How Does an Unplanned Pregnancy Affect Maternal Stress and Depression From Pregnancy to 12 Months Postpartum? A Longitudinal Study

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Abstract

Background: Research studies have shown an increased prevalence of mental health issues in women with unplanned pregnancies. However, many of these studies use cross-sectional methods. This particular study aimed to examine perceptions of stress and depression in women with unplanned pregnancies compared with those with planned pregnancies. The study tracked these perceptions, from the early stages of pregnancy to 12 months postpartum.

Methods: In this quasi-experimental study, pregnant women attending health centers completed a baseline questionnaire around the fifth month of pregnancy. This survey gathered demographic information and inquired about pregnancy planning. Perceived stress and depression were assessed using the Perceived Stress Scale (PSS4) and the Patient Health Questionnaire (PHQ) 4 times up to 12 months postpartum. The relationship between pregnancy planning and PSS4 and PHQ2 scores was analyzed using generalized estimating equations (GEE).

Results: A total of 302 women, with a mean age of 29.31 years and a standard deviation of 6, participated in the study. The findings revealed that women with unplanned pregnancies exhibited significantly higher levels of stress and depression throughout both the prenatal and postpartum periods, even after controlling for confounding variables. Additionally, the unplanned pregnancy group reported lower educational attainment, higher parity, older age, and less support from their marital and family networks.

Conclusion: An unplanned pregnancy can significantly impact a mother's mental health, potentially lasting for months after giving birth. Women going through an unplanned pregnancy can greatly benefit from emotional support from their partners and family.

Keywords: Unplanned pregnancy, Mental Health, Perceived Stress, Depression, Supportive Environment, Postpartum, Maternal Mental Health

Introduction

Around the globe, individuals and couples often desire to start a family. While some are content with their family size, others may have more or fewer children than they initially wanted. In many common cases, women end up hav-

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↑*What is "already known" in this topic:*
Physical and mental issues are common in unplanned pregnancies. Women with an unplanned pregnancy receive antenatal care later and are more likely prone to experience depression during pregnancy and postpartum, and relationship breakdown. Prohibition of abortion can make these processes more complicated. Finding solutions to decrease the adverse effects of unplanned pregnancies is important.

→*What this article adds:*
In these studies, researchers compared 2 groups of mothers with planned and unplanned pregnancies. We find out women going through an unplanned pregnancy can greatly benefit from emotional support from their partners and family.

ing children they did not want from the start of their pregnancy.

Each year in developing countries, there are 89 million unintended pregnancies. About 43% of pregnancies are unplanned (1). Unplanned pregnancies include mistimed pregnancies, which occur earlier than desired, and unwanted pregnancies when no more children are desired (2).

Unplanned pregnancy has adverse effects on mothers. These women receive antenatal care later and are more likely prone to experience depression during pregnancy and postpartum, and relationship breakdown (3, 4). Children born of unplanned pregnancies have been shown to have a lower birthweight, have poorer mental and physical health during childhood, and do less well in cognitive tests (3).

Unplanned pregnancies are associated with lower women's education and their husbands, lower family income, lower woman employment, higher age of women, and lower information of husbands about contraception methods (5).

There are different reports about the prevalence of unplanned pregnancies, but it seems one-third to half of pregnancies lead to live births are unplanned (4, 6). The prevalence of unplanned pregnancy in Iran has been reported at 27.9% (95% CI, 24%-32.1%) (7).

In Iran, abortion is prohibited and considered illegal. Only severely deformed or genetically at-risk fetuses, as well as pregnancies with severe complications that decrease the chances of fetal or maternal survival, are allowed to be terminated before the 19th week of the last menstrual period (8). As a result, women facing unwanted pregnancies must either seek unsafe illegal termination or endure unplanned pregnancy complications. In this situation, it is more important to explore the thoughts and feelings of women with unplanned pregnancies (8). Finding out how pregnancy planning impacts the mental health of mothers and how other factors such as husband and family exposure and mother's age may also play a role, can provide more evidence for policymakers.

In this study, we surveyed perceptions of stress and depression in women with unplanned pregnancies compared with planned pregnancies over time from the first months of pregnancy to 12 months postpartum.

