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Poor self-rated health and its associations with health anxiety in two Australian national surveys

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Abstract

Objectives: Poor self-rated health is predictive of increased mortality and morbidity that is not explained by measures of physical health status. It is therefore of medical interest. It is hypothesised that across two national surveys poor self-rated health will be independently associated with somatisation and will result in high rates of service use after adjusting for established diagnoses.

Design: Two cross-sectional population-based surveys conducted in 1997 and 2007. The use of both surveys allowed replication of results.

Setting: Australia.

Participants: The 1997 and 2007 National Surveys of Mental Health and Well-Being were based on stratified, multistage area probability samples of persons living in private dwellings in Australia. The 1997 survey included 10641 respondents aged 18 to 75, a response rate of 78%. The 2007 survey included 8841 respondents aged 16 to 85, a response rate of 60%.

Main outcome measures: Global ratings of perceived health.

Results: Approximately 15% of the Australian population rated their health as fair or poor in both surveys. The independent relationship between self-rated health and somatisation was replicated across both surveys in multivariate analyses. Individuals with negative self-rated health were 4.1 times as likely to screen positive for health anxiety (OR: 4.1; 95% CI 2.8 to 5.9) and 3.4 times as likely to be diagnosed with neurasthenia (OR: 3.4; 95% CI 2.2 to 5.2), when compared with individuals who rated their health positively. Individuals with negative self-rated health were twice as likely to use health services after controlling for demographics, mental and physical illness, neuroticism, suicidality, cognitive impairment and psychological distress.

Conclusions: The current findings indicate that subjective concerns regarding perceived poor health must be considered an important public health issue. Medically unexplained negative self-rated health, associated with increased mortality and morbidity, should be conceptualised as a variant of hypochondriasis/health anxiety and proactively treated.

Article focus

The current study tests the relationship between self-rated health and somatisation, specifically neurasthenia and health anxiety, in two national surveys of the Australian population conducted in 1997 and 2007.

Key points

These results confirm both of the study hypotheses:

1) that negative self-rated health was powerfully and independently associated with somatisation; and

2) that negative self-rated health was associated with general health service use, hospitalisation and medication use, even after adjusting for an extensive range of psychiatric and physical conditions.

Strengths and limitations of the study

The use of the two Australian national surveys conferred many advantages in terms of replication, sample representativeness, fully structured diagnoses of all the common psychiatric disorders, extensive assessment of service utilisation and the inclusion of a broad range of other clinical measures.

The study relied on subjective rather than objective assessments of physical morbidity

Health anxiety was based on screening questions rather than full diagnostic assessment

The surveys were cross-sectional in nature, precluding an investigation of the direction of the relationships identified in the current study.

1 Introduction

Rating your health as excellent, very good, good, fair or poor seems a simple concept that is unlikely to contain surprises, but ratings of health as fair or poor are predictors of morbidity and mortality after adjusting for clinical health status. The 15-20% of the population who rate their health negatively have mortality risks 2-7 times higher than individuals with excellent self-reported health, even after adjustment for medical history (1). For example, self-rated health has been found to be the best predictor of survival in advanced cancer patients in comparison with other important clinical indicators, such as clinician assessed health status, appetite, fatigue and quality of life (2). In the prospective US National Health and Nutrition Examination Survey (NHANES), self-rated health was found to independently predict mortality and functional limitations over and above a comprehensive range of physical examinations, laboratory tests and self-reported mental and physical symptoms (1, 3). Individuals presenting with perceived poor health die younger than counterparts with equivalent health status.

No country can provide all the health services its citizens want (4), yet, in western countries, we worry that we are medicalising the normal risks of life, at great cost and with little health gain (5, 6). If the purpose of medicine is to reduce the burden of disease then negative self-rated health, because of the increased mortality and morbidity, should be a focus of medical attention, especially if a low cost remedy is a possibility. Four possible hypothetical explanations for the independent association between global self-rated health and increased morbidity and mortality have been proposed (7): 1) Even when extensive clinical investigations and self-reported histories are collected, such as in the NHANES study (1, 3), it is possible that difficult to operationalise, undiagnosed or prodromal conditions may explain the independent effects of self-rated health on morbidity and mortality; 2) self-rated health may reflect additional information about health trajectories, or changes in health, that

are not captured in assessments of current health status; 3) self-perceptions of health may influence health and illness behaviours that increase the risk of morbidity and mortality; and 4) self-rated health may reflect the perception of insufficient external resources, like income or social support, to maintain future health status.

The four hypotheses above are not easy to explore. A fifth option is that perceived poor health is a reflection of a mental disorder. Self-ratings of overall health are only modestly correlated with clinical assessments of medical status, but appear more closely related to psychiatric illness, and aspects of personality such as neuroticism (8-10). These findings are surprising given the evidence that suggests that respondents mainly have physical health problems in mind when asked to rate their global health status (11). Thus, whilst the decision to rate global health positively or negatively is driven by psychological factors, it appears that respondents mainly consider physical health problems when rating their global health status. These findings suggest that psychiatric disorders based on physical health- and disease related-concerns (termed "somatisation" for ease of reading) may be particularly salient in the interpretation of global ratings of health status. Consistent with this hypothesis, hypochondriasis, somatisation and limitations in activities of daily living explain much of the variance in patient reports of overall health status (10).

The current study tests the relationship between self-rated health and somatisation, specifically neurasthenia and health anxiety, in two national surveys of the Australian population conducted in 1997 and 2007. The strength of the current study is therefore in the ability to replicate the findings across two large, epidemiological datasets that included structured diagnoses of the major mental disorders and similar measures of other clinical, demographic and service use variables. It is hypothesised that across both surveys: 1) poor self-rated health will be powerfully and independently associated with neurasthenia and health anxiety; and 2) that this strong association will also manifest itself in high rates of

service use after adjusting for established psychiatric and physical diagnoses. To our knowledge, these hypotheses have not been tested using representative, population-based samples, and never within the context of fully structured diagnoses of the major psychiatric disorders.

2 Method

Sample

The 1997 and 2007 National Surveys of Mental Health and Well-Being (NSMHWB) were based on stratified, multistage area probability samples of persons living in private dwellings in Australia, excluding very remote dwellings (12, 13). The 1997 survey included 10641 respondents aged 18 to 75, representing a response rate of 78%. Characteristics of non-responders were not explicitly examined in the 1997 survey. The 2007 survey included 8841 respondents aged 16 to 85, representing a response rate of 60%. A small, non-random follow-up study of the 2007 survey indicated that while the response rate had little effect at the aggregate level, there may have been some under-estimation in the prevalence estimates for mental disorders in males and young people. The age and gender characteristics of both samples were weighted to match the age and gender distributions in Australia. Both surveys were designed to provide accurate estimates of the population prevalence of selected major mental disorders, the level of disability associated with these disorders and the related service utilisation. The Australian Bureau of Statistics (ABS), the national government statistics agency, conducted both the 1997 and 2007 surveys. The ABS provided ethical review and approval for the surveys, including voluntary recruitment, rigorous confidentiality provisions, and written informed consent. The ABS operates under Australian National Legislation that mandates strict provisions for the ethical conduct of the agency's research. The methods for both surveys have been discussed in more detail elsewhere (12, 13).

Measures

Self-rated health

For the 1997 survey each respondent was administered the 12 item Short Form Health Survey (SF-12), a widely used measure of health and well-being (14). The first item of the SF-12 required the respondent to rate their health in general, with responses categorised as "excellent", "very good", "good", "fair" or "poor". This question informs the physical component scale of the SF-12 (15) and, for the purposes of the current study, constituted the main outcome variable for the 1997 survey. In the 2007 NSMHWB, respondents were asked to rate their overall physical health and overall mental health in two separate questions, with responses to both questions categorised as above. Given that the item used in the 1997 survey is weighted heavily towards physical well-being, the query regarding self-rated physical health was selected as the main outcome variable for the 2007 survey. Respondents were to rate their physical health before they were asked to rate their mental health in the 2007 survey. In both surveys, the questions regarding self-rated health were administered before questions about mental disorders and service use. To ensure sufficient power to detect differences in statistical analyses, the main outcome variables for both surveys were dichotomized into negative ("fair" or "poor") and positive ("good", "very good" and "excellent") self-rated health. Grouping of these responses in such a manner is common practice in the self-rated health literature due to the similar survival probabilities within these collapsed categories (2).

12-month ICD-10 psychiatric disorders

Psychiatric diagnoses were assessed using the Composite International Diagnostic Interview (CIDI version 2.1 in 1997 and version 3.0 in 2007) (16, 17). Both surveys included fully structured ICD-10 12-month diagnoses (18) of panic disorder, agoraphobia, social phobia,

generalised anxiety disorder (GAD), obsessive compulsive disorder (OCD), post-traumatic stress disorder (PTSD), major depression, dysthymia, bipolar disorder, alcohol use disorders (dependence and harmful use) and substance use disorders (dependence and harmful use). The 1997 survey included a module on neurasthenia (19) and a seven item psychosis screener. For both surveys, 12-month ICD-10 diagnoses were coded as absent or present based on standard CIDI diagnostic algorithms that fully operationalized ICD-10 inclusion and exclusion criteria, as well as ICD-10 hierarchical decision rules.

The 2007 survey collected additional information on health anxiety (20, 21). The respondent was first asked whether they had ever worried a lot about serious illness, despite having reassurance from a doctor or medical specialist. If endorsed, the respondents were asked whether they ever had a period of worry like this that lasted for 6 months or longer in the previous 12 months. These screening questions are most consistent with the DSM-IV diagnosis of hypochondriasis (22), addressing Criteria A, B and E for this disorder. In the current study, it was not possible to address the criteria related to differential diagnosis (Criteria C and F), or establish clinically significant impairment or distress specific to this disorder (Criterion D). Consistent with a previous study of the 2007 NSMHWB (20), we refer to these questions as a screener for health anxiety, rather than a proxy diagnosis of hypochondriasis.

The 1997 survey also included a screener for personality disorders (composed of screening questions for 12-month ICD-10 paranoid, schizoid, dissocial, emotionally unstable, histrionic, anankastic, anxious and dependent personality disorders). In the current analyses, individuals who screened positive for one or more personality disorder were compared with those who did not.

Neuroticism

The neuroticism scale of the Eysenck Personality Questionnaire (EPQ) (23) was also included in the 1997 survey. In the current analyses, those reporting a score of six or more on the EPQ (the top ten percentile for neuroticism) were compared with the rest of the sample.

Distress and Disability

The K10, a commonly used measure of psychological distress, was included in both surveys (24). According to established norms, a score of 15 or greater on the K10 was indicative of medium to high psychological distress (25). Days out of role in the previous month were also queried in both surveys and individuals with one or more days out of role were compared to those who reported no days out of role.

Physical disorders

The 1997 survey included information on self-reported physical disorders: asthma, chronic bronchitis, anaemia, high blood pressure, heart trouble, arthritis, kidney disease, diabetes, cancer, stomach or duodenal cancer, gallbladder or liver trouble and hernia or rupture. The chronicity of these conditions was not recorded. In the 2007 survey a wider range of self-reported physical conditions were recorded: asthma, cancer, stroke, gout, rheumatism, arthritis, diabetes, heart or circulatory conditions, hay fever, sinusitis, emphysema, bronchitis, anaemia, epilepsy, oedema, hernias, kidney problems, migraine, psoriasis, stomach ulcer, thyroid trouble, tuberculosis and back or neck problems. In the 2007 survey these conditions were only recorded if the respondent had experienced them for a period of six months or longer, therefore taking into account chronicity. For both surveys, respondents reporting one or more physical conditions were compared with those who reported none.

Cognitive impairment

Both surveys included the Mini Mental State Examination (MMSE), a screener for cognitive impairment (26). Following standard scoring protocols, possible cognitive impairment was coded as present if the respondent scored less than 23 on the MMSE (27). The interview was terminated if the respondent scored less than 15 on the MMSE.

Suicidality

Both surveys included questions regarding suicidal ideation, plans or attempts. The current analyses compared respondents who reported any suicidality (thoughts, plans or attempts) in the 12 months prior to the interview with those who did not.

Service use

In the 1997 survey, respondents were asked whether they had consulted with the following health professionals in the 12 months prior to the interview: general practitioners, radiologists, pathologists, physicians or other medical specialists, surgical specialists or gynaecologists, psychiatrists, psychologists, social workers or welfare officers, drug and alcohol counsellors, other counsellors, nurses, mental health teams, chemists for professional advice, ambulance officers or other health professionals. In the 2007 survey, respondents were asked about consultations with the following health professionals in the 12 months prior to the interview: general practitioners, psychiatrists, psychologists, mental health nurses, other professionals providing specialist mental health services, specialist doctors or surgeons, other professionals providing general services and complementary or alternative therapists. For both surveys these service providers were dichotomised into general health service providers (i.e., general practitioners and specialist doctors) and mental health service providers (i.e., psychiatrists and psychologists). In both surveys, respondents were also asked about hospitalisations (overnight admissions) in the 12 months prior to the interview.

Medications

In the 1997 survey, the respondents were asked about their use of 23 separate medications in the 12 months prior to the interview, including pain relievers, sleeping tablets, prescription medications with abuse potential and medications for psychiatric illness. In the 2007 survey respondents were asked about their use of medications in the 2 weeks prior to the interview including: sleeping tablets/capsules, tablets/capsules for anxiety or nerves, tranquillisers, antidepressants, mood stabilisers, and other medications for mental health. For both surveys, respondents using one or more medication were compared to those who had used none.

