Stress

Age Cohorts	All
Surveys	Surveys 1, 2 (1921-26)
	All surveys in the other cohorts
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
Prepared by	Sandra Bell, Christina Lee, Jennifer Powers, and Jean Ball
Endorsed	December 2001, updated November 2022

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

Stress scale items documentation 2001

David Fitzgerald, Dec 2001

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 1.1). 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 1.1. Stress items were not included on Survey 3 of the Older cohort.

Table 1.1 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 (Please specify)	*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 1.2. 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 1.2 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*	*Overseas travel*	*89*
Future	*My future*		*62*
Children or pregnancy	*First pregnancy* *Trying to get pregnant* *Difficult birth*	*Having a young baby* *Being a sole parent*	*61*
Appearance	*Weight* *Being fat*	*Getting braces* *Very large breast size*	*59*
Transitions	*Moving away from family*	*Planning wedding* *end study, find job, settle*	*47*
Emotional Health	*Depression, low self esteem*	*Spiritual issues*	*43*
Physical Health	*AIDS test results*	*Injury- car accident*	*38*
Death or grief	*Husband passed away* *Loss of first child*	*Suicide of friend*	*35*
Relationships	*Stress with friend's problems*	*Being bridesmaid for a friend*	*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 1.3) 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 1.3). 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 1.4) 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 1.4). A single factor was considered adequate and retained.

Table 1.3 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 1.4 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 *1.*5). The range of possible scores is 0 to 4.

Table 1.5 Number of items included and imputed in calculation of mean stress

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

The distributions of the mean stress score for the three cohorts at Survey 1 are shown in Table 1.6. This score becomes progressively more skewed with each age cohort and probably need to be transformed in the old cohort.

Table 1.6 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 1.7).

Table 1.7 Correlation of Stress score with various psychological and physical health measures

	Correlation Coefficient
Psychological variable	
Life Events Checklist	*0.53*
Mental health scales of the SF-36	
Mental health component score	*-0.53*
Mental health	*-0.50*
Social functioning	*-0.47*
Role-emotional	*-0.43*
Vitality	*-0.41*
Health-related variables	
Physical scales of the SF-36	
Physical health component score	*-0.18*
General health	*0.37*
Bodily pain	*-0.27*
Role physical	*-0.23*
Physical functioning	*-0.13*
GP visits	*0.21*
Alcohol consumption	*0.12*
Smoking	*0.16*
Symptoms	*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 in 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 ;  ** edited out in 2022**;
        if strs(s)=1 then strs(s)=. ;  ** these are NA, 2022 change**;
        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

Mean stress derived variable in ALSWH – Update 2022

David Fitzgerald, Nov 2022

Introduction

ALSWH asks questions about the stress the participants have felt in various areas of their life. These questions are used to derive the Mean Stress variable for analysis. These series of questions were developed by ALSWH on the basis of discussions with key informants, including psychologists, sociologists, and women of all ages.

In 2022 the Mean Stress calculation changed. The change was to do with how not applicable responses were used in the calculation. Before 2022 any not applicable response was given a value of zero and as such was included in the calculation's denominator. From 2022 onwards the not applicable responses were given missing values and so were not included in the calculation's denominator. All the survey waves were changed so the comparison across surveys should not be affected. The earlier and updated code is shown at the end of this document.

Mean stress in ALSWH

Mean stress variables have been derived for all the waves in the 1946-51 and 1973-78 cohort surveys, most of the 1989-95 cohort waves and the first two waves of the 1921-26 cohort.
The questions have slightly changed over the cohorts and waves, as shown in Table 2.1. The introduction to the questions - "Over the last 12 months, how stressed have you felt about the following areas of your life:" - has not changed.

Table 2.1 shows the mean stress questions asked across the cohorts and waves. The oldest cohort were not asked about stress from their parents and the 1973-78 cohort were not initially asked about stress from their children. Note that in Survey 2 of the 1921-26 cohort and Surveys 3 and 4 of the 1946-51 cohort there was no 'Not Applicable' option for some questions. The other surveys did have the 'Not Applicable' option for all questions.

The stress questions were only asked in Surveys 1 and 2 of the 1921-26 cohort.

Table 2.1: Availability of 'Not Applicable' (NA) in three stress questions for all cohorts and waves

Cohort	**1989-95**						**1973-78**								**1946-51**									**1921-26**	
Survey wave	1	2	3	4	5	6	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	9	1	2
Own health	NA	NA	NA	NA	NA	NA	NA	NA				NA	NA	NA	NA	NA								NA	
Money	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA								NA	
Living arrangements	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA								NA	

Note: Not Applicable was available for all other items in all cohorts and waves.

Derivation of Mean Stress score

The mean stress score is calculated from the responses to all the questions and is a mean average of the non-missing responses. The survey responses that are initially valued as 1 to 6 are recoded to 0 to 4 (shown in Table 2.2). These values are then added up and divided by the number of non-missing responses to produce the mean stress value. If there are fewer than 5 non-missing values, then the mean stress value is set to missing. The mean stress score can possibly range from 0 (not stressed to all options) to 4 (extremely stressed to all options).

