

Prevalence of Common Mental Disorders among Incident Individuals on Long-Term Sickness Absence When Compensating for Non-Participation*

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Objective: In a cross-sectional study regarding long-term sickness absence to estimate: 1) The prevalence of mental disorders among incident individuals on long-term sickness absence; 2) The diagnostic frequencies in total and divided by participants and non-participants; and 3) Divided by socio-demographic characteristics. **Method:** In a well-defined cohort with complete coverage, 2414 individuals entering LSA during one year were identified. In a two-phase study, the 1121 (46.4%) participants constituted Phase 1 and they were screened for mental disorders by Common Mental Disorders—Screening Questionnaire. In Phase 2, a subgroup of Phase 1, 337 individuals were diagnosed by means of Present State Examination. Compensation for non-participation was carried out by multiple imputation by the use of data known for all sick-listed individuals from public registers. **Results:** The frequencies of mental disorders were: Any mental disorder 52%, depression 36%, anxiety 15%, somatoform disorder 7%, alcohol and drug dependence 6%, and personality disorder 6%. The diagnostic frequencies were highest for non-participants, female gender, age below 40 years, urban areas, single status, higher education, high skills/ managers, without a job, and low income. **Conclusion:** The prevalence of mental disorders among incident individuals on LSA was found to be about 50%. The burden on society may be higher than expected from previous studies solely based on participants as the methods compensating for missing values in this study indicated that the frequency of mental disorders was higher among non-participants than among participants.

Keywords: Sickness Absence; Epidemiology; Diagnosis; Multiple Imputation; Non-Participation

Background

Mental disorders are frequent as the 12-months prevalence of any psychiatric disorder in population samples has been estimated to be as high as 27% (Wittchen & Jacobi, 2005). In addition to the burden imposed on individuals and families, the high frequency of mental disorders imposes large burdens on society and the public health care system (Andlin-Sobocki et al., 2005; Murray & Lopez, 1997; OECD, 2009).

The burdens on societies are primarily due to indirect costs such as payment of sickness absence benefits, early retirement, and early death (Andlin-Sobocki et al., 2005). The burden is increasing as mental health problems in OECD countries now account for a third of all new disability benefit claims on average, and in some countries nearly 50% (OECD, 2009). In addition, the cumulative incidence of sick-listed individuals with mental disorders on long-term sickness absence (LSA) is increasing (Hensing et al., 2006).

With regard to LSA this was in this study defined as exceeding a continuous sickness absence period of eight weeks as well as in some other studies (Hensing et al., 2006). The exact burden imposed by LSA may be difficult to estimate for more reasons: 1) The exact population of sick-listed individuals is

difficult to identify because the administration of sickness benefits in most countries, except the Scandinavian countries, is based on private insurance or by companies; 2) Mental disorders are often undetected e.g. in general practice (Christensen et al., 2005b); and 3) Because of a large degree of non-participation in epidemiological studies.

Perspective of the Study

The perspective of this study was to overcome the obstacles mentioned above by applying methods to: 1) *Identify all sick-listed individuals* from public registers regarding sickness benefits; 2) *Apply methods for detection of mental disorders* by the use of a standardised instrument for the identification of psychiatric diagnoses; and 3) *Compensate for missing data* by the application of multiple imputation by the use of data from public registers. The identification of all sick-listed individuals can be accomplished in this study which was carried out in a Danish population where the administration of sickness absence benefits is based on public registers.

Danish Legislation Concerning Sickness Absence

In Denmark, it is a citizen's privilege to be compensated financially during sickness absence, if the citizen was available for work prior to the sickness absence. This applies whether the citizen was sick-listed and holding a job or unemployed pro-

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vided the citizen is unable to work due to an illness or injury. Rehabilitation officers in the jobcentres are responsible for the rehabilitation process. The role of general practitioners and other physicians is that they can be requested to do examinations and statements about sick-leave diagnoses, expected duration of sickness absence and necessary rehabilitative measures.

Aim

The aims of the study in regard to individuals on LSA were in a cross-sectional study as follows:

- 1) To estimate the prevalence of common mental disorders among incident individuals on LSA.
- 2) To estimate the frequencies of mental disorders in total and among participants and non-participants.
- 3) To estimate the diagnostic frequencies distributed by socio-demographic characteristics.