Methods
Participants and Procedure
This is part of a follow-up study examining how nurturing care affects children's early development in 2 cities in southern Iran. Fifteen health centers invited women in their first 5 months of pregnancy to participate in the study. The inclusion criteria were enrolling during the first 5 months of pregnancy, living in the study area, having an available smartphone, mothers being ≥18 years old, and providing informed consent. The exclusion criteria for the study encompassed any neuropsychological disorders in either the mother or the child, pregnancy periods of <37 weeks or >42 weeks, and unwillingness to participate in the subsequent stages of the study.

We surveyed 547 expectant mothers who were <5 months pregnant. Of these, 383 participants met the criteria, and 306 provided written informed consent. However,

4 participants could not carry their pregnancies to term; thus, we have excluded them from our analysis.

After completing the first questionnaire with 302 pregnant women, we transitioned to online form-filling for the next meetings due to the COVID-19 pandemic. Of those participants, 260 (86.09%) continued their involvement in the second evaluation stage, held 3 to 6 weeks postpartum. The third and fourth stages were completed with 243 (80.46%) and 188 (62.25%) participants in the 4th and 12th months, respectively (Figure 1). Finally, 302 cases were analyzed.

The ethics review committee of Kerman University of Medical Sciences (IR.KMU.REC.1399.582) approved this study. All participants provided written informed consent before taking part in the study protocol.

Measures
Baseline Characteristics: In the baseline questionnaire (20 ≥ weeks of pregnancy), demographic variables were collected—including age, week of pregnancy, and level of education of pregnant women and their husbands. Information about marital satisfaction and social support was also collected. The Kanzas Marital Satisfaction Scale (KMSS) was used to evaluate marital satisfaction. The strengths of this questionnaire are the small number of questions and the favorable reliability and validity (9). The subscale of family support was selected from the Multidimensional Scale of Perceived Social Support (MSPSS) and was used in the study. There are 4 items in this subscale and based on the literature, it indicates good reliability and validity (10).

Unplanned Pregnancy: As part of the baseline questionnaire, the participating mothers were requested to indicate whether their current pregnancy was planned.

Depression: Numerous tools are available to evaluate depressive symptoms during and after pregnancy. The PHQ-2 (Patient Health Questionnaire-2) is a condensed version of the PHQ-9 that includes only the first 2 questions. A score of ≥3 on the PHQ-2 suggests a likely diagnosis of depression, with scores ranging from 0 to 6. Evidence indicates that the PHQ2 can be an effective tool for diagnosing prenatal and postpartum depression (11, 12). Furthermore, research has demonstrated that the Persian version of the PHQ-9 possesses favorable psychometric properties in those with major depression (13). The Cronbach's alphas for the PHQ-2 was 0.767, indicating good internal consistency. The confirmatory factor analysis results confirmed that PHQ-2 showed a moderate to strong correlation with the measures of the well-being index (WHO-5), the Hospital Anxiety and Depression Scale(HADS), and the 7-item generalized anxiety disorder(GAD-7), confirming convergent validity (14) (Appendix 1).

Perceived stress: The Perceived Stress Scale (PSS-4) questionnaire is a widely used psychological instrument designed to measure the degree to which individuals perceive situations in their lives as stressful (15). The PSS-4 comprises 4 simple questions intended to assess the stress levels experienced by an individual over the past month. Participants are required to rate each question on a scale from 0 (never) to 4 (very often), with total scores ranging from 0
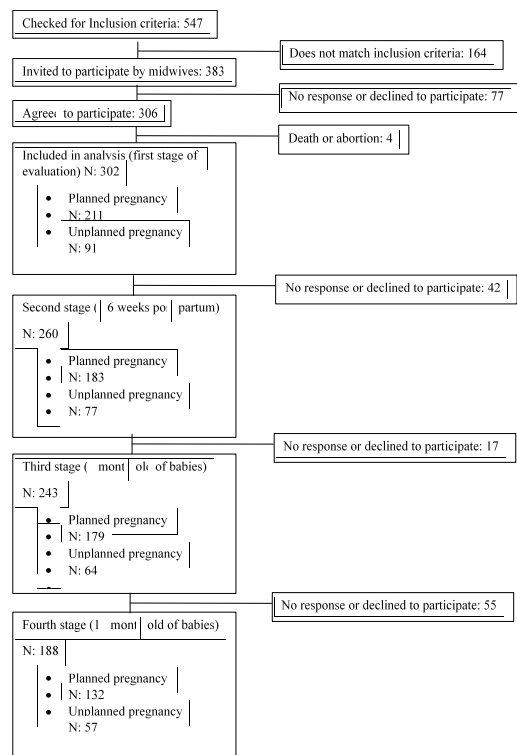
Figure 1. Flowchart for the participants in the study

