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Abstract

Background:
In psychiatric epidemiology, symptoms are often assessed retrospectively. This raises concerns about the accuracy of the information recalled. In this study, we sought to examine the level of agreement between survey items assessing recent and more remote depressive episodes.

Methods:
Data from the Canadian National Population Health Survey (NPHS) were used. The NPHS is a prospective study following a representative cohort of household residents sampled in 1994 and 1995. Every 2 years, participants are administered the Composite International Diagnostic Interview Short Form for Major Depression (CIDI-SFMD). The 2004 NPHS interview also included items asking about past episodes of depression and diagnoses of depression done by health professionals. We used cross-tabulation and logistic regression to explore the relationship between these responses.

Results:
Approximately, 90% of respondents with CIDI-SFMD-defined major depressive episodes in the year preceding the 2004 interview also reported lifetime episodes or professional diagnoses of depression in 2004. However, responses to the 2004 lifetime items corresponded less closely to CIDI-SFMD results from the same individuals earlier in the longitudinal survey. Only 40.8% of respondents having the most recently identified episode in 1994 subsequently affirmed an episode of depression in 2004.

Conclusions:
Reporting of depressive episodes diminishes with time, suggesting that retrospective assessment of such episodes may be vulnerable to inaccuracy.

Keywords (separated by '-') Depressive disorder - Epidemiology - Bias - Measurement - Longitudinal studies - Cohort studies

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ORIGINAL PAPER

Recall of recent and more remote depressive episodes in a prospective cohort study

Scott B. Patten · Jeanne V. A. Williams · Dina H. Lavorato · Andrew G. M. Bulloch · Carl D'Arcy · David L. Streiner

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Abstract

Background In psychiatric epidemiology, symptoms are often assessed retrospectively. This raises concerns about the accuracy of the information recalled. In this study, we sought to examine the level of agreement between survey items assessing recent and more remote depressive episodes.

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Conclusions Reporting of depressive episodes diminishes with time, suggesting that retrospective assessment of such episodes may be vulnerable to inaccuracy.

Keywords Depressive disorder · Epidemiology · Bias · Measurement · Longitudinal studies · Cohort studies

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Introduction

Major depressive disorder and bipolar disorders are conceptualized in DSM-IV as lifelong conditions subject to recurrence and remission [1]. The diagnostic criteria for these disorders are based on the occurrence of major depressive, manic, hypomanic or mixed episodes during one's life. For this reason, the prevalence of mood disorders depends on the pattern of episodes occurring across the lifespan, and lifetime prevalence is a theoretically meaningful target of estimation. Lifetime prevalence is usually estimated from cross-sectional data as the proportion of a sample having had at least one past episode of major depression up to the time of sampling (in the absence of a past history of manic, hypomanic or mixed episodes).

The biggest challenge in estimating lifetime prevalence is the possibility of recall bias. A recent review [2] described two mechanisms that could lead to such bias:

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forgetting and reframing. Some people may simply forget specific symptoms that they have experienced in the past. Others may cognitively reframe their experiences so that they no longer recount them in a way that supports assignment of a diagnosis. Commonly used diagnostic instruments such as the Composite International Diagnostic Interview [3, 4] depend on endorsement of symptom-based criteria occurring during the same 2-week interval over a respondent's life course, such that failing to report a specific pattern of sleep, appetite, fatigue, cognitive distortions and other symptoms may diminish the sensitivity of detection of past episodes.