Demographics

For both surveys, the demographic variables of interest were sex, age (34 years and younger, 35 to 64 years, 65 years and over), country of birth (Australia, other English speaking country, non-English speaking country), marital status (married, separated/widowed/divorced, never married), education (post high school, no post high school education), employment (employed, unemployed, not in the labour force), and current smoking status (present, absent).

Statistical analysis

Weighted means, frequencies and logistic regressions were computed using SAS SURVEY procedures in SAS 9.2 (28) which adjusted for the characteristics of the complex survey design using jackknife repeated replication methods for variance estimation. Univariate and multivariate logistic regressions were then conducted to investigate the relationship between negative self-reported health and the variables of interest (described above). Initial analyses focused on the univariate relationships between self-rated health and the demographic, physical, psychological and service use variables of interest. Multivariate analyses were then

conducted to further investigate the relationship between self-rated health and the presence of any physical condition whilst adjusting for demographics, psychiatric illness, suicidality, cognitive impairment and, in the 1997 survey only, neuroticism. To investigate the independent relationships between self-rated health, health anxiety and the ICD-10 psychiatric disorders of interest, multivariate analyses adjusted for demographics, any physical condition, all other psychiatric disorders, suicidality, cognitive impairment and neuroticism. To investigate the relationship between negative self-rated health and disability, separate multivariate regressions for the K10 and days out of role variables were conducted after adjusting for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment and neuroticism. Finally, multivariate analyses controlling for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment, neuroticism, psychological distress and days out of role were conducted to investigate the independent relationship between service use and self-rated health.

3 Results

Prevalence of negative self-rated health

14.6% (SE = 0.4) of respondents reported that their health was "fair" or "poor" in the 1997 survey, whilst 14.8% (SE = 0.5) responded similarly in the 2007 survey. In both samples, approximately 30% of those with negative self-rated health reported one or more ICD-10 12-month mental disorder, compared with approximately 17% of those with positive self-rated health (see Table 2 for specific odds ratios). Of those with negative self-rated health, 5.4% were diagnosed with ICD-10 neurasthenia in the 1997 survey, whilst 14.8% screened positive for health anxiety in the 2007 survey. Physical conditions were common amongst individuals reporting negative self-rated health (approximately 72% in the 1997 survey and 88% in the 2007 survey).

Univariate relationships between self-rated health and the variables of interest

There were consistencies between the two surveys in terms of the relationships between negative self-rated health and the demographic variables of interest (Table 1). When compared with individuals with positive self-rated health, those with negative self-rated health were more likely to be: older, separated/widowed/divorced, educated to the high school level only, not in the labour force and current regular smokers (see Table 1 for relevant odds ratios for both surveys).

As can be seen from Table 2, the univariate associations between negative self-rated health and all of the correlates of interest were statistically significant in both surveys.

Multivariate relationships between self-rated health and the variables of interest

After adjusting for demographics, psychiatric illness, suicidality, cognitive impairment and neuroticism (the latter in the 1997 survey only), individuals who reported negative self-rated health were 3.6 times as likely to report any listed physical condition in the 1997 survey (95% CI: 3.1 to 4.2) and 2.5 times as likely to report any listed physical condition in the 2007 survey (95% CI: 1.9 to 3.3) when compared with individuals who reported positive self-rated health (Table 2).

Multivariate logistic regressions which included the effects of demographics, any physical condition, all ICD-10 psychiatric disorders, suicidality, cognitive impairment and neuroticism were then conducted. After adjusting for the other variables in the model, individuals with negative self-rated health in the 1997 survey were more likely to be diagnosed with agoraphobia, GAD, neurasthenia, and more likely to report any physical condition, suicidality, cognitive impairment and neuroticism when compared to those with positive self-rated health (see Table 2). In the 1997 survey, the strongest multivariate relationship was

between self-rated health, on the one hand, and any physical condition and neurasthenia, on the other. Individuals with negative self-rated health in the 2007 survey were more likely to be diagnosed with social phobia and affective disorders (major depression, dysthymia and bipolar disorder), and more likely to report any physical condition, health anxiety, suicidality and cognitive impairment when compared to those with positive self-rated health (see Table 2). In the 2007 survey, the strongest relationship was between self-reported health and health anxiety after adjusting for the other variables in the model.

In both surveys, after controlling for demographics, any physical condition, any mental disorder, suicidality, cognitive impairment and neuroticism (in the 1997 survey only) individuals with negative self-rated health were considerably more likely to report medium to high distress on the K10, and one or more days out of role.

After controlling for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment, neuroticism, psychological distress and days out of role, individuals with negative self-rated health were more likely to use all health services when compared to those with positive self-rated health. The relationship between self-rated health and mental health service use was only significant in the 1997 survey. In both surveys, individuals with negative self-rated health were also more likely to have been hospitalized overnight, and to have used medications when compared to those with positive self-rated health.

4 Discussion

These results confirm both of the study hypotheses: 1) that negative self-rated health was powerfully and independently associated with somatisation; and 2) that negative self-rated health was associated with general health service use, hospitalisation and medication use, even after adjusting for an extensive range of psychiatric and physical conditions. The current study provided a strong test of these hypotheses by replicating these findings in two

epidemiological surveys of the Australian population. Negative perceptions of health status were independently associated with the presence of any physical or mental disorder (as well as neurasthenia and health anxiety), disability, psychopathology, suicidality, cognitive impairment and high rates of service use. The current findings, combined with previous research linking negative perceived health with increased rates of mortality, indicate that subjective concerns regarding perceived poor health must be considered an important public health issue.

Limitations

The use of the two Australian national surveys conferred many advantages in terms of replication, sample representativeness, fully structured diagnoses of all the common psychiatric disorders, extensive assessment of service utilisation and the inclusion of a broad range of other clinical measures. The surveys focused on mental health rather than physical health, which meant that objective assessments of physical morbidity were not available. However, others have found very little discrepancy between self-reported physical conditions and physician reported medical histories (9), and most previous research investigating the correlates of negative self-rated health have relied upon similar self-reported measures of physical health problems (7). Health anxiety in the 2007 survey was based on screening questions rather than full diagnostic assessment (20). In particular, it was not possible to determine whether respondents met full criteria for hypochondriasis. Both surveys were cross-sectional in nature, precluding an investigation of the direction of the relationships identified in the current study. To our knowledge, no prospective examination of self-rated health and somatisation has been undertaken, and the current results suggest this may be a fruitful avenue for future research.

The independent relationships between negative self-rated health and psychological distress highlight the nontrivial nature of these health complaints, whilst the consistent, independent relationships with suicidality and cognitive impairment have been identified and discussed previously (9, 29, 30). Negative self-rated health was also independently associated with neuroticism and anxiety disorders (agoraphobia and GAD) in the 1997 survey, and anxiety (social phobia) and affective disorders (major depression, dysthymia and bipolar disorder) in the 2007 survey. Whilst these findings were not replicated across the two surveys at the disorder level, they are consistent with previous research (9). The relationship between negative self-rated health and neurotic, or internalising disorders (31), may reflect an overall tendency towards negative self-evaluation and ruminative style that extends to perceptions of negative health status. The following discussion will focus on the novel aspects of the current study, including the independent relationships between negative self-rated health and somatisation, and the high rates of service use irrespective of the level of mental and physical illness.

The majority of individuals with poor self-rated health reported the presence of at least one of the major physical conditions enquired about in either survey. These findings suggest that, in most cases, negative ratings of health may be partly justified in terms of physical illness. However, self-rated health was also related to psychopathology, even after adjusting for physical illness, suggesting that the perception of global self-rated health is also independently influenced by psychological factors. Whilst the current study found that negative self-rated health was independently associated with affective and anxiety disorders, only the relationship with somatisation was replicated across both surveys. This finding is consistent with previous research (8, 10). Perceived health is principally composed of physical symptoms (11) whilst the distinguishing feature of somatisation is a pathological preoccupation with health and disease-related concerns. The robust associations identified in

the current study suggest that negative self-rated health may be a mild or prodromal symptom of disorders related to health anxiety.

The current study also indicated that, independently of physical and psychiatric conditions, individuals with poor self-rated health used general health services and medications at particularly high rates. Hospitalisations were also common. High rates of service use independent of actual physical and mental problems need to be addressed. Given the strong relationship between negative self-rated health and somatisation, the high rates of service use amongst individuals with negatively perceived health may reflect reassurance-seeking, a symptom central to hypochondriasis and related psychiatric disorders. Consistent with the current findings, previous research has found that negative self-rated health, as well as somatisation, hypochondriasis and medically unexplained physical symptoms, all contribute disproportionately to the growing demand for health services (32). However, individuals presenting with these symptoms and disorders are also more likely to be dissatisfied with the services provided (33, 34). With regards to hypochondriasis specifically, high rates of service use result in consultations that are unsatisfactory and exasperating for both the doctor and patient (35). This tension most likely arises because patients are seeking physical explanations for their concerns, which are largely psychological in nature. Treatment of health anxiety has not been rewarding for either party, with anger on the patients part that cure is not forthcoming and frustration on the clinicians part that reassurance and good advice is not beneficial. Consultations are often fraught. Patient and physician education regarding the psychological nature of health-related concerns, and the direction of patients to appropriate treatment options with minimal clinician involvement, may lessen such tensions in doctor-patient relationships. Internet-delivered cognitive behavioural therapy is effective for the internalising disorders generally (36-38), and has been shown to be effective for health anxiety specifically (39, 40). Internet delivered cognitive behavioural therapy, which

can be administered at low cost and with minimal clinician involvement may be one way around the problems in the interaction between doctor and patient.

Competing interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Author Contributions

LM and GA conceived the study and its design. LM conducted all statistical analyses. GA and LM both contributed to the interpretation of the data. LM wrote the first draft and GA contributed to all successive revisions. Both LM and GA approved the final manuscript to be published.

Data sharing

The data for the 1997 and 2007 NSMHWB are public access files that can be accessed through consultation with the Australian Bureau of Statistics.

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Table 1. Prevalence and demographic correlates of negative self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being

	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING			2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING		
	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*
Sex						
Male	51.9 (1.1)	48.8 (0.2)	Ref	50.5 (1.9)	49.5 (0.4)	Ref
Female	48.1 (1.1)	51.2 (0.2)	0.9 (0.8-1.0) [a]	49.5 (1.9)	50.5 (0.4)	1.0 (0.8-1.1)
Age						
18-34	19.4 (1.2)	36.8 (0.3)	Ref	18.6 (1.4)	36.0 (0.3)	Ref
35-64	49.9 (1.3)	50.4 (0.3)	1.9 (1.6-2.2) [a]	57.0 (2.0)	50.6 (0.4)	2.2 (1.7-2.7) [a]
65-85	30.7 (1.1)	12.8 (0.3)	4.6 (3.8-5.5) [a]	24.4 (1.2)	13.4 (0.2)	3.5 (2.9-4.3) [a]
Country of birth						
Australia	72.1 (1.7)	75.3 (0.5)	Ref	73.3 (2.0)	72.8 (0.8)	Ref
Other English speaking country	10.4 (0.9)	11.5 (0.4)	0.9 (0.8-1.2)	11.3 (1.4)	11.3 (0.4)	1.0 (0.7-1.3)
Other non-English speaking country	17.5 (1.1)	13.1 (0.5)	1.4 (1.2-1.7) [a]	15.4 (1.8)	15.9 (0.8)	1.0 (0.7-1.3)
Marital status						
Married/de facto	62.1 (1.1)	65.7 (0.7)	Ref	54.4 (1.8)	52.8 (0.7)	Ref
Separated/widowed/divorced	21.6 (1.2)	12.2 (0.3)	1.9 (1.6-2.2) [a]	21.6 (1.4)	13.3 (0.4)	1.6 (1.3-1.9) [a]
Never married	16.2 (1.2)	22.1 (0.5)	0.8 (0.7-0.9) [a]	24.0 (1.5)	34.0 (9.7)	0.7 (0.6-0.8) [a]
Education						
Higher education	34.7 (1.6)	49.6 (0.7)	Ref	56.2 (2.1)	56.3 (0.6)	Ref
No higher education	65.3 (1.6)	50.4 (0.7)	1.8 (1.6-2.1) [a]	53.8 (2.1)	43.7 (0.6)	1.5 (1.3-1.8) [a]
Employment						
Employed	33.6 (1.6)	68.6 (0.5)	Ref	45.5 (1.6)	68.7 (0.3)	Ref
Unemployed	5.6 (0.6)	3.9 (0.2)	3.0 (2.3-3.9) [a]	1.9 (0.5)	2.7 (0.1)	1.1 (0.6-1.9)
Not in labour force	60.8 (1.7)	27.5 (0.5)	4.5 (3.9-5.3) [a]	52.6 (1.6)	28.6 (0.3)	2.8 (2.4-3.2) [a]
Regular smoker (current)	30.7 (1.0)	21.9 (0.6)	1.6 (1.4-1.8) [a]	25.1 (1.8)	17.1 (0.7)	1.6 (1.3-2.0) [a]

[a] Statistically significant at $p<0.05$

Table 2. Prevalence and correlates of negative self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being

