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Resilience and associative stigma among mental health professionals in a tertiary psychiatric hospital: a cross-sectional study in Singapore

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Abstract

Objectives: The mental health profession exposes healthcare workers to unique stressors such as associative stigma. Enhancing resilience, or the ability to "bounce back" from adversity, is found to be useful in reducing occupational stress and its negative effects. In view of the high burnout rates reported among mental health professionals, this study aimed to examine resilience in this group of professionals and to explore the association between resilience and associative stigma.

Design: Observational Study- Cross-sectional design

Setting: Tertiary psychiatry hospital in Singapore

Participants: The study was conducted among 470 mental health professionals (doctors, nurses and allied health professionals) working in the hospital.

Measures: Resilience was assessed using the Brief Resilience Scale (BRS) and participants completed questionnaires that examined associative stigma. Participants provided their sociodemographic information, length of service, and information on whether they knew of a close friend or family member who had a mental illness.

Results: Mean resilience score for the overall sample was 3.59. Older age (β =0.012, 95% CI 0.004 to 0.019, p=0.002) and having known a family member or close friend with a mental illness (β=0.155, 95% CI 0.023 to 0.287, p=0.021) predicted higher BRS score. Associative stigma remained significantly associated with resilience score after controlling for sociodemographic factors whereby higher associative stigma predicted lower resilience scores.

Conclusion: The present finding suggests that resilience building program among mental health workers should target those of the younger age group, and addressing the issue of associative stigma is essential.

Keywords: Resilience, Associative Stigma, Mental Health, Brief Resilience Scale

Strengths and limitations of this study

- One of the few studies that examined resilience among mental health professionals and the association between resilience and associative stigma.
- Relatively large sample size with data collected from professionals across various occupational roles strengthens the generalizability of findings.
- Cross-sectional nature of the study, however, limits the ability to draw conclusions on causal effects.

INTRODUCTION

Work in mental healthcare setting is fraught with stressors that are unique to this field(1). The nature of providing mental health services necessitates regular emotional and empathetic engagement with patients and their family members, and also occasional dealing with difficult and challenging behaviors of patients.(2) Prolonged exposure to such workplace stressors has an impact on the well-being of mental health professionals,(3, 4) and also compromises on their ability to provide quality care for patients.(5)

Stigma is a unique stressor for the field of mental health care.(1) Negative stereotypes of and prejudice against mental health professionals might develop as a result of their close relationship with mental health patients. This is often termed "associative stigma" wherein stigmatization is extended from the stigmatized patients to psychiatric professionals (6) and is based on affiliation with an individual with mental illness.(7) Such stigmatization is common among mental health professionals (6, 8, 9) and is associated with more depersonalization, higher emotional exhaustion, and poorer job satisfaction,(8) and these associations were found to be significant even in longitudinal analyses.(10) Studies have found that stigmatization affects self-esteem (11) and professional identities of psychiatric nurses,(12) and has bearing on career decisions and workplace retention.(13, 14)

There is an increased interest towards the construct of resilience as a positive trait that can buffer against the negative effects of such occupational stress.(15) Resilience or the "ability to bounce back or recover from stress" (16) is an important trait for professionals working in the mental health setting given the unique work stressors they face. Studies have found that having higher levels of resilience predicted lower psychological distress among mental health professionals.(17, 18) Additionally, Individual and contextual factors contribute to resilience building in individuals.(19, 20) In a literature review of resilience among health professionals, several factors that promoted resilience were identified, including maintaining a work-life balance, having a professional identity, and having social support from family and friends.(19)

Several studies have looked at the association between stigma and resilience. In a qualitative study by Crowe et al., the relationship between stigma and resilience was described as bidirectional: having resilience decreases the stigma experienced, while being stigmatized decreases one's resilience.(21) Resilience serves to counter the stigma experienced, and at the same time stigma impinges on the ability to develop resilience. Additionally, stigmatized individuals felt obliged to build on their resilience through social support and enhance their personal attribute, such as positive emotions and strengths, to counteract the stigma.(22) Resilience was found to be a coping technique endorsed by mental health professionals to manage associative stigma experiences.(9)

In view of the high level of stress and burnout that has been reported among mental health professionals in Singapore,(23) it is important to better understand resilience among this group of professionals. There has only been one study which explored resilience among healthcare professionals in public hospitals in Singapore.(24) This study found that more than 70% of the staff surveyed had encounters of workplace violence, and less than half of them performed positively on a resilience assessment. Staff who had mental health training were twice as likely to be resilient than those who did not attend such trainings. In view of their findings, the authors recommended the provision of mental health training for hospital staff to enhance their emotional resilience. Furthermore, mental health work is not viewed favorably by the public in Singapore; a study found that 67% of psychiatrists and 58% of psychiatric nurses surveyed had reported being laughed at for working with psychiatric patients.(25) Approximately 30% of them were discouraged by their family from engaging in this line of work. Given the considerable stigma surrounding mental illness and mental healthwork in Singapore (25, 26) which may extend to mental health care providers and act as a workplace stressor, it is thus important to also examine the association between associative stigma and resilience among mental health professionals. The present study therefore aimed to examine correlates of resilience and its association with associative stigma among mental health professionals working at the Institute of Mental Health (IMH), which is the only tertiary psychiatric hospital in Singapore.

METHODS

Study sample

In this cross-sectional study, participants were recruited using convenience sampling. Emails inviting participation in the research study were sent out to mental health professionals including doctors, nurses and allied health staff (psychologists, pharmacists, occupational therapists, physiotherapists, case managers, and medical social workers) working at IMH. A web link was provided in the email for staff to access the online survey which was administered using Questionpro, an online survey software. To be eligible, participants had to be aged 21 years and above and able to complete the online survey in English. Informed consent was obtained from the participants through the online portal and they were reimbursed upon completion of the survey. A total of 470 mental health professionals were recruited for the study between February to April 2016. The study was approved by the National Healthcare Group Domain Specific Review Board in Singapore.