A literature of studies concerned with reliability of assessment of lifetime prevalence intensifies concerns about measurement accuracy. Reliability studies have generally found only modest test–retest reliability for lifetime assessment of major depression. One study administered a modified version of the SCID diagnostic interview twice approximately 5 years apart in a sample of female twin pairs, finding a kappa coefficient for reliability of only 0.43 [5]. In field trials of the Composite International Diagnostic Interview (CIDI), the test–retest reliability assessed using the kappa coefficient was 0.66 for single episodes and 0.62 for recurrent episodes, even though the interviews were conducted within 3 days of another [6]. Estimates of inter-rater reliability were higher (0.97 and 0.93), suggesting that the main source of disagreement is recall and reporting of symptoms rather than errors in interpreting or recording the responses. Consistent with this idea, Kendler et al. [7] reported inter-rater reliability of modified SCID diagnoses as $\kappa = 0.96$, but interviews conducted 19 months apart were less reliable, $\kappa = 0.475$. Furthermore, reliability was predicted by variables related to the memorability of episodes: severity, treatment seeking and mental state at the time of interview (the latter possibly reflecting state-dependent learning) [7]. Such considerations are salient to the most basic goal of descriptive epidemiology: quantifying the frequency of a condition in a population.

Andrews et al. [8] prospectively followed a cohort of forty-five patients after an inpatient admission and found that, of those who had a major depression at the time of their admission, only about half (14/27) recalled and reported symptoms 25 years later in a way that led to a CIDI diagnosis of major depression. Using the data obtained from a cohort of New Zealand children, Wells and Horwood [9] reported that less than half of those diagnosed previously with depression could recall a key symptom 4–10 years later. More recently, Moffitt et al. reported that members of the Dunedin birth cohort, followed prospectively to age 32, had an estimated lifetime prevalence based on a series of annual prevalence assessments that was double that of the retrospectively ascertained lifetime prevalence in the same country approximately at the same time (41.4 vs. 18.5%) [10].

The aim of this study was to assess the accuracy of recall of major depressive episodes. A longitudinal cohort study conducted in Canada called the National Population Health Survey (NPHS) included items inquiring about episodes of depression both in the past year and in respondents' past lives. This provides us a source of information against which different types of items can be compared. Such comparisons help us to quantify the extent to which retrospective assessment of symptoms may be vulnerable to inaccuracy.

Methods

The NPHS is a longitudinal study based on a nationally representative community sample assembled by Statistics Canada (Canada's national statistical agency) in 1994 and 1995. Detailed information about the NPHS methodology is available from Statistics Canada [11]. The NPHS longitudinal cohort is representative of residents of private dwellings in Canada. The sample has since been followed with biannual interviews. Currently, longitudinal data are available up to the 2006 interview. The 1994 NPHS interviews were mostly conducted face to face, but most follow-up interviews (approximately 99%) were conducted over the telephone.

The NPHS interview included the Composite International Diagnostic Interview Short Form for Major Depression (CIDI-SFMD) [12], which assesses past year major depressive episodes (MDE). The CIDI-SFMD is scored with a predictive probability algorithm based on the number of symptom-based criteria fulfilled during a 2-week or longer period in the preceding year. The CIDI-SFMD has two screening items (depressed mood and loss of interest or pleasure) referring to the year preceding the interview. A negative response to both items results in exit from the module. These items are worded as follows: "During the past 12 months, was there ever a time when you felt sad, blue, or depressed for 2 weeks or more in a row?" and "During the past 12 months, was there ever a time lasting 2 weeks or more when you lost interest in most things like hobbies, work or activities that usually give you pleasure?"

In 2004, additional items concerning depression were included in the NPHS interview. These questions were asked of all respondents over the age of 18. The first item had the following wording: "Have you ever had one or several episodes of being sad, depressed, discouraged or uninterested most of the day, for several days, weeks and longer?" The second item asked: "Have you ever been diagnosed with depression by a health professional?"

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Endorsement of either the first item or the second, or both, indicated a reported lifetime history of depressive episodes.

The NPHS interviews from 1994 to 2004 also included items assessing medication use. Respondents were asked to retrieve all medications taken in the 2 days preceding the interview and information about each medication was recorded. Specific medications were categorized using Anatomic Therapeutic Codes [13], enabling identification of antidepressant medications.