	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING				2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING			
	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Poor self-rated health vs. Good self-rated health (ref) *Adjusted OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Poor self-rated health vs. Good self-rated health (ref) *Adjusted OR (95% CI)*
Physical disorder								
Any physical disorders	72.0 (1.2)	32.7 (0.6)	5.3 (4.6-6.0) [a]	3.6 (3.1-4.2) [b]	87.9 (1.4)	65.6 (0.8)	3.8 (2.9-5.0)	2.5 (1.9-3.3) [b]
12 month ICD-10 psychiatric disorders								
Panic disorder	2.8 (0.5)	0.9 (0.1)	3.3 (2.1-5.3) [a]	1.8 (0.9-3.5)	5.6 (0.9)	2.0 (0.2)	2.8 (2.0-4.0) [a]	1.3 (0.9-2.0)
Agoraphobia	3.3 (0.4)	0.7 (0.1)	4.7 (3.1-7.1) [a]	1.9 (1.2-3.2) [c]	7.8 (1.2)	1.9 (0.2)	4.3 (2.9-6.3) [a]	1.1 (0.6-2.0)
Social phobia	5.0 (0.6)	2.4 (0.2)	2.2 (1.7-2.8) [a]	1.4 (0.9-2.1)	11.6 (1.4)	3.6 (0.2)	3.5 (2.6-4.7) [a]	2.1 (1.1-3.9) [c]
Generalised anxiety disorder	7.8 (0.8)	2.2 (0.2)	3.7 (3.1-4.5) [a]	1.6 (1.3-2.1) [c]	6.0 (0.7)	2.1 (0.3)	2.9 (2.0-4.2) [a]	0.8 (0.5-1.3)
Obsessive compulsive disorder	0.7 (0.2)	0.3 (0.1)	2.8 (1.4-5.6) [a]	0.6 (0.3-1.4)	3.5 (0.7)	1.6 (0.2)	2.1 (1.3-3.4) [a]	0.8 (0.4-1.6)
Post-traumatic stress disorder	6.8 (0.7)	2.6 (0.2)	2.7 (2.1-3.5) [a]	1.3 (0.9-1.7)	11.1 (1.1)	5.6 (0.3)	2.1 (1.6-2.7) [a]	1.2 (0.8-1.7)
Major depression	13.2 (0.9)	5.6 (0.3)	2.6 (2.1-3.1) [a]	1.2 (0.9-1.6)	7.5 (1.0)	1.9 (0.3)	4.2 (2.8-6.3) [a]	1.8 (1.1-3.1) [c]
Dysthymia	4.1 (0.7)	0.8 (0.1)	5.1 (3.4-7.8) [a]	1.2 (0.7-2.0)	4.7 (0.7)	0.7 (0.1)	7.1 (4.5-11.1) [a]	2.4 (1.4-4.2) [c]
Bipolar disorder	-	-	-	-	4.9 (0.7)	1.2 (0.2)	4.1 (2.7-6.2) [a]	2.5 (1.4-4.5) [c]
Alcohol use disorder	7.0 (0.5)	6.3 (0.3)	1.1 (0.9-1.4)	0.8 (0.6-1.0)	5.8 (0.9)	4.1 (0.4)	1.4 (1.0-2.2) [a]	1.2 (0.7-2.1)
Substance use disorder	3.5 (0.5)	1.9 (0.2)	2.0 (1.4-2.8) [a]	1.1 (0.7-1.9)	3.0 (0.6)	1.2 (0.1)	2.6 (1.5-4.4) [a]	1.5 (0.8-3.0)
Neurasthenia	5.4 (0.6)	0.8 (0.1)	7.1 (4.8-10.6) [a]	3.4 (2.2-5.2) [c]	-	-	-	-
Any 12-month ICD disorder	30.7 (1.5)	16.9 (0.6)	2.2 (1.9-2.6) [a]	1.7 (1.4-2.1) [c]	35.0 (1.7)	17.3 (0.6)	2.6 (2.2-3.0) [a]	2.1 (1.6-2.6) [c]
Other measures								
Illness anxiety disorder	-	-	-	-	14.8 (1.4)	2.4 (0.2)	7.1 (5.3-9.6) [a]	4.1 (2.8-5.9) [c]
Any personality disorder	12.4 (1.0)	5.4 (0.3)	2.5 (2.0-3.0) [a]	1.2 (0.9-1.6)	-	-	-	-
Psychosis	1.2 (0.3)	0.3 (0.1)	4.0 (2.3-7.2) [a]	2.3 (0.9-5.9)	-	-	-	-
Suicidality	7.3 (0.6)	2.1 (0.1)	3.6 (2.9-4.6) [a]	1.8 (1.1-2.9) [c]	7.2 (1.0)	1.5 (0.2)	4.9 (3.4-7.1) [a]	2.3 (1.4-3.7) [c]
Cognitive impairment (≤ 23 on MMSE)	3.7 (0.6)	0.9 (0.1)	4.5 (2.9-7.0) [a]	1.5 (1.1-2.1) [c]	21.6 (1.1)	12.8 (0.2)	1.9 (1.6-2.2) [a]	2.4 (1.5-4.1) [c]
Neuroticism (top 10 percentile of EPQ)	22.7 (1.3)	7.7 (0.4)	3.5 (3.0-4.2) [a]	2.3 (1.8-2.8) [c]	-	-	-	-
Distress and impairment								
High psychological distress	61.6 (1.2)	27.3 (0.6)	4.3 (3.8-4.8) [a]	3.6 (3.1-4.1) [d]	55.1 (1.7)	24.4 (0.7)	3.8 (3.3-4.4) [a]	2.8 (2.4-3.4) [d]
One or more days out of role	36.5 (1.6)	14.9 (0.5)	3.3 (2.8-3.8) [a]	3.0 (2.5-3.5) [d]	56.3 (2.1)	22.4 (0.7)	4.5 (3.6-5.5) [a]	3.1 (2.5-3.9) [d]
Service use in past 12 months								
Mental health service	10.5 (0.9)	4.1 (0.3)	2.7 (2.1-3.6) [a]	2.1 (1.5-2.9) [e]	13.1 (1.5)	6.3 (0.4)	2.3 (1.7-3.0) [a]	1.2 (0.8-1.7)
General health service	93.5 (0.5)	84.2 (0.5)	2.7 (2.3-3.2) [a]	1.9 (1.6-2.3) [e]	90.9 (1.4)	81.5 (0.9)	2.3 (1.6-3.2) [a]	1.5 (1.0-2.1) [e]
Mental or general health service	93.8 (0.5)	84.5 (0.5)	2.8 (2.3-3.4) [a]	1.9 (1.6-2.3) [e]	91.3 (1.3)	82.0 (0.9)	2.3 (1.6-3.3) [a]	1.5 (1.0-2.1) [e]
Hospitalisations	25.4 (1.1)	10.6 (0.3)	2.9 (2.5-3.3) [a]	2.2 (1.8-2.6) [e]	18.5 (1.4)	9.0 (0.5)	2.3 (1.9-2.8) [a]	1.5 (1.2-1.9) [e]
Medications	38.5 (1.5)	13.5 (0.5)	4.0 (3.5-4.7) [a]	2.6 (2.2-3.1) [e]	24.1 (1.4)	9.5 (0.6)	3.0 (2.5-3.7) [a]	1.6 (1.2-2.0) [e]

[a] Statistically significant at $p<0.05$

[b] Statistically significant at $p<0.05$. Multivariate analysis adjusting for demographics, psychiatric illness, suicidality, cognitive impairment and, in the 1997 survey only, neuroticism.
[c] Statistically significant at $p<0.05$. Multivariate analysis adjusting for demographics, any physical condition, all other psychiatric disorders, suicidality, cognitive impairment and neuroticism (1997 survey only).
[d] Statistically significant at $p<0.05$. Multivariate analysis adjusting for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment and neuroticism (1997 survey only).
[e] Statistically significant at $p<0.05$. Multivariate analysis adjusting for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment, neuroticism (1997 survey only), psychological distress and days out of role.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **(pg. 1)**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **(pg. 2-3)**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **(pg. 4-5)**
Objectives	3	State specific objectives, including any prespecified hypotheses **(pg. 5-6)**
Methods		
Study design	4	Present key elements of study design early in the paper **(pg. 6)**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **(pg.6)**
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants **(pg.6)**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **(pg.7-11)**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **(pg.7-11)**
Bias	9	Describe any efforts to address potential sources of bias **(pg.6)**
Study size	10	Explain how the study size was arrived at **(pg.6)**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why **(pg.7-12)**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **(pg.11-12)**
		(*b*) Describe any methods used to examine subgroups and interactions **(pg.11-12)**
		(*c*) Explain how missing data were addressed **(n/a)**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy **(pg.11-12)**
		(*e*) Describe any sensitivity analyses **(n/a)**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **(pg.6)**
		(b) Give reasons for non-participation at each stage **(pg.6)**
		(c) Consider use of a flow diagram **(n/a)**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **(Tables 1-2)**
		(b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures **(Tables 1-2)**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **(Tables 1-2)**
		(*b*) Report category boundaries when continuous variables were categorized **(pg. 7-**

		11 & Tables 1-2)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period **(n/a)**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **(Tables 1-2)**
Discussion		
Key results	18	Summarise key results with reference to study objectives **(pg. 14-15)**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **(pg.15)**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **(pg. 16-18)**
Generalisability	21	Discuss the generalisability (external validity) of the study results **(pg. 6)**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based **(pg. 18, Acknowledgments)**

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Poor self-rated health and its associations with somatisation in two Australian national surveys

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Poor self-rated health and its associations with somatisation in two Australian national surveys

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Abstract

Objectives: It is hypothesised that across two national surveys poor self-rated health will be independently associated with somatisation and will result in high rates of service use after adjusting for established diagnoses.

Design: Two cross-sectional population-based surveys conducted in 1997 and 2007. The use of both surveys allowed replication of results.

Setting: Australia.

Participants: The 1997 and 2007 National Surveys of Mental Health and Well-Being were based on stratified, multistage area probability samples of persons living in private dwellings in Australia. The 1997 survey included 10641 respondents aged 18 to 75, a response rate of 78%. The 2007 survey included 8841 respondents aged 16 to 85, a response rate of 60%.

Main outcome measures: Self-rated health.

Results: Approximately 15% of the Australian population rated their health as fair or poor in both surveys. The independent relationship between self-rated health and somatisation was replicated across both surveys in multivariate analyses. Individuals with negative self-rated health were 4.1 times as likely to screen positive for health anxiety (OR: 4.1; 95% CI 2.8 to 5.9) and 3.4 times as likely to be diagnosed with neurasthenia (OR: 3.4; 95% CI 2.2 to 5.2), when compared with individuals who rated their health positively. Individuals with negative self-rated health were also more likely to use health services after controlling for demographics, mental and physical illness.

Conclusions: These results confirm both of the study hypotheses: 1) that negative self-rated health was powerfully and independently associated with somatisation; and 2) that this

relationship manifested itself in high rates of service use, even after adjusting for an extensive range of demographics, psychiatric and physical conditions.

1 Introduction

Rating your health as excellent, very good, good, fair or poor seems a simple concept that is unlikely to contain surprises, but ratings of health as fair or poor are predictors of morbidity and mortality after adjusting for clinical health status (1). Self-ratings of overall health are only modestly correlated with clinical assessments of medical status, but appear more closely related to psychiatric illness, and aspects of personality such as neuroticism (2-4). These findings are surprising given the evidence that suggests that respondents mainly have physical health problems in mind when asked to rate their global health status (5). Thus, whilst the decision to rate global health positively or negatively is driven by psychological factors, it appears that respondents mainly consider physical health problems when rating their global health status. These findings suggest that a dysfunctional preoccupation with physical health and disease related concerns (termed "somatisation" for ease of reading) may be particularly salient in the interpretation of global ratings of health status. Consistent with this hypothesis, hypochondriasis, somatisation and limitations in activities of daily living explain much of the variance in patient reports of overall health status (4).

The current study tests the relationship between self-rated health and somatisation, specifically neurasthenia and health anxiety, in two national surveys of the Australian population conducted in 1997 and 2007. The strength of the current study is therefore in the ability to replicate the findings across two large, epidemiological datasets that included structured diagnoses of the major mental disorders and similar measures of other clinical, demographic and service use variables. It is hypothesised that across both surveys: 1) poor self-rated health will be powerfully and independently associated with neurasthenia and health anxiety; and 2) that this association will also manifest itself in high rates of reassurance-seeking, reflected by high rates of service use independent of established psychiatric and physical diagnoses. To our knowledge, these hypotheses have not been tested

using representative, population-based samples, and never within the context of fully structured diagnoses of the major psychiatric disorders.

2 Method

Sample

The 1997 and 2007 National Surveys of Mental Health and Well-Being (NSMHWB) were based on stratified, multistage area probability samples of persons living in private dwellings in Australia, excluding very remote dwellings (6, 7). The 1997 survey included 10641 respondents aged 18 to 75, representing a response rate of 78%. Characteristics of non-responders were not explicitly examined in the 1997 survey. The 2007 survey included 8841 respondents aged 16 to 85, representing a response rate of 60%. A small, non-random follow-up study of the 2007 survey indicated that while the response rate had little effect at the aggregate level, there may have been some under-estimation in the prevalence estimates for mental disorders in males and young people. The age and gender characteristics of both samples were weighted to match the age and gender distributions in Australia. Both surveys were designed to provide accurate estimates of the population prevalence of selected major mental disorders and the related service utilisation. The Australian Bureau of Statistics (ABS), the national government statistics agency, conducted both the 1997 and 2007 surveys. The ABS provided ethical review and approval for the surveys, including voluntary recruitment, rigorous confidentiality provisions, and written informed consent. The ABS operates under Australian National Legislation that mandates strict provisions for the ethical conduct of the agency's research. The methods for both surveys have been discussed in more detail elsewhere (6, 7).