Methods

Study Population

The study was conducted in a well-defined Danish population of approximately 118,000 inhabitants of whom 50% were living in the urban municipality of Herning. The participants were recruited from public registers on sickness benefits. Individuals who had their first day of a sickness absence period between the 30th of August 2004 and the 29th of August 2005 and who later proceeded into LSA were included, but only for the first sickness absence period registered within the year of the study. On a weekly basis, the social services provided the researchers information about sick-listed individuals. Within one week of entering LSA, a sick-listed individual was sent a questionnaire by post. The individuals were included if they were sick-listed from ordinary work, part time work, or adjusted work, and if they were unemployed and their benefits were registered as changing from unemployment benefits to sickness absence benefits. Individuals who were under 18 years on the day when the sickness absence period exceeded eight weeks were excluded. This was also the case for individuals who were absent due to childbirth, and individuals who were unable to understand Danish. Within the geographical area, 56,589 individuals between 20 and 64 years were registered as available for the labour market on the 1st of January 2005 (Statistics Denmark, 2011a).

Two-Phase Design

Within the year studied, 2414 individuals entered LSA of which 1121 (46.4%) participated by returning the above-mentioned questionnaire and an informed consent, referred to as *participants*. The 1293 individuals who did not respond at all are referred to as *non-participants*. The study was carried out by a two-phase design. Phase 1 comprised the 1121 participants who had filled in the Common Mental Disorders—Screening Questionnaire (CMD-SQ) which is a screening instrument covering the categories depression, anxiety, somatoform disorders, and alcohol dependence (Christensen et al., 2005a). In Phase 1, 844 individuals were identified as scoring above the predefined levels of psychological distress in the subscales of CMD-SQ. By random, 423 individuals of this group were allocated to a psychiatric examination which included Present State Examination (PSE) as diagnostic gold standard (World Health Organi-

zation, 1994). Moreover, 11 individuals who did not meet the predefined criteria for psychological distress were also randomly allocated to a psychiatric examination. Due to non-participation at this stage, Phase 2 constituted 337 individuals who participated in a psychiatric examination. The selection process and non-participation is described in detail elsewhere (Soegaard & Bech, 2009).

Data

All individuals on LSA were linked to official registers through their Personal Identification Numbers in the *Danish Centralized Civil Register* (Det Centrale Personregister, The Civil Registration System in Denmark, 2011). Since 1968, this register has comprised every person who is a Danish citizen, and it is updated on a daily basis. In attaining information about the medical history of the individuals on LSA, *The National Board of Health* (The National Board of Health, 2011b) delivered information regarding admission to hospitals, emergency rooms and outpatient clinics. Demo-graphic and socio-economic variables were delivered from *Statistics Denmark* (Statistics Denmark, 2011b). *The Medication Database* (The National Board of Health, 2011a) delivered information on redeemed prescriptions on psychoactive drugs (ATC codes N03, N05A, N05B, N05C, N06A and N06B) and the variable was dichotomised as the individual prescribed at least one type of the drugs or none (WHO Collaborating Centre for Drug Statistics Methodology, 2011). *The Danish National Labour market Authority's DREAM database* (Arbejdsmarkedsstyrelsen & The National Labour Market authority, 2010) registers data concerning benefits for unemployment, sickness absence, and other kinds of economic or public compensation. The data were dichotomised as receiving a benefit or not at the time just before being sick-listed, however not receiving sickness benefits. The final socio-demographic variables were: *Gender, municipality, civil status, children living at home, education, employment, employment situation, and annually gross income*. The categories of each variable are mentioned in.

All individuals in Phase 1 provided information in the posted questionnaire regarding psychological distress in the form of CMD-DQ (Christensen et al., 2005a) and quality of life in the form of SF-36 (Bjorner et al., 1998; Ware & Kosinski, 2001).

In Phase 2, the individuals had their psychiatric diagnoses verified by means of a psychiatric examination which applied PSE as gold standard with output in the form of ICD-10 diagnoses (World Health Organisation, 2006; World Health Organisation, 1994). The psychiatric examinations were carried out by the investigator without knowledge of the screening result. Disorders not covered by PSE such as personality disorders were diagnosed by the psychiatrist according to ICD-10 (World Health Organisation, 2006).

Total Non-Participation and Partial Non-Participation

The study was not affected by *Incomplete coverage* (non-coverage) (Bisoffi et al., 2000) as all individuals on LSA were identified from public registers regarding sickness absence benefits. The *Total non-participation* rate was 53.6% which comprised the 1293 individuals who did not participate in any respect (Bisoffi et al., 2000). *Partial non-participation* occurred as *non-participation by the design* since only 434 (61.0%) individuals of Phase 1 were allocated to the diagnostic verification.