We identified those respondents apparently having their most recent episode of MDE according to the CIDI-SFMD in 1994, 1996, 1998, 2000, 2002 and 2004. For example, those with the most recent episode in 1994 could not have an episode in 1996–2004. Within each group, we estimated the frequency with which lifetime episodes were reported. We then stratified these estimates by age, sex, education and receipt of antidepressant medication at the time of the most recent depressive episode. In order to identify which of these variables independently predicted later recall of a depression history, weighted logistic regression was used.

The NPHS used a multistage, stratified design that also included clustering to select eligible households. To correct for bias resulting from unequal selection probabilities and to ensure accurate assessment of variance, Statistics Canada recommends a bootstrap procedure that uses a set of 500 replicate sampling weights. All of the estimates presented below are weighted in this way and the confidence intervals derived from the bootstrap procedure, using STATA [14]. All analyses were conducted at the Prairie Regional Research Data Center on the University of Calgary campus. Research Data Centers situated across Canada allow supervised access by researchers to original Statistics Canada survey data. The study received approval from the University of Calgary Conjoint Health Research Ethics Board.

Results

The longitudinal cohort included 17,276 respondents, but the current study sample was restricted to $n = 15{,}254$ who were over the age of 12 at the baseline interview. This included $n = 7{,}020$ men and $n = 8{,}234$ women. Their mean age at baseline was 43.5 years; 59% of the eligible respondents were married or reported common-law marital status, 29% reported being single and 12% were divorced, widowed or separated; 52% had at least some post-secondary education. There were 2,451 respondents within this eligible group who had one or more episodes during follow-up, according to the CIDI-SFMD. Of these, 1,688 (69.9%) were successfully followed to 2004.

Of those having a CIDI-SFMD episode of MDE in the year preceding the 2004 episode, nearly 90% reported lifetime episodes in 2004. However, among those whose most recent CIDI-SFMD episode occurred earlier these items were endorsed less frequently, see Fig. 1.

The probability of responding affirmatively to the lifetime episode items was influenced by the number of episodes. Among those with only one CIDI-SFMD detected episode between 1994 and 2004, approximately half reported an episode in 2004. However, among respondents with three or more detected episodes, the probability was more than 90%, see Fig. 2. Table 1 shows the frequency with which lifetime episodes were reported, cross-tabulated by sex, age group and education level. There is an increased frequency of recall in those over the age of 25, women and in those with post-secondary education.

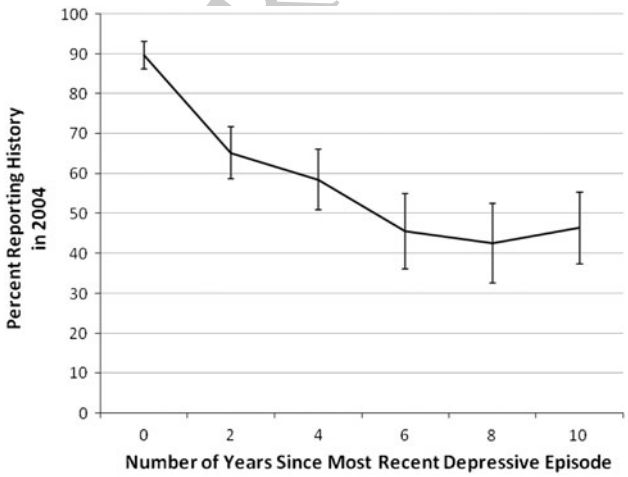

Fig. 1 Percent of NPHS respondents reporting lifetime depressive episodes in 2004, by time since their most recent CIDI-SFMD-detected episode