Measures

The dependent variable in the current study was self-rated health, whilst the main independent variables were neurasthenia, health anxiety and service use (including medication use). In order to investigate the independence of the relationships between self-rated health and somatisation, several possible covariates were also examined. These included demographics and psychiatric disorders which have been shown to be related to health anxiety in a previous study of the 2007 NSMHWB (8), as well as physical disorders to ensure that any relationships identified were not simply a reflection of actual health status.

Independent variable

Self-rated health

For the 1997 survey each respondent was administered the 12 item Short Form Health Survey (SF-12), a widely used measure of health and well-being (9). The first item of the SF-12 required the respondent to rate their health in general, with responses categorised as "excellent", "very good", "good", "fair" or "poor". This question informs the physical component scale of the SF-12 (10) and, for the purposes of the current study, constituted the main outcome variable for the 1997 survey. In the 2007 NSMHWB, respondents were asked to rate their overall physical health and overall mental health in two separate questions, with responses to both questions categorised as above. Given that the item used in the 1997 survey is weighted heavily towards physical well-being, the query regarding self-rated physical health was selected as the main outcome variable for the 2007 survey. Respondents were to rate their physical health before they were asked to rate their mental health in the 2007 survey. In both surveys, the questions regarding self-rated health were administered before questions about mental disorders and service use. To ensure sufficient power to detect differences in statistical analyses, the main outcome variables for both surveys were dichotomized into negative ("fair" or "poor") and positive ("good", "very good" and

"excellent") self-rated health. Grouping of these responses in such a manner is common practice in the self-rated health literature due to the similar survival probabilities within these collapsed categories (11).

Dependent variables

Health anxiety and neurasthenia

The 1997 survey included a module on the ICD-10 diagnosis for neurasthenia (12). Meanwhile, the 2007 survey collected additional information on health anxiety (8, 13). The respondents were first asked whether they had ever worried a lot about serious illness, despite having reassurance from a doctor or medical specialist. If endorsed, the respondents were asked whether they ever had a period of worry like this that lasted for 6 months or longer in the previous 12 months. These screening questions are most consistent with the DSM-IV diagnosis of hypochondriasis (14), addressing Criteria A, B and E for this disorder. In the current study, it was not possible to address the criteria related to differential diagnosis (Criteria C and F), or establish clinically significant impairment or distress specific to this disorder (Criterion D). Consistent with a previous study of the 2007 NSMHWB (20), we refer to these questions as a screener for health anxiety, rather than a proxy diagnosis of hypochondriasis.

Service use

In the 1997 survey, respondents were asked whether they had consulted with the following health professionals in the 12 months prior to the interview: general practitioners, radiologists, pathologists, physicians or other medical specialists, surgical specialists or gynaecologists, psychiatrists, psychologists, social workers or welfare officers, drug and alcohol counsellors, other counsellors, nurses, mental health teams, chemists for professional

advice, ambulance officers or other health professionals. In the 2007 survey, respondents were asked about consultations with the following health professionals in the 12 months prior to the interview: general practitioners, psychiatrists, psychologists, mental health nurses, other professionals providing specialist mental health services, specialist doctors or surgeons, other professionals providing general services and complementary or alternative therapists. For both surveys these service providers were dichotomised into general health service providers (i.e., general practitioners and specialist doctors) and mental health service providers (i.e., psychiatrists and psychologists). In both surveys, respondents were also asked about hospitalisations (overnight admissions) in the 12 months prior to the interview.

Related to service use, the current study also investigated the relationship between medication use and self-rated health. In the 1997 survey, the respondents were asked about their use of 23 separate medications in the 12 months prior to the interview, including pain relievers, sleeping tablets, prescription medications with abuse potential and medications for psychiatric illness. In the 2007 survey respondents were asked about their use of medications in the 2 weeks prior to the interview including: sleeping tablets/capsules, tablets/capsules for anxiety or nerves, tranquillisers, antidepressants, mood stabilisers, and other medications for mental health. For both surveys, respondents using one or more medication were compared to those who had used none.

Covariates

12-month ICD-10 psychiatric disorders

Psychiatric diagnoses were assessed using the Composite International Diagnostic Interview (CIDI version 2.1 in 1997 and version 3.0 in 2007) (15, 16). Both surveys included fully structured ICD-10 12-month diagnoses (17) of panic disorder, agoraphobia, social phobia, generalised anxiety disorder (GAD), obsessive compulsive disorder (OCD), post-traumatic

stress disorder (PTSD), major depression, dysthymia, bipolar disorder, alcohol use disorders (dependence and harmful use) and substance use disorders (dependence and harmful use). For both surveys, 12-month ICD-10 diagnoses were coded as absent or present based on standard CIDI diagnostic algorithms that fully operationalized ICD-10 inclusion and exclusion criteria, as well as ICD-10 hierarchical decision rules. The 1997 survey also included a screener for personality disorders (composed of screening questions for 12-month ICD-10 paranoid, schizoid, dissocial, emotionally unstable, histrionic, anankastic, anxious and dependent personality disorders). In the current analyses, individuals who screened positive for one or more personality disorder were compared with those who did not.

Physical disorders

The 1997 survey included information on self-reported physical disorders: asthma, chronic bronchitis, anaemia, high blood pressure, heart trouble, arthritis, kidney disease, diabetes, cancer, stomach or duodenal cancer, gallbladder or liver trouble and hernia or rupture. The chronicity of these conditions was not recorded. In the 2007 survey a wider range of self-reported physical conditions were recorded: asthma, cancer, stroke, gout, rheumatism, arthritis, diabetes, heart or circulatory conditions, hay fever, sinusitis, emphysema, bronchitis, anaemia, epilepsy, oedema, hernias, kidney problems, migraine, psoriasis, stomach ulcer, thyroid trouble, tuberculosis and back or neck problems. In the 2007 survey these conditions were only recorded if the respondent had experienced them for a period of six months or longer, therefore taking into account chronicity. For both surveys, respondents reporting one or more physical conditions were compared with those who reported none.

Demographics

For both surveys, the demographic variables of interest were sex, age (34 years and younger, 35 to 64 years, 65 years and over), country of birth (Australia, other English speaking

country, non-English speaking country), marital status (married, separated/widowed/divorced, never married), education (post high school, no post high school education), employment (employed, unemployed, not in the labour force), and current smoking status (present, absent).

Statistical analysis

Weighted means, frequencies and logistic regressions were computed using SAS SURVEY procedures in SAS 9.2 (18) which adjusted for the characteristics of the complex survey design using jackknife repeated replication methods for variance estimation. In order to select an appropriate multivariate model, the univariate relationships between self-rated health and the covariates of interest were investigated. In this initial phase, a comparatively liberal unadjusted p-value of 0.05 was selected despite multiple comparisons, because the aim was to adjust for all possible covariates that may explain the relationships between self-rated health, somatization and service use in the multivariate analysis. Those covariates that were significantly related to self-rated health were included in multivariate models investigating the relationships between self-rated health, somatisation and service use. To control for multiple comparisons, a more conservative p-value of 0.01 was selected for use in the multivariate analyses.

3 Results

Prevalence of negative self-rated health

14.6% (SE = 0.4) of respondents reported that their health was “fair” or “poor” in the 1997 survey, whilst 14.8% (SE = 0.5) responded similarly in the 2007 survey. In both samples, approximately 30% of those with negative self-rated health reported one or more ICD-10 12-month mental disorder, compared with approximately 17% of those with positive self-rated

health. Of those with negative self-rated health, 5.4% were diagnosed with ICD-10 neurasthenia in the 1997 survey, whilst 14.8% screened positive for health anxiety in the 2007 survey. Physical conditions were common amongst individuals reporting negative self-rated health (approximately 72% in the 1997 survey and 88% in the 2007 survey).

Univariate relationships between self-rated health and the covariates of interest

There were consistencies between the two surveys in terms of the relationships between negative self-rated health and the demographic variables of interest (Table 1). When compared with individuals with positive self-rated health, those with negative self-rated health were more likely to be: older, separated/widowed/divorced, educated to the high school level only, not in the labour force and current regular smokers (see Table 1 for relevant odds ratios for both surveys). As can be seen from Table 2, the univariate associations between negative self-rated health and all of the covariates of interest were statistically significant in both surveys.

Multivariate relationships between self-rated health, somatisation and service use

Multivariate logistic regressions which included the effects of demographics, any physical condition and all ICD-10 psychiatric disorders were then conducted. After adjusting for the other variables in the model, individuals with negative self-rated health in the 1997 survey were 3.4 (OR: 3.4; 95% CI 2.2 to 5.2; $p<0.01$) times more likely to meet criteria for neurasthenia, and 4.1 (OR: 4.1; 95% CI 2.8 to 5.9; $p<0.01$) times more likely to meet criteria for health anxiety in the 2007 survey (Table 3). In both surveys, after adjusting for demographics, any physical condition and all ICD-10 psychiatric disorders, individuals with negative self-rated health were more likely to have been hospitalized overnight and to have used mental health medications when compared to those with positive self-rated health. The multivariate relationship between self-rated health and the other service use variables (mental

health service use and/or general health service use) was only statistically significant in the 1997 survey.

4 Discussion

These results confirm both of the study hypotheses: 1) that negative self-rated health was powerfully and independently associated with somatisation; and 2) that negative self-rated health was associated with high rates of service use, even after adjusting for an extensive range of demographics, psychiatric and physical conditions. The current study provided a strong test of these hypotheses by replicating these findings in two epidemiological surveys of the Australian population.

Limitations

The use of the two Australian national surveys conferred many advantages in terms of replication, sample representativeness, fully structured diagnoses of all the common psychiatric disorders and extensive assessment of service. However the surveys focused on mental health rather than physical health, which meant that objective assessments of physical morbidity were not available. However, others have found very little discrepancy between self-reported physical conditions and physician reported medical histories (3), and most previous research investigating the correlates of negative self-rated health have relied upon similar self-reported measures of physical health problems (1). Health anxiety in the 2007 survey was based on screening questions rather than full diagnostic assessment (8), whilst personality disorders in the 1997 survey were also based on screening questions. Both surveys were cross-sectional in nature, precluding an investigation of the direction of the relationships identified in the current study. To our knowledge, no prospective examination of self-rated health and somatisation has been undertaken, and the current results suggest this may be a fruitful avenue for future research.

The majority of individuals with poor self-rated health reported the presence of at least one of the major physical conditions enquired about in either survey. These findings suggest that, in most cases, negative ratings of health may be partly justified in terms of physical illness. However, self-rated health was also related to somatisation, even after adjusting for physical illness and other psychiatric illnesses, suggesting that the perception of global self-rated health is also independently influenced by psychological factors. This finding is consistent with previous research (2, 4). One of the distinguishing features of somatisation is a pathological preoccupation with health and disease-related concerns, and negative self-rated health in the absence of physical and psychiatric diagnoses may reflect this aspect of somatisation.

The current study also indicated that, independently of physical and psychiatric conditions, individuals with poor self-rated health used health services and medications at particularly high rates. High rates of service use independent of actual physical and mental problems need to be addressed. Given the relationship between negative self-rated health and somatisation, the high rates of service use amongst individuals with negatively perceived health may reflect reassurance-seeking, a symptom central to hypochondriasis and related psychiatric disorders. Consistent with the current findings, previous research has found that negative self-rated health, as well as somatisation, hypochondriasis and medically unexplained physical symptoms, all contribute disproportionately to the growing demand for health services (19). However, individuals presenting with these symptoms and disorders are also more likely to be dissatisfied with the services provided (20, 21). With regards to hypochondriasis specifically, high rates of service use result in consultations that are unsatisfactory and exasperating for both the doctor and patient (22). This tension most likely arises because patients are seeking physical explanations for their concerns, which are largely psychological in nature. Treatment of health anxiety has not been rewarding for either party, with anger on

the patients part that cure is not forthcoming and frustration on the clinicians part that reassurance and good advice is not beneficial. Consultations are often fraught. Patient and physician education regarding the psychological nature of health-related concerns, and the direction of patients to appropriate treatment options with minimal clinician involvement, may lessen such tensions in doctor-patient relationships. Internet-delivered cognitive behavioural therapy is effective for the internalising disorders generally (23-25), and has been shown to be effective for health anxiety specifically (26, 27). Internet delivered cognitive behavioural therapy, which can be administered at low cost and with minimal clinician involvement may be one way around the problems in the interaction between doctor and patient.

Competing interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Author Contributions

LM and GA conceived the study and its design. LM conducted all statistical analyses. GA and LM both contributed to the interpretation of the data. LM wrote the first draft and GA contributed to all successive revisions. Both LM and GA approved the final manuscript to be published.

Data sharing

The data for the 1997 and 2007 NSMHWB are public access files that can be accessed through consultation with the Australian Bureau of Statistics.

