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Mediating effects of self-stigma on the relationship between perceived stigma and psychosocial outcomes among psychiatric outpatients

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3 **Mediating effects of self-stigma on the relationship between perceived stigma and**
4 **psychosocial outcomes among psychiatric outpatients**
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ABSTRACT

Objectives: To examine whether self-stigma mediates the relationship between perceived stigma and quality of life, self-esteem and general functioning, among outpatients with depression, schizophrenia, anxiety and obsessive compulsive disorder (OCD).

Design: cross-sectional survey

Setting: outpatient clinics at a tertiary psychiatric hospital in Singapore

Participants: 280 outpatients with a primary clinical diagnosis of either schizophrenia, depression, anxiety or OCD

Methods: Data was collected in relation to self-stigma, perceived stigma, self-esteem, functioning and quality of life. In order to examine the mediating role of self-stigma on the relationship between perceived stigma and psychosocial outcomes, bootstrapping mediation analyses were used.

Results: Mediation analyses revealed that the relationship between perceived stigma and psychosocial outcomes were subject to the effect of self-stigma amongst the overall sample. Separate mediation analyses were conducted by diagnoses and showed differences in the mediating effect of self-stigma. Amongst the whole sample and the sub-sample with OCD, self-stigma mediated the relationship between perceived stigma and all psychosocial outcomes. For those with anxiety, depression and schizophrenia, the mediating effects of self-stigma were present in all relationships except (1) perceived stigma with physical health in the anxiety sample, (2) perceived stigma with social relationships in the depression sample, (3) perceived stigma with physical health in the schizophrenia sample.

Conclusions: The mediating effects of self-stigma on the relationship between perceived stigma and various psychosocial outcomes are evident and differ across diagnoses. Interventions to address and reduce the effect of self-stigma along with targeted treatments and psychoeducation to assist people with mental illness overcome or better manage self-stigma, whilst providing them the skills to counteract public stigma are needed.

Strengths and limitations of the study

- The relationship between perceived stigma and various psychosocial outcomes was mediated by self-stigma.
- The effects of perceived and self-stigma differed across disorders.
- The study has some limitations including social desirability bias, the cross-sectional design and lacks generalizability due to inclusion criteria.

INTRODUCTION

Historically, the word 'stigma' originates from a Greek term which refers to a 'mark or brand'. **Goffman [1]** later defined stigma as "an attribute that is deeply discrediting" which reduces someone "from a whole and usual person to a tainted, discounted one" (p. 3). He goes on to say that stigma is fundamentally a social phenomenon rooted in social relationships which is shaped by the culture and structure of society. Whilst stigma is universal and has no boundaries, it is commonly associated with mental illness. More specifically, **Johnstone [2]** believes "people suffering from mental illness and other mental health problems are among the most stigmatized, discriminated against, marginalized, disadvantaged and vulnerable members of society".

In relation to mental illness, stigma is a multifaceted construct that involves feelings, attitudes and behaviours [3]. Stigma has been theorized and conceptualized in different ways and from different perspectives. Social cognitive models [4] depict stigma as comprising three main components: negative stereotypes (negative beliefs about a particular group), prejudice (agreeing with these negative stereotypes) and discrimination (the behavioural consequence of prejudice) [5]. **Link and Phelan [6]** adopt a sociological perspective where stigma exists when four inter-related components occur: (i) labeling, (ii) negative attributes, (iii) separation and (iv) status loss and discrimination.

Mental illness stigma can present in four main ways: personal stigma, perceived stigma, self-stigma and structural stigma [5,7]. Personal stigma refers to an individual's stigmatizing attitudes and beliefs about people with mental illness, whereby they endorse prejudice and discrimination against them [5]. Perceived stigma is the perceived attitudes of others towards people with mental illness [8]. Self-stigma or internalized stigma is the process by which people with mental illness accept the negative attitudes of others towards them, then internalize and apply these beliefs to themselves [9-11]. Finally structural stigma refers to the prejudice and discrimination by policies, laws and constitutional practice which intentionally or unintentionally disadvantage people with mental illness [5,12].

Whilst stigma can present in different ways, it has been proposed that certain types of stigma will present before others. **Link et al., [13]** theorized that public stigma may lead people with mental illness to develop self-stigma, where both forms of stigma have the potential to cause detrimental effects on people with mental illness. **Vogel et al., [14]** substantiated this theory when they examined the relationship between public stigma and self-stigma over a three month

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3 period and found that public stigma is internalized as self-stigma over time, and higher initial
4 public stigma predicted higher subsequent self-stigma. These findings support previous
5 research postulated by modified labeling theory, which has consistently been used to explain
6 the relationship between perceived and self-stigma [13].
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11 These types of stigma can have various ramifications for people with mental illness. Public
12 attitudes about people with mental illness can result in delays in treatment seeking or avoiding
13 treatment altogether [15], whilst public and perceived stigma is negatively associated with work
14 and role functioning [16], self-esteem [17] and quality of life [16]. Similarly, self-stigma has also
15 consistently been linked to poorer outcomes among people with mental illness including
16 reduced quality of life and life satisfaction [18], difficulties obtaining employment and/or housing
17 [19], treatment adherence [20] and self-esteem [21]; self-stigma has also been associated with
18 an increase in symptom severity [22], positive symptoms [23,24] and negative symptoms
19 [23,25].
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28 In Singapore, a multi-ethnic city-state in Southeast Asia, there has been increased interest in
29 the stigma of mental illness stigma due to recent focus on de-stigmatization and mental health
30 promotion initiatives. A recent population-wide mental health literacy study revealed there is
31 considerable personal stigma towards people with mental illness, where 89% of people
32 endorsed that people with a mental illness could get better if they wanted to [26]. A second
33 study, among psychiatric outpatients with anxiety, depression, obsessive compulsive disorder
34 (OCD) and schizophrenia revealed that 43.6% experienced moderate to high self-stigma, whilst
35 there was a significant negative relationship between quality of life, self-esteem and general
36 functioning and self-stigma [27]. These recent studies not only highlight the magnitude of
37 personal stigma towards, but also self-stigma among people with mental illness, and the
38 devastating consequences of stigma on outcomes for people with mental illness.
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48 Whilst it is evident how the various types of stigma can have negative impacts on people with
49 mental illness, less is known about how one or more of these types of stigma may influence or
50 affect another. In a recent study among Chinese outpatients with and without psychotic
51 disorders, **Kao and colleagues [28]** examined the mediating role of self-stigma on the
52 relationship between perceived stigma and psychosocial outcomes. Results revealed that self-
53 stigma mediated the effects of perceived stigma on outcomes including self-esteem, depressive
54 symptoms and quality of life.
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3 Given that we already know self-stigma is negatively associated with various psychosocial
4 outcomes including quality of life, self-esteem and general functioning, among psychiatric
5 outpatients in Singapore [27], this raises the questions as to whether this self-stigma influences
6 or mediates the relationship between perceived stigma and psychosocial outcomes. Also given
7 the majority of research to date has focused on depression and schizophrenia [29], there is a
8 need to further explore the effects of stigma on other disorders such as OCD and anxiety. In
9 order to address some of these gaps in the existing literature and to more clearly delineate the
10 relationship between perceived and self-stigma, the current study aimed to examine whether
11 self-stigma mediates the relationship between perceived stigma and quality of life, self-esteem
12 and functioning, among outpatients with anxiety, depression, OCD and schizophrenia.
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21 **METHODS**

22 **Participants and recruitment**

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24 This cross-sectional study recruited patients seeking treatment at outpatient and affiliated clinics
25 of the Institute of Mental Health (IMH), the only tertiary psychiatric care hospital in Singapore.
26 Recruitment was conducted between May 2014 and September 2015 and required respondents
27 to meet the following inclusion criteria: Singapore citizens or Permanent Residents (PRs), aged
28 21-65 years, belonging to Chinese, Malay or Indian ethnicity (the three main ethnic groups in
29 Singapore), capable of providing consent, literate in English language and having a clinical
30 primary diagnosis of longer than one year of either schizophrenia, depression or anxiety
31 spectrum disorders or OCD, as determined by a psychiatrist, using International Classification
32 of Diseases (ICD-9) criteria. Patients with intellectual disabilities, who were not fluent in English
33 and those who had been seeking treatment at IMH for less than one year were excluded. The
34 study employed a convenient sampling strategy to recruit participants using multiple methods
35 and referral sources. Posters informing attending patients of the ongoing study, its eligibility
36 criteria and contact details of the study team were placed in the clinic waiting areas.
37 Psychiatrists and other healthcare professionals were also informed of the study and requested
38 to refer eligible patients. Ethical approval was obtained from the Domain Specific Review Board
39 of the National Healthcare Group, Singapore, and written informed consent was obtained from
40 all respondents.
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54 **Measures**

55 Socio-demographic information was collected for all respondents including age, gender,
56 ethnicity, education, marital and employment status. Medical record reviews were also
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3 undertaken to confirm each respondent's primary diagnosis, age of onset, co-morbid psychiatric
4 disorders and number of hospitalizations resulting from their mental illness.
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8 *Internalized stigma of mental illness scale*

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10 Self-stigma was measured using the Internalized Stigma of Mental Illness (ISMI) scale which
11 comprises five subscales: alienation, stereotype endorsement, discrimination experience, social
12 withdrawal and stigma resistance [30]. The self-report scale uses a 4-point Likert scale from
13 strongly disagree to strongly agree to rate each of the 29 items, which included statements such
14 as "Having a mental illness has spoiled my life" and "People without mental illness could not
15 possibly understand me". As the stigma resistance subscale has not been included in the ISMI
16 total score in several previous studies, given its relatively weak correlation to the other ISMI
17 subscales and its lack of internal consistency, [23,30] the stigma resistance subscale was
18 excluded from this analysis. Subscale and total scores were calculated by adding the item
19 scores together and then dividing by the number of answered items. The Cronbach's alpha in
20 our sample was 0.93.
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29 *Devaluation-Discrimination Scale*

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31 Perceived public stigma was measured using the 12 item Devaluation-Discrimination Scale
32 (DDS) which assesses self-reported stereotype awareness through perceived discrimination
33 and devaluation subscales [31]. The scale asks respondents the extent to which they agree or
34 disagree with statements indicating that most people devalue individuals who have used
35 psychiatric treatment. Examples include "Most people believe that entering a psychiatric hospital
36 is a sign of personal failure" and "Most people think less of a person after he/she has been
37 hospitalized for a mental illness". Items are answered on a 6-point response scale from strongly
38 agree (1) to strongly disagree (6). After reverse scoring items 1,3,4,7,8 and 11, all item scores
39 are then summed and divided by the total number of items answered. The internal consistency
40 was good amongst the current sample (Cronbach's alpha =0.81).
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49 *World Health Organization Quality of Life-BREF*