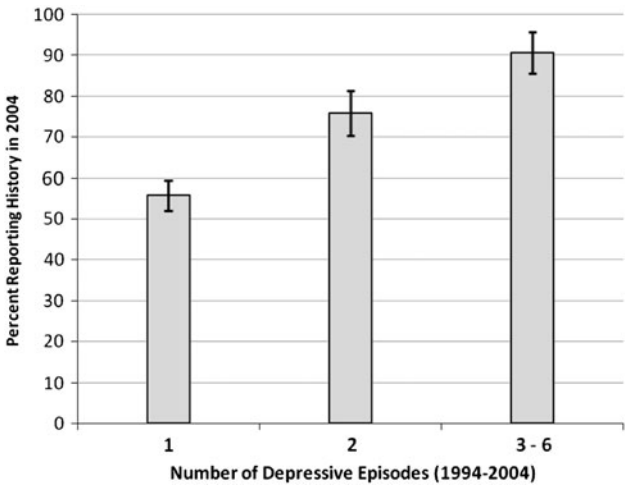

Fig. 2 Proportion of NPHS respondents reporting lifetime depressive episodes in 2004, by the number of previous CIDI-SFMD episodes

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Table 1 Proportion of NPHS respondents reporting lifetime episodes in 2004, by time of their most recent CIDI-SFMD episode, stratified by age, sex and education

Most recent episode	Proportion reporting history in 2004 (95% CI)						
	Age group (years)			Sex		Education	
	12–25	26–45	46+	Male	Female	≤Secondary	>Secondary
1994	31.3 (14.6–48.0)	51.6 (39.0–64.2)	52.1 (36.5–67.7)	32.9 (17.3–48.5)	51.9 (41.3–62.4)	42.6 (28.9–56.2)	48.7 (37.3–60.2)
1996	46.6 (27.2–66.0)	40.5 (22.6–58.4)	42.2 (27.9–56.5)	36.2 (17.7–54.6)	46.3 (35.5–57.1)	26.7 (12.3–41.0)	56.5 (44.7–68.3)
1998	39.1 (15.0–63.3)	50.0 (35.6–64.3)	44.1 (29.0–59.1)	35.1 (19.0–51.1)	51.5 (40.4–62.5)	34.0 (16.9–51.2)	50.8 (40.0–61.5)
2000	81.2 (66.8–95.6)	54.2 (42.7–65.7)	48.2 (35.2–61.2)	49.3 (33.3–65.3)	63.5 (55.0–72.0)	57.4 (42.3–72.5)	58.7 (50.1–67.4)
2002	76.1 (58.0–94.2	65.9 (56.6–75.3)	58.2 (45.7–70.6)	57.8 (44.1–71.5)	68.6 (61.2–76.1)	65.5 (53.1–77.8)	65.1 (57.1–73.2)
2004	[a]	89.5 (84.8–94.3)	88.7 (83.5–93.9)	86.4 (79.4–93.4)	91.0 (87.1–94.9)	94.8 (92.0–97.6)	87.3 (82.6–92.0)

[a] Cannot be released due to inadequate precision according to Statistics Canada guidelines

Table 2 Proportion of NPHS respondents reporting lifetime episodes in 2004, by their most recent CIDI-SFMD episode and receipt of antidepressant medication

Most recent episode of depression	Proportion reporting episodes in 2004: no antidepressant use in the most recent episode (95% CI)	Proportion reporting episodes in 2004 Antidepressant use in the most recent episode (95% CI)
1994	42.2 (32.9–51.6)	79.3 (58.3–100.0)
1996	37.9 (27.5–48.2)	78.3 (56.7–99.8)
1998	39.5 (29.3–49.6)	[a]
2000	54.3 (45.2–63.5)	71.5 (57.9–85.1)
2002	57.6 (49.5–65.7)	90.3 (83.2–97.5)
2004	84.6 (79.4–89.7)	[a]

[a] Cannot be released due to inadequate precision according to Statistics Canada guidelines

Table 2 shows the frequency with which lifetime episodes were reported by year of the most recent episode and stratified by antidepressant use. Respondents who reported treatment for depression during their most recent depressive episode more frequently reported lifetime episodes.

