



# Long-term civil conflict, migration, and the mental health of adults left behind in Thailand: a longitudinal study

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## Abstract

**Objectives** A long-term civil conflict has been occurring in the southernmost provinces of Thailand, and migration to Malaysia has been accelerated by this conflict. The objective of this work was to examine the influence of perceived effects of the unrest, migration of a household member, and children left behind on the reporting of psychiatric symptoms of working age adults.

**Methods** A first round of data collection was conducted in 2014 including interviews with a probability sample of 1102 households and individual interviews with 2058 males and females aged 18–59. In 2016, a second round of data collection was conducted. A fixed effects model was used in the analysis.

**Results** The perceived effect of the unrest on the household was associated with an increased reporting of psychiatric symptoms. Furthermore, the migration of a household member for work and the presence of children left behind were related to an increased reporting of psychiatric symptoms among adults, especially among females.

**Conclusions** The unrest and its associated migration was related to an increased reporting of psychiatric symptoms among working age adults in the study population.

**Keywords** Migration · Mental health · Conflict · Thailand

## Introduction

There has long been a tradition of migration for work from the three southernmost provinces of Thailand to destinations in Malaysia. These three southern provinces of Thailand have also been involved in an extended period of civil unrest. This unrest has increased migration from the area (Jampaklay et al. 2017). Most villages in the three provinces contain a majority of members who are Muslim, and the presence of *masjids* (*mosques*) and practice of the Muslim religion is strong. Migration may increase the

incidence of psychiatric symptoms among adults in communities (Lu 2012; Lu et al. 2012). The tension in a household over economic or other factors that lead to a migration and worry about a household member who is far from home may lead to stress. Migration can also be considered a form of family disruption. In the context of out-migration, the absence of key family members may lead to a loss of social support and heightened stress (Lu 2012). Out-migration may diminish reciprocal social support of the kind that may produce positive social and emotional experiences (Cohen and Willis 1985).

Several cross-sectional studies of adults left behind by migration found a significant negative effect on the mental health of adults left behind (Antman 2010; Lu 2012; Wilkerson et al. 2009) and caregivers (Graham et al. 2015; Siriwardhana et al. 2015). Indeed, previous cross-sectional research in the southern provinces of Thailand showed that persons living in a household with a migrant reported more psychiatric symptoms than persons living in a household without a migrant (Ford et al. 2017). In contrast, a longitudinal study found no meaningful increase in depressive symptoms among Mexican mothers with a spouse in the

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USA (Nobles et al. 2015). Furthermore, an experimental study based on results from a migration lottery that randomly assigned household migration status showed no effects on the mental health of adults left behind (Gibson et al. 2011).

The southernmost provinces became part of Thailand in the late nineteenth century. Further information on the history of this region can be found in publications (Chalk 2008; Croissant 2005). Since the Thai acquisition, there has been tension between the provinces and the Thai government over authority, assimilation to the Thai Buddhist culture, and other issues (UNICEF 2014). Consequently, in addition to a motivation for better income, one of the underlying reasons for migration is the ongoing unrest related to these issues (Jampaklay et al. 2017). In the 15 years since 2004, the area experienced more than 6000 deaths and 15,644 violent incidents (Maxmillian 2018). Ninety percent of the deaths were to civilians.

Exposure to traumatic events has been found to increase risk of post-traumatic stress disorder (PTSD) as well as depression and other mental disorders (Axinn et al. 2013; Jewkes et al. 2017; Miller and Rasmussen 2010). However, direct exposure to violence has been found to explain only a small part of psychiatric symptoms (Miller and Rasmussen 2010). Studies in Afghanistan (Weiss and Marmar 1997), Sri Lanka (Fernando et al. 2010), and Palestine (Al-Krenawi et al. 2007) showed that only a small part of the variance in post-traumatic stress disorder (PTSD) was explained by direct exposure to violence. In addition to stress due to direct exposure to conflict, everyday tensions related to the conflict such as economic depression and migration of family members may also increase the level of symptoms of mental health including depression, anxiety, and other issues (Miller and Rasmussen 2010).