Instruments

Resilience was measured using the Brief Resilience Scale (BRS), a 6-item instrument that assesses the ability of individuals to bounce back or recover from stress (16). Participants indicated the extent to which they agree with each statement on a 5-point scale (1= "*strongly disagree*" to 5= "*strongly agree*"). Examples of the items include "*I tend to bounce back quickly after hard times*" and "*I usually come through difficult times with little trouble*". Negatively worded statements were first reversed coded and a BRS score was derived from the mean of the six items. The scale was found to have a one-factor structure and had obtained good internal consistency (α= 0.80-0.91) and test-retest reliability (r= 0.62-0.69) in its validation study.(16) It has demonstrated an acceptable level of internal consistency in the current study sample, with a Cronbach's alpha of 0.76.

To examine associative stigma, measures of the construct were adapted from other studies (7, 8) and additional items were included based on our literature review as there is no standardized and well validated associative stigma instrument available (see Appendix for the full list of items).

For five of the items, participants responded to statements such as “People react negatively when they know I work in a mental care setting” and “I feel ashamed to be working in a mental health care setting” using a 5-point scale ranging from “never” to “all the time”.(8) Six additional items including “Most people think less of a person who works in a mental health care setting” and “Once they know a person works in a mental health care setting, most people will take their opinions less seriously”.(7) Participants rated their level of agreement with these statements on a 5-point scale from “strongly agree” to “strongly disagree”. Among the same study sample, latent class analysis was conducted to classify underlying responses of associative stigma into mutually exclusive latent classes.(27) Results revealed a three class model that showed the best fit and comprised no/low, moderate, and high associative stigma. These latent classes were used in the subsequent analysis. Detailed description of the findings for the latent class analysis has been reported elsewhere.(27)

Sociodemographic information including age, gender, ethnicity, marital status, educational attainment and residential status was collected. Participants provided information on whether they knew a close friend or family member who had a mental illness. Their occupation and length of service at IMH were also recorded.

Statistical Analysis

Statistical analyses were carried out using Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics were used to describe the sample characteristics where mean and standard deviations were calculated for continuous variables, and frequencies and percentages were calculated for categorical variables. Multiple linear regression was used to explore sociodemographic correlates of resilience. BRS mean scores were entered as the outcome variable in the regression model and predictors were sociodemographic variables including age, gender, ethnicity, marital status, educational attainment, residential status, occupation, length of service and whether they knew a family member or close friend who had a mental illness. Next, the association between resilience and associative stigma was examined at both univariate and multivariate level using linear

regression model, where resilience scores were treated as the outcome variable and associative stigma as the predictor with and without controlling for sociodemographic variables. All statistically significant results were set at *p*-value ≤0.05.

RESULTS

Eight cases were removed from the analysis due to pattern responses being detected or participants not fulfilling the inclusion criteria. Analysis was conducted on the remaining 462 cases and Table 1 presents the characteristics of the study sample. The majority of the participants were female (63.0%), Chinese (60.2%), Singapore Citizens (69.3%) and had been working in the mental health institute for 1-5 years (42.2%). Participants of this study were generally well educated, with the majority having a Bachelor degree (52.2%). There were 58 doctors, 201 nurses and 203 allied health staff in this sample. Among the allied health professionals recruited, there were 57 case managers, 47 medical social workers, 43 psychologists, 28 pharmacists, 25 occupational therapists and 3 physiotherapists.

Table 1. Sociodemographic characteristics of study sample (n=462)

		Mean	**SD**
Age		36.4	10.6
		n	**%**
Gender	Female	291	63.0
	Male	171	37.0
Ethnicity	Chinese	278	60.2
	Malay	36	7.8
	Indian	64	13.9
	Filipino	59	12.8
	Myanmar	16	3.5
	Others	9	2.0
Marital status	Never married	205	44.4
	Ever married	257	55.6
Educational attainment	Secondary/ITE/'O' Level	18	3.9
	A' Level/Diploma	49	10.6
	Bachelor	241	52.2
	Master & above	154	33.3
Residential status	Singapore Citizen	320	69.3
	Permanent Resident	59	12.8

Occupation	Non-resident	83	18.0
	Doctor	58	12.6
	Nurse	201	43.5
	Allied Health	203	43.9
Service duration in IMH	< 1 year	52	11.3
	1-5 years	195	42.2
	6-10 years	103	22.3
	> 10 years	112	24.2
Family/Close Friends diagnosed with mental illness	Yes	130	28.1
	No	332	71.9

Table 2 presents the mean resilience score for the overall sample and by occupation. The mean score for the overall sample was 3.59 (SD= 0.64), with doctors having the highest mean score (3.81; SD =0.62). Age was found to be significantly associated with resilience, where older age predicted higher resilience scores (Table 3; β =0.012, p=0.002). Additionally, those who had a family member or close friend with a mental illness, had significantly higher resilience scores (β=0.155, p=0.021) compared to those who did not.

Table 2. Resilience scores of overall sample and by occupation

	Mean	SD
Overall	3.59	0.64
Doctors	3.81	0.62
Nurses	3.46	0.61
Allied Health	3.65	0.65

Table 3. Correlates of resilience score

			95% Confidence Interval		
		β	Lower	Upper	P value
Age		0.012	0.004	0.019	**0.002**
Gender	Female	-0.081	-0.205	0.043	0.201
	Male	Reference			
Ethnicity	Chinese	0.078	-0.342	0.497	0.718
	Malay	0.118	-0.372	0.609	0.637
	Indian	0.047	-0.388	0.481	0.834

