# A Simple Interview-format Screening Measure for Disaster Mental Health: An instrument newly developed after the 1995 Great Hanshin Earthquake in Japan
## - *The Screening Questionnaire for Disaster Mental Health (SQD)*

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   **Psychological intervention after a large-scale disaster requires an efficient and practical measure.   Using self-reporting scale imposes certain limitations, especially when dealing with the elderly.   It is also required that non-experts in mental health should be able to use the screening device, so that it can be easily incorporated into any local level post-disaster health service. To satisfy such requirements, we developed a simple interview-format measure, the Screening Questionnaire for Disaster Mental Health (SQD), which screens for posttraumatic stress disorder (PTSD) and depression. In this article, its validity and usefulness was analyzed.   Data were obtained from 68 individuals living in reconstruction housing five years after the 1995 Great Hanshin Earthquake.   Applying the Clinician Administered PTSD Scale (CAPS) and the Structured Clinical Interview for DSM-III-R Major Depression Section (SCID) as gold standards, the areas under the Receiver Operating Characteristic curves (ROC-AUC) and stratum-specific likelihood ratios (SSLR) as statistical indices were calculated. The ROC-AUC was 0.91 (95%CI: 0.83-0.99) for diagnosing PTSD, and 0.94 (0.88-1.01) for diagnosing depression.   Three strata for PTSD and 2 strata for depression were obtained, and SSLR for each stratum was 0.10 (95%CI: 0.02-0.45), 1.05 (0.37-3.00), 9.64 (3.77-24.69) for PTSD, and 0.3 (0.1-1.0), 7.8 (3.2-18.7) for depression.   The results showed that this screening measure had good validity, especially for PTSD.**

   The 1995 Great Hanshin Earthquake, which devastated Kobe and its neighboring area, was an epicentral earthquake of magnitude 7.3, causing approximately 6,400 deaths, 43,000 injuries, and 510,000 damaged homes.   Because the downtown of Kobe city was totally damaged, many senior citizens who lived in old houses were severely affected.   Among the deaths caused by this earthquake, including deaths indirectly related to the incident, approximately 60% were citizens over 60 years old.   Many senior citizens who lost their houses had to stay in the shelters for months.   Moreover, during the long reconstruction process, senior citizens were gradually left behind because of their poor ability to rebuild their lives.   They had to live in the temporally housing for years.   It was obvious that they were the most vulnerable population to have mental health problems. Therefore, it became critical to set up long-term support system, which targeted the elderly survivors as the first priority.

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A support program of this nature requires the screening to be simple and not to work against spontaneous communication. A non-clinical atmosphere is also indispensable in order to provide services to survivors, who often have fear of becoming stigmatized further by a diagnosis of a mental disorder as a result of disclosing one's sufferings. However, these non-specialized services tended to overlook mental health problems, and it was not possible to detect the survivors' psychological sufferings satisfactorily. In fact, among the cases which were diagnosed with posttraumatic stress disorder (PTSD) after a clinical interview was conducted, only one third had previously been recognized as suffering from PTSD symptoms by the ongoing on-site support program [14]. Furthermore, although the validated questionnaire like Impact of Event Scale Revised of Japanese version (IES-R-J) [2, 28] was already available at that time, a large number of senior citizens had difficulty responding to the self-reporting check list. Given these limitations, in order to improve the accuracy and efficiency of assessment technique, we developed an interview-format screening measure composed of simple phrases, which can be implemented in brief interviews. This article discusses the validity of this new screening measure.