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51 The World Health Organization Quality of Life-BREF (WHOQOL-BREF) is a 26 item quality of
52 life scale which measures self-reported overall quality of life and general health. It also
53 measures four distinct quality of life domains; physical health, psychological health, social
54 relationships and environmental aspects over the two weeks, prior to the interview [32]. All
55 items are constructed on variations of a 5-point Likert Scale, with scores from 1 to 5, enquiring
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3 on “how much”, “how completely”, “how often”, “how good” or “how satisfied” the individual felt.
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5 Scores for the four domains are calculated by taking the mean of all items within the domain
6 and multiplying by four and then linearly transforming it to a 0-100 scale. For missing items, the
7 mean of other items in the domain is substituted, however if more than two items were missing
8 from the domain, the domain score was not calculated. Domain scores are scaled in a positive
9 direction, with higher scores denoting higher quality of life except for items 3, 4 and 26 which
10 need to be reversed scored. The Cronbach's alpha in our sample for each of the four domains
11 was: physical health, 0.81; psychological health, 0.84; social relationships, 0.63; environment,
12 0.78.
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Rosenberg's Self Esteem Scale

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21 Rosenberg's Self Esteem Scale (RSES) is a short, 10-item scale which measures self-reported
22 global self-worth by measuring positive and negative feeling about one's self. Using a 4-point
23 Likert scale from strongly agree (1) through to strongly disagree (4) respondents indicate how
24 strongly they agree or disagree with each of the statements. Negative items are reverse scored
25 and higher scores indicate greater self-esteem [33]. There were two cases with missing items
26 and these were excluded from the analysis. The RSES displayed good internal consistency
27 (Cronbach's alpha = 0.84).
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Global Assessment of Functioning

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35 The Global Assessment of Functioning (GAF) scale [34] assesses severity of illness in
36 psychiatry in terms of overall functioning, which takes into account impairments in
37 psychological, social and occupational/school functioning in the month prior to the interview.
38 The scale ranges from 0 (inadequate information) to 100 (superior functioning). The 100 point
39 scale is divided into 10 point intervals, each which has verbal anchors describing symptoms and
40 functioning pertaining to that interval. Scores between 91 and 100 indicate optimal mental
41 health and coping capabilities while a score in the 1–10 range may be considered suicidal and
42 incapable of maintaining minimal personal hygiene. Trained raters and members of the study
43 team would start at either the top or the bottom of the scale and go up/down the list until the
44 most accurate description of functioning for the individual was reached as per the raters'
45 judgment.
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Statistical analysis

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3 Analysis was performed using SPSS Version 21. Mediation (indirect) effects were tested using
4 the PROCESS macro for SPSS developed by Hayes [35]. Descriptive statistics were calculated
5 to provide an overview of the socio-demographic, clinical and psychosocial (self-stigma,
6 perceived stigma, self-esteem, functioning and quality of life) characteristics of the sample by
7 the four diagnoses; anxiety, depression, OCD and schizophrenia. ANOVA, followed by the
8 appropriate post-hoc tests, were conducted to identify significant difference in the means of
9 each psychosocial variable across the four diagnostic groups. The psychosocial variables were
10 normally distributed; hence, the associations between these were examined using Pearson's
11 correlation.
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20 The mediation (indirect) effect model hypothesized in this study is illustrated in Figure 1, which
21 examines the mediating role of self-stigma, and is similar to that reported by Kao et al., [28].
22 The relationships between perceived stigma (independent variable) and psychosocial outcomes
23 such as self-esteem, functioning and quality of life (depicted by four domains: physical health,
24 psychological health, social relationships and environment) (dependent variables) without
25 controlling for self-stigma (mediator variable) are referred to as total effects and denoted by 'z'.
26 The relationships between perceived stigma and the psychosocial outcomes controlling for self-
27 stigma are referred to as direct effects denoted by 'z*'. Indirect effects denoted by 'xy' refer to
28 the relationships between perceived stigma and the psychosocial outcomes with self-stigma as
29 the mediator. Applying the PROCESS macro, it conducts bias-corrected bootstrapping through
30 random sampling with replacement from the dataset to create pseudo bootstrap samples, which
31 produce point estimates for the mediation effects as well as their bias-corrected and accelerated
32 95% confidence intervals (BCa CI). 5000 bootstrap samples were used in this study. When the
33 CI does not contain zero, it could be inferred that the mediation effect of the proposed mediator
34 is statistically significant [36]. The mediation analyses were controlled for age, age of onset,
35 gender, ethnicity, marital status, education, employment, co-morbid psychiatric disorders and
36 hospitalization history.
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49 The entire sample was first used to test the mediation effect of self-stigma on the relationship
50 between perceived stigma and psychosocial outcomes. Thereafter, we examined the four
51 diagnostic groups separately to explore if there were any differences in mediation effects
52 between diagnoses.
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56 RESULTS

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3 The socio-demographic and clinical characteristics of the sample (n=280) are presented in
4 Table 1. The majority of respondents were male (54.6%), of Chinese ethnicity (53.6%), never
5 married (63.1%) and employed (55.7%). The mean age of the respondents was 38.9 years
6 (standard deviation (SD) = 11.6 years).
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11 The psychosocial characteristics of the sample are presented in Table 2. ANOVA on the
12 psychosocial variables yielded significant differences among the diagnostic groups, with the
13 exception of self-stigma which was not different across diagnoses. Post-hoc tests revealed that
14 the mean self-esteem scores were higher in participants with schizophrenia than depression.
15 Participants with schizophrenia had lower mean perceived stigma and physical health scores as
16 compared to the other diagnostic groups, whilst they had higher mean psychological health and
17 social relationships scores as compared to those with depression. The results were significant
18 and reported at $p < 0.05$. To determine the correlations between the various stigma and
19 psychosocial measures, Pearson's correlations were performed (Table 3). Results showed that
20 perceived stigma, self-stigma, self-esteem, quality of life and functioning were significantly
21 associated with each other.
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31 The results of the mediation analyses are presented in Table 4. Amongst the overall sample, the
32 significant ($p < 0.05$) total effects (z) of perceived stigma on self-esteem, functioning, physical
33 health, psychological health, social relationships, and environment were -0.187, -0.302, -0.330, -
34 0.506, -0.626, and -0.450 respectively. When self-stigma is entered simultaneously into the
35 model (z^*), the direct effects (z^*) of perceived stigma on psychosocial outcomes decreases to -
36 0.062, -0.873, -0.187, -0.192, -0.291, and -0.155 respectively, implying the negative effect of
37 perceived stigma on the psychosocial outcomes had weakened. In other words, the relationship
38 between perceived stigma and the psychosocial outcomes are subjected to the effect of self-
39 stigma.
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48 After conducting separate mediating analyses on each of the four diagnostic groups, the results
49 presented in Table 4 suggest that the mediating effect of self-stigma differed by diagnosis.
50 Amongst the whole sample and the sub-sample with OCD, self-stigma mediated the relationship
51 between perceived stigma and all psychosocial outcomes. For those with anxiety, depression
52 and schizophrenia, the mediating effects of self-stigma were present in all relationships except
53 (1) perceived stigma with physical health in the anxiety sample, (2) perceived stigma with social
54 relationships in the depression sample, (3) perceived stigma with physical health in the
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3 schizophrenia sample.
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6 7 **DISCUSSION**