Moreover, *partial non-participation* occurred for 97 individuals (9%) of Phase 1 who had either returned to work before a diagnostic examination could be arranged or because they did not want to participate in the examination. Finally, *partial non-participation* occurred as *Item non-participation* which defined the situation when the informants did not answer single items of CMD-SQ. The proportions varied between .3% and 1.0% in Phase 1. This particular non-participation was handled by simple imputation setting non-participation equal to 0 in the Likert scales in the items of CMD-SQ (Bisoffi et al., 2000).

Compensation for Missing Data

The compensation for missing data were carried out by multiple imputation by which data known for all sick-listed individuals were applied from the public registers mentioned above (Collins et al., 2001; Graham, 2009). The data were missing at random (MAR). Multiple imputation by 50 imputations were applied, and the model included the verified diagnoses and the socio-demographic variables and other variables gathered from public registers, which were associated with missingness of the verified diagnoses. Furthermore, the sum-scores of the subscales of CMD-SQ and the scores of the subscales of SF-36 were used as auxiliary variables.

The analyses were carried out as weighted logistic regression (Bisoffi et al., 2000). All endpoint estimates were presented with 95% confidence intervals. For methodological reasons, no tests were carried out with regard to the statistical significance between the prevalences among participants and non-participants.

The analyses were conducted by STATA 11.0 (Stata Corp, 2006) and multiple imputations by ice (UCLA Academic Technology Services, 2010).

Ethical Permission

The study was approved by the local ethics committee, but was found not to be within the framework of the ethics committees (The Ethic Committee for Ringkjøbing, Ribe and Sønderjylland counties ref. number 2607-04). Moreover, it was approved by the Danish Data Protection Agency. The ethical considerations were discussed in a previous paper (Soegaard & Bech, 2008).

Results

Annual Cumulative Incidence of Sickness Absence

For individuals between 20 and 64 years of age, employed or unemployed but available for the labour market, the annual

cumulative incidence of LSA was 42.2/1,000: 36.1 for men and 49.5 for women. This resulted in an annual cumulative incidence of sickness absence by individuals on LSA with mental disorders of 22.0 in total: 16.1 for men and 29.1 for women.

Frequencies of Mental Disorders for all Individuals on LSA

The frequencies of any psychiatric diagnosis were 51.8% for all sick-listed individuals, 49.2% for participants, and 54.2% for non-participants (Table 1). The table shows the frequencies divided the most frequent mental disorders. The frequency of any psychiatric diagnosis was 5% higher among participants than among non-participants. The higher frequency for non-participants was only seen for any psychiatric diagnosis and to a minor degree for depression.

Diagnostic Frequencies Distributed by Gender

Except for alcohol and drug dependence, the frequencies were higher for females than for males; 1.4 times higher for any psychiatric diagnosis, 1.6 times higher for depression and anxiety, 2.6 times higher for somatoform disorder, and 1.2 times higher for personality disorder (Table 2). In contrast, the frequency of alcohol and drug dependence was 3.2 times higher for males than for females.

Diagnostic Frequencies of any Psychiatric Diagnosis Divided by Socio-Demographic Characteristics

There was an intraclass variation in the frequencies of any mental disorder for the following variables *gender, age groups, municipality, civil status, education, employment, and annual gross income* whereas the variation was low for the variables *children living at home and employment situation* (Table 3). High frequencies of a mental disorders occurred for *females, urbanity, living alone; general upper secondary school, higher education, high skills/manager, without a job, and low income*. With regard to age groups, individuals *below 40 years of age* had the highest frequency with a decreasing trend with increasing age.

Differences in Diagnostic Frequencies between Participants and Non-Participants According to Socio-Demographic Characteristics

Table 3 also shows that the frequency of any psychiatric diagnosis was higher among non-participants than among participants for all socio-demographic characteristics except the *age group below 40 years, general secondary upper school,*

Table 1.

Frequencies and 95% confidence intervals of psychiatric diagnosis for all sick-listed individuals, participants and non-participants.