**SQD: Screening Questionnaire for Disaster Mental Health.** To develop the new screening questionnaire, the Post-Traumatic Symptom Scale (PTSS-10) [21, 27] as the base instrument was used. Answers are dichotomous, either "yes" or "no". Six items from PTSS-10 that match DSM-IV [1] diagnostic criteria for PTSD were selected. These items are: "nightmares about the accident or disaster" (B-2), "fears when approaching the place of the accident or situations that remind me of it" (B-4), "tendencies to withdraw myself from others" (C-2), "difficulty with sleep" (D-1), "irritable feelings" (D-2), and "tendencies to jump or startle at sudden noises or unexpected movements" (D-5). In addition, 3 other items from DSM-IV criteria for PTSD were included: "recurrent and intrusive distressing recollections of the event" (B-1), "efforts to avoid thoughts, feelings, or conversations associated with the trauma" (C-1), and "markedly diminished interest or participation in significant activities" (C-4). In total, 9 questions, with 3 questions from each of the 3 subscales of PTSD diagnosis (i.e., B: intrusion, C: avoidance, and D: hyperarousal), were selected. Moreover, 3 items (A-1: depressed mood, A-3: decrease in appetite, and A-6: fatigue or loss of energy nearly everyday) from DSM-IV's diagnostic criteria for Major Depressive Episode (MDE) were added in order to screen for depression at the same time. It was because many prior studies report high prevalence of depression coexisting with PTSD [11, 17, 19]. Of the other diagnostic criteria for MDE, i.e., A-2: diminished interest, A-4: insomnia, and A-5: psychomotor agitation, were considered to match C-4, D-1, and D-2 from the diagnostic criteria for PTSD. Thus, 9 items on PTSD (B-1, 2, 4; C-1, 2, 4; D-1, 2, 5) and 6 items on MDE (A-1 through 6) were combined to create an easy-to-implement screening measure with a total of 12 questions. This new screening instrument is called the Screening Questionnaire for Disaster Mental Health (SQD) (see *Appendix 1*). The English version of SQD was translated from Japanese by a clinical psychologist with high proficient in English and was later checked by a native speaker. In the appendix and tables, the subscales on PTSD (9 items) and depression (6 items) are shown separately as SQD-P and SQD-D (note: these subscales will be presented as such from here on.) along with the whole scale, SQD.

## MATERIALS AND METHODS

**Participants**. One of the reconstruction housing complexes consisted of 1,156 households and was located in a newly developed residential community, which was constructed in a hilly area approximately 20 km northwest of the center of Kobe city. In

this complex, public health nurses were offering ongoing health consultation sessions, as well as home visits whenever a survivor was suspected of suffering from some psychological and/or physical problem.   In 1999, these public health nurses were asked to screen 127 survivors using SQD during their home visits.   The feedback from nurses on the utility of SQD was favorable.   With the help of the local public health office, the same survivors were conducted to participate in an interview study in order to verify the validity of the screening measure.   Seventy-four survivors (58.3%) agreed to participate in the study.   The study was conducted by visiting the homes of the subjects during the four months between November 2000 and February 2001.   Of the 74 people, four individuals could not carry out the interview, and two individuals showed clear signs of memory and orientation problems. These six data were excluded because they would impose a risk of reducing the validity of the scale.   Therefore, data from 68 individuals, which consisted of 15 males (22.1%, average age $71.2 \pm 5.7$) and 53 females (77.9%, $71.9\pm5.0$)) were used for analysis.

The interview consisted of demographic profiling, conditions of their living after the disaster, also the presence or absence of any subjective suffering at the time of the disaster (i.e., assessment of the symptoms from Criterion A of DSM-IV). Two structured interview to diagnose PTSD and major depression, the Japanese-language version of the Clinician Administered PTSD Scale (CAPS) [4], the Major Depression section of the Japanese-language version of the Structured Clinical Interview for DSM-III-R (SCID) [25] were conducted. At the time the study was conducted, the Japanese version of SCID for DSM-IV was not yet available. And SQD and IES-R-J to screen the psychological symptoms were used.   On average, it took two to three hours for each interview.   The interviews were conducted by psychiatrists, clinical psychologists, and mental health social workers, all of whom had experience working with disaster survivors and were given thorough training in advance.   The CAPS was carried out by psychiatrists in all cases.

The ethical aspect of the study was approved by the research planning committee of Hyogo Research Institute for Ageless Society.   The objectives and procedure of this study, as well as the voluntary nature of their participation, were explained orally to the participants before each interview, and their written consent was obtained.

**Statistical methodology**.   SPSS 13.0J for Windows [26] was used for data analysis. Except for the sum distribution of SQD-P, which was found to be normal, those of the other scales used in the study were not normally distributed.   Therefore, a non-parametric method was used for statistical testing.   The Kruskal-Wallis Test and the Mann-Whitney Test were used to evaluate the differences in the median, and the Spearman's correlation coefficient was used for correlation analysis.   With regard to SQD's convergent validity, those of SQD-P and SQD-D were analyzed by using the results from CAPS and SCID as gold standards respectively, and by calculating their areas under the Receiver Operating Characteristic curves (ROC-AUC) and stratum-specific likelihood ratios (SSLR) [10, 18, 23]. Likewise for IES-R, CAPS was used as a gold standard to calculate its ROC-AUC and SSLR. Ninety-five percent confidence intervals (95% CI) of SSLR, and the post-test probability from the pre-test probability & SSLR, were calculated using the spreadsheet obtained from the website of the Evidence-Based Psychiatry Center [7].