8 To our knowledge, this is the first study to examine the mediating effects of self-stigma on the
9 relationship between perceived stigma and psychosocial outcomes among a multi-ethnic Asian
10 sample of outpatients with anxiety, depression, OCD and schizophrenia. Results revealed
11 significant differences in stigma and psychosocial mean scores across diagnostic groups.
12 Furthermore, results showed that self-stigma mediated the effects of perceived stigma on
13 psychosocial outcomes including self-esteem, quality of life and functioning. As hypothesized,
14 differences in the mediation effect were also observed when the sample was split by diagnostic
15 groups, with self-stigma having no mediation effect on several psychosocial outcomes.
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23 Across the different diagnostic groups, we observed significant differences in mean self-stigma,
24 perceived stigma and psychosocial scores. Overall, those with depression had higher self and
25 perceived stigma scores and lower psychosocial scores compared to other diagnostic groups.
26 More specifically, mean self-esteem, psychological health and social relationships scores were
27 significantly lower among those with depression compared to those with schizophrenia.
28 Research has shown that self-stigma is associated with increased depression [37] which may
29 partly explain the current findings. On the other hand, schizophrenia is associated with a lack of
30 insight or awareness [38] and may also be a contributing factor. There is a dearth of research
31 exploring differences in self and perceived stigma and psychosocial outcomes across
32 psychiatric disorders and given the obvious differences observed in the current study, this
33 warrants further exploration in the future, to ascertain why such differences may occur.
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42 Mediation analysis revealed that whilst perceived stigma and self-stigma are distinct constructs,
43 they are related. The current study specifically examined how self-stigma mediates the
44 relationship between perceived stigma and quality of life, self-esteem and functioning. Amongst
45 the overall sample we observed the mediating effects of self-stigma, whereby it reduced the
46 effect of perceived stigma on self-esteem, quality of life and functioning and higher self-stigma
47 scores were associated with lower scores among the psychosocial outcome measures. In other
48 words, the effects of perceived stigma on these psychosocial outcomes are mediated by
49 internalizing public stigma amongst those with mental illness. Our findings are in line with **Kao**
50 **et al.**, [28] who also observed the effect of perceived stigma on psychosocial outcomes was
51 mediated by self-stigma. These findings highlight the importance and impact self-stigma can
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3 have for people with mental illness and its predictive influence on psychosocial outcomes. Given
4 that self-stigma is the internalization of public beliefs and stigmatizing views [39,40], efforts to
5 dispel misconceptions relating to mental illness among the general population are needed. At
6 the same time, counteracting the negative effects of self-stigma among people with mental
7 illness is also needed. Mittal et al., [41] undertook a review of strategies to reduce self-stigma
8 among people with mental illness and concluded that two prominent approaches for self-stigma
9 reduction emerged. The first being interventions that attempt to alter the stigmatizing beliefs and
10 attitudes of those experiencing self-stigma, whilst the second related to enhancing coping skills
11 through improvements in self-esteem, empowerment, and help-seeking behavior; given the
12 findings of this study, such interventions need to be considered for the local population.
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21 When the sample was split by diagnostic groups, distinct differences in the effects of self and
22 perceived stigma were observed. The mediating effect of self-stigma among those with anxiety
23 and depression were not dissimilar to that observed for the overall sample. There was no
24 mediating effect of self-stigma on the physical health quality of life domain for those with
25 anxiety, nor was there a mediating effect on the social relationships quality of life domain for
26 those with depression. Items within the physical health domain ask about tangible aspects of
27 physical health such as pain, the need for medical treatment to function, ability to get around,
28 energy levels and satisfaction with sleep, ability to perform daily living activities, and capacity for
29 work. So whilst perceived stigma is a significant predictor of the physical health domain and
30 people with anxiety may internalize stigmatizing views, it was found that this relationship was
31 not influenced by self-stigma.
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41 The same applies for those with depression and the social relationships domain, whereby
42 perceived stigma is negatively associated with this quality of life domain, yet the relationship is
43 not influenced by self-stigma. Interestingly, while the mean social relationships score was
44 significantly lower among those with depression (versus schizophrenia), self-stigma did not
45 appear to be an influencing factor. It is possible that whilst those with depression had higher
46 mean self and perceived stigma scores, self-stigma did not affect their social relationships, but
47 rather the impact of what others think (perceived stigma) is more influential to social
48 relationships. Contrary to this however, longitudinal evidence has shown that self-stigma has a
49 stronger effect on psychosocial outcomes of people with mental illness compared to perceived
50 stigma [11]. Given that little is known about the effects of stigma on various psychosocial
51 outcomes over time, and how this may in fact influence the mediating effect of self-stigma on
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3 these outcomes, this warrants further exploration in the future, to better understand the complex
4 interplays between these constructs.
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9 Amongst those with schizophrenia, both self-stigma and perceived stigma did not have a
10 significant effect on physical health related quality of life. Although people with schizophrenia
11 may experience perceived or self-stigma, perceived stigma is not associated with physical
12 health related quality of life and self-stigma does not mediate the relationship between
13 perceived stigma and this psychosocial outcome. These findings suggest it is likely that other
14 factors such as symptom severity or coping methods may influence physical health related
15 quality of life amongst those with schizophrenia. Therefore, whilst it is important to address self-
16 stigma given that it does influence the relationship between perceived stigma and most
17 psychosocial outcomes, people with different mental illnesses may perceive or experience
18 stigma in unique ways. Previous literature has also shown that self-stigma is negatively
19 associated with quality of life among those with schizophrenia [27, 43] and this further
20 compounds the impact it can have on this and other psychosocial outcomes.
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30 Unlike other mental illnesses such as depression or schizophrenia, there has been substantially
31 less published literature on stigma relating to OCD and therefore little is known about the
32 magnitude or impact of stigma on psychosocial outcomes for people with OCD. Among those
33 with OCD in the current sample, while the mediating effects of self-stigma were present,
34 perceived stigma was not associated with any of the psychosocial outcomes. That is, whilst
35 perceived stigma does not seem to have an impact on the psychosocial outcomes of people
36 with OCD, self-stigma still has a mediating effect and further reduces the impact perceived
37 stigma has on self-esteem, quality of life and functioning. It is difficult to postulate why this lack
38 of association would be observed and to our knowledge there is no empirical evidence that has
39 previously explored this. Some possible explanations are proposed. It could be that people with
40 OCD disassociate the disorder from negative public conceptions of 'mental illness' and perceive
41 OCD as a less serious or dangerous condition [44], and consequently perceived stigma has no
42 effect on psychosocial outcomes. Similarly it could be that those with OCD learn to distinguish
43 between OCD thoughts and real thoughts, resulting in these people being able to reduce self-
44 stigma by disassociating the OCD from oneself [44]. An alternative explanation could be that
45 public stigma towards OCD in Singapore is lower compared to other disorders [26] which may
46 result in less perceived and self-stigma amongst those with the disorder. Finally whilst OCD
47 refers to unwanted recurrent and persistent thoughts, urges, or impulses and/or repetitive
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3 behaviors that an individual feels driven to perform [45], these thoughts or behaviours can relate
4 to a broad range of areas. It is therefore possible that this subgroup with OCD form quite a
5 heterogeneous group in terms of their specific OCD symptoms which may result in variance in
6 the extent to which they experience self or perceived stigma. Given the impact of stigma on
7 people with OCD is hugely understudied and that findings from the current study highlight
8 distinct differences in the mediating effect of self-stigma on the relationship of perceived stigma
9 and psychosocial outcomes, further research is need to explore this phenomenon further.
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16 It is important to note that this study is not without its limitations. Stigma and psychosocial
17 variables were all self-reported which can result in social desirability bias. The cross-sectional
18 design of our study precluded any causal inferences being made. Furthermore, whilst the
19 majority of investigations exploring mediation are based on cross-sectional designs, there are
20 certain limitations to this study design, particularly in capturing true mediation processes [46]
21 and these should be considered when interpreting the study findings. In addition, sampling was
22 also based on convenient sampling methods among a heterogeneous group of patients with
23 anxiety, depression, OCD and schizophrenia and was also restricted to English-speaking
24 patients, aged 21-65, who were seeking care at IMH and therefore our results may not be
25 generalizable to all patients with mental illness in Singapore. As the primary aim of the study
26 was to explore the types and extent of stigma experienced by people with mental illness, we did
27 not collect information on severity of illness or physical comorbidities, which may impact
28 perceived stigma, self-stigma or psychosocial outcomes. Accordingly, it would be beneficial to
29 further explore the effects of symptom severity and physical comorbidities on stigma and
30 psychosocial outcomes in the future. Finally, as this was a treatment seeking population, it is
31 possible that the extent of perceived and self-stigma may be inflated or may not be a true
32 reflection of these types of stigma among people with mental illness.
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46 Despite these limitations, this is to our knowledge, the first study to explore the mediating effects
47 of self-stigma on the relationship between perceived stigma and psychosocial outcomes across
48 psychiatric disorders amongst a multi-ethnic Asian sample. Findings have highlighted that the
49 relationship between perceived stigma and various psychosocial outcomes were subjected to
50 the effect of self-stigma, whilst the effects of perceived and self-stigma differ across disorders.
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56 Whilst perceived stigma contributes to self-stigma, both types of stigma can have pernicious
57 effects on various outcomes for people with mental illness. Given that self-stigma mediates the
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3 relationship between perceived stigma and various psychosocial outcomes and that existing
4 literature has shown self-stigma is considered a risk factor for poorer mental health prognosis
5 [47], it is important that interventions aim to address and reduce the effect of self-stigma among
6 people with mental illness. There is a need for targeted treatments and psychoeducation which
7 aim to assist people with mental illness overcome or better manage self-stigma, whilst providing
8 them the skills to counteract public stigma [11].
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14 The repercussions of self and or perceived stigma are also often responsible for delayed help-
15 seeking or treatment avoidance and further exemplify the damaging effects stigma can have for
16 people with mental illness. A better understanding of how these different stigma constructs
17 relate to each other over time, and how they might differ across disorders, will provide important
18 information and guidance for designing interventions at the individual and societal level aimed at
19 reducing stigma associated with mental illness and will aid to reduce barriers to help-seeking
20 [14].
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28 **COMPETING INTEREST**

29 The authors declare that they have no competing interests.
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33 **FUNDING**

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35 Council under the Centre Grant Programme (Grant No.: NMRC/CG/004/2013).
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39 **ETHICS APPROVAL**

40 The study was approved by the National Healthcare Group Domain Specific Review Board and
41 all participants provided written informed consent.
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46 **AUTHOR CONTRIBUTIONS**

47 LP was responsible for the study design, data collection and verification wrote the manuscript.
48 YWL and EA were involved in the data analysis and interpretation and provided inputs into the
49 manuscript. SP and JAV were involved in data collection, clean up and provided inputs and
50 edits to the manuscript. SAC and MS supervised the overall study and provided intellectual
51 inputs on the manuscript.
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56 **DATA SHARING**

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3 Data are not available for online access; however, readers who wish to gain access to the data
4 can write to the senior author Dr Mythily Subramaniam at mythily@imh.com.sg with their
5 requests. Access can be granted subject to the Institutional Review Board (IRB) and the
6 research collaborative agreement guidelines. This is a requirement mandated for this research
7 study by our IRB and funders.
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For peer review only

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Table 1: Sample characteristics by diagnosis

	Anxiety n (%)	Depression n (%)	OCD* n (%)	Schizophrenia n (%)	Total Sample n (%)
Gender					
Male	41 (57.7%)	36 (48.6%)	38 (62.3%)	38 (51.4%)	153 (54.6%)
Female	30 (42.3%)	38 (51.4%)	23(37.7%)	36 (48.6%)	127 (45.4%)
Ethnicity					
Chinese	50 (70.4%)	25 (33.8%)	49 (80.3%)	26 (35.1%)	150 (53.6%)
Malay	10 (14.1%)	25 (33.8%)	6 (9.8%)	24 (32.4%)	65 (23.2%)
Indian/Others	11 (15.5%)	24 (2.4%)	6 (9.8%)	24 (32.4%)	65 (23.2%)
Marital Status					
Never Married	51 (71.8%)	23 (31.1%)	50 (82.0%)	52 (71.2%)	176 (63.1%)
Married	14 (19.7%)	24 (32.4%)	6 (9.8%)	14 (19.2%)	58 (20.8%)
Separated/Divorced/Widowed	6 (8.5%)	27 (36.5%)	5 (8.2%)	7 (9.6%)	45 (16.1%)
Education					
PSLE and below	3 (4.2%)	6 (8.2%)	1 (1.6%)	9 (12.2%)	19 (6.8%)
Secondary or O/N level	13 (18.3%)	28 (38.4%)	18 (29.5%)	34 (45.9%)	93 (33.3%)
A Level/Diploma	43 (60.6%)	26 (35.6%)	28 (45.9%)	27 (36.5%)	124 (44.4%)
University	12 (16.9%)	13 (17.8%)	14 (23.0%)	4 (5.4%)	43 (15.4%)
Employment					
Employed	42 (59.2%)	40 (54.1%)	37 (60.7%)	37 (50.0%)	156 (55.7%)
Unemployed	17 (24%)	8 (36.4%)	17 (27.9%)	29 (39.2%)	90 (32.1%)
Student/homemaker/retired	12 (16.9%)	7 (9.5%)	7 (11.5%)	8 (10.8%)	34 (12.1%)
Hospitalization					
Yes	9 (12.9%)	28 (39.4%)	25 (42.4%)	61 (88.4%)	123 (45.7%)
No	61 (87.1%)	43 (60.6%)	34 (57.6%)	8 (11.6%)	146 (54.3%)
Co-morbid psychiatric disorder					
Yes	38 (53.5%)	25 (33.8%)	36 (59.0%)	11 (14.9%)	110 (39.3%)
No	33 (46.5%)	49 (66.2%)	25 (41.0%)	63 (85.1%)	170 (60.7%)
Age (mean, SD)					
	33.6 (10.9)	42.2 (10.8)	32.5 (9.45)	43.0 (10.4)	38.9 (11.6)
Age of onset of illness					
	28.8 (9.42)	35.6 (10.8)	25.4 (10.0)	25.7 (7.94)	29.5 (10.4)

* OCD- obsessive compulsive disorder

Table 2: Stigma and psychosocial outcomes among people with mental illness by disorder

Mean (SD)	Anxiety	Depression	OCD	Schizophrenia	Total Sample
ISMI	2.23 (0.56)	2.44 (0.55)	2.41 (0.49)	2.41 (0.52)	2.37 (0.54)
DDS	48.5 (9.52)	49.0 (8.96)	48.1 (10.0)	42.5 (11.6)	46.9 (10.4)
RSES	26.5 (6.31)	25.4 (5.34)	25.6 (5.67)	27.7 (4.13)	26.3 (5.45)
GAF	55.9 (15.9)	50.0 (17.6)	53.33 (13.5)	54.3 (16.0)	53.4 (16.0)
WHOQOL-BREF					
Physical	53.4 (13.3)	50.4 (11.8)	51.4 (14.0)	60.4 (11.5)	54.0 (13.2)
Psychological	49.1 (15.0)	47.1 (16.4)	48.6 (15.7)	54.2 (16.1)	49.8 (16.0)
Social	54.5 (22.6)	48.8 (24.6)	53.6 (21.6)	59.8 (18.8)	54.2 (22.3)
Environment	63.5 (16.9)	56.5 (17.9)	61.6 (16.1)	63.1 (15.1)	61.1 (16.7)