	Filipino	0.123	-0.335	0.580	0.600
	Myanmar	-0.106	-0.623	0.411	0.688
	Others	Reference			
Marital status	Never married	0.045	-0.085	0.176	0.495
	Ever married	Reference			
Educational attainment	Secondary/ITE/'O' Level	-0.313	-0.649	0.023	0.068
	A' Level/Diploma	-0.180	-0.430	0.070	0.158
	Bachelor	-0.135	-0.282	0.013	0.074
	Master & above	Reference			
Residential status	Singapore Citizen	0.101	-0.135	0.337	0.403
	Permanent Resident	-0.065	-0.303	0.172	0.591
	Non-resident	Ref			
Occupation	Doctor	0.037	-0.169	0.242	0.728
	Nurse	-0.062	-0.238	0.114	0.490
	Allied Health	Reference			
Service duration in IMH	< 1 year	0.038	-0.228	0.304	0.779
	1-5 years	0.114	-0.080	0.308	0.249
	6-10 years	-0.036	-0.227	0.155	0.712
	> 10 years	Reference			
Family/Close Friends diagnosed with mental illness	Yes	0.155	0.023	0.287	**0.021**
	No	Reference			

Mean resilience scores for no/low, moderate and high associative stigma groups were 3.76, 3.49 and 3.17 respectively. Resilience was significantly associated with associative stigma at both the univariate and multivariate level (Table 4). After adjusting for potential confounding variables, resilience remained significantly associated with associative stigma. Participants who experienced moderate (β =-0.271, p<0.001) and high associative stigma (β = -0.577, p<0.001) had lower resilience scores than those with no/low associative stigma.

Table 4. Resilience scores predicted by associative stigma class in adjusted and unadjusted regression model

		95% Confidence Interval		
	β	Lower	Upper	P value
Unadjusted model				
No/Low associative stigma	Reference			
Moderate associative stigma	-0.265	-0.384	-0.146	**<0.001**
High associative stigma	-0.590	-0.776	-0.404	**<0.001**
Adjusted model [a.]				
No/Low associative stigma	Reference			

Moderate associative stigma	-0.271	-0.390	-0.151	**<0.001**
High associative stigma	-0.577	-0.767	-0.386	**<0.001**

a. β coefficient was derived from multiple linear regression after adjusted for age, gender, ethnicity, marital status, education, residential status, occupation, duration of service and if they know of a family/close friend diagnosed with mental illness

DISCUSSION

The present study aimed to examine resilience and its association with associative stigma among mental health professionals. A positive correlation was found between age and resilience: resilience increases with age. Mental health professionals who personally knew of someone, a family member or close friend, being diagnosed with mental illness also had higher resilience score. Another main finding in this study was that individuals who experienced moderate and high levels of associative stigma had lower resilience scores.

Mental health professionals in this sample reported a moderate level of resilience with a sample mean of 3.59. To the best of our knowledge, no other study has assessed resilience among psychiatric staff using the BRS. This limits the ability to draw any definite conclusion with regards to the level of resilience in our study sample. A study on first-year pediatric and medicine-pediatric residents reported a sample mean of 3.80,(28) while another study on young health professionals and trainees reported a mean of 3.60 using the BRS.(29) These figures are higher than the mean obtained from this study – suggesting that mental health professionals have lower resilience. However the aforementioned studies were conducted in the western context and the lower resilience score may instead reflect cultural differences in the notion of resilience.(30) It is important to bear in mind the cultural dimensions when interpreting this difference. There are components of resilience that were found to be unqiue to eastern culture – religious faith and psychosocial gratitude (31) – which may not be adequately reflected. It is plausible that individuals with an eastern sociocultural background may score 'higher' when resilience is defined in these aspects. More research is therefore required among mental health professionals to obtain comparable data and to investigate possible cultural differences of resilience.

The positive association found between age and resilience is not a surprising finding. In a study that looked at psychological resilience, older adults reported greater resilience than younger adults in the domains of emotional regulation and problem solving, though younger adults had greater resilience that was related to social support.(32) With age comes a greater range of life experiences, through which individuals are more likely to have gained effective coping strategies and acquired useful resources that benefit their appraisal of stress, and hence building on their resilience. Given that the association between age and resilience found in the present study took into account the years of service at the hospital, it is likely that these resources extend beyond those which mental health professionals acquired within the organization to those available from their immediate surrounding, for example friends and family members.

Furthermore, having known someone who was diagnosed with mental illness was associated with higher resilience scores. It is plausible that having been on the recovery journey together with a friend or family with mental illness provided resources and skill set for this group of mental health professionals, in a way psychologically preparing them for whatever difficult times that may come. In times of adversity, they would be prepared to deal with the situation and able to "bounce back" from the hardships.

Doctors were found to have the highest mean resilience scores as compared to nursing staff and allied health professionals in this study (Table 2). However these differences were not significant when accounted for other sociodemographic variables (Table 3). This suggests that there may be a common pathway through which mental health professionals develop resilience,(19) possibly through institutional support, or that the similarities in the nature of work require comparable levels of resilience.

In this study, mental health professionals who experienced moderate and high associative stigma were found to have lower resilience. Having higher associative stigma meant that these individuals were more likely to endorse items such as "The mental health profession lacks a scientific

basis", "I am reluctant to tell people I work in a mental health care setting", and "Working in a mental health care setting does not require special skills". In view of these negative perceptions pertaining to their own occupation, it suggests that mental health professions with moderate and high associative stigma may not identify with their job and not find pride in the work they do. Several studies have pointed out the importance of professional identity in relation to building resilience among health care workers including nurses, psychologists and social workers.(19, 33, 34) It is plausible that the lack of professional identity among those with moderate and high associative stigma accounts for the lower level of resilience in them. What this implies is that when they are stigmatized by others for the work they do, given that they do not identify with their job and feel ashamed about it, it may be more difficult for them to overcome work stressors they encounter, and thus less able to recover from stress (i.e. lower resilience).

