

Stress

Age Cohorts	Younger, Mid-age and Older
Surveys	All Young, Mid-age, Older 1 and 2 only
Derived Variable	MNSTRS
Definition	Multi-item summed score for perceived stress
Source Items	STRS-001 to STRS-013, STRS-030 (see table below)
Statistical form	Continuous variable
Index Number	STRS-029
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Stress item	Index Number
Own health	STRS-001
Health of other family members	STRS-002
Work/Employment	STRS-003
Living arrangements	STRS-004
Study	STRS-005
Money	STRS-006
Relationship with parents	STRS-007
Relationship with partner/spouse	STRS-008
Relationship with other family members	STRS-010
Relationships with boyfriends	STRS-012
Relationships with girlfriends	STRS-013
Relationships with friends	STRS-030
Relationship with children	STRS-009
Anything else	STRS-011

Development of items

The stress scale items were first used in 1995 in one of the pilot surveys of the Younger cohort. The scale included items in specific life domains: own health, health of other family members, work/employment, living arrangements, study, money, relationship with parents, relationship with partner/spouse, relationships with children, relationship with other family members, relationships with boyfriends, and relationships with girlfriends. The items were developed on the basis of discussions with key informants, including psychologists, sociologists, and women of all ages. An open-ended item, 'anything else', provided an opportunity for respondents to specify other life domains that had added to their stress levels in the last 12 months.

At Survey 1, 12 items were included for the Younger cohort, 11 items for the Mid-age cohorts and 8 items for the Older cohort (Table 1). Evaluation of responses showed

redundancy of some items for the Younger cohort; these were omitted at Survey 2. The item about 'relationships with boyfriends' was deleted because of a high correlation with item about 'relationship with partner/spouse'. Also, 'relationships with girlfriends' was changed to 'relationships with friends' in order to distinguish more clearly between sexual and platonic relationships. Items included at Surveys 2 and 3 are also in Table 1. Stress items were not included on Survey 3 of the Older cohort.

Table 1 Items from the perceived stress scale for each of the age cohorts, Surveys 1, 2 and 3

Over the LAST 12 months, how stressed have you felt about the following areas of your life: *(Circle one number on each line)*

Cohort:	Younger			Mid-age			Older
Survey:	1	2	3	1	2	3	1 & 2
Question Number:	27	71	80	35	30	39	28 & 29
Own health	a	a	a	a	a	a	a
Health of other family members	b	b	b	b	b	b	d
Work/Employment	c	c	c	c	c	c	
Living arrangements	d	d	d	d	d	d	b
Study	e	e	e	e	e	e	
Money	f	f	f	f	f	f	c
Relationship with parents	g	g	g	g	g	g	
Relationship with partner/spouse	h	h	h	h	h	h	e
Relationship with other family members	i	i	i	j	j	i	g
Relationships with boyfriends	j						
Relationships with girlfriends	k						
Relationships with friends		j	j				
Relationship with children				i			f
Motherhood/children			k				
Anything else <i>(Please specify)</i>	l			k			

Almost half the sample provided responses (n=7 210, 48.8%) for a content analysis of the open-ended 'anything else' item included in the first survey of the Younger cohort. Of these, 6 141 responses were 'not applicable' or 'not at all stressed', with only 1 069 (7.3%) reporting any degree of stress from another source. There were 728 written responses (5% of the sample) to this item, and a content analysis identified the major areas of response shown in Table 2. Major areas were defined as those areas that were mentioned by at least 5% of those who responded to this item (0.2% of all respondents).

Participants tended to use the ‘anything else’ item to provide additional information concerning items already marked. So responses to this item were excluded from Survey 2.