A factor to consider during a period of conflict is the well-being of the migrant and the migrant's family before the migration. Persons living in a conflict area are at risk of violence as well as being drawn into the conflict. After a migration from the household, the adults left behind may experience a reduction in psychiatric symptoms because the family member is away from the violence in the area.

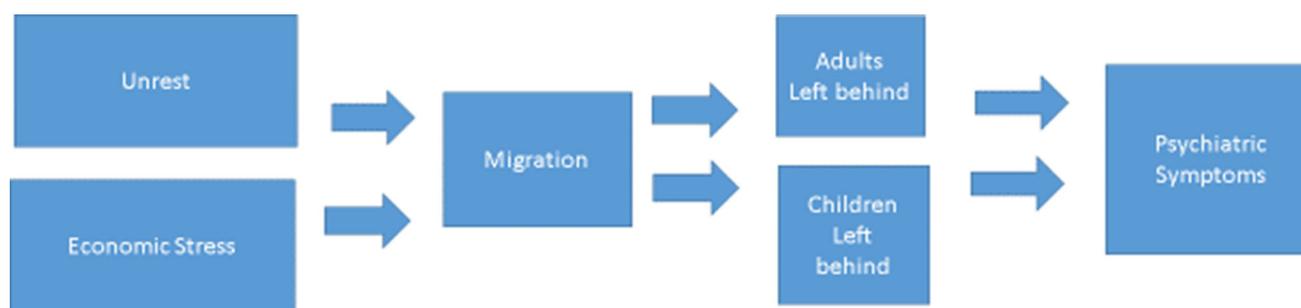
Figure 1 shows the conceptual framework for the study. The perceived effects of the unrest may accelerate migration resulting in children and adults left behind. This absence of the migrant may increase reporting of psychiatric symptoms among the adults left behind. If children have been left behind, this may also increase the reporting of psychiatric symptoms among the adults left behind.

Antman (2013) expressed the view that due to inconsistent results, more studies on persons left behind should be conducted in a variety of settings. First, this study is significant due to its unique setting—an area of long-term conflict where the practice of Islam is an important part of everyday life. This study will also add to this literature by using a longitudinal design. Third, while many earlier studies of the impact of migration on the household left behind focus on the elderly (Abas et al. 2013; Adhikari et al. 2011) or on children (Antman 2011; Fellmeth et al. 2018; Hildebrandt et al. 2005; Jampaklay and Vapattana-wong 2013), this study focuses on working age adults who serve as providers for the young and the elderly (Lu 2012). Finally, studies of children left behind have mainly focused on the elderly or female caregivers (spouses of the migrant and caregivers of children) who were left behind, while this study includes the effects of having children who were left behind on both female and male adults of working age.

## Methods

### Data

In 2014, a project was initiated on the impact of the unrest in the three southern provinces of Pattani, Yala, and Narathiwat on migration, mental health, and gender roles of the adult population. The survey was designed to capture a representative sample of the Muslim population in the three southernmost population using the probability proportional to size (PPS) sampling strategy (Jampaklay et al. 2017). In general, the three southernmost provinces are considered homogeneous in terms of level of socioeconomic status, culture, as well as the level of violence.



**Fig. 1** Conceptual framework for the study of the unrest and migration on psychiatric symptoms of those left behind, Thailand, 2014–2016

Therefore, villages in all three provinces were included in the sampling frame without differentiating in which province a given village is located. Thirty villages in the three provinces were covered in the survey: 10 villages in Patani, 9 in Yala, and 11 in Narathiwat. In each province, the study was designed to survey 80% of the sampled communities in the rural areas and 20% in the urban areas, corresponding to the rural–urban proportion of persons in the three provinces. Muslim households with a resident woman of working age (18–59) were eligible for inclusion in the study. The power calculation for the survey is shown in the Online Resource. In each household, the household head was interviewed. The household head was asked to complete a household roster, including demographic and health information of resident and nonresident members, as well as questions on household wealth and the impact of the conflict on the household. In addition, individual interviews were conducted with a woman and a man of working age (18–59) who were selected randomly from the household roster. A first round of data collection was conducted in 2014 including interviews with a probability sample of 1102 household heads and individual interviews with 2058 males and females. In 2016, a second round of data collection was conducted in the same households. About 90% of households were re-interviewed including individual interviews with 1746 persons (85% of individuals were re-interviewed). Interviews were conducted in the respondents' homes. All interviewers were residents of the study provinces and were fluent in both Thai and Malayu. Both languages were used in the interviews. The project was approved by a Mahidol University Human Subjects Committee.