Another way to interpret the association between higher associative stigma and lower resilience is through the idea of social support.(35) Mental health professionals experiencing moderate and high associative stigma are unlikely to receive emotional support from those who stigmatized them, given the perpetuators of associative stigma are those who trivialize the work that mental health professionals do. Thus in times of stress, these mental health workers would have lesser resources to tap on to bounce back from adversity, as compared to those experiencing no/low associative stigma. Additionally, there is some evidence to suggest that social support may play a mediating role in the association between resilience and associative stigma. A study found that mental health patients with higher levels of social support had lower levels of internalized stigma, and this mediated the negative association between societal stigma and recovery.(36) It can thus be hypothesized that having social support reduces the impact of stigma on resilience through the pathway of internalized stigma. It would be interesting to test this hypothesized relationship among mental health professionals in future studies. It must be acknowledged that the relationship between stigma and resilience may be bidirectional.(21) Given that resilience has been used as a strategy to cope with associative stigma,(9) it is also possible that mental health professionals with

lower resilience were more likely to experience higher associative stigma. Having lower resilience could lead these professionals to be more sensitive and perceive being stigmatized more than those who had higher levels of resilience. These professionals might also, as a result of having lower resilience, have lesser ability to counter against the stigma they experienced, and therefore perceived experiencing a higher level of associative stigma.

It has been recommended that resilience building should be incorporated into training programs for healthcare professionals.(37) Given the unique stressors that psychiatric professionals encounter, it would be of practical use to implement resilience programs in this group as well, particularly in the workplace setting.(38) Findings from this study would suggest that such programs can be targeted at younger professionals as they have lower levels of resilience. Resilience programs for mental health professionals may need to address the issue of associative stigma, given that those who experienced higher associative stigma had lower resilience. These programs can seek to promote professional identity among staff, placing emphasis on the importance of their work and increasing public recognition of it, as efforts to counteract stigma and enhancing resilience. Knowing that stigmatized individuals take steps to draw support from others,(21, 22) resilience programs may also need to be augmented with a supportive network from within the organization that acts a resource for psychiatric staff.

Findings from this study should be interpreted in view of its limitations. The present study was cross-sectional in nature, thus causal relationship between resilience and associative stigma cannot be established. The study sample was based on convenient sampling from a single tertiary psychiatric hospital, and thus the findings may be specific to mental health professionals in this context. Differences among staff within the allied health group itself were not investigated and there could be variation in resilience and associative stigma that is related to their work tasks.

Conclusions

Resilience, or the ability to "bounce back" or recover from stress, is an important trait for mental health professionals in view of challenges in this field of work such as associative stigma. To the best of our knowledge, the present study is one of the first studies that has conducted a quantitative assessment of resilience among mental health professionals and examined its association with associative stigma. The mental health profession should look at ways to enhance resilience among mental health professionals, and addressing the issue of associative stigma might be one such approach.

Declarations

Competing interests

The authors declare they have no competing interests.

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 MS 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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Authors' contributions

SC interpreted the findings, wrote the draft manuscript and critically revised the article. LP conceived the study, wrote the protocol and provided inputs for the manuscript. EA performed the statistical analysis and assisted in the interpretation of the findings. QY and SAC critically reviewed the article and provided their inputs. MS reviewed the study protocol and critically reviewed the article. All authors have read and approved the final manuscript.

Patient and public involvement

There was no patient or public involvement in the study design, however, staff at IMH will be informed of the study findings.

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Associative Stigma

Please indicate how often you have experienced any of the following as a result of working in mental health care.

Response options: Never, Rarely, Sometimes, Often, All the time

1. People react negatively when they know I work in a mental health care setting
2. People make jokes about me for working in a mental health care setting
3. I feel ashamed to be working in a mental health care setting
4. I am reluctant to tell people I work in a mental health care setting
5. I have been treated unfairly by others when they learn I work in a mental health care setting

Please indicate how much you agree or disagree with the following statements.

Response options: Strongly agree, Slightly agree, Neither agree nor disagree, Slightly disagree, Strongly disagree

1. Most people think less of a person who works in that works a mental health care setting
2. Once they know a person works in a mental health care setting, most people will take their opinions less seriously
3. Mental health care contributes to the health of people, families, communities and society in unique and meaningful ways
4. The mental health profession lacks a scientific basis
5. Working in a mental health care setting does not require special skills
6. Mental health work is dangerous

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

	Item No	Recommendation	Page No in the Manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6-7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
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	6-7
Bias	9	Describe any efforts to address potential sources of bias	nil
Study size	10	Explain how the study size was arrived at	nil
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7-8
		(*b*) Describe any methods used to examine subgroups and interactions	7-8
		(*c*) Explain how missing data were addressed	8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	nil
		(*e*) Describe any sensitivity analyses	nil
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	nil
		(b) Give reasons for non-participation at each stage	nil
		(c) Consider use of a flow diagram	nil
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	nil

Outcome data	15*	Report numbers of outcome events or summary measures	nil
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	8-11
		(*b*) Report category boundaries when continuous variables were categorized	nil
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	nil
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	nil
Discussion			
Key results	18	Summarise key results with reference to study objectives	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	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
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	16

*Give information separately for exposed and unexposed groups.

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

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Resilience and associative stigma among mental health professionals in a tertiary psychiatric hospital: a cross-sectional study in Singapore

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Resilience and associative stigma among mental health professionals in a tertiary psychiatric hospital: a cross-sectional study in Singapore

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Abstract

Objectives: The mental health profession exposes healthcare workers to unique stressors such as associative stigma (stigmatization that is extended from the stigmatized patients to psychiatric professionals and is based on affiliation with an individual with mental illness). Enhancing resilience, or the ability to "bounce back" from adversity, is found to be useful in reducing occupational stress and its negative effects. In view of the high burnout rates reported among mental health professionals, this study aimed to examine resilience in this group of professionals and to explore the association between resilience and associative stigma.

Design: Observational Study- Cross-sectional design

Setting: Tertiary psychiatry hospital in Singapore

Participants: The study was conducted among 470 mental health professionals (doctors, nurses and allied health professionals) working in the hospital.