to 16. Higher scores on the PSS-4 indicate higher perceived levels of stress. The questionnaire has demonstrated good reliability and validity, making it a valuable tool for assessing perceived stress levels among various populations. Also, the Persian version of the PSS-4 questionnaire demonstrates strong reliability and validity in assessing perceived stress levels in Iranian populations (16, 17). The Cronbach's alphas for the PSS-4 was between 0.70-0.77, indicating good internal consistency. Pearson correlation scores between the PSS-4 and the Depression Anxiety and Stress Scale-21 was 0.642, which indicates convergent validity of the scale (18) (Appendix 2).

Statistical Analysis

Comparison of demographic variables between women with an unplanned pregnancy (WUP) versus those with a planned pregnancy (WPP) was examined using a t test for continuous variables and a chi-square for categorical variables.

Next, generalized estimating equations (GEE) were used to investigate the association between pregnancy intention (planned versus unplanned) on the perceived stress and depression of mothers over time, adjusting for covariates—including age, number of children, level of education in both mother and father and perceived support of family and marital satisfaction as a marker for perceived support from husband. GEE models were used to analyze continuous outcomes (19, 20).

Levels of perceived stress and depression were separately analyzed. The main effects of 6 covariates—including mother's age, both mother and father's education, number

of children, perceived support of family, and marital satisfaction—and their interaction with the type of pregnancy planning were surveyed. Then, insignificant variables in the model were omitted one by one based on the value of corrected quasi-likelihood under the independence model criterion (QICC) in the goodness of fit of the model.

The Statistical Package for Social Sciences (SPSS Version 27.0, IBM) was used to conduct statistical analysis.

Results

A total of 302 women, with a mean (±SD) age of 29.31 ± 6, participated in the study. The mean age of WUP (N = 91), and WPP (N = 211) was not significantly different.

The mean number of children per family was 0.9 ± 1, while the WUP group had a mean of 1.39 ± 1.32, which was double compared with the WPP group (0.69 ± 0.73).

The WUP group has lower levels of education compared with the WPP. Our xi-square analysis indicated that the mean level of education for the WUP group was 2.32 ± 0.48 and it was 2.21 ± 0.46 for their husbands, which was significantly lower than the average level for women in the WPP group (2.49 ± 0.50) and their husbands (2.32 ± 0.91).

The characteristics of both participating groups with planned and unplanned pregnancies are shown in Table 1. Participants with an unplanned pregnancy had higher scores in perceived stress and depression during the entire prenatal and postpartum period. The only exception was the perceived depression scores at 12 months postpartum and no significant difference was seen.

In this study, GEE analysis results (Table 2) showed that WUPs experienced significantly higher stress levels than WPPs. Initially, WUPs reported a mean score of 7.21 on the PSS4 scale, which was considerably higher than the WPP group's mean score of 5.94 ($P < 0.01$). Although the difference decreased after their babies were born, there was still a significant distinction ($P < 0.05$).

The PHQ2 scores in the WPP were also lower compared with the WUP group (Table 3). The depression mean score for WPPs was 1.7 ± 1.34 at baseline and 1.58 ± 1.45 at 12 months postpartum, while the WUPs' depression mean scores were 2.3 ± 1.56 at baseline and 2.03 ± 1.77 at 12 months postpartum. These changes resulted in an insignificant difference between the 2 groups at the final evaluation.

Mean PSS4 scores and mean PHQ2 scores stratified for pregnancy planning, for all 4 assessment planning during pregnancy (under week 5), and postpartum (3-6 weeks, 4 months, and 12 months post-partum) are shown in Figures 2 and 3.