Logistic regression was used to simultaneously model these effects. The model predicted reported lifetime episodes using age, sex, education, antidepressant use and year of the most recent episode as predictors. There was no significant association with age after adjustment for other variables. The ORs for year of interview between 1996 (1994 was the baseline) and 2000 were non-significant with values falling between 0.75 and 1.2, but became significant in 2002 (OR = 1.6, 95% CI 1.1–2.4, $p = 0.02$) and highly significant in 2004 (OR = 7.5, 95% CI 3.2–8.5, $p < 0.001$). Women had a higher probability of reporting lifetime episodes compared to men (OR = 1.5, 95% CI 1.1–2.0, $p = 0.006$) as did those taking antidepressant medications during their most recent episode (OR = 5.2, 95% CI 3.2–8.5). Post-secondary education was weakly and non-significantly associated with reporting of lifetime episodes (OR = 1.3, 95% CI 1.0–1.8, $p = 0.09$).

In the analyses reported above, affirmative responses to either one of the two NPHS items was taken as reporting of a lifetime history. This approach differs from that taken by most fully structured diagnostic interviews. These interviews use screening items that inquire about past episodes (analogous to the first NPHS item) without reference to past diagnoses (covered by the second NPHS item). For this reason, we estimated the proportion of respondents with past episodes according to the CIDI-SFMD in the 1994–2004 who subsequently failed to report these episodes in response to the first item only irrespective of whether they reported being diagnosed with depression in response to the second item. The resulting estimates are reported in Table 3. Predictably, the proportions reporting past episodes are lower, but the same pattern of diminishing frequencies with increasing time since the last episode continues to be seen.

Discussion

These results add to a growing literature that raises concerns about the accuracy of retrospectively assessed lifetime prevalence of common psychiatric disorders such as major depression. Past studies have used the term lack of "reliability" in this context, but in the strict epidemiologic sense this term refers to the extent to which the same test can be repeated under identical conditions. Lack of "validity" may be preferable to lack of reliability since errors in retrospective recall suggest that lifetime measures may not accurately measure what they purport to measure.

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Table 3 Proportion of NPHS respondents reporting lifetime depressive episodes (excluding those who reported only a diagnosis of depression) in 2004, by year of their most recent CIDI-SFMD episode

Most recent episode of depression	Proportion reporting history in 2004 (95% CI)
1994	40.8 (32.2–49.4)
1996	37.8 (28.3–47.4)
1998	39.0 (29.9–48.0)
2000	52.5 (44.1–60.8)
2002	56.5 (49.6–63.4)
2004	86.6 (82.8–90.4)

However, the term validity should be used with caution here since we do not have a "gold standard" for comparison purposes. It is also possible considering use of the terminology lack of "sensitivity" since we are concerned with accurate identification of positive cases. The results presented here raise concerns predominantly about the sensitivity of lifetime measures. However, in the absence of a "gold standard," the study could not estimate sensitivity or specificity.

Our main conclusion complements results reported by Moffitt et al. [10] using data from the Dunedin birth cohort, Andrews et al. [15] in a clinical cohort and by Wells and Horwood [9] using data from a New Zealand birth cohort. The study by Andrews et al. assessed 45 patients who were part of a long-term follow-up of depression and found that 70% of those hospitalized for depression recall being depressed 25 years later, but only half could recall enough detail to satisfy DSM-III-R diagnostic criteria at this time point. Wells and Horwood [9] used DSM-III and DSM-IV criteria to test recall of key depressive symptoms (sadness or lack of interest for 2 weeks; i.e., not a full diagnosis of depression) by 1,003 members of the Christchurch Health and Development Study. Of those diagnosed with depression 4–10 years earlier, only 44% recalled a key symptom. Recall was predicted by episode severity, chronicity, current key symptoms, being female and currently receiving treatment. These results are in accord with our observations that greater accuracy of recall is predicted by being female, being treated with antidepressants during the most recent episode (which is likely to be related to severity and chronicity), and by number of past depressive episodes. Moffitt et al. [10] took yet another approach in that they compared the results of different surveys. The prospective longitudinal Dunedin (New Zealand) study ($n = 1037$) was compared with retrospective NCS, NCS-R and the New Zealand Mental Health Survey. The prevalence of the lifetime disorder for age 18–32 was approximately double in the prospective survey, compared to the retrospective ones, for anxiety, depression as well as alcohol and cannabis dependence. Our results are consistent with these former studies, but may be more generalizable in that we used data from a large sample of the general population. This is a unique feature of our study and an important one since lifetime assessment instruments are often used in general population studies. Our results help us to confirm that the concerns about measurement accuracy raised by prior studies using hospitalized patients, birth cohorts and twin registries also apply to general population samples.