## RESULTS

**Diagnosis by CAPS and SCID, and statistical results of screening measures.**   As shown in *Table 1*, 14 subjects (20.6%) were diagnosed to have current PTSD even after five years since the disaster.   Eleven individuals were diagnosed as suffering from partial PTSD if they met all of the B (intrusion) diagnostic criterion symptoms in DSM-IV as well as either

C (avoidance) or D (hyperarousal) criterion [2, 24]. When adding the number of partial PTSD and the current PTSD cases, 36.8% of the participants can be considered as "survivors with PTSD symptoms as a clinical concern" [2]. Scores of SQD were the summation of each item calculated by counting "yes" as 1 and "no" as 0, treating the scale as an interval scale. Scores of different scales (SQD, SQD-P, IES-R, CAPS) were found to be statistically significantly different among groups, i.e., current PTSD, partial PTSD, and no PTSD diagnoses. With regard to depression, four subjects (6.1%) were diagnosed by SCID as suffering from present major depressive episode. The results from the total score of SQD, and those from the subscale SQD-D, showed statistically significant differences between one group with diagnosis and another without.

**Table 1.** Current PTSD diagnosis by CAPS, Major Depressive Episode (MDE) diagnosis by SCID, and median scores of SQD, SQD-P, IES-R, CAPS and SQD-D with 25th to 75th percentile inter-quartile range

| | | | Current PTSD diagnosis by CAPS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ( + ) | | **Partial**[a] | | ( - ) | | Total | |
| | | N | 14 | | 11 | | 43 | | 68 | |
| | | % | 20.6% | | 16.2% | | 63.2% | | 100.0% | |
| | | | | | | | | | $\chi^{2\,b}$ | p-value |
| Median | (25th to75th percentile inter-quartile range) | SQD | 9.0 | ( 6.00-10.00) | 6.0 | ( 3.00- 8.00) | 2.0 | (1.00- 3.00) | 31.71 | p<.01 |
| | | SQD-P | 7.0 | ( 5.00- 8.00) | 4.0 | ( 2.00- 7.00) | 2.0 | (1.00- 3.00) | 31.82 | p<.01 |
| | | IES-R | 34.0 | (28.50-42.50) | 17.0 | (12.00-24.00) | 6.0 | (3.00-13.00) | 33.63 | p<.01 |
| | | CAPS | 52.0 | (42.75-61.50) | 22.0 | (18.00-29.00) | 5.0 | ( .00-13.00) | 46.95 | p<.01 |

| | | | MDE diagnosis by SCID | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ( + ) | | ( - ) | | Total | |
| | | N | 4 | | 62 | | 66 | |
| | | % | 6.1% | | 93.9% | | 100.0% | |
| | | | | | | | U[c] | p-value |
| Median | (25th to75th percentile inter-quartile range) | SQD | 10.0 | (7.75-10.75) | 3.0 (1.00-6.00) | | 14.00 | p<.01 |
| | | SQD-D | 5.0 | (4.25- 5.75) | 1.0 ( .00-3.00) | | 14.00 | p<.01 |

[a]: Cases which fulfilled the DSM-IV criterion for re-experiencing, along with either the DSM-IV criterion for avoidance or the DSM-IV criterion for hyperarousal.
[b]: Kruskal-Wallis Test    [c]: Mann-Whitney Test

**Reliability and Validity of SQD**. Cronbach's alpha coefficient of each scale was as follows: SQD: 0.83, SQD-P: 0.77, and SQD-D: 0.74, all exceeding 0.7. The alpha coefficient of IES-R was 0.92. With regard to the diagnosis of PTSD, Spearman's correlation coefficients between the scores of SQD-P and those of IES-R, and those of CAPS were 0.77 (p<.01) and 0.79 (p<.01) respectively, indicating high concurrent validity. Furthermore, results of an analysis of SQD's convergent validity, by using ROC-AUC and SSLR as criteria, are shown in *Figure 1* and *Table 2*.