ISMI- Internalized Stigma of Mental Illness Scale (self stigma)

DDS- Devaluation and Discrimination Scale (perceived stigma)

RSES- Rosenberg's Self-Esteem Scale

GAF- Global Assessment of Functioning

WHOQOL-BREF- World Health Organization Quality of Life-BREF

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Table 3: Correlations among study variables

	Self-Stigma	Perceived Stigma	Self-Esteem	Physical health	Psychological health	Social relationships	Environmental	GAF
Self-Stigma	-							
Perceived Stigma	0.269	-						
Self-Esteem	-0.576	-0.305	-					
Quality of life								
Physical health	-0.316	-0.309	0.483	-				
Psychological health	-0.518	-0.313	0.659	0.646	-			
Social relationships	-0.453	-0.280	0.511	0.520	0.604	-		
Environmental	-0.512	-0.180	0.535	0.529	0.645	0.553	-	
GAF	-0.401	-0.133	0.434	0.419	0.462	0.454	0.497	-

*All correlations are significant at the 0.001 level (2-tailed)

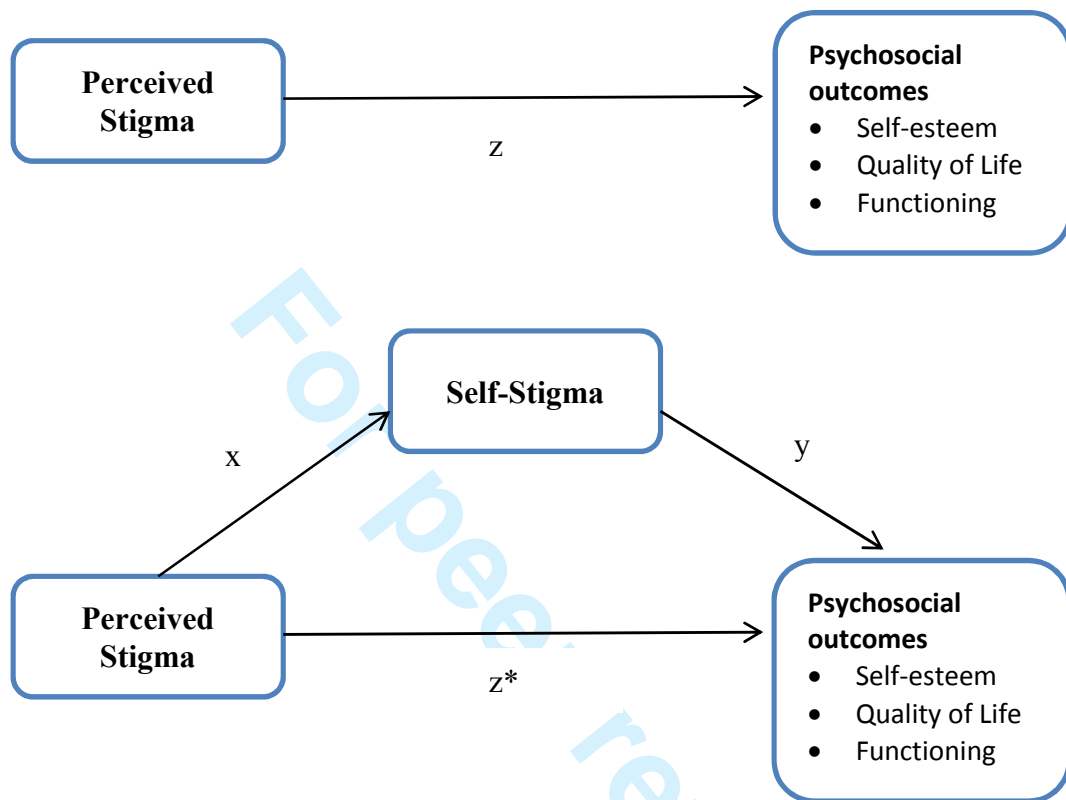
Table 4: Mediating effects of self-stigma on the relationship between perceived stigma and psychosocial outcomes

Outcomes	Total Effects		Direct Effects		Indirect Effects			Mediation Ratio ^b
	z	SE	z*	SE	xy	SE	CI	
Total Sample								
Self-Esteem	-0.186***	0.032	-0.063*	0.028	-0.123 ^a	0.021	[-0.165, -0.084]	0.663
Functioning	-0.292**	0.096	-0.074	0.097	-0.218 ^a	0.045	[-0.319, -0.139]	0.746
Physical health	-0.338***	0.076	-0.209**	0.080	-0.130 ^a	0.035	[-0.214, -0.071]	0.383
Psychological health	-0.504***	0.093	-0.196*	0.087	-0.308 ^a	0.052	[-0.419, -0.215]	0.612
Social relationships	-0.620***	0.130	-0.296*	0.130	-0.324 ^a	0.068	[-0.471, -0.201]	0.522
Environmental	-0.445***	0.097	-0.156	0.093	-0.289 ^a	0.054	[-0.412, -0.196]	0.649
Anxiety								
Self-Esteem	-0.304***	0.065	-0.121	0.067	-0.182 ^a	0.050	[-0.300, -0.103]	0.600
Functioning	-0.478*	0.196	-0.224	0.228	-0.254 ^a	0.136	[-0.599, -0.042]	0.531
Physical health	-0.496**	0.157	-0.380*	0.187	-0.115	0.119	[-0.370, 0.107]	
Psychological health	-0.616***	0.167	-0.305	0.187	-0.311 ^a	0.116	[-0.569, -0.108]	0.505
Social relationships	-0.934***	0.250	-0.549	0.287	-0.384 ^a	0.171	[-0.820, -0.126]	0.413
Environmental	-0.581**	0.206	-0.040	0.213	-0.541 ^a	0.176	[-0.933, -0.246]	0.931
Depression								
Self-Esteem	-0.199*	0.080	-0.096	0.074	-0.102 ^a	0.051	[-0.228, -0.024]	0.515
Functioning	-0.426	0.239	-0.172	0.232	-0.254 ^a	0.133	[-0.580, -0.054]	0.596
Physical health	-0.414**	0.146	-0.288	0.147	-0.126 ^a	0.068	[-0.302, -0.024]	0.305
Psychological health	-0.583*	0.242	-0.240	0.216	-0.343 ^a	0.149	[-0.699, -0.099]	0.589
Social relationships	-0.769*	0.373	-0.482	0.379	-0.287	0.199	[-0.794, 0.008]	
Environmental	-0.702**	0.244	-0.446	0.237	-0.256 ^a	0.133	[-0.575, -0.050]	0.365
OCD								
Self-Esteem	-0.163*	0.077	-0.059	0.066	-0.104 ^a	0.047	[-0.211, -0.024]	0.638
Functioning	-0.257	0.177	-0.123	0.179	-0.134 ^a	0.077	[-0.331, -0.019]	0.520
Physical health	-0.367	0.197	-0.242	0.202	-0.125 ^a	0.086	[-0.365, -0.067]	0.341
Psychological health	-0.345	0.205	-0.126	0.194	-0.220 ^a	0.110	[-0.510, -0.052]	0.637
Social relationships	-0.586*	0.272	-0.237	0.242	-0.349 ^a	0.160	[-0.710, -0.078]	0.595
Environmental	-0.352	0.215	-0.157	0.211	-0.196 ^a	0.092	[-0.437, -0.053]	0.556
Schizophrenia								
Self-Esteem	-0.116*	0.050	-0.013	0.044	-0.103 ^a	0.038	[-0.199, -0.040]	0.885
Functioning	0.085	0.177	0.226	0.191	-0.141 ^a	0.086	[-0.368, -0.008]	-1.667
Physical health	-0.154	0.142	-0.130	0.158	-0.024	0.068	[-0.190, 0.093]	
Psychological health	-0.544**	0.183	-0.252	0.180	-0.292 ^a	0.110	[-0.561, -0.110]	0.536
Social relationships	-0.314	0.212	-0.075	0.222	-0.238 ^a	0.125	[-0.570, -0.054]	0.760
Environmental	-0.218	0.163	-0.027	0.170	-0.191 ^a	0.100	[-0.439, -0.036]	0.876

Note: ^a: CI does not contain zero; ^b: Ratio of the indirect effect to the total effect, ***significant at p-value<0.001, **significant at p-value<0.01, * p-value significant at p-value<0.05

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Figure 1. Mediation effect model



STROBE Statement—checklist of items that should be included in reports of observational 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 Page 1 (b) Provide in the abstract an informative and balanced summary of what was done and what was found Page 1
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Page 2-3
Objectives	3	State specific objectives, including any prespecified hypotheses Page 3
Methods		
Study design	4	Present key elements of study design early in the paper Page 4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection Page 4
Participants	6	<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants Page 4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable Page 4-6
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 Page 4-6
Bias	9	Describe any efforts to address potential sources of bias NA
Study size	10	Explain how the study size was arrived at NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why Page 6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding Page 6-7 (b) Describe any methods used to examine subgroups and interactions Page 6-7 (c) Explain how missing data were addressed Page 7 <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy NA (e) Describe any sensitivity analyses NA
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 NA (b) Give reasons for non-participation at each stage NA (c) Consider use of a flow diagram NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders Page 7 (b) Indicate number of participants with missing data for each variable of interest NA (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount) NA

Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time NA <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure NA <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures NA
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 Page 7-8 (b) Report category boundaries when continuous variables were categorized NA (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses NA
Discussion		
Key results	18	Summarise key results with reference to study objectives Page 8-11
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 Page 12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence Page 12
Generalisability	21	Discuss the generalisability (external validity) of the study results Page 12
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 Page 13

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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.

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Mediating effects of self-stigma on the relationship between perceived stigma and psychosocial outcomes among psychiatric outpatients

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4 **psychosocial outcomes among psychiatric outpatients**
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ABSTRACT

Objectives: To examine whether self-stigma mediates the relationship between perceived stigma and quality of life, self-esteem and general functioning, among outpatients with depression, schizophrenia, anxiety and obsessive compulsive disorder (OCD).

Design: cross-sectional survey

Setting: outpatient clinics at a tertiary psychiatric hospital in Singapore

Participants: 280 outpatients with a primary clinical diagnosis of either schizophrenia, depression, anxiety or OCD

Methods: Data was collected in relation to self-stigma, perceived stigma, self-esteem, functioning and quality of life. In order to examine the mediating role of self-stigma on the relationship between perceived stigma and psychosocial outcomes, bootstrapping mediation analyses were used.