Measures: Resilience was assessed using the Brief Resilience Scale (BRS) and participants completed questionnaires that examined associative stigma. Participants provided their sociodemographic information, length of service, and information on whether they knew of a close friend or family member who had a mental illness.

Results: Mean resilience score for the overall sample was 3.59 (SD= 0.64). Older age (β =0.012, 95% CI 0.004 to 0.019, p=0.003) and having known a family member or close friend with a mental illness (β=0.155, 95% CI 0.019 to 0.290, p=0.025) predicted higher BRS score. Associative stigma remained significantly associated with resilience score after controlling for sociodemographic factors whereby higher associative stigma predicted lower resilience scores.

Conclusion: The present finding suggests that resilience building programs among mental health workers should target those of the younger age group, and that addressing the issue of associative stigma is essential.

Keywords: Resilience, Associative Stigma, Mental Health, Brief Resilience Scale

Strengths and limitations of this study

- One of the few studies that have examined resilience among mental health professionals and the association between resilience and associative stigma.
- Relatively large sample size with data collected from professionals across various occupational roles strengthens the generalizability of findings.
- Cross-sectional nature of the study, however, limits the ability to draw conclusions on causal effects.

INTRODUCTION

Work in mental healthcare setting is fraught with stressors that are unique to this field(1). The nature of providing mental health services necessitates regular emotional and empathetic engagement with patients and their family members, and also occasional dealing with difficult and challenging behaviors of patients.(2) Prolonged exposure to such workplace stressors has an impact on the well-being of mental health professionals,(3, 4) and also compromises on their ability to provide quality care for patients.(5)

Stigma is a unique stressor for the field of mental health care.(1) Negative stereotypes of and prejudice against mental health professionals might develop as a result of their close relationship with mental health patients. This is often termed “associative stigma” wherein stigmatization is extended from the stigmatized patients to psychiatric professionals (6) and is based on affiliation with an individual with mental illness.(7) Such stigmatization is common among mental health professionals (6, 8, 9) and is associated with more depersonalization, higher emotional exhaustion, and poorer job satisfaction,(8) and these associations were found to be significant even in longitudinal analyses.(10) Studies have found that stigmatization affects self-esteem (11) and professional identities of psychiatric nurses,(12) and has bearing on career decisions and workplace retention.(13, 14)

There is an increased interest towards the construct of resilience as a positive trait that can buffer against the negative effects of such occupational stress.(15) Resilience or the “ability to bounce back or recover from stress” (16) is an important trait for professionals working in the mental health setting given the unique work stressors they face. Studies have found that having higher levels of resilience predicted lower psychological distress among mental health professionals.(17, 18) Additionally, Individual and contextual factors contribute to resilience building in individuals.(19, 20) In a literature review of resilience among health professionals, several factors that promoted resilience were identified, including maintaining a work-life balance, having a professional identity, and having social support from family and friends.(19)

Several studies have looked at the association between stigma and resilience. In a qualitative study by Crowe et al., the relationship between stigma and resilience was described as bidirectional: having resilience decreases the stigma experienced, while being stigmatized decreases one's resilience.(21) Resilience serves to counter the stigma experienced, and at the same time stigma impinges on the ability to develop resilience. Additionally, stigmatized individuals felt obliged to build on their resilience through social support and enhance their personal attribute, such as positive emotions and strengths, to counteract the stigma.(22) Resilience was found to be a coping technique endorsed by mental health professionals to manage associative stigma experiences.(9)

In view of the high level of stress and burnout that has been reported among mental health professionals in Singapore,(23) it is important to better understand resilience among this group of professionals. There has only been one study which explored resilience among healthcare professionals in public hospitals in Singapore.(24) This study found that more than 70% of the staff surveyed had encounters of workplace violence, and less than half of them performed positively on a resilience assessment. Staff who had mental health training were twice as likely to be resilient than those who did not attend such trainings. Though the study did not indicate the type of mental health trainings that staff had attended, the authors noted that these can range from mental-health related talks to certified therapy programs that are aimed at enhancing "resistance, resiliency and recovery of health care workers affected by personal or workplace stress or critical incidents". In view of their findings, the authors recommended the provision of mental health and crisis intervention training for hospital staff to enhance their emotional resilience. Furthermore, mental health work is not viewed favorably by the public in Singapore; a study found that 67% of psychiatrists and 58% of psychiatric nurses surveyed had reported being laughed at for working with psychiatric patients.(25) Approximately 30% of them were discouraged by their family from engaging in this line of work. Interestingly, a U-shaped relationship has been proposed to describe the association between public stigma and familiarity; service providers may have higher public stigma towards mental illness owing to burden and associative stigma that comes alongside greater familiarity. (26) However, while

psychiatric professionals may be familiar with mental illness on the basis of their job, it is also possible that their familiarity stems from having personal contact with a friend or family member with mental health problems. Contact in a personal capacity may be different from that in a professional capacity in terms of evoking empathy or resilience when interacting with a family or friend with mental illness. It is hence important to account for any potential impact of having personal contact with an individual with mental illness when exploring the relationship of associative stigma with other concepts. Given the considerable stigma surrounding mental illness and mental healthwork in Singapore (25, 27) which may extend to mental health care providers and act as a workplace stressor, it is thus important to also examine the association between associative stigma and resilience among mental health professionals. The present study therefore aimed to examine correlates of resilience and its association with associative stigma among mental health professionals working at the Institute of Mental Health (IMH), which is the only tertiary psychiatric hospital in Singapore.

METHODS

Study sample

In this cross-sectional study, participants were recruited using convenience sampling. Emails inviting participation in the research study were sent out to mental health professionals including doctors, nurses and allied health staff (psychologists, pharmacists, occupational therapists, physiotherapists, case managers, and medical social workers) working at IMH. A web link was provided in the email for staff to access the online survey which was administered using Questionpro, an online survey software. To be eligible, participants had to be aged 21 years and above and able to complete the online survey in English. Informed consent was obtained from the participants through the online portal and they were reimbursed upon completion of the survey. A total of 470 mental health professionals were recruited for the study between February to April 2016. The study was approved by the National Healthcare Group Domain Specific Review Board in Singapore.