**Figure 1.** ROC curves of (a) SQD-P, IES-R, and (b) SQD-D with values of ROC-AUC



(a) SQD-P and IES-R

(b) SQD-D
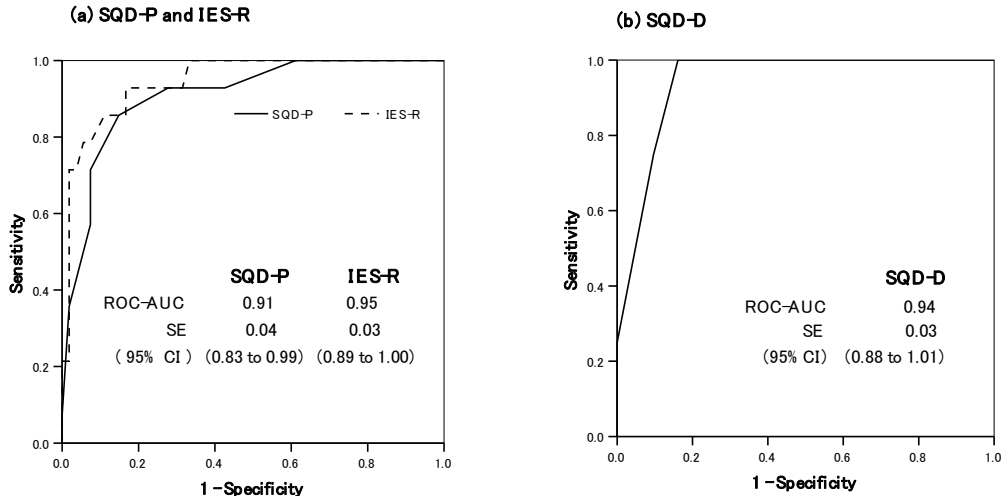
**Table 2.** SSLR of SQD-P, IES-R and SQD-D with 95% Confidence Interval

| | PTSD by CAPS (N) | | SSLR | (95% CI) |
|---|---|---|---|---|
| | ( + ) | ( - ) | | |
| **SQD-P score** | | | | |
| 0-3 | 1 | 39 | 0.10 | (0.02 – 0.45) |
| 4-5 | 3 | 11 | 1.05 | (0.37 – 3.00) |
| 6-9 | 10 | 4 | 9.64 | (3.77 – 24.69) |
| **IES-R score** | | | | |
| 0-19 | 1 | 45 | 0.09 | (0.02 - 0.39) |
| 20-24 | 2 | 5 | 1.54 | (0.39 – 6.12) |
| 25-88 | 11 | 4 | 10.61 | (4.21 – 26.70) |
| | Depression by SCID (N) | | SSLR | (95% CI) |
| | ( + ) | ( - ) | | |
| **SQD-D score** | | | | |
| 0-4 | 1 | 56 | 0.3 | (0.1 – 1.0) |
| 5-6 | 3 | 6 | 7.8 | (3.2 – 18.7) |

In *Figure 1*, ROC-AUC of SQD-P was 0.91 (standard error (SE) 0.04), indicating a high efficiency. In its evaluation by SSLR, there were a sufficient number, although small, of cases for each of the three strata, as shown in *Table 2*. And SSLR becomes greater, from that of the first stratum to the second and then to the third. Only between the first (0-3 points) stratum's upper 95% CI and the second (4-5 points) stratum's lower 95% CI, there was a slight overlap. SSLR of the second stratum was 1.05 (95% CI: 0.37-3.00), which is considered to be an indeterminate stratum [18]. SSLRs of the other two strata were 9.64 and 0.1, and are thus considered to have high efficiency. Given that the pre-test probability (illness prevalence rate) was 20.6%, the post-test probability of the stratum with the scores of 6-9 points in SQD-P is 71%, and that of the stratum with 0-3 points is 3%. When the illness prevalence rate is considered to be 36.8% (including respondents with partial PTSD), the post-test probability of the former stratum becomes 85% and that of the latter 6%. Based on these probabilities, a guideline for SQD-P was created, as shown in *Appendix 1*.