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Table 1. Univariate relationships between demographics and self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being

	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING			2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING		
	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*
Sex						
Male	51.9 (1.1)	48.8 (0.2)	Ref	50.5 (1.9)	49.5 (0.4)	Ref
Female	48.1 (1.1)	51.2 (0.2)	0.9 (0.8-1.0) [a]	49.5 (1.9)	50.5 (0.4)	1.0 (0.8-1.1)
Age						
18-34	19.4 (1.2)	36.8 (0.3)	Ref	18.6 (1.4)	36.0 (0.3)	Ref
35-64	49.9 (1.3)	50.4 (0.3)	1.9 (1.6-2.2) [a]	57.0 (2.0)	50.6 (0.4)	2.2 (1.7-2.7) [a]
65-85	30.7 (1.1)	12.8 (0.3)	4.6 (3.8-5.5) [a]	24.4 (1.2)	13.4 (0.2)	3.5 (2.9-4.3) [a]
Country of birth						
Australia	72.1 (1.7)	75.3 (0.5)	Ref	73.3 (2.0)	72.8 (0.8)	Ref
Other English speaking country	10.4 (0.9)	11.5 (0.4)	0.9 (0.8-1.2)	11.3 (1.4)	11.3 (0.4)	1.0 (0.7-1.3)
Other non-English speaking country	17.5 (1.1)	13.1 (0.5)	1.4 (1.2-1.7) [a]	15.4 (1.8)	15.9 (0.8)	1.0 (0.7-1.3)
Marital status						
Married/de facto	62.1 (1.1)	65.7 (0.7)	Ref	54.4 (1.8)	52.8 (0.7)	Ref
Separated/widowed/divorced	21.6 (1.2)	12.2 (0.3)	1.9 (1.6-2.2) [a]	21.6 (1.4)	13.3 (0.4)	1.6 (1.3-1.9) [a]
Never married	16.2 (1.2)	22.1 (0.5)	0.8 (0.7-0.9) [a]	24.0 (1.5)	34.0 (9.7)	0.7 (0.6-0.8) [a]
Education						
Higher education	34.7 (1.6)	49.6 (0.7)	Ref	56.2 (2.1)	56.3 (0.6)	Ref
No higher education	65.3 (1.6)	50.4 (0.7)	1.8 (1.6-2.1) [a]	53.8 (2.1)	43.7 (0.6)	1.5 (1.3-1.8) [a]
Employment						
Employed	33.6 (1.6)	68.6 (0.5)	Ref	45.5 (1.6)	68.7 (0.3)	Ref
Unemployed	5.6 (0.6)	3.9 (0.2)	3.0 (2.3-3.9) [a]	1.9 (0.5)	2.7 (0.1)	1.1 (0.6-1.9)
Not in labour force	60.8 (1.7)	27.5 (0.5)	4.5 (3.9-5.3) [a]	52.6 (1.6)	28.6 (0.3)	2.8 (2.4-3.2) [a]
Regular smoker (current)	30.7 (1.0)	21.9 (0.6)	1.6 (1.4-1.8) [a]	25.1 (1.8)	17.1 (0.7)	1.6 (1.3-2.0) [a]

[a] Statistically significant at $p<0.05$

Table 2. Univariate relationships between physical and psychiatric disorders and self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being

	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING			2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING		
	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*
Physical disorders						
Any physical disorder	72.0 (1.2)	32.7 (0.6)	5.3 (4.6-6.0) [a]	87.9 (1.4)	65.6 (0.8)	3.8 (2.9-5.0) [a]
12 month ICD-10 psychiatric disorders						
Panic disorder	2.8 (0.5)	0.9 (0.1)	3.3 (2.1-5.3) [a]	5.6 (0.9)	2.0 (0.2)	2.8 (2.0-4.0) [a]
Agoraphobia	3.3 (0.4)	0.7 (0.1)	4.7 (3.1-7.1) [a]	7.8 (1.2)	1.9 (0.2)	4.3 (2.9-6.3) [a]
Social phobia	5.0 (0.6)	2.4 (0.2)	2.2 (1.7-2.8) [a]	11.6 (1.4)	3.6 (0.2)	3.5 (2.6-4.7) [a]
Generalised anxiety disorder	7.8 (0.8)	2.2 (0.2)	3.7 (3.1-4.5) [a]	6.0 (0.7)	2.1 (0.3)	2.9 (2.0-4.2) [a]
Obsessive compulsive disorder	0.7 (0.2)	0.3 (0.1)	2.8 (1.4-5.6) [a]	3.5 (0.7)	1.6 (0.2)	2.1 (1.3-3.4) [a]
Post-traumatic stress disorder	6.8 (0.7)	2.6 (0.2)	2.7 (2.1-3.5) [a]	11.1 (1.1)	5.6 (0.3)	2.1 (1.6-2.7) [a]
Major depression	13.2 (0.9)	5.6 (0.3)	2.6 (2.1-3.1) [a]	7.5 (1.0)	1.9 (0.3)	4.2 (2.8-6.3) [a]
Dysthymia	4.1 (0.7)	0.8 (0.1)	5.1 (3.4-7.8) [a]	4.7 (0.7)	0.7 (0.1)	7.1 (4.5-11.1) [a]
Bipolar disorder	-	-	-	4.9 (0.7)	1.2 (0.2)	4.1 (2.7-6.2) [a]
Alcohol use disorder	7.0 (0.5)	6.3 (0.3)	1.1 (0.9-1.4)	5.8 (0.9)	4.1 (0.4)	1.4 (1.0-2.2) [a]
Substance use disorder	3.5 (0.5)	1.9 (0.2)	2.0 (1.4-2.8) [a]	3.0 (0.6)	1.2 (0.1)	2.6 (1.5-4.4) [a]
Any personality disorder	12.4 (1.0)	5.4 (0.3)	2.5 (2.0-3.0) [a]	-	-	-

[a] Statistically significant at $p<0.05$

Table 3. Univariate and multivariate relationships between somatisation and service use and self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being

	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING				2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING			
			Univariate	Multivariate			Univariate	Multivariate
	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Poor self-rated health vs. Good self-rated health (ref) *Adjusted OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Poor self-rated health vs. Good self-rated health (ref) *Adjusted OR (95% CI)*
Somatisation								
Neurasthenia	5.4 (0.6)	0.8 (0.1)	7.1 (4.8-10.6) [a]	3.4 (2.2-5.2) [b]	-	-	-	-
Health anxiety	-	-	-	-	14.8 (1.4)	2.4 (0.2)	7.1 (5.3-9.6) [a]	4.1 (2.9-5.9) [b]
Service use in past 12 months								
Mental health service	10.5 (0.9)	4.1 (0.3)	2.7 (2.1-3.6) [a]	2.5 (1.8-3.4) [b]	13.1 (1.5)	6.3 (0.4)	2.3 (1.7-3.0) [a]	1.3 (0.9-1.8)
General health service	93.5 (0.5)	84.2 (0.5)	2.7 (2.3-3.2) [a]	1.9 (1.6-2.4) [b]	90.9 (1.4)	81.5 (0.9)	2.3 (1.6-3.2) [a]	1.5 (1.0-2.2)
Mental or general health service	93.8 (0.5)	84.5 (0.5)	2.8 (2.3-3.4) [a]	2.0 (1.6-2.4) [b]	91.3 (1.3)	82.0 (0.9)	2.3 (1.6-3.3) [a]	1.5 (1.0-2.2)
Hospitalisations	25.4 (1.1)	10.6 (0.3)	2.9 (2.5-3.3) [a]	2.2 (1.9-2.7) [b]	18.5 (1.4)	9.0 (0.5)	2.3 (1.9-2.8) [a]	1.5 (1.2-1.9) [b]
Medications	38.5 (1.5)	13.5 (0.5)	4.0 (3.5-4.7) [a]	2.7 (2.3-3.2) [b]	24.1 (1.4)	9.5 (0.6)	3.0 (2.5-3.7) [a]	1.7 (1.3-2.1) [b]

[a] Statistically significant at $p<0.05$.

[b] Statistically significant at $p<0.01$. Multivariate analysis adjusting for demographics, any physical condition and ICD-10 psychiatric disorders.

Poor self-rated health and its associations with ~~health anxiety~~somatisation in two Australian national surveys

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Conflict of interest: None

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Abstract

Objectives: ~~Poor self-rated health is predictive of increased mortality and morbidity that is not explained by measures of physical health status. It is therefore of medical interest.~~ It is hypothesised that across two national surveys poor self-rated health will be independently associated with somatisation and will result in high rates of service use after adjusting for established diagnoses.

Design: Two cross-sectional population-based surveys conducted in 1997 and 2007. The use of both surveys allowed replication of results.

Setting: Australia.

Participants: The 1997 and 2007 National Surveys of Mental Health and Well-Being were based on stratified, multistage area probability samples of persons living in private dwellings in Australia. The 1997 survey included 10641 respondents aged 18 to 75, a response rate of 78%. The 2007 survey included 8841 respondents aged 16 to 85, a response rate of 60%.

Main outcome measures: Self-rated health ~~Global ratings of perceived health.~~

Results: Approximately 15% of the Australian population rated their health as fair or poor in both surveys. The independent relationship between self-rated health and somatisation was replicated across both surveys in multivariate analyses. Individuals with negative self-rated health were 4.1 times as likely to screen positive for health anxiety (OR: 4.1; 95% CI 2.8 to 5.9) and 3.4 times as likely to be diagnosed with neurasthenia (OR: 3.4; 95% CI 2.2 to 5.2), when compared with individuals who rated their health positively. Individuals with negative self-rated health were ~~twice as~~ also more likely to use health services after controlling for demographics, mental and physical illness, neuroticism, suicidality, cognitive impairment and psychological distress.

Conclusions: These results confirm both of the study hypotheses: 1) that negative self-rated health was powerfully and independently associated with somatisation; and 2) that this relationship manifested itself in high rates of service use, even after adjusting for an extensive range of demographics, psychiatric and physical conditions. ~~The current findings indicate that subjective concerns regarding perceived poor health must be considered an important public health issue. Medically unexplained negative self rated health, associated with increased mortality and morbidity, should be conceptualised as a variant of hypochondriasis/health anxiety and proactively treated.~~

Article focus

The current study tests the relationship between self-rated health and somatisation, specifically neurasthenia and health anxiety, in two national surveys of the Australian population conducted in 1997 and 2007.

Key points

These results confirm both of the study hypotheses:

1) that negative self-rated health was powerfully and independently associated with somatisation; and

2) that negative self-rated health was associated with general health service use, hospitalisation and medication use, even after adjusting for an extensive range of psychiatric and physical conditions.

Strengths and limitations of the study

The use of the two Australian national surveys conferred many advantages in terms of replication, sample representativeness, fully structured diagnoses of all the common psychiatric disorders, extensive assessment of service utilisation and the inclusion of a broad range of other clinical measures.

The study relied on subjective rather than objective assessments of physical morbidity

Health anxiety was based on screening questions rather than full diagnostic assessment

The surveys were cross-sectional in nature, precluding an investigation of the direction of the relationships identified in the current study.

1 Introduction

Rating your health as excellent, very good, good, fair or poor seems a simple concept that is unlikely to contain surprises, but ratings of health as fair or poor are predictors of morbidity and mortality after adjusting for clinical health status. ~~The 15-20% of the population who rate their health negatively have mortality risks 2-7 times higher than individuals with excellent self-reported health, even after adjustment for medical history (1). For example, self-rated health has been found to be the best predictor of survival in advanced cancer patients in comparison with other important clinical indicators, such as clinician-assessed health status, appetite, fatigue and quality of life (2). In the prospective US National Health and Nutrition Examination Survey (NHANES), self-rated health was found to independently predict mortality and functional limitations over and above a comprehensive range of physical examinations, laboratory tests and self-reported mental and physical symptoms (1, 3). Individuals presenting with perceived poor health die younger than counterparts with equivalent health status.~~

~~No country can provide all the health services its citizens want (4), yet, in western countries, we worry that we are medicalising the normal risks of life, at great cost and with little health gain (5, 6). If the purpose of medicine is to reduce the burden of disease then negative self-rated health, because of the increased mortality and morbidity, should be a focus of medical attention, especially if a low cost remedy is a possibility. Four possible hypothetical explanations for the independent association between global self-rated health and increased morbidity and mortality have been proposed (7): 1) Even when extensive clinical~~

~~investigations and self reported histories are collected, such as in the NHANES study (1, 3), it is possible that difficult to operationalise, undiagnosed or prodromal conditions may explain the independent effects of self rated health on morbidity and mortality; 2) self rated health may reflect additional information about health trajectories, or changes in health, that are not captured in assessments of current health status; 3) self perceptions of health may influence health and illness behaviours that increase the risk of morbidity and mortality; and 4) self rated health may reflect the perception of insufficient external resources, like income or social support, to maintain future health status.~~

~~The four hypotheses above are not easy to explore. A fifth option is that perceived poor health is a reflection of a mental disorder.~~ Self-ratings of overall health are only modestly correlated with clinical assessments of medical status, but appear more closely related to psychiatric illness, and aspects of personality such as neuroticism (1-3). These findings are surprising given the evidence that suggests that respondents mainly have physical health problems in mind when asked to rate their global health status (4). Thus, whilst the decision to rate global health positively or negatively is driven by psychological factors, it appears that respondents mainly consider physical health problems when rating their global health status. These findings suggest that a dysfunctional preoccupation with~~psychiatric disorders based on~~ physical health~~-~~ and disease related ~~-~~concerns (termed "somatisation" for ease of reading) may be particularly salient in the interpretation of global ratings of health status. Consistent with this hypothesis, hypochondriasis, somatisation and limitations in activities of daily living explain much of the variance in patient reports of overall health status (3).

The current study tests the relationship between self-rated health and somatisation, specifically neurasthenia and health anxiety, in two national surveys of the Australian population conducted in 1997 and 2007. The strength of the current study is therefore in the ability to replicate the findings across two large, epidemiological datasets that included

structured diagnoses of the major mental disorders and similar measures of other clinical, demographic and service use variables. It is hypothesised that across both surveys: 1) poor self-rated health will be powerfully and independently associated with neurasthenia and health anxiety; and 2) that this strong association will also manifest itself in high rates of service use after adjusting for established psychiatric and physical diagnoses. To our knowledge, these hypotheses have not been tested using representative, population-based samples, and never within the context of fully structured diagnoses of the major psychiatric disorders.