Instruments

Resilience was measured using the Brief Resilience Scale (BRS), a 6-item instrument that assesses the ability of individuals to bounce back or recover from stress (16). Participants indicated the extent to which they agree with each statement on a 5-point scale (1= "*strongly disagree*" to 5= "*strongly agree*"). Examples of the items include "*I tend to bounce back quickly after hard times*" and "*I usually come through difficult times with little trouble*". Negatively worded statements were first reversed coded and a BRS score was derived from the mean of the six items. The scale was found to have a one-factor structure and had obtained good internal consistency (α= 0.80-0.91) and test-retest reliability (r= 0.62-0.69) in its validation study.(16) It has demonstrated an acceptable level of internal consistency in the current study sample, with a Cronbach's alpha of 0.76.

To examine associative stigma, measures of the construct were adapted from other studies (7, 8) and additional items were included based on our literature review as at the time the study was conducted, there was no standardized and well validated associative stigma instrument available (see Appendix for the full list of items). For five of the items, participants responded to statements such as "People react negatively when they know I work in a mental care setting" and "I feel ashamed to be working in a mental health care setting" using a 5-point scale ranging from "never" to "all the time".(8) Six additional items including "Most people think less of a person who works in a mental health care setting" and "Once they know a person works in a mental health care setting, most people will take their opinions less seriously".(7) Participants rated their level of agreement with these statements on a 5-point scale from "strongly agree" to "strongly disagree". Among the same study sample, latent class analysis was conducted to classify underlying responses of associative stigma into mutually exclusive latent classes.(28) Results revealed a three class model that showed the best fit and comprised no/low, moderate, and high associative stigma. These latent classes were used in the subsequent analysis. Detailed description of the findings for the latent class analysis has been reported elsewhere.(28)

Sociodemographic information including age, gender, ethnicity, marital status, educational attainment and residential status was collected. Participants provided information on whether they knew a close friend or family member who had a mental illness. Their occupation and length of service at IMH were also recorded.

Statistical Analysis

Statistical analyses were carried out using Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics were used to describe the sample characteristics where mean and standard deviations were calculated for continuous variables, and frequencies and percentages were calculated for categorical variables. One-way ANOVA test with post-hoc Bonferroni correction was conducted to examine group differences in BRS mean scores by occupational group. Multiple linear regression was used to explore sociodemographic correlates of resilience. BRS mean scores were entered as the outcome variable in the regression model and predictors were sociodemographic variables including age, gender, ethnicity, marital status, educational attainment, residential status, occupation, length of service and whether they knew a family member or close friend who had a mental illness. Next, the association between resilience and associative stigma was examined at both univariate and multivariate level using linear regression model, where resilience scores were treated as the outcome variable and associative stigma as the predictor with and without controlling for sociodemographic variables. All statistically significant results were set at p-value ≤0.05.

RESULTS

Eight cases were removed from the analysis due to pattern responses being detected or participants not fulfilling the inclusion criteria. Analysis was conducted on the remaining 462 cases and Table 1 presents the characteristics of the study sample. The majority of the participants were female (63.0%), Chinese (60.2%), Singapore Citizens (69.3%) and had been working at IMH for 1-5 years (42.2%). Participants of this study were generally well educated, with the majority having a Bachelor degree (52.2%). There were 58 doctors, 201 nurses and 203 allied health staff in this

sample. Among the allied health professionals recruited, there were 57 case managers, 47 medical social workers, 43 psychologists, 28 pharmacists, 25 occupational therapists and 3 physiotherapists.

Table 1. Sociodemographic characteristics of study sample (n=462)

		Mean	SD
Age		36.4	10.6
		n	**%**
Gender	Female	291	63.0
	Male	171	37.0
Ethnicity	Chinese	278	60.2
	Malay	36	7.8
	Indian	64	13.9
	Filipino	59	12.8
	Myanmar	16	3.5
	Others	9	2.0
Marital status	Never married	205	44.4
	Ever married	257	55.6
Educational attainment	Secondary/'O/N' Level[a.]	18	3.9
	'A' Level[b.]/Diploma	49	10.6
	Bachelor	241	52.2
	Master & above	154	33.3
Residential status	Singapore Citizen	320	69.3
	Permanent Resident	59	12.8
	Non-resident	83	18.0
Occupation	Doctor	58	12.6
	Nurse	201	43.5
	Allied Health	203	43.9
Service duration in IMH	< 1 year	52	11.3
	1-5 years	195	42.2
	6-10 years	103	22.3
	> 10 years	112	24.2
Family/Close Friends diagnosed with mental illness	Yes	130	28.1
	No	332	71.9

a. Singapore-Cambridge GCE O-Level and N-Level examinations taken after four years of secondary school education.
b. Singapore-Cambridge GCE A-Level examination taken upon completion of pre-university education.

Table 2 presents the mean resilience score for the overall sample and by occupation. The mean score for the overall sample was 3.59 (SD= 0.64) and statistically significant group differences were observed from the one-way ANOVA results [F(2, 452)= 8.681, p<0.001]. Post-hoc test using Bonferroni correction found that the mean score of nurses was significantly lower than that of doctors (p=0.001) and allied health staff (p=0.009). Results from the multiple linear regression showed that age was significantly associated with resilience, where older age predicted higher resilience scores (Table 3; β =0.012, p=0.003). Additionally, those who had a family member or close friend with a mental illness, had significantly higher resilience scores (β=0.155, p=0.025) compared to those who did not.