ROC-AUC of IES-R was 0.95 (SE=0.03), it was higher than that of SQD-P. There was an overlap between the second (20-24 points) stratum's upper 95% CI and the third (25-88 points) stratum's lower 95% CI. The second stratum's SSLR was 1.54, and its 95% CI included 1.0, therefore, it was considered to be an indeterminate stratum. SSLR of the third stratum was 10.61, while that of the first (0-19 points) stratum was 0.09. Given the pre-test probability of 20.6%, the post-test probabilities of these strata were 73% and 2% respectively. When the illness prevalence rate is considered to be 36.8%, the post-test probability of the former stratum is 86% and that of the latter 5%. These post-test probabilities are very similar to those obtained from SQD-P.

With regard to SQD-D, its convergent validity obtained through ROC-AUC was 0.94 (SE=0.03). However, according to the evaluation by SSLR, it was only possible to divide the scores into 2 strata, one of low scores (0-4 points) and another of high scores (5-6 points), resulting in the same outcome when a single cutoff point is set. This was believed to be due to the fact that there were only four cases of present major depression in the target population, which was insufficient to be divided into multiple strata. SSLR was 0.3 when the scores in SQD-D were 0-4 points, and 7.8 when they were 5-6 points. A provisional guideline is presented in *Appendix 1*.

**Appendix 1.** SQD: Screening Questionnaire for Disaster Mental Health

DATE                                      Interviewer
ID                                        Place of Interview
Name of subject
Note

[Indication]

"People who have experienced [repeat the traumatic event] often report that their lives have changed dramatically and they are constantly under various kinds of stress. Have you experienced any of the symptoms listed below in the past month?"

| | | | |
|---|---|---|---|
| Q1. | Have you noticed any changes in your appetite? | 1. Yes | 0. No |
| Q2. | Do you feel that you are easily tired and/or tired all the time? | 1. Yes | 0. No |
| Q3. | Do you have trouble falling asleep or sleeping through the night? | 1. Yes | 0. No |
| Q4. | Do you have nightmares about <u>the event</u>? | 1. Yes | 0. No |
| Q5. | Do you feel depressed? | 1. Yes | 0. No |
| Q6. | Do you feel irritable? | 1. Yes | 0. No |
| Q7. | Do you feel that you are hypersensitive to small noises or tremors? | 1. Yes | 0. No |
| Q8. | Do you avoid places, people, topics related to <u>the event</u>? | 1. Yes | 0. No |
| Q9. | Do you think about <u>the event</u> when you do not want to? | 1. Yes | 0. No |
| Q10. | Do you have trouble enjoying things you used to enjoy? | 1. Yes | 0. No |
| Q11. | Do you get upset when something reminds you of <u>the event</u>? | 1. Yes | 0. No |
| Q12. | Do you notice that you are making an effort to try not to think about <u>the event</u>, or are trying to forget it? | 1. Yes | 0. No |

[ Score ]

SQD-P: Q3 + Q4 + Q6 + Q7 + Q8 + Q9 + Q10 + Q11 + Q12 = _____

SQD-D: Q1 + Q2 + Q3 + Q5 + Q6 + Q10 = _____

[ Guideline ]

SQD-P: 9-6 = Severely affected (**possible PTSD**)
      5-4 = Moderately affected
      3-0 = Slightly affected (**currently little possibility of PTSD**)

SQD-D: 6-5 = More likely to be depressed
      4-0 = Less likely to be depressed

## DISCUSSION

**Advantages of SQD and its prospects**.   A large-scale natural disaster produces a large number of survivors at once.   Therefore, self-report scales are often used in order to make the screening process efficient.   In the case of the Great Hanshin Earthquake, the Japanese language versions of various scales, developed in the Western countries such as IES-R, were used.   After the Marmara Earthquake in Turkey and the Chi-Chi Earthquake in Taiwan in 1999, new self-report screening tests were developed taking the cultural background and the language into consideration.   Both of these scales include depression as well as PTSD.   In 23 items of Turkey's Traumatic Stress Symptom Checklist (TSSC) [3], 6 items from MDE's diagnostic criteria were included in addition to 17 items on PTSD.   In the case of Taiwan's Disaster-Related Psychological Screening Test (DRPST) [6], logistic regression was used to analyze all of the diagnostic criteria for PTSD and MDE (17 + 9 = 26 items) as predictors of the diagnosis by the Mini-International Neuro-psychiatric Interview. As a result, 7 items on PTSD and 3 on MDE were selected for the screening test.   Both tests are reported to have high discriminating power.