2 Method

Sample

The 1997 and 2007 National Surveys of Mental Health and Well-Being (NSMHWB) were based on stratified, multistage area probability samples of persons living in private dwellings in Australia, excluding very remote dwellings (5, 6). The 1997 survey included 10641 respondents aged 18 to 75, representing a response rate of 78%. Characteristics of non-responders were not explicitly examined in the 1997 survey. The 2007 survey included 8841 respondents aged 16 to 85, representing a response rate of 60%. A small, non-random follow-up study of the 2007 survey indicated that while the response rate had little effect at the aggregate level, there may have been some under-estimation in the prevalence estimates for mental disorders in males and young people. The age and gender characteristics of both samples were weighted to match the age and gender distributions in Australia. Both surveys were designed to provide accurate estimates of the population prevalence of selected major mental disorders, the level of disability associated with these disorders and the related service utilisation. The Australian Bureau of Statistics (ABS), the national government statistics agency, conducted both the 1997 and 2007 surveys. The ABS provided ethical review and

approval for the surveys, including voluntary recruitment, rigorous confidentiality provisions, and written informed consent. The ABS operates under Australian National Legislation that mandates strict provisions for the ethical conduct of the agency's research. The methods for both surveys have been discussed in more detail elsewhere (5, 6).

Measures

The dependent variable in the current study was self-rated health, whilst the main independent variables were neurasthenia, health anxiety and service use (including medication use). In order to investigate the independence of the relationships between self-rated health and somatisation, several possible covariates were also examined. These included demographics and psychiatric disorders which have been shown to be related to health anxiety in a previous study of the 2007 NSMHWB (7), as well as physical disorders to ensure that any relationships identified were not simply a reflection of actual health status.

Independent variable

Self-rated health

For the 1997 survey each respondent was administered the 12 item Short Form Health Survey (SF-12), a widely used measure of health and well-being (8). The first item of the SF-12 required the respondent to rate their health in general, with responses categorised as "excellent", "very good", "good", "fair" or "poor". This question informs the physical component scale of the SF-12 (9) and, for the purposes of the current study, constituted the main outcome variable for the 1997 survey. In the 2007 NSMHWB, respondents were asked to rate their overall physical health and overall mental health in two separate questions, with responses to both questions categorised as above. Given that the item used in the 1997 survey is weighted heavily towards physical well-being, the query regarding self-rated physical

health was selected as the main outcome variable for the 2007 survey. Respondents were to rate their physical health before they were asked to rate their mental health in the 2007 survey. In both surveys, the questions regarding self-rated health were administered before questions about mental disorders and service use. To ensure sufficient power to detect differences in statistical analyses, the main outcome variables for both surveys were dichotomized into negative ("fair" or "poor") and positive ("good", "very good" and "excellent") self-rated health. Grouping of these responses in such a manner is common practice in the self-rated health literature due to the similar survival probabilities within these collapsed categories (10).

Dependent variables

Health anxiety and neurasthenia

The 1997 survey included a module on the ICD-10 diagnosis for neurasthenia (11). Meanwhile, the 2007 survey collected additional information on health anxiety (7, 12). The respondents were first asked whether they had ever worried a lot about serious illness, despite having reassurance from a doctor or medical specialist. If endorsed, the respondents were asked whether they ever had a period of worry like this that lasted for 6 months or longer in the previous 12 months. These screening questions are most consistent with the DSM-IV diagnosis of hypochondriasis (13), addressing Criteria A, B and E for this disorder. In the current study, it was not possible to address the criteria related to differential diagnosis (Criteria C and F), or establish clinically significant impairment or distress specific to this disorder (Criterion D). Consistent with a previous study of the 2007 NSMHWB (20), we refer to these questions as a screener for health anxiety, rather than a proxy diagnosis of hypochondriasis.

Service use

In the 1997 survey, respondents were asked whether they had consulted with the following health professionals in the 12 months prior to the interview: general practitioners, radiologists, pathologists, physicians or other medical specialists, surgical specialists or gynaecologists, psychiatrists, psychologists, social workers or welfare officers, drug and alcohol counsellors, other counsellors, nurses, mental health teams, chemists for professional advice, ambulance officers or other health professionals. In the 2007 survey, respondents were asked about consultations with the following health professionals in the 12 months prior to the interview: general practitioners, psychiatrists, psychologists, mental health nurses, other professionals providing specialist mental health services, specialist doctors or surgeons, other professionals providing general services and complementary or alternative therapists. For both surveys these service providers were dichotomised into general health service providers (i.e., general practitioners and specialist doctors) and mental health service providers (i.e., psychiatrists and psychologists). In both surveys, respondents were also asked about hospitalisations (overnight admissions) in the 12 months prior to the interview.

In the 1997 survey, the respondents were asked about their use of 23 separate medications in the 12 months prior to the interview, including pain relievers, sleeping tablets, prescription medications with abuse potential and medications for psychiatric illness. In the 2007 survey respondents were asked about their use of medications in the 2 weeks prior to the interview including: sleeping tablets/capsules, tablets/capsules for anxiety or nerves, tranquillisers, antidepressants, mood stabilisers, and other medications for mental health. For both surveys, respondents using one or more medication were compared to those who had used none.

Covariates

12-month ICD-10 psychiatric disorders

Psychiatric diagnoses were assessed using the Composite International Diagnostic Interview (CIDI version 2.1 in 1997 and version 3.0 in 2007) (14, 15). Both surveys included fully structured ICD-10 12-month diagnoses (16) of panic disorder, agoraphobia, social phobia, generalised anxiety disorder (GAD), obsessive compulsive disorder (OCD), post-traumatic stress disorder (PTSD), major depression, dysthymia, bipolar disorder, alcohol use disorders (dependence and harmful use) and substance use disorders (dependence and harmful use). ~~The 1997 survey included a module on neurasthenia (11) and a seven item psychosis screener.~~ For both surveys, 12-month ICD-10 diagnoses were coded as absent or present based on standard CIDI diagnostic algorithms that fully operationalized ICD-10 inclusion and exclusion criteria, as well as ICD-10 hierarchical decision rules.

~~The 2007 survey collected additional information on health anxiety (7, 12). The respondent was first asked whether they had ever worried a lot about serious illness, despite having reassurance from a doctor or medical specialist. If endorsed, the respondents were asked whether they ever had a period of worry like this that lasted for 6 months or longer in the previous 12 months. These screening questions are most consistent with the DSM-IV diagnosis of hypochondriasis (13), addressing Criteria A, B and E for this disorder. In the current study, it was not possible to address the criteria related to differential diagnosis (Criteria C and F), or establish clinically significant impairment or distress specific to this disorder (Criterion D). Consistent with a previous study of the 2007 NSMHWB (20), we refer to these questions as a screener for health anxiety, rather than a proxy diagnosis of hypochondriasis.~~

The 1997 survey also included a screener for personality disorders (composed of screening questions for 12-month ICD-10 paranoid, schizoid, dissocial, emotionally unstable, histrionic, anankastic, anxious and dependent personality disorders). In the current analyses, individuals

who screened positive for one or more personality disorder were compared with those who did not.

~~*Neuroticism*~~

~~The neuroticism scale of the Eysenck Personality Questionnaire (EPQ) (17) was also included in the 1997 survey. In the current analyses, those reporting a score of six or more on the EPQ (the top ten percentile for neuroticism) were compared with the rest of the sample.~~

~~*Distress and Disability*~~

~~The K10, a commonly used measure of psychological distress, was included in both surveys (18). According to established norms, a score of 15 or greater on the K10 was indicative of medium to high psychological distress (19). Days out of role in the previous month were also queried in both surveys and individuals with one or more days out of role were compared to those who reported no days out of role.~~

Physical disorders

The 1997 survey included information on self-reported physical disorders: asthma, chronic bronchitis, anaemia, high blood pressure, heart trouble, arthritis, kidney disease, diabetes, cancer, stomach or duodenal cancer, gallbladder or liver trouble and hernia or rupture. The chronicity of these conditions was not recorded. In the 2007 survey a wider range of self-reported physical conditions were recorded: asthma, cancer, stroke, gout, rheumatism, arthritis, diabetes, heart or circulatory conditions, hay fever, sinusitis, emphysema, bronchitis, anaemia, epilepsy, oedema, hernias, kidney problems, migraine, psoriasis, stomach ulcer, thyroid trouble, tuberculosis and back or neck problems. In the 2007 survey these conditions were only recorded if the respondent had experienced them for a period of six months or

longer, therefore taking into account chronicity. For both surveys, respondents reporting one or more physical conditions were compared with those who reported none.

~~*Cognitive impairment*~~

~~Both surveys included the Mini Mental State Examination (MMSE), a screener for cognitive impairment (20). Following standard scoring protocols, possible cognitive impairment was coded as present if the respondent scored less than 23 on the MMSE (21). The interview was terminated if the respondent scored less than 15 on the MMSE.~~

~~*Suicidality*~~

~~Both surveys included questions regarding suicidal ideation, plans or attempts. The current analyses compared respondents who reported any suicidality (thoughts, plans or attempts) in the 12 months prior to the interview with those who did not.~~

~~*Service use*~~

~~In the 1997 survey, respondents were asked whether they had consulted with the following health professionals in the 12 months prior to the interview: general practitioners, radiologists, pathologists, physicians or other medical specialists, surgical specialists or gynaecologists, psychiatrists, psychologists, social workers or welfare officers, drug and alcohol counsellors, other counsellors, nurses, mental health teams, chemists for professional advice, ambulance officers or other health professionals. In the 2007 survey, respondents were asked about consultations with the following health professionals in the 12 months prior to the interview: general practitioners, psychiatrists, psychologists, mental health nurses, other professionals providing specialist mental health services, specialist doctors or surgeons, other professionals providing general services and complementary or alternative therapists. For both surveys these service providers were dichotomised into general health service~~

~~providers (i.e., general practitioners and specialist doctors) and mental health service providers (i.e., psychiatrists and psychologists). In both surveys, respondents were also asked about hospitalisations (overnight admissions) in the 12 months prior to the interview.~~

~~*Medications*~~

~~In the 1997 survey, the respondents were asked about their use of 23 separate medications in the 12 months prior to the interview, including pain relievers, sleeping tablets, prescription medications with abuse potential and medications for psychiatric illness. In the 2007 survey respondents were asked about their use of medications in the 2 weeks prior to the interview including: sleeping tablets/capsules, tablets/capsules for anxiety or nerves, tranquillisers, antidepressants, mood stabilisers, and other medications for mental health. For both surveys, respondents using one or more medication were compared to those who had used none.~~

Demographics

For both surveys, the demographic variables of interest were sex, age (34 years and younger, 35 to 64 years, 65 years and over), country of birth (Australia, other English speaking country, non-English speaking country), marital status (married, separated/widowed/divorced, never married), education (post high school, no post high school education), employment (employed, unemployed, not in the labour force), and current smoking status (present, absent).

Statistical analysis

Weighted means, frequencies and logistic regressions were computed using SAS SURVEY procedures in SAS 9.2 (22) which adjusted for the characteristics of the complex survey design using jackknife repeated replication methods for variance estimation.

In order to select an appropriate multivariate model, the univariate relationships between self-rated health and the covariates of interest were investigated. In this initial phase, a comparatively liberal unadjusted p-value of 0.05 was selected despite multiple comparisons, because the aim was to adjust for all possible covariates that may explain the relationships between self-rated health, somatization and service use in the multivariate analysis. Those covariates that were significantly related to self-rated health were included in multivariate models investigating the relationships between self-rated health, somatisation and service use. To control for multiple comparisons, a more conservative p-value of 0.01 was selected for use in the multivariate analyses.

~~Univariate and multivariate logistic regressions were then conducted to investigate the relationship between negative self reported health and the variables of interest (described above). Initial analyses focused on the univariate relationships between self rated health and the demographic, physical, psychological and service use variables of interest. Multivariate analyses were then conducted to further investigate the relationship between self rated health and the presence of any physical condition whilst adjusting for demographics, psychiatric illness, suicidality, cognitive impairment and, in the 1997 survey only, neuroticism. To investigate the independent relationships between self rated health, health anxiety and the ICD-10 psychiatric disorders of interest, multivariate analyses adjusted for demographics, any physical condition, all other psychiatric disorders, suicidality, cognitive impairment and neuroticism. To investigate the relationship between negative self rated health and disability, separate multivariate regressions for the K10 and days out of role variables were conducted after adjusting for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment and neuroticism. Finally, multivariate analyses controlling for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment,~~

~~neuroticism, psychological distress and days out of role were conducted to investigate the independent relationship between service use and self-rated health.~~

3 Results

Prevalence of negative self-rated health

14.6% (SE = 0.4) of respondents reported that their health was "fair" or "poor" in the 1997 survey, whilst 14.8% (SE = 0.5) responded similarly in the 2007 survey. In both samples, approximately 30% of those with negative self-rated health reported one or more ICD-10 12-month mental disorder, compared with approximately 17% of those with positive self-rated health (see Table 2 for specific odds ratios). Of those with negative self-rated health, 5.4% were diagnosed with ICD-10 neurasthenia in the 1997 survey, whilst 14.8% screened positive for health anxiety in the 2007 survey. Physical conditions were common amongst individuals reporting negative self-rated health (approximately 72% in the 1997 survey and 88% in the 2007 survey).