In analysis with the GEE method, we had to import PSS4 scores and PHQ2 scores separately. Thus, in Tables 2 and 3, the results for the comparison of PSS4 and PHQ2 scores between the 2 planned and unplanned groups are shown.

In our study, we found that the stress model is primarily influenced by pregnancy planning and marital satisfaction. When predicting depression levels, the best results are obtained when we prioritize pregnancy planning and family support as the main variables. In simpler terms, the most significant factor affecting stress levels is the type of pregnancy, followed by marital satisfaction. The type of pregnancy has the most significant impact on depression levels

Table 1. Characteristics of women with a planned compared to unplanned pregnancy

	Total N=302		Planned N=211		Unplanned N=91		Range		P-value	
	N (%)	Mean ± SD	N %	Mean ± SD	N %	Mean ± SD	Min	Max	X²	t-test
Mother's age	302	29.31± 6.00	29.45	5.70	29.98	6.00	18	38		0.206
Mother's education level	302	2.44 ± 0.51	211	2.49 ± 0.50	91	2.32 ± 0.48	1	6	0.001**	
Basic 1	2 (0.7%)		0 (0%)		2 (0.7%)					
Intermediate 2	164 (54.30%)		107 (35.43%)		57 (18.87%)					
Advanced 3	136 (45.03%)		104 (34.43%)		32 (10.59%)					
Husband's education level	302	2.29 ± 0.48		2.32 ± 0.91		2.21 ± 0.46	1	7	0.002**	
Basic1	4 (1.3%)		2 (0.7%)		2 (0.7%)					
Intermediate 2	206 (68.12%)		139 (46.02%)		67 (22.18%)					
Advanced 3	92 (30.46%)		70 (23.17%)		22 (7.28%)					
Number of children		0.9 ± 1.00		0.69 ± 0.73		1.39 ± 1.32	0	10		0.001*
Perceived support from family	5.90	1.15	6.04	0.94	5.58	1.49	1	7		0.001*
Marital satisfaction	18.02	3.73	18.35	3.59	17.27	3.95	3	21		0.021*

Table 2. Generalized Estimating Equations: Association between pregnancy intention and demographic factors with PSS4 scores

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	P-value
(Intercept)	2.208	.0815	2.048	2.367	733.972	1	<0.001
Planned Pregnancy	-.137	.0314	-.199	-.076	19.143	1	<0.001
Unplanned pregnancy	0[a]	.	.	.	.	.	.
Marital satisfaction (husband's support)	-.013	.0045	-.022	-.004	8.588	1	.003
(Scale)	.141						

Table 3. Generalized Estimating Equations: Association between pregnancy intention and demographic factors with PSS4 scores

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	1.371	.1183	1.139	1.603	134.345	1	<0.001
Planned Pregnancy	-.096	.0472	-.188	-.003	4.117	1	.042
Unplanned pregnancy	0[a]	.	.	.	.	.	.
Family support	-.074	.0198	-.113	-.036	14.109	1	<0.001
(Scale)	.242						

after family support.

Discussion

In the present study, we aimed to assess the association between unplanned pregnancy and the perception of stress and depressive symptoms in a follow-up study that spanned from early pregnancy (under month 5) until 12 months postpartum.

We found that women who reported an unplanned pregnancy consistently had higher scores in perceived stress and depression scales during pregnancy and the first 12 months postpartum.

However, we noticed that the discrepancies between the 2 groups tend to decrease after giving birth, particularly at the 12-month postpartum mark. Additionally, we observed that women with unplanned pregnancies tended to have lower education levels for both themselves and their husbands, as well as more children. They also reported receiving less support from family and lower marital satisfaction during the pregnancy period and the 12 months postpartum.

In some previous studies, lower mental health scores have been reported. These studies often only surveyed stress or depression. For example, in a longitudinal study,

Moskens et al found consistently higher depressive scores in women with an unplanned pregnancy, from the first trimester of pregnancy to 12 months postpartum (21). This study is noteworthy as it is one of the rare longitudinal (not cross-sectional) studies on this issue. Furthermore, Tarafa et al have reported a significant association between unwanted pregnancy and pregnancy-related anxiety (22).

It is interestingly reported in a study by Hall et al that among different stressful life events, emotional and partner-related factors are the most significant (23). In our study, when we excluded factors to find the best-fit model, we found that marital satisfaction (in addition to the type of pregnancy) played a crucial role in shaping the most fitting model predicting PSS4 scores.