In the area of epidemiological research on mental illness, the need to develop easy-to-administer screening methods with high validity is pointed out.   For example, the scales developed by Kessler et al. called K-10 and K-6 [16] are easy to use and economical while equally high in validity as Goldberg's General Health Questionnaire (GHQ), which had been widely used previously.   For screening for PTSD, Breslau et al. statistically examined the Diagnostic Interview Schedule (DIS) and the Composite International Diagnostic Interview (CIDI), and reported that 7 questions on avoidance and hyperarousal were sufficient as a screening measure [5].   Foa et al. developed a brief instrument to assess PTSD consisting of 17 questions, called the PTSD Symptom Scale (PSS). The PSS has two versions, these are the self-report version (PSS-SR) and the interview version (PSS-I) [8]. The authors of PSS pointed out that the interview version appears to be superior to the self-report version with respect to diagnosing PTSD.   It is also reported that the validity and reliability of PSS-I are high enough to make it a valuable alternative to CAPS [9].

SQD was developed as an interview-format rather than a self-reporting scale with a small number of questions.   One of the motives for developing this measure was to create an instrument that would reflect the characteristics of the aftermath of a large-scale disaster. For instance, those who often get left behind in the process of reconstruction are individuals with few economical resources and senior citizens.   It was precisely these people who were forced to reside in temporary housing for a long time after the Great Hanshin Earthquake. These individuals are very reluctant to seek local public health services [20], and therefore, it becomes important for service providers to reach out to this population.   In this type of outreach, it is indispensable to screen for mental health related problems.   However, to do so, a screening measure has to be easy to understand even for the elderly and people with low educational levels.   Prior to this study, a large-scale screening using IES-R, which is a self-reporting scale commonly used in Japan, was conducted.   However, in order to ensure the validity of the responses, the questions had to be read out to the respondents despite the fact that it is meant to be a self-reporting scale.   SQD was developed in such a context to ensure that it would be easy to use even for those individuals such as the elderly who have difficulty completing self-reporting scales. Therefore it consists of only 12 yes/no questions, including 9 items on PTSD.   SQD has as high efficiency of screening test for PTSD as that of IES-R.   It also has the advantage that non-experts in mental health, such as public health nurses and clinical nurses, can use this measure after a brief training, and thus is easily incorporated into any local level post-disaster health services.

**Limitations of this study and weakness of SQD with respect to the assessment of depression**.   Because of the limited time and resources available to conduct interviews, SQD and the other structured interviews were not rated independently by different interviewers, which may have led to a certain bias.   In addition, because the target population was a convenience sample, the results of this study carry little epidemiological significance.   And the study population was the elderly who have different PTSD and MDE profile than people of other ages, which limits the generalizability to different age groups.

The prevalence rate of major depression among survivors 14 years after the Buffalo Creek Dam Collapse in 1972 was 19.3% [11], while Rubonis and Bickman [22] reported the prevalence rate of depression as a psychopathology in the disaster population to be 25.8% after reviewing 52 disaster studies and recalculating data from 10 studies.   Also, many studies revealed that comorbidity rate between PTSD and depression is very high [15, 17]. It is also suggested by studies [12, 13] on hypothalamic-pituitary-adrenal (HPA) axis responses related to PTSD and depression that the depression that accompanies PTSD differs from normal depression in its neurobiological conditions.   Depressive state that accompanies PTSD is also believed to respond less effectively to medication than when depression exists alone [29].   It is therefore important to detect the comorbidity between PTSD and depression in the screening process.

In the evaluation of SQD-D, its efficacy according to ROC-AUC was found to be high. However, its convergent validity according to SSLR was not satisfactory.   This is because the target population did not include a sufficiently wide variety of subjects for the evaluation of the convergent validity of SQD-D, and therefore it was necessary to take spectrum bias into account.   In order to evaluate the scale with an appropriate number of strata, sufficient numbers of positive and negative cases in each stratum would be required, using a target population with a certain level of illness prevalence rate.

**Conclusion**.   Efficient screening for PTSD and other coexisting problems after a large-scale disaster is indispensable in implementing local mental health service activities. Using self-reporting scales in such activities imposes certain limitations, especially when dealing with the elderly and individuals with low educational background.   This study found that the simple interview-format scale that was developed and named as the SQD serves as a useful screening measure for disaster mental health, especially for PTSD.

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