## Measurement of variables

### Outcome variable

Mental health was measured using the WHO Self-Reporting Questionnaire (SRQ-20) (WHO 1994). This measure was designed to screen for psychiatric disturbances, particularly in developing countries. Data on evaluation of the measure can be found in the WHO guide (WHO 1994). This 20-item measure has been used in many international studies, including Thailand (Jampaklay and Vapattana-wong 2013). The questionnaire measured the domains of anxiety and depression as well as somatic symptoms. Item responses were recorded as binary (yes = 1, no = 0) and cover a 30-day recall period. The items were summed to create a total score.

## Exposures

### Unrest

The perceived effect of the unrest was measured with the question “Many people living in these provinces have been affected by the unrest. In general, how much has your household been affected by the unrest?” Responses were: (1) not at all, (2) a little, (3) fairly, and (4) very much. Three dummy variables were created: very much, fairly, and a little, with not at all as the reference variable.

### Migration

*Household migration for work* We define migration for work as leaving the home of origin for at least one month for the purpose of work. First, a dichotomous variable was created to measure whether someone was away from the household for work (1 = migrant away for work, 0 = no migrant away for work). Because remittances may affect the experience of loss of a family member, a measure was coded using one dummy variable (1 = had a current migrant sending remittances, 0 = has a current migrant no remittances). Current migrants for work from a household were coded regardless of destination.

*Children left behind* This variable was defined as the number of children under age 15 left behind by a migrant

## Covariates

*Individual religious practice* Respondents were asked how strictly they practice their religion on a four-point scale. Two dummy variables were created 1) very strictly and 2) strictly, with not strictly or not strictly at all as the reference variable. The two lower categories were combined due to sample size.

*Gender of respondent* Gender of respondent was coded as male (1) and female (0).

*Secular education* Secular education was measured by the number of years completed.

*Age of respondent* Age of respondent was coded in single years.

*Marital status* Marital status was coded using dummy variables: married with spouse present, married with spouse absent, widowed, divorced or separated, or single. Single was used as the reference category.

*Health* Health was measured on a five-point scale from (1) very poor to (5) very good.

*Total wealth of the household* This is an asset-based measure of household wealth derived from a principal components analysis of household assets (Filmer and Pritchett 2001). The results were coded into ten groups ranging from zero to nine to ease interpretation.

### Analytic considerations

In the analysis of longitudinal data sets, investigators often use either fixed or random effects models (Clark and Linzer 2015). If an omitted variable has resulted in a correlation between an independent variable and unit effects, random effects estimates will be biased (Allison 2009; Clark and Linzer 2015). Random effects models produce smaller standard errors of the coefficients than the fixed effects models. Fixed effects models can control for unchanging, unmeasured variables, while random effects models do not make this adjustment. The Hausman test has been used to determine if the regressor is correlated with the unit effects, creating a bias in the coefficients. This test indicates whether or not the coefficients in the random effects model differ significantly from the coefficients in the fixed effects model (Allison 2009). As shown below, the Hausman test was significant for the model that included “had a working migrant” as an exposure variable, indicating that the fixed effect model may be preferable.

There was concern about omitted variables in our analysis because one of the main exposure variables was having a working migrant. A difficulty in assessing the mental health of persons living in migrant households is the selectiveness of migration (Antman 2013). There is a large literature that emphasizes the selectiveness of migration on many factors (Lindstrom and Ramirez 2010; Lu 2008). Households that send migrants may differ from households that do not send migrants, and it is difficult to measure all of these differences. Because of this, it is possible that the correlation between this exposure variable (migration) and the unit effects may be large. Indeed, a longitudinal study using a fixed effects analysis found no meaningful increase in depressive symptoms among Mexican mothers with a spouse in the USA (Nobles et al. 2015). This Mexican study also noted that when a different statistical procedure was used that did not adjust for unmeasured unchanging variables, a random effects model, the results showed large and significant associations between spouse migration and mothers’ depressive symptoms. Because of this concern about omitted variables related to migration, the main models in this paper were estimated using fixed effects methods. Random effects models are shown in the online materials for comparison.