Table 2 Summary of the major areas mentioned from content analysis of open-ended responses – Younger cohort, Survey 1

Major Area	Examples	Number
Lifestyle	Life in general City life	89
Future	My future	62
Children or pregnancy	First pregnancy Trying to get pregnant Difficult birth	61
Appearance	Weight Being fat	59
Transitions	Moving away from family	47
Emotional Health	Depression, low self esteem	43
Physical Health	AIDS test results	38
Death or grief	Husband passed away Loss of first child	35
Relationships	Stress with friend's problems	33

Scale Evaluation

ALSWH researchers have documented the validity of these items as a measure of perceived stress.^{1,2} The brief summary included below is based on the Methodological Issues sections of Reports 15 to 17 for the Commonwealth Department of Health and Ageing.

Internal reliability (Surveys 1 and 2 – Younger cohort)

Item-total correlations were calculated for women completing all items (Table 3) and were similar for surveys 1 and 2. All but two items had item-total correlations greater than 0.3, with only stress about other family members' health, and stress about study having item-total correlations of 0.3 or less. Data from both surveys show high internal reliability for the scale as a whole (Table 3). Reliability was minimally affected with the removal of one or both items with low item-total correlation.

Factor Analysis (Surveys 1 and 2 – Younger cohort)

A principal factor analysis of Survey 1 data (Table 4) indicated only one factor with an eigenvalue of greater than 1 (explaining 22% of total variance); all other factors had eigenvalues of less than 0.3. All items loaded positively on this factor, with 10 of the 11 items loadings greater than 0.3. A varimax rotation did not improve item loadings. Results were similar at Survey 2 (Table 4). A single factor was considered adequate and retained.

Table 3 Item - total correlations and Cronbach's alpha for stress scale items among the Younger cohort at Surveys 1 (n = 14 232) and 2 (n = 8 944)

Item	Survey 1	Survey 2
Item - total correlations		
Living arrangements	0.53	0.50
Money	0.51	0.50
Relationship with parents	0.46	0.42
Relationship with other family members	0.43	0.42
Relationships with boyfriends	0.39	Not asked
Own health	0.39	0.42
Relationships with girlfriends/friends	0.38	0.43
Work/employment	0.37	0.40
Relationship with partner/spouse	0.36	0.37
Health of other family members	0.29	0.30
Study	0.24	0.26
Cronbach's alpha		
All items	0.75	0.74
Excluding health of other family members	0.74	0.73
Excluding study	0.75	0.74
Excluding health of other family members and study	0.71	0.74

Table 4 Eigenvalues and factor loadings from factor analysis of stress scale items for the Younger cohort at surveys 1 and 2

Item loadings	Survey 1	Survey 2
Living Arrangements	0.61	0.58
Money	0.58	0.58
Relationship with Parents	0.55	0.54
Relationship with Other Family Members	0.51	0.54
Relationship with Boyfriends	0.46	Not asked
Relationship with Partner/Spouse	0.45	0.46
Own Health	0.44	0.49
Work/Employment	0.44	0.47
Relationship with Girlfriends/Friends	0.42	0.50
Health of Other Family Members	0.33	0.36
Study	0.28	0.31
Eigenvalue	2.43	2.42

Derived variable

Scores

The response codes initially assigned to each response category were not considered to adequately weight response categories in the calculation of a summary stress measure. Scores of 0 to 4 were assigned.

Code	Re-code	Response
1	0	Not applicable
2	0	Not at all stressed
3	1	Somewhat stressed
4	2	Moderately stressed
5	3	Very stressed
6	4	Extremely stressed

Mean stress scores were calculated from all closed-ended, non-missing items and were set to missing if half or more of the scale items were missing (Table 5). The range of possible scores is 0 to 4.

Table 5 Number of items included and imputed in calculation of mean stress

Survey	Younger		Mid-age	Older
	1	2	1 & 2	1 & 2
<i>Number of items used to calculate mean stress</i>	11	10	10	7
<i>Number of non-missing items required</i>	6	5	5	4
<i>Maximum number of missing items imputed</i>	5	5	5	3

The distributions of the mean stress score for the three cohorts at Survey 1 are shown in Table 6. This score becomes progressively more skewed with each age cohort and probably need to be transformed in the old cohort.