Results: Mediation analyses revealed that the relationship between perceived stigma and psychosocial outcomes were subject to the effect of self-stigma amongst the overall sample. Separate mediation analyses were conducted by diagnoses and showed differences in the mediating effect of self-stigma. Amongst the whole sample and the sub-sample with OCD, self-stigma mediated the relationship between perceived stigma and all psychosocial outcomes. For those with anxiety, depression and schizophrenia, the mediating effects of self-stigma were present in all relationships except (1) perceived stigma with physical health in the anxiety sample, (2) perceived stigma with social relationships in the depression sample, (3) perceived stigma with physical health in the schizophrenia sample.

Conclusions: The mediating effects of self-stigma on the relationship between perceived stigma and various psychosocial outcomes are evident and differ across diagnoses. Interventions to address and reduce the effect of self-stigma along with targeted treatments and psychoeducation to assist people with mental illness overcome or better manage self-stigma, whilst providing them the skills to counteract public stigma are needed.

Strengths and limitations of the study

- This was a cross-sectional study, which adopted a convenient sampling strategy to recruit out-patients with a clinical primary diagnosis of longer than one year of schizophrenia, depression, anxiety or obsessive compulsive disorder.
- The mediating role of self-stigma on the relationship between perceived stigma and psychosocial outcomes was examined using bootstrapping mediation analyses.

- This is the first study to explore the mediating effects of self-stigma on the relationship between perceived stigma and psychosocial outcomes across psychiatric disorders amongst a multi-ethnic Asian sample.
- The study has some limitations including social desirability bias, the cross-sectional design and limited generalizability due to inclusion criteria.

INTRODUCTION

Historically, the word 'stigma' originates from a Greek term which refers to a 'mark or brand'. **Goffman [1]** later defined stigma as "an attribute that is deeply discrediting" which reduces someone "from a whole and usual person to a tainted, discounted one" (p. 3). He goes on to say that stigma is fundamentally a social phenomenon rooted in social relationships which is shaped by the culture and structure of society. Whilst stigma is universal and has no boundaries, it is commonly associated with mental illness. More specifically, **Johnstone [2]** believes "people suffering from mental illness and other mental health problems are among the most stigmatized, discriminated against, marginalized, disadvantaged and vulnerable members of society".

In relation to mental illness, stigma is a multifaceted construct that involves feelings, attitudes and behaviours **[3]**. Stigma has been theorized and conceptualized in different ways and from different perspectives. Social cognitive models **[4]** depict stigma as comprising three main components: negative stereotypes (negative beliefs about a particular group), prejudice (agreeing with these negative stereotypes) and discrimination (the behavioural consequence of prejudice) **[5]**. **Link and Phelan [6]** adopt a sociological perspective where stigma exists when four inter-related components occur: (i) labeling, (ii) negative attributes, (iii) separation and (iv) status loss and discrimination.

Mental illness stigma can present in four main ways: personal stigma, perceived stigma, self-stigma and structural stigma **[5,7]**. Personal stigma refers to an individual's stigmatizing attitudes and beliefs about people with mental illness, whereby they endorse prejudice and discrimination against them **[5]**. Perceived stigma is the perceived attitudes of others towards people with mental illness **[8]**. Self-stigma or internalized stigma is the process by which people with mental illness accept the negative attitudes of others towards them, then internalize and apply these beliefs to themselves **[9-11]**. Finally structural stigma refers to the prejudice and discrimination by policies, laws and constitutional practice which intentionally or unintentionally disadvantage people with mental illness **[5,12]**.

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5 Whilst stigma can present in different ways, it has been proposed that certain types of stigma
6 will present before others. **Link et al., [13]** theorized that public stigma may lead people with
7 mental illness to develop self-stigma, where both forms of stigma have the potential to cause
8 detrimental effects on people with mental illness. **Vogel et al., [14]** substantiated this theory
9 when they examined the relationship between public stigma and self-stigma over a three month
10 period and found that public stigma is internalized as self-stigma over time, and higher initial
11 public stigma predicted higher subsequent self-stigma. These findings support previous
12 research postulated by modified labeling theory, which has consistently been used to explain
13 the relationship between perceived and self-stigma **[13]**.

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21 These types of stigma can have various ramifications for people with mental illness. Public
22 attitudes about people with mental illness can result in delays in treatment seeking or avoiding
23 treatment altogether **[15]**, whilst public and perceived stigma is negatively associated with work
24 and role functioning **[16]**, self-esteem **[17]** and quality of life **[16]**. Similarly, self-stigma has also
25 consistently been linked to poorer outcomes among people with mental illness including
26 reduced quality of life and life satisfaction **[18]**, difficulties obtaining employment and/or housing
27 **[19]**, treatment adherence **[20]** and self-esteem **[21]**; self-stigma has also been associated with
28 an increase in symptom severity **[22]**, positive symptoms **[23,24]** and negative symptoms
29 **[23,25]**.

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37 In Singapore, a multi-ethnic city-state in Southeast Asia, there has been increased interest in
38 the stigma of mental illness stigma due to a recent focus on de-stigmatization and mental health
39 promotion initiatives. A recent population-wide mental health literacy study revealed there is
40 considerable personal stigma towards people with mental illness, where 89% of people
41 endorsed that people with a mental illness could get better if they wanted to **[26]**. A second
42 study, among psychiatric outpatients with anxiety, depression, obsessive compulsive disorder
43 (OCD) and schizophrenia revealed that 43.6% experienced moderate to high self-stigma, whilst
44 there was a significant negative relationship between quality of life, self-esteem and general
45 functioning and self-stigma **[27]**. These recent studies not only highlight the magnitude of
46 personal stigma towards, but also self-stigma among people with mental illness, and the
47 devastating consequences of stigma on outcomes for people with mental illness.

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57 Whilst it is evident how the various types of stigma can have negative impacts on people with
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3 mental illness, less is known about how one or more of these types of stigma may influence or
4 affect another. In a recent study among Chinese outpatients with and without psychotic
5 disorders, **Kao and colleagues [28]** examined the mediating role of self-stigma on the
6 relationship between perceived stigma and psychosocial outcomes. Results revealed that self-
7 stigma mediated the effects of perceived stigma on outcomes including self-esteem, depressive
8 symptoms and quality of life.
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14 Given that we already know self-stigma is negatively associated with various psychosocial
15 outcomes including quality of life, self-esteem and general functioning, among psychiatric
16 outpatients in Singapore **[27]**, this raises the questions as to whether this self-stigma influences
17 or mediates the relationship between perceived stigma and psychosocial outcomes. Also given
18 the majority of research to date has focused on depression and schizophrenia **[29]**, there is a
19 need to further explore the effects of stigma on other disorders such as OCD and anxiety. In
20 order to address some of these gaps in the existing literature and to more clearly delineate the
21 relationship between perceived and self-stigma, the current study aimed to examine whether
22 self-stigma mediates the relationship between perceived stigma and quality of life, self-esteem
23 and functioning, among outpatients with anxiety, depression, OCD and schizophrenia.
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32 **METHODS**

33 **Participants and recruitment**

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35 This cross-sectional study recruited patients seeking treatment at outpatient and affiliated clinics
36 of the Institute of Mental Health (IMH), the only tertiary psychiatric care hospital in Singapore.
37 Recruitment was conducted between May 2014 and September 2015 and required respondents
38 to meet the following inclusion criteria: Singapore citizens or Permanent Residents (PRs), aged
39 21-65 years, belonging to Chinese, Malay or Indian ethnicity (the three main ethnic groups in
40 Singapore), capable of providing consent, literate in English language and having a clinical
41 primary diagnosis of longer than one year of either schizophrenia, depression or anxiety
42 spectrum disorders or OCD, as determined by a psychiatrist, using International Classification
43 of Diseases (ICD-9) criteria. Patients with intellectual disabilities, who were not fluent in English
44 and those who had been seeking treatment at IMH for less than one year were excluded. The
45 study employed a convenient sampling strategy to recruit participants using multiple methods
46 and referral sources. Posters informing attending patients of the ongoing study, its eligibility
47 criteria and contact details of the study team were placed in the clinic waiting areas.
48 Psychiatrists and other healthcare professionals were also informed of the study and requested
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3 to refer eligible patients. Ethical approval was obtained from the Domain Specific Review Board
4 of the National Healthcare Group, Singapore, and written informed consent was obtained from
5 all respondents.
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8 9 10 **Measures**

11 Socio-demographic information was collected for all respondents including age, gender,
12 ethnicity, education, marital and employment status. Medical record reviews were also
13 undertaken to confirm each respondent's primary diagnosis, age of onset, co-morbid psychiatric
14 disorders and number of hospitalizations resulting from their mental illness.
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18 19 20 *Internalized stigma of mental illness scale*

21 Self-stigma was measured using the Internalized Stigma of Mental Illness (ISMI) scale which
22 comprises five subscales: alienation, stereotype endorsement, discrimination experience, social
23 withdrawal and stigma resistance [30]. The self-report scale uses a 4-point Likert scale from
24 strongly disagree to strongly agree to rate each of the 29 items, which included statements such
25 as "Having a mental illness has spoiled my life" and "People without mental illness could not
26 possibly understand me". As the stigma resistance subscale has not been included in the ISMI
27 total score in several previous studies, given its relatively weak correlation to the other ISMI
28 subscales and its lack of internal consistency, [23,30] the stigma resistance subscale was
29 excluded from this analysis. Subscale and total scores were calculated by adding the item
30 scores together and then dividing by the number of answered items. The Cronbach's alpha in
31 our sample was 0.93.
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40 41 *Devaluation-Discrimination Scale*

42 Perceived public stigma was measured using the 12 item Devaluation-Discrimination Scale
43 (DDS) which assesses self-reported stereotype awareness through perceived discrimination
44 and devaluation subscales [31]. The scale asks respondents the extent to which they agree or
45 disagree with statements indicating that most people devalue individuals who have used
46 psychiatric treatment. Examples include "Most people believe that entering a psychiatric hospital
47 is a sign of personal failure" and "Most people think less of a person after he/she has been
48 hospitalized for a mental illness". Items are answered on a 6-point response scale from strongly
49 agree (1) to strongly disagree (6). After reverse scoring items 1,3,4,7,8 and 11, all item scores
50 are then summed and divided by the total number of items answered. The internal consistency
51 was good amongst the current sample (Cronbach's alpha =0.81).
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World Health Organization Quality of Life-BREF

The World Health Organization Quality of Life-BREF (WHOQOL-BREF) is a 26 item quality of life scale which measures self-reported overall quality of life and general health. It also measures four distinct quality of life domains; physical health, psychological health, social relationships and environmental aspects over the two weeks, prior to the interview [32]. All items are constructed on variations of a 5-point Likert Scale, with scores from 1 to 5, enquiring on “how much”, “how completely”, “how often”, “how good” or “how satisfied” the individual felt. Scores for the four domains are calculated by taking the mean of all items within the domain and multiplying by four and then linearly transforming it to a 0-100 scale. For missing items, the mean of other items in the domain are substituted, however if more than two items were missing from the domain, the domain score was not calculated. Domain scores are scaled in a positive direction, with higher scores denoting higher quality of life except for items 3, 4 and 26 which need to be reversed scored. The Cronbach's alpha in our sample for each of the four domains was: physical health, 0.81; psychological health, 0.84; social relationships, 0.63; environment, 0.78.