Univariate relationships between self-rated health and the variables of interest

There were consistencies between the two surveys in terms of the relationships between negative self-rated health and the demographic variables of interest (Table 1). When compared with individuals with positive self-rated health, those with negative self-rated health were more likely to be: older, separated/widowed/divorced, educated to the high school level only, not in the labour force and current regular smokers (see Table 1 for relevant odds ratios for both surveys).

As can be seen from Table 2, the univariate associations between negative self-rated health and all of the correlates of interest were statistically significant in both surveys.

Multivariate relationships between self-rated health and the variables of interest

Multivariate logistic regressions which included the effects of demographics, any physical condition and all ICD-10 psychiatric disorders were then conducted. After adjusting for the other variables in the model, individuals with negative self-rated health in the 1997 survey were 3.4 (OR: 3.4; 95% CI 2.2 to 5.2; $p<0.01$) times more likely to meet criteria for neurasthenia, and 4.1 (OR: 4.1; 95% CI 2.8 to 5.9; $p<0.01$) times more likely to meet criteria for health anxiety in the 2007 survey (Table 3). In both surveys, after adjusting for demographics, any physical condition and all ICD-10 psychiatric disorders, individuals with negative self-rated health were more likely to have been hospitalized overnight and to have used mental health medications when compared to those with positive self-rated health. The multivariate relationship between self-rated health and the other service use variables (mental health service use and/or general health service use) was only statistically significant in the 1997 survey.

~~After adjusting for demographics, psychiatric illness, suicidality, cognitive impairment and neuroticism (the latter in the 1997 survey only), individuals who reported negative self-rated health were 3.6 times as likely to report any listed physical condition in the 1997 survey (95% CI: 3.1 to 4.2) and 2.5 times as likely to report any listed physical condition in the 2007 survey (95% CI: 1.9 to 3.3) when compared with individuals who reported positive self-rated health (Table 2).~~

~~Multivariate logistic regressions which included the effects of demographics, any physical condition, all ICD-10 psychiatric disorders, suicidality, cognitive impairment and neuroticism were then conducted. After adjusting for the other variables in the model, individuals with negative self-rated health in the 1997 survey were more likely to be diagnosed with agoraphobia, GAD, neurasthenia, and more likely to report any physical condition, suicidality, cognitive impairment and neuroticism when compared to those with positive self-rated health (see Table 2). In the 1997 survey, the strongest multivariate relationship was~~

~~between self-rated health, on the one hand, and any physical condition and neurasthenia, on the other. Individuals with negative self-rated health in the 2007 survey were more likely to be diagnosed with social phobia and affective disorders (major depression, dysthymia and bipolar disorder), and more likely to report any physical condition, health anxiety, suicidality and cognitive impairment when compared to those with positive self-rated health (see Table 2). In the 2007 survey, the strongest relationship was between self-reported health and health anxiety after adjusting for the other variables in the model.~~

~~In both surveys, after controlling for demographics, any physical condition, any mental disorder, suicidality, cognitive impairment and neuroticism (in the 1997 survey only) individuals with negative self-rated health were considerably more likely to report medium to high distress on the K10, and one or more days out of role.~~

~~After controlling for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment, neuroticism, psychological distress and days out of role, individuals with negative self-rated health were more likely to use all health services when compared to those with positive self-rated health. The relationship between self-rated health and mental health service use was only significant in the 1997 survey. In both surveys, individuals with negative self-rated health were also more likely to have been hospitalized overnight, and to have used medications when compared to those with positive self-rated health.~~

4 Discussion

These results confirm both of the study hypotheses: 1) that negative self-rated health was powerfully and independently associated with somatisation; and 2) that negative self-rated health was associated with general health service use, hospitalisation and medication use, even after adjusting for an extensive range of psychiatric and physical conditions. The current study provided a strong test of these hypotheses by replicating these findings in two

epidemiological surveys of the Australian population. ~~Negative perceptions of health status were independently associated with the presence of any physical or mental disorder (as well as neurasthenia and health anxiety), disability, psychopathology, suicidality, cognitive impairment and high rates of service use. The current findings, combined with previous research linking negative perceived health with increased rates of mortality, indicate that subjective concerns regarding perceived poor health must be considered an important public health issue.~~

Limitations

The use of the two Australian national surveys conferred many advantages in terms of replication, sample representativeness, fully structured diagnoses of all the common psychiatric disorders, extensive assessment of service utilisation and the inclusion of a broad range of other clinical measures. The surveys focused on mental health rather than physical health, which meant that objective assessments of physical morbidity were not available. However, others have found very little discrepancy between self-reported physical conditions and physician reported medical histories (2), and most previous research investigating the correlates of negative self-rated health have relied upon similar self-reported measures of physical health problems (23). Health anxiety in the 2007 survey was based on screening questions rather than full diagnostic assessment (7). In particular, it was not possible to determine whether respondents met full criteria for hypochondriasis. Both surveys were cross-sectional in nature, precluding an investigation of the direction of the relationships identified in the current study. To our knowledge, no prospective examination of self-rated health and somatisation has been undertaken, and the current results suggest this may be a fruitful avenue for future research.

~~The independent relationships between negative self-rated health and psychological distress highlight the nontrivial nature of these health complaints, whilst the consistent, independent relationships with suicidality and cognitive impairment have been identified and discussed previously (2, 24, 25). Negative self-rated health was also independently associated with neuroticism and anxiety disorders (agoraphobia and GAD) in the 1997 survey, and anxiety (social phobia) and affective disorders (major depression, dysthymia and bipolar disorder) in the 2007 survey. Whilst these findings were not replicated across the two surveys at the disorder level, they are consistent with previous research (2). The relationship between negative self-rated health and neurotic, or internalising disorders (26), may reflect an overall tendency towards negative self-evaluation and ruminative style that extends to perceptions of negative health status. The following discussion will focus on the novel aspects of the current study, including the independent relationships between negative self-rated health and somatisation, and the high rates of service use irrespective of the level of mental and physical illness.~~

The majority of individuals with poor self-rated health reported the presence of at least one of the major physical conditions enquired about in either survey. These findings suggest that, in most cases, negative ratings of health may be partly justified in terms of physical illness. However, self-rated health was also related to ~~psychopathology~~somatisation, even after adjusting for physical illness, suggesting that the perception of global self-rated health is also independently influenced by psychological factors. Whilst the current study found that negative self-rated health was independently associated with affective and anxiety disorders, only the relationship with somatisation was replicated across both surveys. This finding is consistent with previous research (1, 3). One of the distinguishing features of somatisation is a pathological preoccupation with health and disease-related concerns, and negative self-rated

health in the absence of physical and psychiatric diagnoses may reflect this aspect of somatisation.

~~Perceived health is principally composed of physical symptoms (4) whilst the distinguishing feature of somatisation is a pathological preoccupation with health and disease related concerns. The robust associations identified in the current study suggest that negative self-rated health may be a mild or prodromal symptom of disorders related to health anxiety.~~

The current study also indicated that, independently of physical and psychiatric conditions, individuals with poor self-rated health used general health services and medications at particularly high rates. Hospitalisations were also common. High rates of service use independent of actual physical and mental problems need to be addressed. Given the strong relationship between negative self-rated health and somatisation, the high rates of service use amongst individuals with negatively perceived health may reflect reassurance-seeking, a symptom central to hypochondriasis and related psychiatric disorders. Consistent with the current findings, previous research has found that negative self-rated health, as well as somatisation, hypochondriasis and medically unexplained physical symptoms, all contribute disproportionately to the growing demand for health services (27). However, individuals presenting with these symptoms and disorders are also more likely to be dissatisfied with the services provided (28, 29). With regards to hypochondriasis specifically, high rates of service use result in consultations that are unsatisfactory and exasperating for both the doctor and patient (30). This tension most likely arises because patients are seeking physical explanations for their concerns, which are largely psychological in nature. Treatment of health anxiety has not been rewarding for either party, with anger on the patients part that cure is not forthcoming and frustration on the clinicians part that reassurance and good advice is not beneficial. Consultations are often fraught. Patient and physician education regarding the psychological nature of health-related concerns, and the direction of patients to

appropriate treatment options with minimal clinician involvement, may lessen such tensions in doctor-patient relationships. Internet-delivered cognitive behavioural therapy is effective for the internalising disorders generally (31-33), and has been shown to be effective for health anxiety specifically (34, 35). Internet delivered cognitive behavioural therapy, which can be administered at low cost and with minimal clinician involvement may be one way around the problems in the interaction between doctor and patient.

Competing interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Author Contributions

LM and GA conceived the study and its design. LM conducted all statistical analyses. GA and LM both contributed to the interpretation of the data. LM wrote the first draft and GA contributed to all successive revisions. Both LM and GA approved the final manuscript to be published.

Data sharing

The data for the 1997 and 2007 NSMHWB are public access files that can be accessed through consultation with the Australian Bureau of Statistics.

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Table 1. Univariate relationships between demographics and self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being

	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING			2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING		
	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*
Sex						
Male	51.9 (1.1)	48.8 (0.2)	Ref	50.5 (1.9)	49.5 (0.4)	Ref
Female	48.1 (1.1)	51.2 (0.2)	0.9 (0.8-1.0) [a]	49.5 (1.9)	50.5 (0.4)	1.0 (0.8-1.1)
Age						
18-34	19.4 (1.2)	36.8 (0.3)	Ref	18.6 (1.4)	36.0 (0.3)	Ref
35-64	49.9 (1.3)	50.4 (0.3)	1.9 (1.6-2.2) [a]	57.0 (2.0)	50.6 (0.4)	2.2 (1.7-2.7) [a]
65-85	30.7 (1.1)	12.8 (0.3)	4.6 (3.8-5.5) [a]	24.4 (1.2)	13.4 (0.2)	3.5 (2.9-4.3) [a]
Country of birth						
Australia	72.1 (1.7)	75.3 (0.5)	Ref	73.3 (2.0)	72.8 (0.8)	Ref
Other English speaking country	10.4 (0.9)	11.5 (0.4)	0.9 (0.8-1.2)	11.3 (1.4)	11.3 (0.4)	1.0 (0.7-1.3)
Other non-English speaking country	17.5 (1.1)	13.1 (0.5)	1.4 (1.2-1.7) [a]	15.4 (1.8)	15.9 (0.8)	1.0 (0.7-1.3)
Marital status						
Married/de facto	62.1 (1.1)	65.7 (0.7)	Ref	54.4 (1.8)	52.8 (0.7)	Ref
Separated/widowed/divorced	21.6 (1.2)	12.2 (0.3)	1.9 (1.6-2.2) [a]	21.6 (1.4)	13.3 (0.4)	1.6 (1.3-1.9) [a]
Never married	16.2 (1.2)	22.1 (0.5)	0.8 (0.7-0.9) [a]	24.0 (1.5)	34.0 (9.7)	0.7 (0.6-0.8) [a]
Education						
Higher education	34.7 (1.6)	49.6 (0.7)	Ref	56.2 (2.1)	56.3 (0.6)	Ref
No higher education	65.3 (1.6)	50.4 (0.7)	1.8 (1.6-2.1) [a]	53.8 (2.1)	43.7 (0.6)	1.5 (1.3-1.8) [a]
Employment						
Employed	33.6 (1.6)	68.6 (0.5)	Ref	45.5 (1.6)	68.7 (0.3)	Ref
Unemployed	5.6 (0.6)	3.9 (0.2)	3.0 (2.3-3.9) [a]	1.9 (0.5)	2.7 (0.1)	1.1 (0.6-1.9)
Not in labour force	60.8 (1.7)	27.5 (0.5)	4.5 (3.9-5.3) [a]	52.6 (1.6)	28.6 (0.3)	2.8 (2.4-3.2) [a]
Regular smoker (current)	30.7 (1.0)	21.9 (0.6)	1.6 (1.4-1.8) [a]	25.1 (1.8)	17.1 (0.7)	1.6 (1.3-2.0) [a]

~~Table 1. Prevalence and demographic correlates of negative self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being~~

[a] Statistically significant at $p<0.05$

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	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING	2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING

Table 2. Univariate relationships between physical and psychiatric disorders and self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being