### Analytic strategy

Descriptive analyses were conducted on both the household roster (all adults) and the analytic sample (individual interview respondents). Bivariate (unadjusted) fixed effects regression models were then tested in the analytic sample, with SRQ as the outcome and each of the exposure variables (perceived unrest, working migrant, and children left behind) and the covariates (strictness of religious practice, secular education, household wealth, marital status, and health) tested separately. Finally, multivariable fixed effects models were conducted in two sets. The SRQ was the outcome variable in all models. The first set included two multivariable models. The first model of this set used the full analytic sample, and regressors included the exposure variables effect of the unrest and had a working migrant as well as the covariates. The second model in the first set included only persons living in households with a working migrant. The regressors in the second model of the first set included the effect of the unrest and whether the migrant sent remittances as well as the covariates. The second set of multivariable models used the whole analytic sample. The regressors for these models included the exposure variables effect of the unrest, working migrant, and children under 15 left behind as well as the covariates. Almost two-thirds of respondents in this survey reported that there was no one person designated to take care of the children left behind. Because of this issue, combined with the size of the sample, no variable was created to reflect caregiver status. The small number of caregivers reported was mainly mothers or grandmothers. Consequently, gender issues were considered in the analysis that includes children left behind. Three models were estimated in this set: one for the total sample, one for females, and one for males.

## Results

### Descriptive and bivariate results

Demographic statistics are available for the analysis sample (data from the individual interviews) as well as for all adults (data from the household roster) (Table 1). The two samples were similar on demographic characteristics except that more members of the analytic sample were married and fewer were single. Education is now compulsory in Thailand up to grade nine (lower secondary or Mattayom). After that, students may transfer to high schools or vocational schools. Education has been impacted by the unrest, due to violence directed at the schools (UNICEF 2014).

**Table 1** Baseline demographic characteristics of the analytic sample and the household roster, Thailand, 2014–2016

Variable	Household roster	Analytic sample
Gender		
Females	54%	54%
Males	46%	46%
Age mean (SD)	35.3 (12.2)	39.7 (11.0)
Marital status		
Married	64%	81%
Widowed/divorced, separated	6%	7%
Single	30%	12%
Secular education		
Mean years (SD)	8.6 (4.4)	7.9 (4.3)
N	3487	2035

The mean (SD) SRQ score in round 1 was 2.99 (3.2; range 0–18) and 3.1 (3.1) in round 2. In some studies, the proportion of persons reporting eight or more symptoms has been used as an indicator of persons needing mental health services. In this sample, 10.3% reported more than eight symptoms in round 1 and 8.9% reported eight or more

symptoms in round 2. These data should be interpreted with caution because this cutoff has not been standardized for this population.

Table 2 shows descriptive statistics on exposure variables and bivariate fixed effects models. About a third of respondents reported that the unrest had a sizeable effect on the family. About 16% (N = 176) of households had a working migrant away from the household, and about 25% (44/176) of households with a migrant had children left behind under age 15. Most households with a working migrant reported receipt of remittances (78%, 132/176). On average, religious practice was strict and almost a quarter of respondents reported very strict practice. Most respondents reported good health. The household wealth index averaged 4.6, the middle of the range (0–9).

The bivariate fixed effect analysis in Table 2 includes rounds 1 and 2. The variables measuring the perceived effect of the unrest on the household were significant. The larger the perceived effect, the greater the increase in psychiatric symptoms. Respondents in households with a current working migrant reported more psychiatric symptoms than persons living in households without a migrant.