Diagnosis	All sick-listed individuals		Participants		Non-participants	
	Frequency %	95% CI	Frequency %	95% CI	Frequency %	95% CI
Any psychiatric diagnosis	51.8	47.0 - 56.7	49.2	44.2 - 54.2	54.2	47.8 - 60.5
Depression	36.2	32.4 - 40.2	35.4	31.6 - 39.5	36.9	31.5- 42.6
Anxiety	14.7	11.4 - 18.7	15.2	12.1 - 18.9	14.2	10.2 - 19.5
Somatoform disorder	6.6	4.4 - 9.8	7.0	4.7 - 10.1	6.2	3.7 - 10.4
Alcohol and drug dependence	5.3	2.5 - 11.2	5.5	2.8 - 10.2	5.1	1.9 - 13.1
Personality disorder	6.3	3.4 - 11.4	6.2	3.7 - 10.2	6.3	2.8 - 13.5

Table 2.

Frequencies and 95% confidence intervals of any psychiatric diagnosis distributed by gender for all individuals on long-term sickness absence, participants and non-participants.

Diagnosis	Males		Females	
	Frequency %	95% CI	Frequency %	95% CI
Any psychiatric diagnosis	43.6	36.2 - 51.3	58.9	52.5 - 65.1
Depression	27.2	21.4 - 33.8	43.9	38.4 - 49.6
Anxiety	11.2	7.0 - 17.6	17.5	13.0 - 23.2
Somatoform disorder	3.5	1.5 - 8.1	9.0	5.7 - 14.0
Alcohol and substance dependence	8.2	3.3 - 19.0	2.6	.1 - 7.7
Personality disorder	5.6	2.2 - 13.7	6.6	3.4 - 12.6

Table 3.

Frequencies and 95% confidence interval of any psychiatric diagnosis distributed by socio-demographic characteristics for all individuals, participants, and non-participants.

Socio-demographic characteristics		All sick-listed individuals		Participants		Non-participants	
		Frequency %	95% CI	Frequency %	95% CI	Frequency %	95% CI
Gender	Male	43.6	36.2 - 51.3	39.4	32.4 - 47.0	46.8	37.0 - 56.8
	Female	58.9	52.5 - 65.1	56.5	49.9 - 63.0	61.3	53.1 - 68.9
Age groups	< 40 years	54.7	48.2 - 61.0	56.7	49.7 - 63.4	53.1	44.6 - 61.4
	40 - 49 years	52.1	46.6 - 57.6	48.0	41.2 - 54.8	55.9	47.9 - 63.6
	≥ 50 years	48.4	42.2 - 54.6	42.8	35.8 - 50.2	53.9	45.3 - 62.2
Municipality	Rural	48.7	41.4 - 56.1	44.4	37.0 - 52.0	52.3	43.0 - 61.3
	Urban	54.8	48.1 - 61.3	53.4	47.1 - 59.5	56.1	47.2 - 64.7
Civil status	Single	56.0	42.7 - 68.5	55.1	42.2 - 67.4	56.7	41.5 - 70.7
	Married/living together	50.3	44.9 - 55.7	47.2	42.1 - 52.4	53.2	45.5 - 60.8
Children living at home	No	51.4	45.4 - 57.5	48.1	41.7 - 54.6	54.1	46.1 - 62.0
	Yes	52.4	47.0 - 57.7	50.4	44.7 - 56.0	54.3	46.4 - 61.9
Education	Primary and lower secondary school	51.6	45.1 - 58.1	49.0	41.8 - 56.2	53.9	45.1 - 62.5
	General upper secondary school	57.5	43.7 - 70.3	59.4	43.0 - 74.0	55.9	36.3 - 73.8
	Vocational upper secondary school	48.8	43.0 - 54.6	44.2	38.2 - 50.4	52.5	44.5 - 60.3
	Higher education	58.9	47.3 - 69.5	57.9	46.7 - 68.4	60.0	44.3 - 73.9
Employment	Self-employed	44.7	33.7 - 56.3	38.6	25.5 - 53.5	48.7	33.4 - 64.1
	High skills/manager	56.7	48.7 - 64.2	54.7	45.3 - 63.8	58.7	48.1 - 68.5
	Basic skilled worker	49.7	43.5 - 55.8	46.9	40.6 - 53.3	52.4	43.6 - 61.1
	Unskilled worker	49.8	42.9 - 56.7	45.0	36.9 - 53.4	53.5	44.1 - 62.6
	Without a job	59.4	50.3 - 67.8	61.3	49.4 - 71.9	58.1	46.2 - 69.2
	Full time	51.6	46.8 - 56.4	48.9	44.0 - 53.9	54.1	47.6 - 60.5
Employment situation	Part time	53.4	39.9 - 66.4	47.2	30.6 - 64.5	58.0	40.7 - 73.5
	Benefits	52.6	43.6 - 61.4	51.6	40.4 - 62.8	53.2	41.3 - 64.8
	< 200.000	55.7	49.2 - 62.0	54.6	47.2 - 61.7	56.5	48.1 - 64.5
Annually gross income	200.000 - 249.999	52.3	45.9 - 58.6	50.9	43.4 - 58.3	53.7	44.7 - 62.5
	250.000 - 299.999	49.2	42.4 - 56.0	44.9	36.5 - 53.6	53.2	43.8 - 62.4
	≥ 300.000	46.7	39.3 - 54.2	42.4	34.0 - 51.2	50.9	40.4 - 61.3