Table 2.2: Response categories and scoring of stress scale items

	Response Category					
	Not applicable	Not at all stressed	Somewhat stressed	Moderately stressed	Very stressed	Extremely stressed
Code	1	2	3	4	5	6
Score	0	0	1	2	3	4

The change in 2021 / 2022

In 2021, ALSWH staff queried the recoding of 'Not Applicable' to zero rather than missing. A 'Not at all stressed' response is a definitive statement of no stress while 'Not Applicable' may not be (e.g., in response to questions about relationship with parents or children it may be simply because there are no parents or children in the participant's life). The Data Management Group in late 2021 decided the 'Not Applicable' response is not considered equivalent to 'Not at all stressed', and so should be set to missing (Table 2.3). It was decided to update all the mean stress variables using the new derivation method.

Table 2.3: New response categories and scoring of stress scale items

	Response Category					
	Not applicable	Not at all stressed	Somewhat stressed	Moderately stressed	Very stressed	Extremely stressed
Code	1	2	3	4	5	6
Score	.	0	1	2	3	4

This change affected the value of the mean stress variable in two ways. Firstly, some non-missing values were set to missing where there were now five or more missing values. Secondly, where there were some 'Not Applicable' values set to missing, but still fewer than five missing in total the mean stress value is larger. This is because the numerator total is same, but the denominator number of non-missing values is smaller. Figure 2.1 below shows the means of the existing and new mean stress values in the 1973-78 (YNG) and 1946-51 (MID) cohorts. The 1973-78 cohort is shown from ages 20 to 40 and the 1946-51 cohort from ages 45 to 70. The new values are higher because the denominator is smaller.

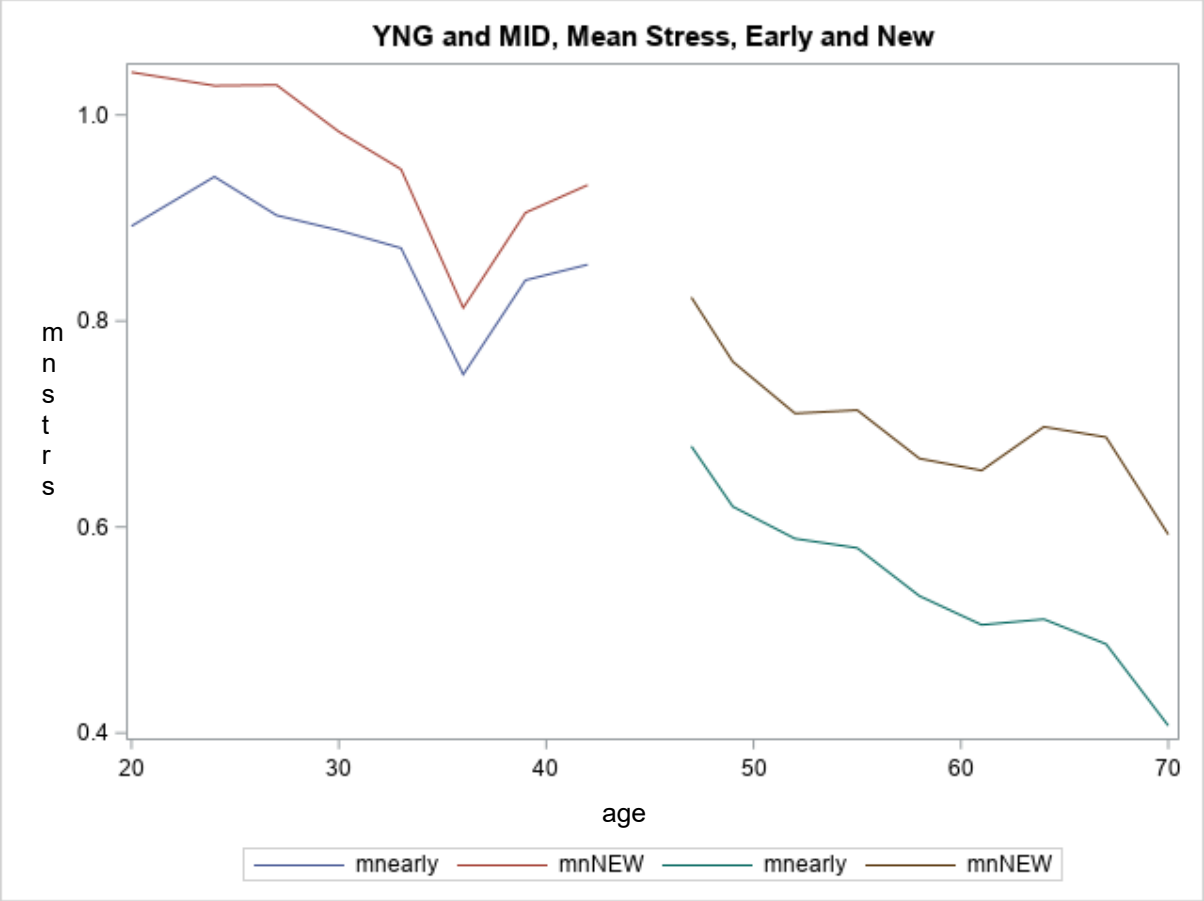

Figure 2.1: Previous and re-calculated mean stress scores for the 1973-78 and 1946-51 cohorts.

Implications

The change was made in early 2022 to all relevant datasets at the same time. Anyone receiving ALSWH data from 2022 will receive the new mean stress values in all datasets. The values are used in comparison to other values at different waves so the absolute value does not have any intrinsic meaning. Previous ALSWH advice regarding interpretation of mean stress (0 to <.25 not stressed; .25 to <.50 somewhat stressed; .50 to <1.0 moderately stressed; 1.0 to 4.0 very stressed) may no longer be valid, as the values have changed. Data users will be informed of these changes to calculation of the mean stress values in the next ALSWH data user newsletter.