In another well-designed study, Barton et al studied how unplanned pregnancy may impact psychological distress (24). They measured partnership quality, perceived social support, and mother's feelings about pregnancy (happy, ambivalent, or unhappy). The quality of the partnership, the mother's attitudes toward the pregnancy (happy, ambivalent, or dissatisfied), and the adjustment for perceived social support were all evaluated.
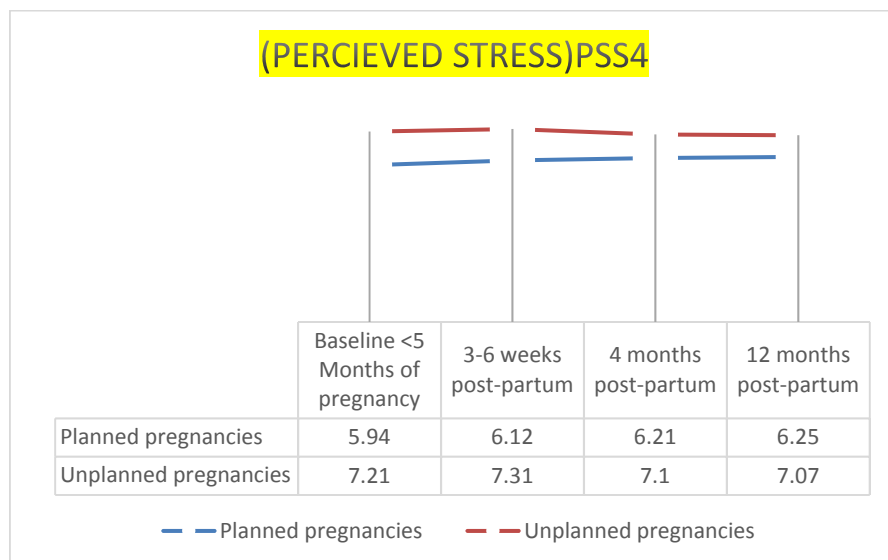
(PERCIEVED STRESS)PSS4

	Baseline <5 Months of pregnancy	3-6 weeks post-partum	4 months post-partum	12 months post-partum
Planned pregnancies	5.94	6.12	6.21	6.25
Unplanned pregnancies	7.21	7.31	7.1	7.07

‒ ‒ Planned pregnancies   ‒ ‒ Unplanned pregnancies

Figure 21. Results of PHQ2 scores in two groups over time

DEPRESSION(PHQ-2)

	Baseline <5 Months of pregnancy	3-6 weeks post-partum	4 months post-partum	12 months post-partum
Planned pregnancies	1.7	1.48	1.73	1.58
Unplanned pregnancies	2.3	2.15	2.21	2.03

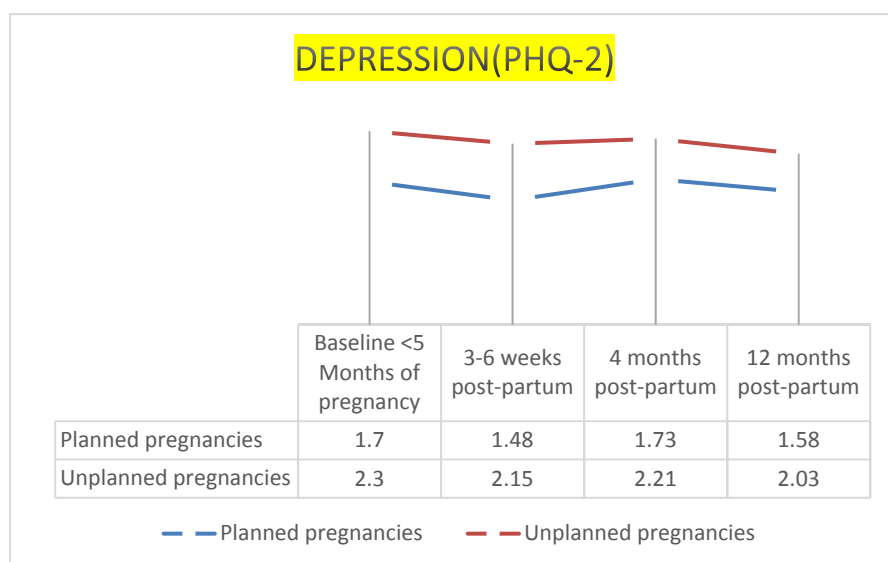‒ ‒ Planned pregnancies   ‒ ‒ Unplanned pregnancies