and without a job. For the age group of 50 years or older and self-employed, the differences were highest, 10.7%-point for both characteristics. In addition, the differences in frequencies between the most frequent and the least frequent characteristics were generally of larger magnitude among the participants than among the non-participants, for most variables. In more variables the most frequent and the least frequent characteristics were different for participants and non-participants.

Discussion

Key Findings

The prevalence of common mental disorders among incident individuals on LSA was 51.8% in total.

Comparison with Other Studies

The best study to compare with is a Norwegian study which

found a cumulative incidence of sickness absence for females with mental disorders of 46/1000 individuals available for the labour market and of 22 for males in 2000 (Hensing et al., 2006). The cumulative incidence in the Norwegian study was higher than in the present study showing a cumulative incidence of 29 for females and 16 for males even though the present study applied methods to identify undetected mental disorders which was not the case in the Norwegian study. The explanation may be due to differences in national legislation and practice regarding economic compensation for sickness absence. In addition, the differences may be rooted in variation over time with regard to the incentive to go on sickness absence since the Norwegian figures are from 2000 and the figures in this study from 2004/2005. Finally, in Norway, it is obligatory, when entering LSA, to code the sick-leave diagnoses in accordance with the ICPC-classification standards which is different from the Danish practice (Lambets et al., 1993). The obligation of this coding may improve the awareness of coding mental disorders.

The higher frequency of mental disorders for the female gender than for male gender shown in this study is in accordance with consistent findings from population samples for affective disorders and anxiety (Alonso et al., 2004; Bijl et al., 1998; Lindeman et al., 2000; Hodiament et al., 1987; Offord et al., 1996; Bijl et al., 2002; Peen et al., 2007; Jenkins et al., 1997; Bebbington et al., 2003; Akhtar-Danesh & Landeen, 2007; Kessler et al., 1994). The opposite for alcohol and drug dependence was also in agreement with other studies. (Alonso et al., 2004; Bijl et al., 1998; Lindeman et al., 2000; Hodiament et al., 1987; Offord et al., 1996; Bijl et al., 2002; Peen et al., 2007; Jenkins et al., 1997; Bebbington et al., 2003; Akhtar-Danesh & Landeen, 2007; Kessler et al., 1994). The high frequency of mental disorders for individuals aged below 40 years as well as the trend of decreasing frequencies of mental disorders with older age as found in this study was also in accordance with the majority of other studies (Alonso et al., 2004; Bijl et al., 1998; Lindeman et al., 2000; Offord et al., 1996; Bijl et al., 2002; Bebbington et al., 2003; Akhtar-Danesh & Landeen, 2007; Kessler et al., 1994). Several population studies have shown higher frequencies of mental disorders with increasing urbanity (Bijl et al., 1998; Hodiament et al., 1987; Peen et al., 2007; Jenkins et al., 1997). This trend was verified in the present study as well. However, the trend may not be as apparent in this study as in other studies due to the fact that the most urbanised area was a city of only 60.000 inhabitants. Living alone (unmarried, widow or widower, separated, divorced, and not living with children), has in other studies especially for the female gender been associated with a high frequency of mental disorders (Alonso et al., 2004; Bijl et al., 1998; Lindeman et al., 2000; Hodiament et al., 1987; Jenkins et al., 1997; Bebbington et al., 2003; Akhtar-Danesh & Landeen, 2007). These findings were confirmed in this study as far as civil status is concerned, but not with regard to whether the individuals were living with children below 18 years of age or not. In this study, the high frequency of mental disorders for the variable *without a job* corresponds to a high frequency for unemployment in other studies even though the variable *without a job* was not fully comparable with unemployment (Alonso et al., 2004; Bijl et al., 1998; Hodiament et al., 1987; Jenkins et al., 1997; Bebbington et al., 2003; Akhtar-Danesh & Landeen, 2007; Kessler et al., 1994). As in other studies, the frequency of mental disorders was decreasing with income (Bijl et al., 1998; Kessler et al.,