**Table 2** Descriptive values and bivariate fixed effects analysis of exposures on mental health, Thailand 2014–2016

Exposure variables	Descriptive statistics	Bivariate models	
		Coefficient	95% CI
<i>Data from household questionnaires</i>			
Overall effect of unrest			
Very much	9% (99)	1.24***	(0.58, 1.89)
Fairly	23% (255)	0.66**	(0.20, 1.11)
A little	25% (271)	0.44*	(0.09, 0.80)
Not at all	43% (473)	Reference	
Total households	100% (1102)		
Migration variables			
Current working migrant	16% (176)	0.54***	(0.18, 0.91)
Current working migrant—remittances	78% (139/176)	– 0.21 <sup>a</sup>	(– 1.79, 1.36)
Children under 15 left behind in migrant households	25% (44/176)	0.57***	(0.21, 0.92)
Total households	100% (1102)		
<i>Data from individual questionnaires</i>			
Strictness of practice			
Very strictly	24% (488)	– 0.09	(– 0.78, 0.57)
Strictly	69% (1404)	– 0.29	(– 0.91, 0.33)
Not strictly or not at all strictly	7% (43)	Reference	
Total	100% (2035)		
Health mean (SD)	4.0 (0.66)	– 0.65***	(– 0.89, – .41)
Household wealth mean (SD)	4.6 (2.85)	0.08	(– 0.01, 0.17)
Number of persons (round 1)	2035	2035	
Number of records	N/A	3548	

\*\*\*p < 0.001. \*\*p < 0.01, \*p < 0.05

<sup>a</sup>The analysis for current working migrant—remittances include only households with a working migrant. All other bivariate models include the full analytic sample

Persons in households with children less than 15 left behind reported more psychiatric symptoms than persons in other households. Persons living in households with a migrant who sent remittances reported about the same number of psychiatric symptoms as persons living in households with a migrant who did not send remittance. Good health was strongly associated with reduced psychiatric symptoms.

## Multivariable results

Table 3 shows the multivariable fixed effect analysis of the study variables. Model 1 showed that the perceived effect of the unrest was significantly related to reporting of more

psychiatric symptoms. Those who reported “very much” or “fairly” reported significantly more psychiatric symptoms. Persons living in a household with a working migrant also reported more psychiatric symptoms. Persons who reported better health reported fewer psychiatric symptoms.

Model 2 included the exposure variable representing the reporting of remittance. Only respondents who reported a working migrant were included in this analysis. Respondents living in household with a current working migrant who was submitting remittances were no more likely to report psychiatric symptoms than respondents with a migrant(s) who was not submitting remittances.

**Table 3** Multivariable fixed effects analysis of the effects of study variables on reporting of psychiatric symptoms, Thailand, 2014–2016

Multivariable model	Model 1 working migrant—persons in all households <sup>a</sup>		Model 2 remittances—persons in households with a current migrant	
	Coefficient	95% CI	Coefficient	95% CI
<i>Exposure variables</i>				
Perceived effect of unrest				
Very much	129***	(0.63, 1.94)	2.69	(− 0.56, 5.94)
Fairly	0.64**	(0.18, 1.09)	0.50	(− 1.37, 2.55)
A little	0.33	(− 0.02, 0.68)	− 0.07	(− 2.27, 2.13)
Not at all (ref)	Reference	−	−	−
Migration variables				
Working migrant	0.54**	(0.18, 0.90)	−	−
Working migrant with remittances	−	−	0.60	(− 1.01, 2.21)
<i>Covariates</i>				
Strictness of practice				
Very strictly	− 0.13	(− 0.82, 0.55)	0.89	(− 2.34, 4.12)
Strictly	− 0.29	(− 0.90, 0.33)	0.05	(− 2.79, 2.89)
Not strictly or not at all strictly	Reference	−	−	−
Secular education	− 0.02	(− 0.07, 0.04)	− 0.38**	(− 0.64, − 0.12)
Age	0.01	(− 0.02, 0.03)	− 0.04	(− 0.14, 0.05)
Marital status				
Married spouse present	0.21	(− 0.48, 0.91)	− 1.06	(− 4.18, 2.06)
Married spouse absent	0.21	(− 0.76, 1.18)	− 0.52	(− 5.09, 4.04)
Widowed or divorced	0.87	(− 0.04, 1.78)	− 0.24	(− 3.82, 3.34)
Single	Reference	−	Reference	−
Health	− 0.56***	(− 0.80, − .32)	− 1.33*	(− 2.64, − 0.03)
Household wealth	0.07	(− 0.01, 0.16)	0.52	(− 0.04, 1.08)
<i>F</i> ( <i>p</i> )	5.4***	−	1.99*	−
<i>N</i> records	3548	−	789	−
<i>N</i> individuals	2035	−	706	−