Figure 3. Results of PHQ2 scores in two groups over time

When adjusting for perceived social support and relationship quality (marital closeness, partner support, and instances of interpersonal violence), there was a significant reduction in the likelihood of experiencing psychological distress after an unplanned pregnancy. This underscores the potential role that social support plays in the connection between unplanned pregnancy and psychological distress. These findings align with our observation that there is a strong association between unplanned pregnancy, family support, and PHQ-2 scores.

Our observation showed that women with an unplanned pregnancy and their husbands are less educated. A strong association was reported between unplanned pregnancy and certain health-related factors, such as current smoking and lower educational attainment (3). Based on these data, higher education reduces the rate of unplanned pregnancies as a health life-threatening factor and its consequences.

We encountered 2 notable issues in this study. First, we conducted our sampling in public health centers that offer free services. In the areas where we conducted the sampling, about 70% of people opted to receive these services. Conversely, those with more economic resources often choose to receive services from private clinics, which are usually less crowded. Second, the areas involved in this study are known to be underprivileged, which may have an impact on the results.

Including a larger and more diverse community in this study could be beneficial in gaining a deeper understanding of the consequences of unplanned pregnancy and how to mitigate them.

The data highlight the susceptibility of women with unplanned pregnancies to mental health issues. Our study demonstrates that this group benefits from strong marital

relationships and social support. It is important to raise public awareness about pregnancy planning and the consequences of unplanned pregnancy. Moreover, it is essential to educate communities to be more considerate and supportive of pregnant women.

Conclusion

According to the results of our study, women who become pregnant unexpectedly are more likely than other women to suffer from stress and sadness. For several months following childbirth, this risk may persist. Some populations are more susceptible to unintended pregnancies than others—including older moms, parents with lower educational attainment, and larger families. Women who benefit from social support and good marital happiness may be less likely to suffer the negative effects of an unintended pregnancy.

Authors' Contributions

Conceptualization: Mahdi Khodadoust, Reyhane Mohammadi, Zahra Mahmoodian, and Nouzar Nakhaee.

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Writing the original draft: Mahdi Khodadoust, Reyhane Mohamadi, Maedeh Sarreshteh, and Nouzar Nakhaee.

Review & editing: Mahdi Khodadoust, Reyhane Mohammadi, Gholamreza Asadi-Karam, Maedeh Sarreshteh, and Nouzar Nakhaee.

Ethical Considerations

The ethics review committee of Kerman University of Medical Sciences (IR.KMU.REC.1399.582) approved this study.

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Conflict of Interests

The authors declare that they have no competing interests.

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Appendix 1. The Patient Health Questionnaire (PHQ-2)

Over the past 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly everyday
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3

Appendix 2. Perceived Stress Scale (PSS4)

INSTRUCTIONS

The questions in this scale ask you about your feelings and thoughts during THE LAST MONTH. In each case, please indicate your response by placing an "X" over the square representing HOW OFTEN you felt or thought a certain way.

	Never 0	Almost Never 1	Sometimes 2	Fairly Often 3	Very Often 4
1. In the last month, how often have you felt that you were unable to control the important things in your life?	☐	☐	☐	☐	☐
2. In the last month, how often have you felt confident about your ability to handle your personal problems?	☐	☐	☐	☐	☐
3. In the last month, how often have you felt that things were going your way?	☐	☐	☐	☐	☐
4. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	☐	☐	☐	☐	☐

Scoring for the Perceived Stress Scale 4:

Questions 1 and 4
0 = Never
1 = Almost Never
2 = Sometimes
3 = Fairly Often
4 = Very Often

Questions 2 and 3
4 = Never
3 = Almost Never
2 = Sometimes
1 = Fairly Often
0 = Very Often

Lowest score: 0
Highest score: 16

Higher scores are correlated to more stress.