1994). The most striking finding in this study was that the frequency of mental disorders increased with a higher level of education. This is in contradiction with other studies (Alonso et al., 2004; Bijl et al., 1998; Hodiament et al., 1987; Akhtar-Danesh & Landeen, 2007; Kessler et al., 1994). The explanation may be that this study concerns sick-listed individuals. It is possible that individuals of a lower educational level such as lower and secondary Danish primary school as well as unskilled workers and basic skilled workers are not prone to take a leave of absence on account of lower levels of psychological distress because they can keep working in jobs that are not mentally demanding. In comparison, individuals with a higher socioeconomic status and of a higher educational level, who often hold mentally demanding jobs, are more promptly faced with challenges when experiencing psychological distress.

In comparing other studies and the present study, it must be taken into account that this study comprised incident individuals on LSA, whereas the population-based studies comprise prevalent individuals whose illness will be of longer duration. Mental disorders are frequently of longer duration, and, consequently, they occur with a higher frequency in prevalence studies.

In the general population, anxiety is found to be more frequent than depression, 12% versus 9%. However, this study documented that depression was much more frequent than anxiety, 35% versus 15% (Wittchen & Jacobi, 2005). The rather high frequency of depression might be explained by the fact that depression is much more associated with work performance than anxiety (Angst, 1990).

The study revealed more intra class variation among participants than non-participants, and the frequency of any mental disorder was 5%-point higher among non-participants than among participants. The interpretation could be that socio-demographic differences are overestimated in studies which are delimited to the participants.

Methodological Considerations

When compensating for missing data, weighting methods, multiple imputation, or maximum likelihood methods are the most appropriate instruments (Collins et al., 2001; Graham, 2009). In this study, the missing data regarding the verified diagnoses was associated with more variables known for all individuals on LSA. For this reason, the missing data were not missing completely at random (MCAR), but merely missing at random (MAR). However, the missing data were probably also missing not at random (MNAR) which is likely when it was beyond the control of the researcher to verify the diagnoses for certain individuals (Collins et al., 2001; Graham, 2009).

Strengths and Limitations

The major strength of the study is the fact that it is not affected by incomplete coverage since the individuals in the study were identified from public registers as receiving sickness absence benefits. Furthermore, it is a major strength that a subgroup of informants was diagnosed by a psychiatrist applying a standardised diagnostic instrument. Finally, it was a major strength that the variables used in the multiple imputations were gathered from public registers, and, consequently, not affected with recall bias.

It is a shortcoming, however, that there was a delay of more than eight weeks in carrying out the psychiatric examinations

related to the specific time when the individuals began their sick-leave. This may have caused an overestimation of the number of mental disorders since mental disorders may have developed from the point in time when the individuals began their sick-leave to the point in time when the psychiatric examinations were carried out. However, the mental disorders which may have developed during the sickness absence period would still be of significance for rehabilitation after eight weeks. It is also a shortcoming that no statistics was applied for methodological reasons with regard to the differences between participants and non-participants. However, the 95%-confidence intervals of the intervals are overlapping which indicate that the differences were statistically significant.

Conclusion

The study provided evidence that the burdens imposed by mental disorders on society and the Danish health care system is high as the frequency of mental disorders in LSA was 52%. In addition the study suggests that the burden may be higher than previously expected from studies solely based on participants as when compensating for non-participation the frequencies of mental disorders were found higher among non-participants than among participants, however not significantly. The implications for future research is to replicate the study in a larger scale by including more urbanised areas together with applying methods which compensate for non-participation (missing values). In addition, studies in which actions are taken to improve the participation rate are warranted. Furthermore, there is a need for identifying variables which are the most optimal in the models compensating for missing values.

Authorship Credits

The authors' responsibilities were as follows: HJS and PP: study concept and design; HJS and PP: data acquisition; HJS: statistical analyses; HJS and PP: interpretation of the data; HJS: drafting of the manuscript; HJS and PP: critical review of the manuscript.