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$

<sup>a</sup>Hausman test result (Chi-square = 36.2,  $p < 0.01$ )

**Table 4** Multivariable fixed effects analysis of the effects of study variables on the reporting of psychiatric symptoms including children left behind in the household, Thailand 2014–2016

	Total		Female		Male	
	Coefficient	95% CI	Coefficient	95% CI	Coefficient	95% CI
<i>Exposure variables</i>						
Perceived effect of unrest						
Very much	1.34**	(0.68, 1.99)	1.24**	(0.44, 2.03)	1.54**	(0.43, 2.64)
Fairly	0.64***	(0.18, 1.09)	0.81**	(0.22, 1.39)	0.40	(- 0.33, 1.34)
A little	0.33	(- 0.01, 0.68)	0.59*	(0.14, 1.04)	0.10	(- 0.45, 0.65)
Not at all	Reference		Reference		Reference	
Migration variables						
Current working migrant	0.39*	0.01, 0.77)	0.19	(- .31, 0.68)	0.63*	(0.03, 1.23)
Children less than 15 left behind	0.53**	(0.12, 0.95)	0.54*	(0.03, 1.04)	0.53	(- 0.17, 1.23)
<i>Covariates</i>						
Strictness of practice						
Very strictly	- 0.12	(- 0.80, 0.56)	- 0.10	(- 0.98, 0.78)	- 0.14	(- 1.22, 0.94)
Strictly	- 0.27	(- 0.88, 0.34)	- 0.32	(- 1.10, 0.47)	- 0.18	(- 1.14, 0.79)
Not strictly or not at all strictly	Reference		Reference		Reference	
Secular education	- 0.01	(- 0.06, 0.04)	0.02	(- 0.05, 0.08)	- 0.04	(- 0.12, 0.04)
Age	0.00	(- 0.02, 0.02)	- 0.00	(- 0.02, 0.02)	0.01	(- 0.02, 0.05)
Marital status						
Married spouse present	0.24	(- 0.45, 0.94)	- 0.04	(- 0.92, 0.83)	0.53	(- 0.60, 1.66)
Married spouse absent	0.11	(- 0.87, 1.08)	0.44	(- 0.82, 1.71)	- 0.10	(- 1.62, 1.43)
Widowed or divorced	0.87	(- 0.03, 1.79)	0.60	(- 0.60, 1.79)	0.88	(- 0.55, 2.31)
Single	Reference		Reference		Reference	
Health	- 0.57***	(- 0.81, - .33)	- 0.61***	(- 0.92, - 0.30)	- 0.49*	(- 0.87, - 0.11)
Household wealth	0.07	(- 0.01, 0.16)	0.05	(- 0.06, 0.16)	0.09	(- 0.04, 0.23)
<i>F</i> ( <i>p</i> )	6.74***		3.41***		2.97***	
Number of records	3548		1852		1696	
Number of persons	2035		1092		943	

\*\*\**p* < 0.001, \*\**p* < 0.01, \**p* < 0.05

Table 4 shows multivariable models of the effects of having a working migrant as well as having children left behind for the total population, females and males. In these models, the perceived effect of the unrest was associated with a significant increase in reporting of psychiatric symptoms for the female and the male models. The two migration variables, current working migrant and children less than 15 left behind, were both positive and significant for the total model. Having a current working migrant as well as having children left behind increased the number of symptoms reported. There were gender differences in the estimates of the effects of these two variables. For females, the coefficient of current working migrant was not significant, but the coefficient of children left behind was positive and significant. For males, the coefficient of having a working migrant was positive and significant but the coefficient of children less than 15 left behind was not significant. As discussed

below, this gender difference in the effect of children left behind may reflect gender roles in the household.