Rosenberg's Self Esteem Scale

Rosenberg's Self Esteem Scale (RSES) is a short, 10 item scale which measures self-reported global self-worth by measuring positive and negative feeling about one's self. Using a 4-point Likert scale from strongly agree (1) through to strongly disagree (4), respondents indicate how strongly they agree or disagree with each of the statements. Negative items are reverse scored and higher scores indicate greater self-esteem [33]. There were two cases with missing items and these were excluded from the analysis. The RSES displayed good internal consistency (Cronbach's alpha = 0.84).

Global Assessment of Functioning

The Global Assessment of Functioning (GAF) scale [34] assesses severity of illness in psychiatry in terms of overall functioning, which takes into account impairments in psychological, social and occupational/school functioning in the month prior to the interview. The scale ranges from 0 (inadequate information) to 100 (superior functioning). The 100 point scale is divided into 10 point intervals, each which has verbal anchors describing symptoms and functioning pertaining to that interval. Scores between 91 and 100 indicate optimal mental health and coping capabilities while a score in the 1–10 range may be considered suicidal and

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3 incapable of maintaining minimal personal hygiene. Trained raters and members of the study
4 team started at either the top or the bottom of the scale and went up/down the list until the most
5 accurate description of functioning for the individual was reached as per the raters' judgment.
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10 **Statistical analysis**

11 Analysis was performed using SPSS Version 21. Mediation (indirect) effects were tested using
12 the PROCESS macro for SPSS developed by Hayes [35]. Descriptive statistics were calculated
13 to provide an overview of the socio-demographic, clinical and psychosocial (self-stigma,
14 perceived stigma, self-esteem, functioning and quality of life) characteristics of the sample by
15 the four diagnoses; anxiety, depression, OCD and schizophrenia. ANOVA, followed by the
16 appropriate post-hoc tests, were conducted to identify significant difference in the means of
17 each psychosocial variable across the four diagnostic groups. The psychosocial variables were
18 normally distributed; hence, the associations between these were examined using Pearson's
19 correlation.
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28 The mediation (indirect) effect model hypothesized in this study is illustrated in Figure 1, which
29 examines the mediating role of self-stigma, and is similar to that reported by Kao et al., [28].
30 The relationships between perceived stigma (independent variable) and psychosocial outcomes
31 such as self-esteem, functioning and quality of life (depicted by four domains: physical health,
32 psychological health, social relationships and environment) (dependent variables) without
33 controlling for self-stigma (mediator variable) are referred to as total effects and denoted by 'z'.
34 The relationships between perceived stigma and the psychosocial outcomes controlling for self-
35 stigma are referred to as direct effects denoted by 'z*'. Indirect effects denoted by 'xy' refer to
36 the relationships between perceived stigma and the psychosocial outcomes with self-stigma as
37 the mediator. Applying the PROCESS macro, it conducts bias-corrected bootstrapping through
38 random sampling with replacement from the dataset to create pseudo bootstrap samples, which
39 produce point estimates for the mediation effects as well as their bias-corrected and accelerated
40 95% confidence intervals (BCa CI). 5000 bootstrap samples were used in this study. When the
41 CI does not contain zero, it could be inferred that the mediation effect of the proposed mediator
42 is statistically significant [36]. The mediation analyses were controlled for age, age of onset,
43 gender, ethnicity, marital status, education, employment, co-morbid psychiatric disorders and
44 hospitalization history.
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3 The entire sample was first used to test the mediation effect of self-stigma on the relationship
4 between perceived stigma and psychosocial outcomes. Thereafter, we examined the four
5 diagnostic groups separately to explore if there were any differences in mediation effects
6 between diagnoses.
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10 11 **RESULTS**

12 The socio-demographic and clinical characteristics of the sample (n=280) are presented in
13 Table 1. The majority of respondents were male (54.6%), of Chinese ethnicity (53.6%), never
14 married (63.1%) and employed (55.7%). The mean age of the respondents was 38.9 years
15 (standard deviation (SD) = 11.6 years).
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21 The psychosocial characteristics of the sample are presented in Table 2. ANOVA on the
22 psychosocial variables yielded significant differences among the diagnostic groups, with the
23 exception of self-stigma which was not different across diagnoses. Post-hoc tests revealed that
24 the mean self-esteem scores were higher in participants with schizophrenia than depression.
25 Participants with schizophrenia had lower mean perceived stigma and physical health scores as
26 compared to the other diagnostic groups, whilst they had higher mean psychological health and
27 social relationships scores as compared to those with depression. The results were significant
28 and reported at $p < 0.05$. To determine the correlations between the various stigma and
29 psychosocial measures, Pearson's correlations were performed (Table 3). Results showed that
30 perceived stigma, self-stigma, self-esteem, quality of life and functioning were significantly
31 associated with each other.
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40 The results of the mediation analyses are presented in Table 4. Amongst the overall sample, the
41 significant ($p < 0.05$) total effects (z) of perceived stigma on self-esteem, functioning, physical
42 health, psychological health, social relationships, and environment were -0.187, -0.302, -0.330, -
43 0.506, -0.626, and -0.450 respectively. When self-stigma was entered simultaneously into the
44 model (z^*), the direct effects (z^*) of perceived stigma on psychosocial outcomes decreases to -
45 0.062, -0.873, -0.187, -0.192, -0.291, and -0.155 respectively, implying the negative effect of
46 perceived stigma on the psychosocial outcomes had weakened. In other words, the relationship
47 between perceived stigma and the psychosocial outcomes are subjected to the effect of self-
48 stigma.
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57 After conducting separate mediation analyses on each of the four diagnostic groups, the results
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3 presented in Table 4 suggest that the mediating effect of self-stigma differed by diagnosis.
4 Amongst the whole sample and the sub-sample with OCD, self-stigma mediated the relationship
5 between perceived stigma and all psychosocial outcomes. For those with anxiety, depression
6 and schizophrenia, the mediating effects of self-stigma were present in all relationships except
7 (1) perceived stigma with physical health in the anxiety sample, (2) perceived stigma with social
8 relationships in the depression sample, (3) perceived stigma with physical health in the
9 schizophrenia sample. The controlled variables that were significant in each of the mediation
10 analyses are presented in Supplementary Table 1.
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18 DISCUSSION

19 To our knowledge, this is the first study to examine the mediating effects of self-stigma on the
20 relationship between perceived stigma and psychosocial outcomes among a multi-ethnic Asian
21 sample of outpatients with anxiety, depression, OCD and schizophrenia. Results revealed
22 significant differences in stigma and psychosocial mean scores across diagnostic groups.
23 Furthermore, results showed that self-stigma mediated the effects of perceived stigma on
24 psychosocial outcomes including self-esteem, quality of life and functioning. Differences in the
25 mediation effect were also observed when the sample was split by diagnostic groups, with self-
26 stigma having no mediating effect on several psychosocial outcomes.
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34 Across the different diagnostic groups, we observed significant differences in mean self-stigma,
35 perceived stigma and psychosocial scores. Overall, those with depression had higher self and
36 perceived stigma scores and lower psychosocial scores compared to other diagnostic groups.
37 More specifically, mean self-esteem, psychological health and social relationships scores were
38 significantly lower among those with depression compared to those with schizophrenia.
39 Research has shown that self-stigma is associated with increased depression [37] which may
40 partly explain the current findings. On the other hand, schizophrenia is associated with a lack of
41 insight or awareness [38] and may also be a contributing factor. There is a dearth of research
42 exploring differences in self and perceived stigma and psychosocial outcomes across
43 psychiatric disorders and given the obvious differences observed in the current study, this
44 warrants further exploration in the future, to ascertain why such differences may occur.
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53 Mediation analysis revealed that whilst perceived stigma and self-stigma are distinct constructs,
54 they are related. The current study specifically examined how self-stigma mediates the
55 relationship between perceived stigma and quality of life, self-esteem and functioning. Amongst
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3 the overall sample we observed the mediating effects of self-stigma, whereby it reduced the
4 effect of perceived stigma on self-esteem, quality of life and functioning and higher self-stigma
5 scores were associated with lower scores among the psychosocial outcome measures. In other
6 words, the effects of perceived stigma on these psychosocial outcomes are mediated by
7 internalizing public stigma amongst those with mental illness. Our findings are in line with **Kao**
8 **et al.**, [28] who also observed the effect of perceived stigma on psychosocial outcomes was
9 mediated by self-stigma. These findings highlight the importance and impact self-stigma can
10 have for people with mental illness and its predictive influence on psychosocial outcomes. Given
11 that self-stigma is the internalization of public beliefs and stigmatizing views [39,40], efforts to
12 dispel misconceptions relating to mental illness among the general population are needed. At
13 the same time, counteracting the negative effects of self-stigma among people with mental
14 illness is also needed. **Mittal et al.**, [41] undertook a review of strategies to reduce self-stigma
15 among people with mental illness and concluded that two prominent approaches for self-stigma
16 reduction emerged. The first being interventions that attempt to alter the stigmatizing beliefs and
17 attitudes of those experiencing self-stigma, whilst the second related to enhancing coping skills
18 through improvements in self-esteem, empowerment, and help-seeking behavior; given the
19 findings of this study, such interventions need to be considered for the local population.
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33 When the sample was split by diagnostic groups, distinct differences in the effects of self and
34 perceived stigma were observed. The mediating effect of self-stigma among those with anxiety
35 and depression were not dissimilar to that observed for the overall sample. There was no
36 mediating effect of self-stigma on the physical health quality of life domain for those with
37 anxiety, nor was there a mediating effect on the social relationships quality of life domain for
38 those with depression. Items within the physical health domain ask about tangible aspects of
39 physical health such as pain, the need for medical treatment to function, ability to get around,
40 energy levels and satisfaction with sleep, ability to perform daily living activities, and capacity for
41 work. So whilst perceived stigma is a significant predictor of the physical health domain and
42 people with anxiety may internalize stigmatizing views, it was found that this relationship was
43 not influenced by self-stigma.
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53 The same applies for those with depression and the social relationships domain, whereby
54 perceived stigma is negatively associated with this quality of life domain, yet the relationship is
55 not influenced by self-stigma. Interestingly, while the mean social relationships score was
56 significantly lower among those with depression (versus schizophrenia), self-stigma did not
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3 appear to be an influencing factor. It is possible that whilst those with depression had higher
4 mean self and perceived stigma scores, self-stigma did not affect their social relationships, but
5 rather the impact of what others think (perceived stigma) is more influential to social
6 relationships. Contrary to this however, longitudinal evidence has shown that self-stigma has a
7 stronger effect on psychosocial outcomes of people with mental illness compared to perceived
8 stigma [11]. Given that little is known about the effects of stigma on various psychosocial
9 outcomes over time, and how this may in fact influence the mediating effect of self-stigma on
10 these outcomes, this warrants further exploration in the future, to better understand the complex
11 interplays between these constructs.
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20 Amongst those with schizophrenia, both self-stigma and perceived stigma did not have a
21 significant effect on physical health related quality of life. Although people with schizophrenia
22 may experience perceived or self-stigma, perceived stigma is not associated with physical
23 health related quality of life and self-stigma does not mediate the relationship between
24 perceived stigma and this psychosocial outcome. These findings suggest it is likely that other
25 factors such as symptom severity or coping methods may influence physical health related
26 quality of life amongst those with schizophrenia. Therefore, whilst it is important to address self-
27 stigma given that it does influence the relationship between perceived stigma and most
28 psychosocial outcomes, people with different mental illnesses may perceive or experience
29 stigma in unique ways. Previous literature has also shown that self-stigma is negatively
30 associated with quality of life among those with schizophrenia [27, 42] and this further
31 compounds the impact it can have on this and other psychosocial outcomes.
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41 Unlike other mental illnesses such as depression or schizophrenia, there has been substantially
42 less literature published on stigma relating to OCD and therefore little is known about the
43 magnitude or impact of stigma on psychosocial outcomes for people with OCD. Among those
44 with OCD in the current sample, while the mediating effects of self-stigma were present,
45 perceived stigma was not associated with any of the psychosocial outcomes. That is, whilst
46 perceived stigma does not seem to have an impact on the psychosocial outcomes of people
47 with OCD, self-stigma still has a mediating effect and further reduces the impact perceived
48 stigma has on self-esteem, quality of life and functioning. It is difficult to postulate why this lack
49 of association would be observed and to our knowledge there is no empirical evidence that has
50 previously explored this. Some possible explanations are proposed. It could be that people with
51 OCD disassociate the disorder from negative public conceptions of 'mental illness' and perceive
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OCD as a less serious or dangerous condition [43], and consequently perceived stigma has no effect on psychosocial outcomes. Similarly it could be that those with OCD learn to distinguish between OCD thoughts and real thoughts, resulting in these people being able to reduce self-stigma by disassociating the OCD from oneself [43]. An alternative explanation could be that public stigma towards OCD in Singapore is lower compared to other disorders [26] which may result in less perceived and self-stigma amongst those with the disorder. Finally whilst OCD refers to unwanted recurrent and persistent thoughts, urges, or impulses and/or repetitive behaviors that an individual feels driven to perform [44], these thoughts or behaviours can relate to a broad range of areas. It is therefore possible that this subgroup with OCD form quite a heterogeneous group in terms of their specific OCD symptoms which may result in variance in the extent to which they experience self or perceived stigma. Given the impact of stigma on people with OCD is hugely understudied and that findings from the current study highlight distinct differences in the mediating effect of self-stigma on the relationship of perceived stigma and psychosocial outcomes, further research is need to explore this phenomenon further.