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REFERENCES

- Akhtar-Danesh, N., & Landeen, J. (2007). Relation between depression and sociodemographic factors. *International Journal of Mental Health Systems*, 1, 4. doi:10.1186/1752-4458-1-4
- Alonso, J., Angermeyer, M. C., & Bernert, S. (2004). Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. *Acta Psychiatrica Scandinavica*, 109, 21-27. doi:10.1111/j.1600-0047.2004.00327.x
- Andlin-Sobocki, P., Jonsson, B., Wittchen, H. U., & Olesen, J. (2005). Cost of disorders of the brain in Europe. *European Journal of Neurology*, 12, 1-27. doi:10.1111/j.1468-1331.2005.01202.x
- Angst, J. (1990). Depression and anxiety: A review of studies in the community and in primary health care. In: N. Sartorius, D. Goldberg, G. de Girolamo, J. A. Costa e Silva, Y Lecrubier, & H.-U. Wittchen (Eds.), *Psychological disorders in general medical settings* (pp. 60-68). Toronto: Hogrefe & Huber.
- Arbejdsmarkedstyrelsen, The National Labour Market authority. DREAM-databasen. The DREAM Databse. URL (Last checked 16 June 2012). <http://www.dst.dk/da/TilSalg/Forskningservice/Data/~media/E61C0C35353141D0A692BF410BF1A3EC.pdf>
- Bebbington, P., Dunn, G., Jenkins, R., Lewis, G., Brugha, T., Farrell, M. et al. (2003). The influence of age and sex on the prevalence of depressive conditions: Report from the National Survey of Psychiatric Morbidity. *International Review of Psychiatry*, 15, 74-83. doi:10.1080/0954026021000045976
- Bijl, R. V., Ravelli, A., & van Zessen, G. (1998). Prevalence of psychiatric disorder in the general population: Results of The Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Social Psychiatry and Psychiatric Epidemiology*, 33, 587-595. doi:10.1007/s001270050098
- Bijl, R. V., De, G. R., Ravelli, A., Smit, F., & Vollebergh, W. A. (2002). Gender and age-specific first incidence of DSM-III-R psychiatric disorders in the general population. Results from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Social Psychiatry and Psychiatric Epidemiology*, 37, 372-379. doi:10.1007/s00127-002-0566-3
- Bisoffi, G., Mazzi, M. A., & Dunn, G. (2000). Evaluating screening questionnaires using Receiver Operating Characteristic (ROC) curves from two-phase (double) samples. *International Journal of Methods in Psychiatric Research*, 9, 121-133. doi:10.1002/mpr.86
- Bjerner, J. B., Thunborg, K., Kristensen, T. S., Modvig, J., & Bech, P. (1998). The Danish SF-36 Health Survey: Translation and preliminary validity studies. *Journal of Clinical Epidemiology*, 51, 991-999. doi:10.1016/S0895-4356(98)00091-2
- Christensen, K. S., Fink, P., Toft, T., Frostholm, L., Ornbol, E., & Olesen, F. (2005). A brief case-finding questionnaire for common mental disorders: The CMDQ. *Family Practice*, 22, 448-457. doi:10.1093/fampra/cmi025
- Christensen, K. S., Toft, T., Frostholm, L., Ornbol, E., Fink, P., & Olesen, F. (2005). Screening for common mental disorders: Who will benefit? Results from a randomised clinical trial. *Family Practice*, 22, 428-434. doi:10.1093/fampra/cmi032
- Collins, L. M., Schafer, J. L., & Kam, C. M. (2001). A comparison of inclusive and restrictive strategies in modern missing data procedures. *Psychological Methods*, 6, 330-351. doi:10.1037/1082-989X.6.4.330
- Det Centrale Personregister (2012). The Civil Registration System in Denmark. URL (Last checked 16 June 2012). <http://www.cpr.dk/cpr/site.aspx?p=198&ArticleTypeID=76&t=ForsideVisartikel&ArticleId=4327>
- Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, 60, 549-576. doi:10.1146/annurev.psych.58.110405.085530
- Hensing, G., Andersson, L., & Brage, S. (2006). Increase in sickness absence with psychiatric diagnosis in Norway: A general population-based epidemiologic study of age, gender and regional distribution. *BMC Medicine*, 4, 19. doi:10.1186/1741-7015-4-19
- Hodiamont, P., Peer, N., & Syben, N. (1987). Epidemiological aspects of psychiatric disorder in a Dutch health area. *Psychological Medicine*, 17, 495-505. doi:10.1017/S0033291700025058
- Jenkins, R., Lewis, G., Bebbington, P., Brugha, T., Farrell, M., Gill, B. et al. (1997). The national psychiatric morbidity surveys of Great Britain—Initial findings from the household survey. *Psychological Medicine*, 27, 775-789. doi:10.1017/S0033291797005308
- Kessler, R. C., McGonagle, K. A., Zhao, S., Nelson, C. B., Hughes, M., Eshleman, S. et al. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. *Archives of General Psychiatry*, 51, 8-19. doi:10.1001/archpsyc.1994.03950010008002
- Lambets, H., Wood, M., & Hofmanns-Okkes, I. (1993). *The international classification of primary care in the European community*. Oxford: Oxford University Press.
- Lindeman, S., Hamalainen, J., Isometsa, E., Kaprio, J., Poikolainen, K., Heikkinen, M. et al. (2000). The 12-month prevalence and risk factors for major depressive episode in Finland: Representative sample of 5993 adults. *Acta Psychiatrica Scandinavica*, 102, 178-184. doi:10.1034/j.1600-0447.2000.102003178.x
- Murray, C. J., & Lopez, A. D. (1997). Global mortality, disability, and the contribution of risk factors: Global burden of disease study. *Lan-*