The results are also consistent with the idea that lifetime prevalence, as detected in cross-sectional community surveys, probably reflects a subset of respondents having more severe, more frequently treated, more recently active and more highly recurrent disorders. This idea is supported by Foley at al. [5] who showed that less severe episodes are associated with poorer reporting of lifetime depression. These findings suggest that a majority of respondents with recent, highly recurrent or treated episodes will report lifetime episodes. As our study lacked a gold standard assessment of lifetime prevalence, it could not estimate the sensitivity of the NPHS lifetime episode items, and it should be emphasized that the lifetime items included in the NPHS were not the same as those included in the CIDI. However, in a qualitative sense, the results suggest that lifetime prevalence is probably much higher than that has been reported in the most psychiatric epidemiological surveys. As treated episodes are more likely to be recalled, the treatment frequency is likely to be overestimated.

A previous study by Kruijshaar et al. used incidence and prevalence data in a microsimulation model to quantify the likely extent of misclassification bias. Their models also suggested that recall bias can be expected to cause a considerable under-estimation of lifetime prevalence [16]. Small rates of recall failure (2–4% cases per year) could account for the low lifetime prevalence estimates of retrospective surveys [17]. Further, previously reported estimates from the NPHS indicate that the accumulation of MDE in the longitudinal cohort during a relatively brief (relative to the lifespan) 12-year period of observation already exceeds the usually reported range of values for retrospectively estimated lifetime prevalence in Canada [18].

Recall bias may also influence the pattern of age-specific lifetime prevalence. In many studies, lifetime prevalence has been reported to decline with age, which has sometimes been interpreted as a birth cohort effect. Although multiple factors may contribute to the pattern, including differential mortality, these results corroborate previous studies indicating that recall bias is likely to be an important part of the explanation [19, 20]. Lifetime prevalence may appear to diminish with age because episodes occurring earlier in life are not recalled by older survey respondents.

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It appears that lifetime prevalence may underestimate the quantity that it purports to estimate. Paradoxically, this may be one reason for the continued popularity of this parameter, despite its problematic features, see review [2]. The reported values typically range from 10–20% in North American and European studies—a range of values that may seem intuitively acceptable whereas dramatically higher estimates may not be. In this context the prospective estimates of Moffitt et al. [10] suggested that some DSM-defined disorders may be very common: 49.5% for anxiety disorders and 41.4% for depression (in the 18–32 age range). Such greatly higher prevalence estimates have significant consequences for estimates of disease burden, service delivery policy, the stigmatization of mental disorders and understanding the impact of mental disorders on economic productivity [21]. However, a proviso is that the episodes missed by lifetime instruments may differ from those that are detected. Caution appears to be warranted in the interpretation of estimates that depend on retrospective assessment of symptoms.

This study has a number of limitations. For example, we relied on the use of only two questions to indicate a lifetime history of depression. Further, the first question allows a period of sadness of only few days, rather than the usual DSM-IV requirement of at least 2 weeks, to qualify as major depression. The CIDI-SFMD does not include the detailed questions of the full CIDI and may be less specific than the full CIDI [22, 23].Taking together our new data with other related studies reviewed above, we suggest that caution is warranted in the interpretation of estimates that depend on retrospective assessment of symptoms.

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Conflict of interest None of the authors have conflicts of interest to declare.

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