Table 2. Resilience scores of overall sample and by occupation

	Mean	SD	P value
Overall	3.59	0.64	**<0.001**
Doctors	3.81	0.62	
Nurses	3.46	0.61	
Allied Health	3.65	0.65	

Table 3. Correlates of resilience score

			95% Confidence Interval		
		β	Lower	Upper	P value
Age		0.012	0.004	0.019	**0.003**
Gender	Female	-0.081	-0.208	0.046	0.212
	Male	Reference			
Ethnicity	Malay	0.041	-0.216	0.297	0.756
	Indian	-0.031	-0.223	0.161	0.751
	Filipino	0.045	-0.240	0.330	0.756
	Myanmar	-0.184	-0.561	0.194	0.340
	Others	-0.078	-0.508	0.353	0.724
	Chinese	Reference			
Marital status	Never married	0.045	-0.088	0.179	0.505
	Ever married	Reference			
Educational attainment	Secondary/'O/N' Level[a.]	-0.313	-0.658	0.032	0.075
	'A' Level [b.]/Diploma	-0.180	-0.437	0.076	0.168
	Bachelor	-0.135	-0.286	0.017	0.082

	Master & above	Reference			
Residential status	Singapore Citizen	0.101	-0.141	0.343	0.414
	Permanent Resident	-0.065	-0.309	0.179	0.600
	Non-resident	Reference			
Occupation	Doctor	0.037	-0.175	0.248	0.734
	Nurse	-0.062	-0.242	0.118	0.500
	Allied Health	Reference			
Service duration in IMH	< 1 year	0.038	-0.235	0.311	0.784
	1-5 years	0.114	-0.085	0.313	0.260
	6-10 years	-0.036	-0.232	0.160	0.718
	> 10 years	Reference			
Family/Close Friends diagnosed with mental illness	Yes	0.155	0.019	0.290	**0.025**
	No	Reference			

a. Singapore-Cambridge GCE O-Level and N-Level examinations taken after four years of secondary school education.
b. Singapore-Cambridge GCE A-Level examination taken upon completion of pre-university education.

Mean resilience scores for no/low, moderate and high associative stigma groups were 3.76, 3.49 and 3.17 respectively. Resilience was significantly associated with associative stigma at both the univariate and multivariate level (Table 4). After adjusting for potential confounding variables, resilience remained significantly associated with associative stigma. Participants who experienced moderate (β =-0.271, p<0.001) and high associative stigma (β = -0.577, p<0.001) had lower resilience scores than those with no/low associative stigma.

Table 4. Resilience scores predicted by associative stigma class in adjusted and unadjusted regression model

		95% Confidence Interval		
	β	Lower	Upper	P value
Unadjusted model				
No/Low associative stigma	Reference			
Moderate associative stigma	-0.265	-0.384	-0.146	**<0.001**
High associative stigma	-0.590	-0.776	-0.404	**<0.001**
Adjusted model [a.]				
No/Low associative stigma	Reference			
Moderate associative stigma	-0.271	-0.390	-0.151	**<0.001**
High associative stigma	-0.577	-0.767	-0.386	**<0.001**

a. β coefficient was derived from multiple linear regression after adjusted for age, gender, ethnicity, marital status, education, residential status, occupation, duration of service and if they know of a family/close friend diagnosed with mental illness

DISCUSSION

The present study aimed to examine resilience and its association with associative stigma among mental health professionals. A positive correlation was found between age and resilience: resilience increases with age. Mental health professionals who personally knew of someone, a family member or close friend, diagnosed with mental illness also had higher resilience score. Another main finding in this study was that individuals who experienced moderate and high levels of associative stigma had lower resilience scores.

Mental health professionals in this sample reported a moderate level of resilience with a sample mean of 3.59. To the best of our knowledge, no other study has assessed resilience among psychiatric staff using the BRS. This limits the ability to draw any definite conclusion with regards to the level of resilience in our study sample. A study on first-year pediatric and medicine-pediatric residents reported a sample mean of 3.80,(29) while another study on young health professionals and trainees reported a mean of 3.60 using the BRS.(30) These figures are higher than the mean obtained from this study – suggesting that mental health professionals have lower resilience. However the aforementioned studies were conducted in the western context and the lower resilience score may instead reflect cultural differences in the notion of resilience.(31) It is important to bear in mind the cultural dimensions when interpreting this difference. There are components of resilience that were found to be unqiue to eastern culture – religious faith and psychosocial gratitude (32) – which may not be adequately reflected. It is plausible that individuals with an eastern sociocultural background may score 'higher' when resilience is defined in these aspects. More research is therefore required among mental health professionals to obtain comparable data and to investigate possible cultural differences of resilience.

The positive association found between age and resilience is not a surprising finding. In a study that looked at psychological resilience, older adults reported greater resilience than younger adults in the domains of emotional regulation and problem solving, though younger adults had greater resilience that was related to social support.(33) With age comes a greater range of life experiences, through which individuals are more likely to have gained effective coping strategies and acquired useful resources that benefit their appraisal of stress, and hence building on their resilience. Given that the association between age and resilience found in the present study took into account the years of service at the hospital, it is likely that these resources extend beyond those which mental health professionals acquired within the organization to those available from their immediate surrounding, for example friends and family members.

Furthermore, having known someone who was diagnosed with mental illness was associated with higher resilience scores. It is plausible that having been on the recovery journey together with a friend or family with mental illness provided resources and skill set for this group of mental health professionals, in a way psychologically preparing them for whatever difficult times that may come. In times of adversity, they would be prepared to deal with the situation and able to "bounce back" from the hardships.

Doctors were found to have the highest mean resilience scores as compared to nursing staff and allied health professionals in this study (Table 2). However these differences were not significant when accounted for other sociodemographic variables (Table 3). This suggests that there may be a common pathway through which mental health professionals develop resilience,(19) possibly through institutional support, or that the similarities in the nature of work require comparable levels of resilience.