- et*, 17, 1436-1442.
- OECD (2009). *Sickness, disability and work: Keeping on track in the economic downturn—background paper*. URL (Last checked 16 June 2012). <http://www.oecd.org/dataoecd/42/15/42699911.pdf>
- Offord, D. R., Boyle, M. H., Campbell, D., Goering, P., Lin, E., Wong, M. et al. (1996). One-year prevalence of psychiatric disorder in Ontarians 15 to 64 years of age. *Canadian Journal of Psychiatry*, 41, 559-563.
- Peen, J., Dekker, J., Schoevers, R. A., Have, M. T., De, G. R., & Beekman, A. T. (2007). Is the prevalence of psychiatric disorders associated with urbanization? *Social Psychiatry and Psychiatric Epidemiology*, 42, 984-989. [doi:10.1007/s00127-007-0256-2](https://doi.org/10.1007/s00127-007-0256-2)
- SCAN (1994). *Schedules for Clinical Assessment in Neuropsychiatry (Computer Program)*. Geneva: World Health Organization.
- Soegaard, H. J., & Bech, P. (2008). Psychiatric disorders in long-term sickness absence—A population based cross-sectional study. *Scandinavian Journal of Public Health*, 37, 682-689. [doi:10.1177/1403494809344357](https://doi.org/10.1177/1403494809344357)
- Soegaard, H. J., & Bech, P. (2009). Psychiatric disorders in long-term sickness absence—A population based cross-sectional study. *Scandinavian Journal of Public Health*, 37, 682-689. [doi:10.1177/1403494809344357](https://doi.org/10.1177/1403494809344357)
- STATA 11.0 (2006). 4505 Lakeway Drive College Station, TX 77845, USA. URL (Last checked 16 June 2012). <http://www.stata.com/>
- Statistics Denmark (2011). Statistics Denmark. URL (Last checked 16 June 2012) <http://www.dst.dk/en.aspx>
- The National Board of Health, Denmark. URL (Last checked 16 June 2012). <http://www.sst.dk/English.aspx>
- The National Board of Health D. Laegemiddeldatabasen. The medication database. URL (Last checked 16 June 2012). <http://laegemiddelstyrelsen.dk/da/topics/statistik,-priser-og-tilskud/statistik-og-analyser/om-laegemiddel-statistikregisteret>
- UCLA Academic Technology Services. Stata Library Multiple Imputation Using ICE. URL (Last checked 16 June 2012). <http://www.ats.ucla.edu/stat/stata/library/ice.htm>
- Ware, J. E., & Kosinski, M. (2001). *Physical and mental health summary scales: A manual for users of Version 1* (2nd ed.). Lincoln, RI: Quality Metric, Inc.
- Wittchen, H. U., & Jacobi, F. (2005). Size and burden of mental disorders in Europe—A critical review and appraisal of 27 studies. *European Neuropsychopharmacology*, 15, 357-376. [doi:10.1016/j.euroneuro.2005.04.012](https://doi.org/10.1016/j.euroneuro.2005.04.012)
- WHO Collaborating Centre for Drug Statistics Methodology. ATC/DDD Index 2011. URL (Last checked 16 June 2012). http://www.whocc.no/atc_ddd_index/
- World Health Organisation (2006). *International Statistical Classification of Diseases and Related Health Problems*. 10th Revision. Geneva: World Health Organisation.