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	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Poor self-rated health vs. Good self-rated health (ref) *Adjusted OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Poor self-rated health vs. Good self-rated health (ref) *Adjusted OR (95% CI)*
Physical disorder								
Any physical disorders	72.0 (1.2)	32.7 (0.6)	5.3 (4.6-6.0) [a]	3.6 (3.1-4.2) [b]	87.9 (1.4)	65.6 (0.8)	3.8 (2.9-5.0)	2.5 (1.9-3.3) [b]
12 month ICD-10 psychiatric disorders								
Panic disorder	2.8 (0.5)	0.9 (0.1)	3.3 (2.1-5.3) [a]	1.8 (0.9-3.5)	5.6 (0.9)	2.0 (0.2)	2.8 (2.0-4.0) [a]	1.3 (0.9-2.0)
Agoraphobia	3.3 (0.4)	0.7 (0.1)	4.7 (3.1-7.1) [a]	1.9 (1.2-3.2) [c]	7.8 (1.2)	1.9 (0.2)	4.3 (2.9-6.3) [a]	1.1 (0.6-2.0)
Social phobia	5.0 (0.6)	2.4 (0.2)	2.2 (1.7-2.8) [a]	1.4 (0.9-2.1)	11.6 (1.4)	3.6 (0.2)	3.5 (2.6-4.7) [a]	2.1 (1.1-3.9) [c]
Generalised anxiety disorder	7.8 (0.8)	2.2 (0.2)	3.7 (3.1-4.5) [a]	1.6 (1.3-2.1) [c]	6.0 (0.7)	2.1 (0.3)	2.9 (2.0-4.2) [a]	0.8 (0.5-1.3)
Obsessive compulsive disorder	0.7 (0.2)	0.3 (0.1)	2.8 (1.4-5.6) [a]	0.6 (0.3-1.4)	3.5 (0.7)	1.6 (0.2)	2.1 (1.3-3.4) [a]	0.8 (0.4-1.6)
Post-traumatic stress disorder	6.8 (0.7)	2.6 (0.2)	2.7 (2.1-3.5) [a]	1.3 (0.9-1.7)	11.1 (1.1)	5.6 (0.3)	2.1 (1.6-2.7) [a]	1.2 (0.8-1.7)
Major depression	13.2 (0.9)	5.6 (0.3)	2.6 (2.1-3.1) [a]	1.2 (0.9-1.6)	7.5 (1.0)	1.9 (0.3)	4.2 (2.8-6.3) [a]	1.8 (1.1-3.1) [c]
Dysthymia	4.1 (0.7)	0.8 (0.1)	5.1 (3.4-7.8) [a]	1.2 (0.7-2.0)	4.7 (0.7)	0.7 (0.1)	7.1 (4.5-11.1) [a]	2.4 (1.4-4.2) [c]
Bipolar disorder	-	-	-	-	4.9 (0.7)	1.2 (0.2)	4.1 (2.7-6.2) [a]	2.5 (1.4-4.5) [c]
Alcohol use disorder	7.0 (0.5)	6.3 (0.3)	1.1 (0.9-1.4)	0.8 (0.6-1.0)	5.8 (0.9)	4.1 (0.4)	1.4 (1.0-2.2) [a]	1.2 (0.7-2.1)
Substance use disorder	3.5 (0.5)	1.9 (0.2)	2.0 (1.4-2.8) [a]	1.1 (0.7-1.9)	3.0 (0.6)	1.2 (0.1)	2.6 (1.5-4.4) [a]	1.5 (0.8-3.0)
Neurasthenia	5.4 (0.6)	0.8 (0.1)	7.1 (4.8-10.6) [a]	3.4 (2.2-5.2) [c]	-	-	-	-
Any 12-month ICD disorder	30.7 (1.5)	16.9 (0.6)	2.2 (1.9-2.6) [a]	1.7 (1.4-2.1) [c]	35.0 (1.7)	17.3 (0.6)	2.6 (2.2-3.0) [a]	2.1 (1.6-2.6) [c]
Other measures								
Illness anxiety disorder	-	-	-	-	14.8 (1.4)	2.4 (0.2)	7.1 (5.3-9.6) [a]	4.1 (2.8-5.9) [c]
Any personality disorder	12.4 (1.0)	5.4 (0.3)	2.5 (2.0-3.0) [a]	1.2 (0.9-1.6)	-	-	-	-
Psychosis	1.2 (0.3)	0.3 (0.1)	4.0 (2.3-7.2) [a]	2.3 (0.9-5.9)	-	-	-	-
Suicidality	7.3 (0.6)	2.1 (0.1)	3.6 (2.9-4.6) [a]	1.8 (1.1-2.9) [c]	7.2 (1.0)	1.5 (0.2)	4.9 (3.4-7.1) [a]	2.3 (1.4-3.7) [c]
Cognitive impairment (≤ 23 on MMSE)	3.7 (0.6)	0.9 (0.1)	4.5 (2.9-7.0) [a]	1.5 (1.1-2.1) [c]	21.6 (1.1)	12.8 (0.2)	1.9 (1.6-2.2) [a]	2.4 (1.5-4.1) [c]
Neuroticism (top 10 percentile of EPQ)	22.7 (1.3)	7.7 (0.4)	3.5 (3.0-4.2) [a]	2.3 (1.8-2.8) [c]	-	-	-	-
Distress and impairment								
High psychological distress	61.6 (1.2)	27.3 (0.6)	4.3 (3.8-4.8) [a]	3.6 (3.1-4.1) [d]	55.1 (1.7)	24.4 (0.7)	3.8 (3.3-4.4) [a]	2.8 (2.4-3.4) [d]
One or more days out of role	36.5 (1.6)	14.9 (0.5)	3.3 (2.8-3.8) [a]	3.0 (2.5-3.5) [d]	56.3 (2.1)	22.4 (0.7)	4.5 (3.6-5.5) [a]	3.1 (2.5-3.9) [d]
Service use in past 12 months								
Mental health service	10.5 (0.9)	4.1 (0.3)	2.7 (2.1-3.6) [a]	2.1 (1.5-2.9) [c]	13.1 (1.5)	6.3 (0.4)	2.3 (1.7-3.0) [a]	1.2 (0.8-1.7)
General health service	93.5 (0.5)	84.2 (0.5)	2.7 (2.3-3.2) [a]	1.9 (1.6-2.3) [c]	90.9 (1.4)	81.5 (0.9)	2.3 (1.6-3.2) [a]	1.5 (1.0-2.1) [c]
Mental or general health service	93.8 (0.5)	84.5 (0.5)	2.8 (2.3-3.4) [a]	1.9 (1.6-2.3) [c]	91.3 (1.3)	82.0 (0.9)	2.3 (1.6-3.3) [a]	1.5 (1.0-2.1) [c]
Hospitalisations	25.4 (1.1)	10.6 (0.3)	2.9 (2.5-3.3) [a]	2.2 (1.8-2.6) [c]	18.5 (1.4)	9.0 (0.5)	2.3 (1.9-2.8) [a]	1.5 (1.2-1.9) [c]
Medications	38.5 (1.5)	13.5 (0.5)	4.0 (3.5-4.7) [a]	2.6 (2.2-3.1) [c]	24.1 (1.4)	9.5 (0.6)	3.0 (2.5-3.7) [a]	1.6 (1.2-2.0) [c]

[a] Statistically significant at $p<0.05$

[b] Statistically significant at $p<0.05$. Multivariate analysis adjusting for demographics, psychiatric illness, suicidality, cognitive impairment and, in the 1997 survey only, neuroticism.

[c] Statistically significant at $p<0.05$. Multivariate analysis adjusting for demographics, any physical condition, all other psychiatric disorders, suicidality, cognitive impairment and neuroticism (1997 survey only).

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[d] Statistically significant at $p<0.05$. Multivariate analysis adjusting for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment and neuroticism (1997 survey only).

[e] Statistically significant at $p<0.05$. Multivariate analysis adjusting for demographics, any physical condition, psychiatric illness, suicidality, cognitive impairment, neuroticism (1997 survey only), psychological distress and days out of role.

	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING			2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING		
	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*
Physical disorders						
Any physical disorder	72.0 (1.2)	32.7 (0.6)	5.3 (4.6-6.0) [a]	87.9 (1.4)	65.6 (0.8)	3.8 (2.9-5.0) [a]
12 month ICD-10 psychiatric disorders						
Panic disorder	2.8 (0.5)	0.9 (0.1)	3.3 (2.1-5.3) [a]	5.6 (0.9)	2.0 (0.2)	2.8 (2.0-4.0) [a]
Agoraphobia	3.3 (0.4)	0.7 (0.1)	4.7 (3.1-7.1) [a]	7.8 (1.2)	1.9 (0.2)	4.3 (2.9-6.3) [a]
Social phobia	5.0 (0.6)	2.4 (0.2)	2.2 (1.7-2.8) [a]	11.6 (1.4)	3.6 (0.2)	3.5 (2.6-4.7) [a]
Generalised anxiety disorder	7.8 (0.8)	2.2 (0.2)	3.7 (3.1-4.5) [a]	6.0 (0.7)	2.1 (0.3)	2.9 (2.0-4.2) [a]
Obsessive compulsive disorder	0.7 (0.2)	0.3 (0.1)	2.8 (1.4-5.6) [a]	3.5 (0.7)	1.6 (0.2)	2.1 (1.3-3.4) [a]
Post-traumatic stress disorder	6.8 (0.7)	2.6 (0.2)	2.7 (2.1-3.5) [a]	11.1 (1.1)	5.6 (0.3)	2.1 (1.6-2.7) [a]
Major depression	13.2 (0.9)	5.6 (0.3)	2.6 (2.1-3.1) [a]	7.5 (1.0)	1.9 (0.3)	4.2 (2.8-6.3) [a]
Dysthymia	4.1 (0.7)	0.8 (0.1)	5.1 (3.4-7.8) [a]	4.7 (0.7)	0.7 (0.1)	7.1 (4.5-11.1) [a]
Bipolar disorder	-	-	-	4.9 (0.7)	1.2 (0.2)	4.1 (2.7-6.2) [a]
Alcohol use disorder	7.0 (0.5)	6.3 (0.3)	1.1 (0.9-1.4)	5.8 (0.9)	4.1 (0.4)	1.4 (1.0-2.2) [a]
Substance use disorder	3.5 (0.5)	1.9 (0.2)	2.0 (1.4-2.8) [a]	3.0 (0.6)	1.2 (0.1)	2.6 (1.5-4.4) [a]
Any personality disorder	12.4 (1.0)	5.4 (0.3)	2.5 (2.0-3.0) [a]	-	-	-

[a] Statistically significant at $p<0.05$

Table 3. Univariate and multivariate relationships between somatisation and service use and self-rated health in the 1997 (n = 10641) and 2007 (n = 8841) Australian National Surveys of Mental Health and Well-Being

	1997 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING				2007 NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING			
			Univariate	Multivariate			Univariate	Multivariate
	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Poor self-rated health vs. Good self-rated health (ref) *Adjusted OR (95% CI)*	Negative self-rated health *Weighted Prevalence % (SE)*	Positive self-rated health *Weighted Prevalence % (SE)*	Poor self-rated health vs. Good self-rated health (ref) *OR (95% CI)*	Poor self-rated health vs. Good self-rated health (ref) *Adjusted OR (95% CI)*
Somatisation								
Neurasthenia	5.4 (0.6)	0.8 (0.1)	7.1 (4.8-10.6) [a]	3.4 (2.2-5.2) [b]	-	-	-	-
Health anxiety	-	-	-	-	14.8 (1.4)	2.4 (0.2)	7.1 (5.3-9.6) [a]	4.1 (2.9-5.9) [b]
Service use in past 12 months								
Mental health service	10.5 (0.9)	4.1 (0.3)	2.7 (2.1-3.6) [a]	2.5 (1.8-3.4) [b]	13.1 (1.5)	6.3 (0.4)	2.3 (1.7-3.0) [a]	1.3 (0.9-1.8)
General health service	93.5 (0.5)	84.2 (0.5)	2.7 (2.3-3.2) [a]	1.9 (1.6-2.4) [b]	90.9 (1.4)	81.5 (0.9)	2.3 (1.6-3.2) [a]	1.5 (1.0-2.2)
Mental or general health service	93.8 (0.5)	84.5 (0.5)	2.8 (2.3-3.4) [a]	2.0 (1.6-2.4) [b]	91.3 (1.3)	82.0 (0.9)	2.3 (1.6-3.3) [a]	1.5 (1.0-2.2)
Hospitalisations	25.4 (1.1)	10.6 (0.3)	2.9 (2.5-3.3) [a]	2.2 (1.9-2.7) [b]	18.5 (1.4)	9.0 (0.5)	2.3 (1.9-2.8) [a]	1.5 (1.2-1.9) [b]
Medications	38.5 (1.5)	13.5 (0.5)	4.0 (3.5-4.7) [a]	2.7 (2.3-3.2) [b]	24.1 (1.4)	9.5 (0.6)	3.0 (2.5-3.7) [a]	1.7 (1.3-2.1) [b]

[a] Statistically significant at $p<0.05$.

[b] Statistically significant at $p<0.01$. Multivariate analysis adjusting for demographics, any physical condition and ICD-10 psychiatric disorders.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **(pg. 1)**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **(pg. 2-3)**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **(pg. 4-5)**
Objectives	3	State specific objectives, including any prespecified hypotheses **(pg. 5-6)**
Methods		
Study design	4	Present key elements of study design early in the paper **(pg. 6)**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **(pg.6)**
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants **(pg.6)**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **(pg.7-11)**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **(pg.7-11)**
Bias	9	Describe any efforts to address potential sources of bias **(pg.6)**
Study size	10	Explain how the study size was arrived at **(pg.6)**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why **(pg.7-12)**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **(pg.11-12)**
		(*b*) Describe any methods used to examine subgroups and interactions **(pg.11-12)**
		(*c*) Explain how missing data were addressed **(n/a)**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy **(pg.11-12)**
		(*e*) Describe any sensitivity analyses **(n/a)**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **(pg.6)**
		(b) Give reasons for non-participation at each stage **(pg.6)**
		(c) Consider use of a flow diagram **(n/a)**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **(Tables 1-2)**
		(b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures **(Tables 1-2)**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **(Tables 1-2)**
		(*b*) Report category boundaries when continuous variables were categorized **(pg. 7-**

		11 & Tables 1-2)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period **(n/a)**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **(Tables 1-2)**
Discussion		
Key results	18	Summarise key results with reference to study objectives **(pg. 14-15)**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **(pg.15)**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **(pg. 16-18)**
Generalisability	21	Discuss the generalisability (external validity) of the study results **(pg. 6)**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based **(pg. 18, Acknowledgments)**

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.