In this study, mental health professionals who experienced moderate and high associative stigma were found to have lower resilience. Having higher associative stigma meant that these individuals were more likely to endorse items such as "The mental health profession lacks a scientific

basis" and "People react negatively when they know I work in a mental healthcare setting". In view of these negative perceptions pertaining to their own occupation, it suggests that mental health professions with moderate and high associative stigma may not identify with their job and not find pride in the work they do. Several studies have pointed out the importance of professional identity in relation to building resilience among health care workers including nurses, psychologists and social workers.(19, 34, 35) It is plausible that the lack of professional identity among those with moderate and high associative stigma accounts for the lower level of resilience in them. What this implies is that when they are stigmatized by others for the work they do, given that they do not identify with their job and feel ashamed about it, it may be more difficult for them to overcome work stressors they encounter, and thus less able to recover from stress (i.e. lower resilience).

Another way to interpret the association between higher associative stigma and lower resilience is through the idea of social support.(36) Mental health professionals experiencing moderate and high associative stigma are unlikely to receive emotional support from those who stigmatized them, given the perpetuators of associative stigma are those who trivialize the work that mental health professionals do. Thus in times of stress, these mental health workers would have lesser resources to tap on to bounce back from adversity, as compared to those experiencing no/low associative stigma. Additionally, there is some evidence to suggest that social support may play a mediating role in the association between resilience and associative stigma. A study found that mental health patients with higher levels of social support had lower levels of internalized stigma, and this mediated the negative association between societal stigma and recovery.(37) It can thus be hypothesized that having social support reduces the impact of stigma on resilience through the pathway of internalized stigma. It would be interesting to test this hypothesized relationship among mental health professionals in future studies. It must be acknowledged that the relationship between stigma and resilience may be bidirectional.(21) Given that resilience has been used as a strategy to cope with associative stigma,(9) it is also possible that mental health professionals with lower resilience were more likely to experience higher associative stigma. Having lower resilience

could lead these professionals to be more sensitive and perceive being stigmatized more than those who had higher levels of resilience. These professionals might also, as a result of having lower resilience, have lesser ability to counter against the stigma they experienced, and therefore perceived experiencing a higher level of associative stigma. Future longitudinal studies would be needed to parse out the bidirectional nature of resilience and associative stigma.

It has been recommended that resilience building should be incorporated into training programs for healthcare professionals.(38) Given the unique stressors that psychiatric professionals encounter, it would be of practical use to implement resilience programs in this group as well, particularly in the workplace setting.(39) Findings from this study would suggest that such programs can be targeted at younger professionals as they have lower levels of resilience. Resilience programs for mental health professionals may need to address the issue of associative stigma, given that those who experienced higher associative stigma had lower resilience. These programs can seek to promote professional identity among staff, placing emphasis on the importance of their work and increasing public recognition of it, as efforts to counteract stigma and enhancing resilience. Such workplace programs may also serve to mitigate the negative effects of associative stigma among mental health professionals on service users' satisfaction and self-stigma that has been identified in previous research. (8) Knowing that stigmatized individuals take steps to draw support from others,(21, 22) resilience programs may also need to be augmented with a supportive network from within the organization that acts a resource for psychiatric staff.

Findings from this study should be interpreted in view of its limitations. The present study was cross-sectional in nature, thus causal relationship between resilience and associative stigma cannot be established. The study sample was based on convenient sampling from a single tertiary psychiatric hospital, and thus the findings may be specific to mental health professionals in this context. Differences among staff within the allied health group itself were not investigated and there could be variation in resilience and associative stigma that is related to their work tasks.

Conclusions

Resilience, or the ability to "bounce back" or recover from stress, is an important trait for mental health professionals in view of challenges in this field of work such as associative stigma. To the best of our knowledge, the present study is one of the first studies that has conducted a quantitative assessment of resilience among mental health professionals and examined its association with associative stigma. The mental health profession should look at ways to enhance resilience among mental health professionals, and addressing the issue of associative stigma might be one such approach.

Declarations

Competing interests

The authors declare they have no competing interests.

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 MS 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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Authors' contributions

SC interpreted the findings, wrote the draft manuscript and critically revised the article. LP conceived the study, wrote the protocol and provided inputs for the manuscript. EA performed the statistical analysis and assisted in the interpretation of the findings. QY and SAC critically reviewed the article and provided their inputs. MS reviewed the study protocol and critically reviewed the article. All authors have read and approved the final manuscript.

Patient and public involvement

There was no patient or public involvement in the study design, however, staff at IMH will be informed of the study findings.

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Associative Stigma

Please indicate how often you have experienced any of the following as a result of working in mental health care.

Response options: Never, Rarely, Sometimes, Often, All the time

1. People react negatively when they know I work in a mental health care setting
2. People make jokes about me for working in a mental health care setting
3. I feel ashamed to be working in a mental health care setting
4. I am reluctant to tell people I work in a mental health care setting
5. I have been treated unfairly by others when they learn I work in a mental health care setting

Please indicate how much you agree or disagree with the following statements.

Response options: Strongly agree, Slightly agree, Neither agree nor disagree, Slightly disagree, Strongly disagree

1. Most people think less of a person who works in that works a mental health care setting
2. Once they know a person works in a mental health care setting, most people will take their opinions less seriously
3. Mental health care contributes to the health of people, families, communities and society in unique and meaningful ways
4. The mental health profession lacks a scientific basis
5. Working in a mental health care setting does not require special skills
6. Mental health work is dangerous

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

	Item No	Recommendation	Page No in the Manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6-7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
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	6-7
Bias	9	Describe any efforts to address potential sources of bias	nil
Study size	10	Explain how the study size was arrived at	nil
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	nil
		(*e*) Describe any sensitivity analyses	nil
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	nil
		(b) Give reasons for non-participation at each stage	nil
		(c) Consider use of a flow diagram	nil
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	nil

Outcome data	15*	Report numbers of outcome events or summary measures	nil
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	8-11
		(*b*) Report category boundaries when continuous variables were categorized	nil
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	nil
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	nil
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
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	15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
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	17

*Give information separately for exposed and unexposed groups.

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