It is important to note that this study is not without its limitations. Stigma and psychosocial variables were all self-reported which can result in social desirability bias. The cross-sectional design of our study precluded any causal inferences being made. Furthermore, whilst the majority of investigations exploring mediation are based on cross-sectional designs, there are certain limitations to this study design, particularly in capturing true mediation processes [45] and these should be considered when interpreting the study findings. In addition, sampling was also based on convenient sampling methods among a heterogeneous group of patients with anxiety, depression, OCD and schizophrenia and was also restricted to English-speaking patients, aged 21-65, who were seeking care at IMH and therefore our results may not be generalizable to all patients with mental illness in Singapore. The clinical primary diagnoses of the disorders were determined by a psychiatrist, using ICD-9 criteria, which has been superseded by ICD-10. Consequently, the two versions use slightly different criteria for classification of mental disorders and therefore it is possible that in some instances, those with an ICD-9 diagnosis in the current study would be diagnosed somewhat differently, or possibly excluded, according to ICD-10 classifications. As the primary aim of the study was to explore the types and extent of stigma experienced by people with mental illness, we did not collect information on severity of illness or physical comorbidities, which may impact perceived stigma, self-stigma or psychosocial outcomes. Accordingly, it would be beneficial to further explore the effects of symptom severity and physical comorbidities on stigma and psychosocial outcomes in

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3 the future. Finally, as this was a treatment seeking population, it is possible that the extent of
4 perceived and self-stigma may be inflated or may not be a true reflection of these types of
5 stigma among people with mental illness.
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10 Despite these limitations, this is to our knowledge, the first study to explore the mediating effects
11 of self-stigma on the relationship between perceived stigma and psychosocial outcomes across
12 psychiatric disorders amongst a multi-ethnic Asian sample. Findings have highlighted that the
13 relationship between perceived stigma and various psychosocial outcomes were subjected to
14 the effect of self-stigma, whilst the effects of perceived and self-stigma differ across diagnoses.
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20 Whilst perceived stigma contributes to self-stigma, both types of stigma can have pernicious
21 effects on various outcomes for people with mental illness. Given that self-stigma mediates the
22 relationship between perceived stigma and various psychosocial outcomes and that existing
23 literature has shown self-stigma is considered a risk factor for poorer mental health prognosis
24 [46], it is important that interventions aim to address and reduce the effect of self-stigma among
25 people with mental illness. There is a need for targeted treatments and psychoeducation which
26 aim to assist people with mental illness overcome or better manage self-stigma, whilst providing
27 them the skills to counteract public stigma [11].
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35 The repercussions of self and or perceived stigma are also often responsible for delayed help-
36 seeking or treatment avoidance and further exemplify the damaging effects stigma can have for
37 people with mental illness. A better understanding of how these different stigma constructs
38 relate to each other over time, and how they might differ across disorders, will provide important
39 information and guidance for designing interventions at the individual and societal level aimed at
40 reducing stigma associated with mental illness and will aid to reduce barriers to help-seeking
41 [14].
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48 **COMPETING INTEREST**

49 The authors declare that they have no competing interests.
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54 Council under the Centre Grant Programme (Grant No.: NMRC/CG/004/2013).
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ETHICS APPROVAL

The study was approved by the National Healthcare Group Domain Specific Review Board and all participants provided written informed consent.

AUTHOR CONTRIBUTIONS

LP was responsible for the study design, data collection and verification wrote the manuscript. YWL and EA were involved in the data analysis and interpretation and provided inputs into the manuscript. SP and JAV were involved in data collection, clean up and provided inputs and edits to the manuscript. SAC and MS supervised the overall study and provided intellectual inputs on the manuscript.

DATA SHARING

Data are not available for online access; however, readers who wish to gain access to the data can write to the senior author Dr Mythily Subramaniam at mythily@imh.com.sg with their requests. Access can be granted subject to the Institutional Review Board (IRB) and the research collaborative agreement guidelines. This is a requirement mandated for this research study by our IRB and funders.

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Table 1: Sample characteristics by diagnosis

	Anxiety n (%)	Depression n (%)	OCD* n (%)	Schizophrenia n (%)	Total Sample n (%)
Gender					
Male	41 (57.7%)	36 (48.6%)	38 (62.3%)	38 (51.4%)	153 (54.6%)
Female	30 (42.3%)	38 (51.4%)	23(37.7%)	36 (48.6%)	127 (45.4%)
Ethnicity					
Chinese	50 (70.4%)	25 (33.8%)	49 (80.3%)	26 (35.1%)	150 (53.6%)
Malay	10 (14.1%)	25 (33.8%)	6 (9.8%)	24 (32.4%)	65 (23.2%)
Indian/Others	11 (15.5%)	24 (2.4%)	6 (9.8%)	24 (32.4%)	65 (23.2%)
Marital Status					
Never Married	51 (71.8%)	23 (31.1%)	50 (82.0%)	52 (71.2%)	176 (63.1%)
Married	14 (19.7%)	24 (32.4%)	6 (9.8%)	14 (19.2%)	58 (20.8%)
Separated/Divorced/Widowed	6 (8.5%)	27 (36.5%)	5 (8.2%)	7 (9.6%)	45 (16.1%)
Education					
PSLE and below	3 (4.2%)	6 (8.2%)	1 (1.6%)	9 (12.2%)	19 (6.8%)
Secondary or O/N level	13 (18.3%)	28 (38.4%)	18 (29.5%)	34 (45.9%)	93 (33.3%)
A Level/Diploma	43 (60.6%)	26 (35.6%)	28 (45.9%)	27 (36.5%)	124 (44.4%)
University	12 (16.9%)	13 (17.8%)	14 (23.0%)	4 (5.4%)	43 (15.4%)
Employment					
Employed	42 (59.2%)	40 (54.1%)	37 (60.7%)	37 (50.0%)	156 (55.7%)
Unemployed	17 (24%)	8 (36.4%)	17 (27.9%)	29 (39.2%)	90 (32.1%)
Student/homemaker/retired	12 (16.9%)	7 (9.5%)	7 (11.5%)	8 (10.8%)	34 (12.1%)
Hospitalization					
Yes	9 (12.9%)	28 (39.4%)	25 (42.4%)	61 (88.4%)	123 (45.7%)
No	61 (87.1%)	43 (60.6%)	34 (57.6%)	8 (11.6%)	146 (54.3%)
Co-morbid psychiatric disorder					
Yes	38 (53.5%)	25 (33.8%)	36 (59.0%)	11 (14.9%)	110 (39.3%)
No	33 (46.5%)	49 (66.2%)	25 (41.0%)	63 (85.1%)	170 (60.7%)
Age (mean, SD)					
	33.6 (10.9)	42.2 (10.8)	32.5 (9.45)	43.0 (10.4)	38.9 (11.6)
Age of onset of illness					
	28.8 (9.42)	35.6 (10.8)	25.4 (10.0)	25.7 (7.94)	29.5 (10.4)

* OCD- obsessive compulsive disorder

Table 2: Stigma and psychosocial outcomes among people with mental illness by disorder

Mean (SD)	Anxiety	Depression	OCD	Schizophrenia	Total Sample
ISMI	2.23 (0.56)	2.44 (0.55)	2.41 (0.49)	2.41 (0.52)	2.37 (0.54)
DDS	48.5 (9.52)	49.0 (8.96)	48.1 (10.0)	42.5 (11.6)	46.9 (10.4)
RSES	26.5 (6.31)	25.4 (5.34)	25.6 (5.67)	27.7 (4.13)	26.3 (5.45)
GAF	55.9 (15.9)	50.0 (17.6)	53.33 (13.5)	54.3 (16.0)	53.4 (16.0)
WHOQOL-BREF					
Physical	53.4 (13.3)	50.4 (11.8)	51.4 (14.0)	60.4 (11.5)	54.0 (13.2)
Psychological	49.1 (15.0)	47.1 (16.4)	48.6 (15.7)	54.2 (16.1)	49.8 (16.0)
Social	54.5 (22.6)	48.8 (24.6)	53.6 (21.6)	59.8 (18.8)	54.2 (22.3)
Environment	63.5 (16.9)	56.5 (17.9)	61.6 (16.1)	63.1 (15.1)	61.1 (16.7)

ISMI- Internalized Stigma of Mental Illness Scale (self stigma)

DDS- Devaluation and Discrimination Scale (perceived stigma)

