do not change over time within an individual. These could cover personality traits or genetic factors that could be associated with the onset of insomnia. This variable enables us to only consider variation across the outcome variable over time within the same individual, rather than comparing the effects of insomnia on life satisfaction across different individuals.
- Y_t are time-specific effects, such as a control variable for each year the observation has been recorded in the data. These effects are common across the units included in the analysis, including for instance changes in GDP or other time-varying factors which are common across individuals (e.g. onset of a global pandemic within a country, economic down- or upturns).

Step 2: Calculate compensating income variation

In the **second step**, the aim is to quantify the welfare loss associated with insomnia. To measure the monetary equivalent of a given change in terms of subjective well-being we use the regression coefficient β_I (i.e. mean impact of insomnia on life-satisfaction controlling for a vector of other variables) to calculate the CIV, which can be estimated as follows:

$$CIV = \frac{\beta_I}{\beta_M} \quad (2)$$

β_M represents the well-being effect associated with income, which is typically modelled in log form, *ln(M)*, to account for the diminishing marginal utility of income. In this case the CIV in monetary terms can be calculated as follows:

$$CIV = M\left[\underbrace{exp\left(-\frac{\beta_I \Delta Insomnia}{\beta_M}\right) - 1}_{= MRS}\right] \quad (3)$$

Where:

1. M = equivalised household income[7]
2. β_M = coefficient of log income (1.25)
3. β_I = coefficient for the effect of insomnia on subjective life satisfaction
4. $\Delta insomnia$ = the change from having insomnia to not having insomnia, which is usually measured as a binary indicator unless insomnia symptom severity and their varying impacts on well-being are taken into account
5. Marginal Rate of Substitution (MRS) = percentage of income an individual would have to be compensated to accept suffering from insomnia

Note that we follow the guidance by Fujiwara & Dass (2021)[8] and used βM from outside of the study's statistical analysis. This is because in most cases the coefficient for income in a well-being equation is not estimated accurately and suffers from biases (e.g. omitted variable bias). Using the income coefficient β_M of 1.25 ensures that the CIV is not overestimated, as lower values of β_M would increase the CIV, all else equal (Frijters & Krekel 2021).[9, 10] Furthermore, the bracketed expression in equation (3) above represents in essence the MRS.

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7 Note that equivalised household income is the household income adjusted by the household size. For the purpose of this analysis we use household income reported by the individual and calculated the equivalised household income as: income/householdsize^(1/2).

8 Fujiwara D. & D. Das. 2021. 'Incorporating life satisfaction in discrete choice experiments to estimate wellbeing values for non-market goods.' Research Paper. Simetrica-Jacobs Limited.

9 Note that because life satisfaction is measured on a scale from 1-7, we use a coefficient for β_M of 1.25, but for life satisfaction measured on a scale from 1-10 this would have to be converted multiplying the log income coefficient for income by 11/7, resulting in 1.96

10 Frijters P. & C. Krekel. 2021. A handbook for wellbeing policy-making: History, theory, measurement, implementation, and examples. Oxford: Oxford University Press.

Table J.1: Individual compensating income variation (CIV) for insomnia in 2019 USD

Country	Individual CIV ($, 2019 values)	Individual CIV ($, 95% CI: low)	Individual CIV ($, 95% CI: high)
Austria	$5,632.3	$3,333.0	$8,045.9
Australia	$5,433.7	$3,215.5	$7,762.2
Belgium	$5,153.6	$3,049.8	$7,362.1
Canada	$4,870.9	$2,882.5	$6,958.2
Finland	$4,906.9	$2,903.7	$7,009.6
France	$5,071.5	$3,001.1	$7,244.8
Germany	$5,773.5	$3,416.6	$8,247.6
Italy	$4,455.5	$2,636.6	$6,364.8
Norway	$5,638.5	$3,336.7	$8,054.8
Portugal	$3,746.3	$2,216.9	$5,351.6
Spain	$4,011.7	$2,374.0	$5,730.7
Sweden	$4,801.7	$2,841.5	$6,859.3
Switzerland	$5,778.5	$3,419.5	$8,254.7
United Kingdom	$4,883.4	$2,889.9	$6,976.1
United States	$7,674.8	$4,541.7	$10,963.6

Notes: Entries report the individual compensating income variation for a person suffering from insomnia by country. The same marginal substitution rate that was estimated based on UK data (14.0%; 95% CI: 8.3%, 20.1%) was applied to other countries to calculate the CIV. Household income per capita data was taken from OECD data. CI=confidence interval. USD = United States Dollar.

Table J.2: Individual compensating income variation (CIV) for insomnia and other health conditions based on Howley (2017) in 2019 USD

Condition	Individual CIV ($, 2019 values)
Congestive Heart Failure	$21,152.4
Chronic Bronchitis	$12,970.9
Epilepsy	$12,628.9
Hyperthyroidism	$12,289.4
Cancer	$9,801.6
Diabetes	$9,095.2
Emphysema	$8,955.3
Insomnia	$4,883.4
Coronary Heart Disease	$4,174.2
Arthritis	$3,957.2
Angina	$3,374.1
Liver Disease	$2,859.8
Asthma	$2,322.8
Stroke	$2,116.1
High Blood Pressure	$1,706.1
Hypothyroidism	$447.0

Notes: Entries report the individual compensating income variation for a person suffering from insomnia and other health conditions based on Howley (2017). We apply the parameter estimates presented in Howley (2017) Table 2 (adjusted for personality controls) in equation (3). Household income per capita data for the UK was taken from OECD data. USD = United States Dollar.