Table 6 Distribution of the mean stress scores among three age cohorts at Survey 1

	Younger (n = 14 779)	Mid-age (n = 14 100)	Older (n = 12 939)
Mean	0.89	0.68	0.37
Standard deviation	0.57	0.53	0.44
Median	0.82	0.60	0.29
Quartile1;Quartile 3	0.45; 1.18	0.30; 1.00	0; 0.57
Skewness	0.9	1.2	2.3
Kurtosis	0.9	1.8	5.4
Missing	0.5%	0.7%	3.2%

Convergent validity (Survey 1 – Younger cohort)

Mean stress scores were moderately and significantly correlated with the ALSWH Life Events Check-list, all physical and mental health scales for the SF-36, number of GP visits, alcohol consumption, smoking and number of symptoms (Table 7).

Table 7 Correlation of Stress score with various psychological and physical health measures

	Correlation Coefficient
Psychological variable	
<i>Life Events Checklist</i>	0.53
<i>Mental health scales of the SF-36</i>	
<i>Mental health component score</i>	-0.53
<i>Mental health</i>	-0.50
<i>Social functioning</i>	-0.47
<i>Role-emotional</i>	-0.43
<i>Vitality</i>	-0.41
Health-related variables	
<i>Physical scales of the SF-36</i>	
<i>Physical health component score</i>	-0.18
<i>General health</i>	0.37
<i>Bodily pain</i>	-0.27
<i>Role physical</i>	-0.23
<i>Physical functioning</i>	-0.13
<i>GP visits</i>	0.21
<i>Alcohol consumption</i>	0.12
<i>Smoking</i>	0.16
<i>Symptoms</i>	0.42.

Recommendations for usage

This analysis provides evidence that the mean stress measure is internally reliable and uni-dimensional; validity is also demonstrated by the correlations with mental and physical health measures. It is recommended that this variable be used as a continuous measure.

The mean stress score can also be categorised to reflect the item scores: 0 'Not at all stressed' ; <-1 'somewhat stressed' ; <-2 'moderately stressed' ; <-3 'Very stressed' and <-4 'Extremely stressed'.

The stress items and mean stress scores have been used differently in particular analyses. For example, mean stress has been categorised as 'Very stressed' or 'Not'³; where a response of 'very stressed' and 'extremely stressed' to three or more items was classified as Very stressed. Also, individual items have also been classified as 'Stressed' (very or extremely stressed) or 'Not stressed' (not applicable, not at all stressed, somewhat or moderately stressed.).^{4,5}

The SAS code defining mean stress at surveys 1 is:

```
nstrs = 0 ;
mnstrs = 0 ;
sumstrs = 0 ;
/* Recode */;
  do s=1 to numstr ;
    if strs(s)=1 then strs(s)=0 ;
    else if strs(s)=2 then strs(s)=0 ;
    else if strs(s)=3 then strs(s)=1 ;
    else if strs(s)=4 then strs(s)=2 ;
    else if strs(s)=5 then strs(s)=3 ;
    else if strs(s)=6 then strs(s)=4 ;
    else strs(s)=. ;

    if strs(s) ne . then do ;
      nstrs = nstrs + 1 ;
      sumstrs = sumstrs + strs(s) ;
    end ;
  end ;
if valstr<=nstrs<=numstr then mnstrs = sumstrs/nstrs ;
else mnstrs=. ;
```

References

1. Bell S, Lee C. Development of the perceived stress questionnaire for young women. *Psychology, Health and Medicine* 2002;7(2):189-201
2. Bell S, Lee C. Perceived stress revisited: the Women's Health Australia project Younger cohort. *Psychology, Health and Medicine* 2003;8(3):343-353
3. Bryson L. The Women's Health Australia Project and policy development. *Australian Journal of Primary Health* 1998 4: 59-71
4. Byles JE, Feldman S, Mishra G. For richer, for poorer, in sickness and in health: older widowed women's health, relationships and financial security. *Women and Health* 1999;29:15-30
5. Brown W, Ball K, Powers J. Is life a party for young women? *The ACHPER Healthy Lifestyles Journal* 1998;45:21-26