RSES- Rosenberg's Self-Esteem Scale

GAF- Global Assessment of Functioning

WHOQOL-BREF- World Health Organization Quality of Life-BREF

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Table 3: Correlations among study variables

	Self-Stigma	Perceived Stigma	Self-Esteem	Physical health	Psychological health	Social relationships	Environmental	GAF
Self-Stigma	-							
Perceived Stigma	0.269	-						
Self-Esteem	-0.576	-0.305	-					
Quality of life								
Physical health	-0.316	-0.309	0.483	-				
Psychological health	-0.518	-0.313	0.659	0.646	-			
Social relationships	-0.453	-0.280	0.511	0.520	0.604	-		
Environmental	-0.512	-0.180	0.535	0.529	0.645	0.553	-	
GAF	-0.401	-0.133	0.434	0.419	0.462	0.454	0.497	-

*All correlations are significant at the 0.001 level (2-tailed)

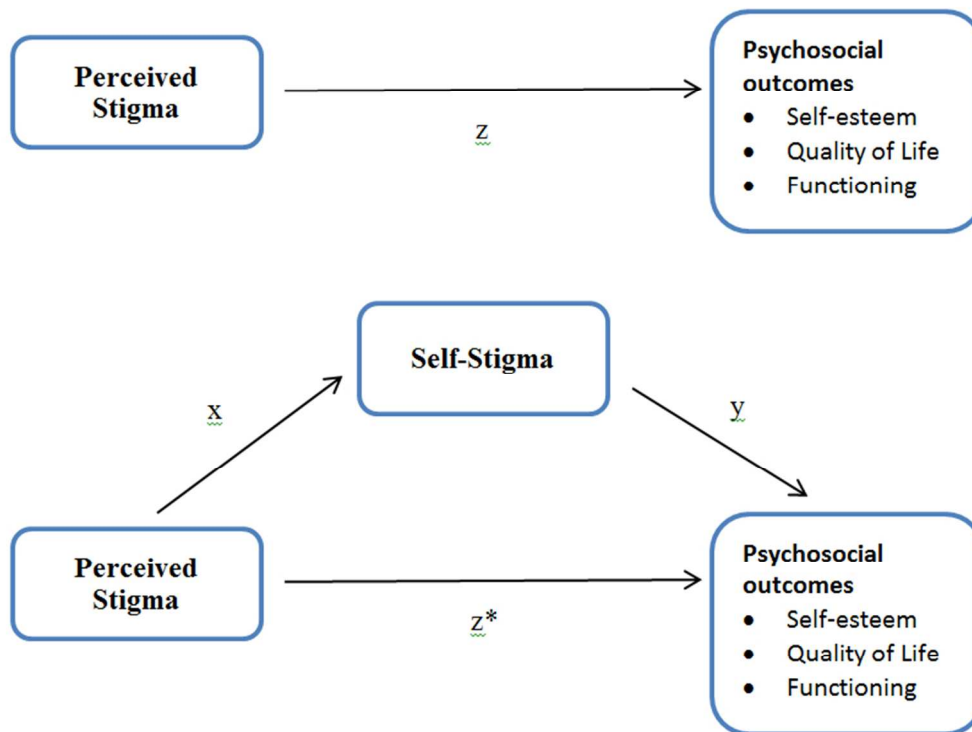
Table 4: Mediating effects of self-stigma on the relationship between perceived stigma and psychosocial outcomes

Outcomes	Total Effects		Direct Effects		Indirect Effects			Mediation Ratio ^b
	z	SE	z*	SE	xy	SE	CI	
Total Sample								
Self-Esteem	-0.186***	0.032	-0.061*	0.028	-0.126 ^a	0.021	[-0.170, -0.089]	0.674
Functioning	-0.299***	0.095	-0.085	0.097	-0.214 ^a	0.046	[-0.316, -0.136]	0.716
Physical health	-0.332***	0.076	-0.192**	0.080	-0.140 ^a	0.037	[-0.225, -0.077]	0.422
Psychological health	-0.510***	0.094	-0.196*	0.088	-0.314 ^a	0.052	[-0.429, -0.223]	0.616
Social relationships	-0.623***	0.130	-0.289*	0.131	-0.335 ^a	0.069	[-0.492, -0.218]	0.537
Environmental	-0.450***	0.097	-0.158	0.094	-0.292 ^a	0.054	[-0.407, -0.193]	0.650
Anxiety								
Self-Esteem	-0.298***	0.066	-0.119	0.068	-0.179 ^a	0.050	[-0.297, -0.094]	0.601
Functioning	-0.458*	0.198	-0.213	0.230	-0.245 ^a	0.131	[-0.560, -0.028]	0.536
Physical health	-0.499**	0.160	-0.384*	0.190	-0.115	0.119	[-0.357, 0.120]	
Psychological health	-0.613***	0.170	-0.306	0.189	-0.307 ^a	0.116	[-0.588, -0.114]	0.501
Social relationships	-0.918***	0.254	-0.541	0.290	-0.377 ^a	0.170	[-0.793, -0.112]	0.411
Environmental	-0.604**	0.208	-0.062	0.212	-0.543 ^a	0.187	[-0.966, -0.246]	0.898
Depression								
Self-Esteem	-0.199*	0.080	-0.097	0.075	-0.103 ^a	0.051	[-0.225, -0.022]	0.515
Functioning	-0.444*	0.219	-0.213	0.214	-0.231 ^a	0.128	[-0.561, -0.040]	0.521
Physical health	-0.420**	0.144	-0.300	0.145	-0.120 ^a	0.067	[-0.296, -0.020]	0.286
Psychological health	-0.590*	0.242	-0.250	0.217	-0.340 ^a	0.149	[-0.690, -0.097]	0.576
Social relationships	-0.777*	0.373	-0.499	0.381	-0.279	0.200	[-0.782, 0.019]	
Environmental	-0.707**	0.244	-0.454	0.239	-0.253 ^a	0.131	[-0.573, -0.051]	0.358
OCD								
Self-Esteem	-0.155*	0.078	-0.059	0.067	-0.096 ^a	0.046	[-0.196, -0.016]	0.621
Functioning	-0.237	0.177	-0.120	0.179	-0.117 ^a	0.076	[-0.309, -0.036]	0.493
Physical health	-0.370	0.199	-0.244	0.203	-0.126 ^a	0.083	[-0.377, -0.014]	0.341
Psychological health	-0.347	0.208	-0.129	0.195	-0.218 ^a	0.115	[-0.495, -0.038]	0.630
Social relationships	-0.582*	0.276	-0.241	0.243	-0.342 ^a	0.165	[-0.705, -0.061]	0.587
Environmental	-0.325	0.214	-0.153	0.211	-0.173 ^a	0.088	[-0.417, -0.042]	0.531
Schizophrenia								
Self-Esteem	-0.115*	0.051	-0.006	0.046	-0.109 ^a	0.039	[-0.204, -0.046]	0.949
Functioning	0.085	0.182	0.216	0.199	-0.130 ^a	0.095	[-0.370, -0.018]	-1.528
Physical health	-0.129	0.144	-0.077	0.160	-0.052	0.072	[-0.243, 0.071]	
Psychological health	-0.539**	0.187	-0.251	0.187	-0.288 ^a	0.113	[-0.575, -0.109]	0.535
Social relationships	-0.266	0.214	-0.032	0.228	-0.234 ^a	0.120	[-0.543, -0.042]	0.879
Environmental	-0.251	0.166	-0.062	0.176	-0.189 ^a	0.105	[-0.480, -0.029]	0.753

Note: ^a : CI does not contain zero; ^b : Ratio of the indirect effect to the total effect, ***significant at p-value<0.001, **significant at p-value<0.01, * p-value significant at p-value<0.05

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For peer review only



Mediation effect model

69x52mm (300 x 300 DPI)

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Supplementary Table 1: Controlled variables in individual mediation analyses

	Self Esteem	Functioning	Physical Health	Psychological Health	Social Relationships	Environmental
Predictors	β	β	β	β	β	β
Total Sample						
Age	0.102	-	0.375	0.357	0.476	-
Age of Onset of Illness	-	-	-	-0.269	-0.386	-0.280
Employment - Unemployed	-	-8.562	-3.594	-	-	-
Employment – Student/Homemaker/Retired	-	-	-	-	8.831	-
Ethnicity - Malay	-	-	-	-	7.567	-
Education – PSLE and below	-	-	-	-	-	-12.616
Education- Secondary, O/N Levels	-	-	-	-	-	-4.518
Anxiety						
Age	-	-	-	-	-	0.930
Employment - Unemployed	-	-12.138	-	-	-	-
Employment – Student/Homemaker/Retired	-	-	-	-	19.975	-
Education – Secondary, O/N Levels	-3.735	-	-	-	-	-
Ethnicity - Indian	-	-	-	10.927	-	-
Depression						
Age	-	-	0.530	-	-	-
Employment - Unemployed	-	-	-6.998	-	-	-
Education – PSLE and below	-	-	-	-	-	-17.465
Education- Secondary, O/N Levels	-	-	-	-	-	-14.420
Gender - Female	-	8.677	-	-	-	-
Marital Status – Married	-	15.152	-	-	-	-
OCD						
Age	0.264	-	-	0.887	-	-
Age of onset	-0.273	-	-	-0.771	-	-
Schizophrenia						
Employment – Student/Homemaker/Retired	-	-18.639	-	-	-	-
Education- Secondary, O/N Levels	-	9.399	-	-	-	-
Education - University	-	20.101	-	-	-	-
Marital Status - Married	-	-11.381	-	-	-	-
Hospitalisation - Yes	-	10.679	-	-	-	-

All β reported are significant at $p < 0.05$.

Reference category: Employment = Employed; Education = A level/ Diploma; Gender = male; Ethnicity = Chinese; Marital Status = Never married; Hospitalisation = No

STROBE Statement—checklist of items that should be included in reports of observational 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 Page 1 (b) Provide in the abstract an informative and balanced summary of what was done and what was found Page 1
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Page 2-3
Objectives	3	State specific objectives, including any prespecified hypotheses Page 3
Methods		
Study design	4	Present key elements of study design early in the paper Page 4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection Page 4
Participants	6	<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants Page 4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable Page 4-6
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 Page 4-6
Bias	9	Describe any efforts to address potential sources of bias NA
Study size	10	Explain how the study size was arrived at NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why Page 6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding Page 6-7 (b) Describe any methods used to examine subgroups and interactions Page 6-7 (c) Explain how missing data were addressed Page 7 <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy NA (e) Describe any sensitivity analyses NA
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 NA (b) Give reasons for non-participation at each stage NA (c) Consider use of a flow diagram NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders Page 7 (b) Indicate number of participants with missing data for each variable of interest NA (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount) NA

Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time NA <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure NA <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures NA
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 Page 7-8 (b) Report category boundaries when continuous variables were categorized NA (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses NA
Discussion		
Key results	18	Summarise key results with reference to study objectives Page 8-11
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 Page 12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence Page 12
Generalisability	21	Discuss the generalisability (external validity) of the study results Page 12
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 Page 13

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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.