### Discussion

In this analysis of factors related to reporting of psychiatric symptoms in the southernmost provinces of Thailand, the significance of the variable effect of the unrest on the household mirrors the results found in other countries on mental health and traumatic events (Axinn et al. 2013; Jewkes et al. 2017; Miller and Rasmussen 2010). Psychiatric symptoms increased with the severity of the effect of the unrest.

In this population, migration from the household increased the reporting of psychiatric symptoms of adults of working age. The absence of household members as well

as other members of the village may affect the levels of social support in the household and the village, leading to increased psychiatric symptoms (Ford et al. 2017; Lu 2012). The results from this study are in agreement with other studies in China, Thailand, Indonesia, and Mexico that showed negative effects upon the mental health of adults of working age remaining at home in migrant households (Ford et al. 2017; Lu 2012; Lu et al. 2012; Wilkerson et al. 2009).

An earlier study of the mental health of mothers left behind by a migrant in Mexico found that the coefficient of the effect of a migrant on the well-being of mothers left behind decreased substantially when a fixed effects model was used instead of a random effects model (Nobles et al. 2015). The Nobles et al. (2015) survey population was mothers aged 18–44 whose husband had migrated to the USA. The random effects model does not adjust for unchanging omitted variables. When a random effects model was used in the current study (Online Resource), the estimated coefficient was 0.50 (.12)  $p < .001$ , compared to 0.54 (.18)  $p < .001$  in the fixed effects model. The confidence intervals for these coefficients overlapped substantially, suggesting that the effects of unchanging omitted variables did not have a significant effect on the random effects estimate. However, the fixed effects coefficient had a larger variance.

This study also found that persons living in a household with children under age 15 who were left behind by a migrant also reported more psychiatric symptoms, and that this effect was stronger for female adults compared to male adults. We did not use a primary caregiver variable because less than half of the households in round 1 (45%) reported a primary caregiver and the sample size would make estimation of this effect difficult. When a caregiver was listed, it was overwhelmingly the grandmother or the mother. It is likely that the effect of having children under 15 in the household affects women's mental health more than men's mental health because women take more responsibility for the children. Earlier studies have evaluated mental health for female caregivers (Graham et al. 2015; Siriwardhana et al. 2015; Nobles et al. 2015), though they have not looked at the effects on the mental health of males when children are left behind.

Further results showed that having a migrant who sent remittances did not affect the adults left behind differently from those adults left behind who did not receive any remittance. This may be because the number of persons living in a households with a non-remitting migrant was small (4% in round 1), affecting the power of the statistical test. An alternative hypothesis may be that the households receiving remittances have a greater need for the financial support from remittances, and consequently higher stress, but this is unlikely since household wealth and secular education were controlled for in the analysis.

A contrast with the earlier cross-sectional study in this area (Ford et al. 2017) was the lack of significance of religious practice. This variable may not be significant because the respondents were living in an area where Islamic religious practice was part of everyday life and their adult religious practice was firmly established, leading to little change between the two surveys (mean round 1, 3.16; mean round 2, 3.14), reducing the power of the statistical test. The fixed effects model often produces larger variances when there is little change between the survey rounds, reducing the level of significance (Allison 2009). The corresponding random effects model showed a significant effect (Online Resource).

The study has some limitations. We do not have direct measures of stress or social support. The study included two waves of data conducted two years apart. A two-year time interval can reduce attrition, while the effects of the migration and unrest on mental health may take a longer time to develop.

## Conclusion

In summary, this study provided some support for the hypotheses that the unrest as well as migration of a family member can have a negative effect on the mental health of the population left behind and this may have a strong effect on women when children are also left behind. Longer-term longitudinal studies of migration and mental health should be encouraged.

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## Compliance with ethical standards

**Conflict of interest** The authors have no conflicts of interest.

**Ethical approval** The study protocol was reviewed and approved by a Human Subjects Committee of Mahidol University. The authors assert that all procedures contributing to this work have been performed in accordance with the ethical standards set down in the 1964 Declaration of Helsinki and its later amendments.

**Informed consent** All persons provided written informed consent prior to their inclusion in the study.

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