ORIGINAL ARTICLE

Migration of Children and Impact on Depression in Older Parents in Rural Thailand, Southeast Asia

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Context: Migration is feared to be associated with abandonment and depression in older parents "left behind" in rural areas of low- and middle-income countries.

Objective: To test for prospective associations between (1) out-migration of all children and subsequent depression in parents and (2) having a child move back and an improvement in parents' depression.

Design: A cohort study with a 1-year follow-up.

Setting: A population-based study nested in a demographic surveillance site of 100 villages in rural Thailand. Most out-migration is to the capital city.

Participants: A stratified random sample of 1111 parents 60 years and older (1 per household) drawn from all 100 villages, of whom 960 (86%) provided depression data at follow-up.

Main Outcome Measures: Scoring 6 or more on the Thai version of the EURO-D depression scale at follow-up.

Results: Depression prevalence was 22%. At baseline, 155 (16%) had all their children migrated from the district and 806 (84%) had at least 1 child living in the district. Having all children out-migrated at baseline, compared with having none or some children out-migrated, predicted a smaller odds of depression, after controlling for baseline sociodemographic and health measures (odds ratio [OR], 0.43; 95% CI, 0.20-0.92). Having a child move back in the study year was associated with greater odds of depression at follow-up when adjusted for baseline measures (OR, 1.75; 95% CI, 1.04-2.94), although this was no longer significant after adjusting for changes in disability and marital status since baseline (OR, 1.72; 95% CI, 0.99-2.98).

Conclusions: Contrary to our hypothesis, parents whose children are not migrants may be at greater risk of depression than those with migrant children. More understanding is needed about the risks for depression in older rural populations and about the effectiveness of interventions.

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DEPRESSIVE SYNDROMES ARE common in older people, with prevalence ranging from 9% to 33%.[1-3] These conditions, although broader than *DSM* major depression, are associated with disability and mortality.[4,5] While rural residence may be protective for depression in Western settings,[6] the reverse was found in China,[7] and suicide is more common in rural than urban areas.[8,9]

The rising rate of out-migration of younger people may contribute to late-life depression in rural Southeast Asia. It is commonly said that older people are "left behind" in the rural areas of many low- and middle-income countries by out-migrant children,[10] leading to isolation, loss of role, and even loss of basic support.[11] However, we previously reported unexpected findings from a cross-sectional survey in rural Thailand suggesting lower levels of depression in older people with all their children migrated.[12] We set out to extend the earlier study to include a prospective phase 1 year after baseline assessment.

Our hypotheses were:

1. Having all children out-migrated from the parents' district at baseline is associated with increased depression in older parents at 1-year follow-up, adjusting for depression at baseline and confounding variables.
2. Having a child return to the parents' district in the study year is associated with reduced depression in older parents, adjusting for depression at baseline.

The study was set in Thailand where traditionally children take responsibility for aging parents and older parents con-

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tinue to provide support (instrumental, financial, emotional, and moral) for adult children.[13,14]

METHODS

SETTING AND SAMPLING

As described elsewhere,[12] the baseline survey was nested in the Kanchanaburi Demographic Surveillance System (DSS).[15] This provides a robust longitudinal database on more than 42 000 individuals from 12 500 households in 100 villages. Kanchanaburi Province in western Thailand is Thailand's third largest province, sharing a border with Myanmar and covering more than 19 000 km^2, including mountains and forests. The central town is 120 km from Bangkok. Most villages in the province are reached by car from Bangkok within 1 day, but only 41% have a regular bus service. Some villages have a demanding final journey section relying on water transport, cycle, or foot. The selection of the 100 villages (sampling units) in the DSS reflects the diversity in the province; they comprised 20 villages each of the following strata: (1) rice producing, (2) plantation crop producing, (3) uplands areas, (4) urban/semiurban (industrialized), and (5) mixed economy.

The DSS communities have consented to annual data collection since 2000, with a 92% individual response rate.[16] Each year face-to-face interviews are conducted with all those 15 years and older in every household.

For our baseline survey, eligible subjects were all those living in those DSS households containing at least 1 person 60 years or older on November 1, 2006. We hypothesized an 18% greater prevalence of depression in those with all children migrated vs those with some or no children migrated. To capture adequate numbers to test this, we sampled 60% of households where an older adult was living without at least 1 child and 30% of households where an older adult was living with at least 1 of their children We excluded only those older adults without at least 1 living child—biological, stepchild, or adopted (<5%)—and those for whom Thai was not the household language (<1%). From the potential eligible sample of 1300 from 1300 households, 1111 (85%) completed data collection.[12] Index assessment interviews were carried out in 2006 and follow-up, 12 months later.

DEFINITIONS

As some previous studies have done, we defined an outmigrant child as a child living outside the parent's district of residence[17] for a minimum of the past 3 months. A district is a well-recognized administrative boundary, with a radius of approximately 15 km or more. We defined children in the household as either in the parental household or next door.

RECRUITMENT

The interviewing team visited each sampling unit in 2007 with a list of all participants from 2006 and a map of households. Interviewers visited each household that had participated in 2006. The interviewer first interviewed the household head with the household questionnaire and then the older adult with the individual questionnaire.

ASSESSMENTS

Depression

The EURO-D is a 12-item screen for depression using items from the Geriatric Mental State Examination, a standardized, validated diagnostic measure.[18] It is strongly correlated with its parent instrument and shows high criterion validity against *DSM* major depression.[18] In studies from developing countries, the EURO-D has a similar factor structure to that in European countries.[19] We defined depression as being more than the cutoff point for probable depression of 6 or more of 12 on the Thai version of the EURO-D scale.[20]

Location of Children Inside or Outside the District

For the baseline survey, we had made use of existing DSS methods to carefully establish household membership and the location of all the participant's children by asking children's names, where they lived, and length of time living at that location. To assist precision, we asked if the child was in the household, the village (or for urban dwellers, within average walking distance), the subdistrict/neighborhood (*tambon*), or the district (*amphoe*), all of which are well recognized. We then stipulated which child we were referring to when we asked subsequently about support exchanges and remittances, cross-checking to ensure we were rating the correct child. For those who performed poorly cognitively or who gave vague or inconsistent answers, we asked an informant. At follow-up, we gathered this information again and so determined movement of any children in or out of the district in the study year.

Socioeconomic Position

To determine socioeconomic position, we assessed years of education, number of household assets (of 24), and household wealth index (based on 14 household assets such as ownership of a refrigerator, motorcycle, or mobile telephone[21] and household quality).

Support

We also looked at social network and social support from children and from others[12] and financial remittances from children in the previous year.

Cognitive Function

To determine cognitive function, we assessed immediate recall and delayed recall of a 10-word list learning task. Ten nouns were presented for 3 trials; recall was tested immediately (score of 30) and after a 5-minute delay (score of 10).[22,23] We also used the animal naming verbal fluency task (score is total number of different animals listed in 1 minute). We defined significant cognitive impairment as performance at or less than 1.5 SDs below the norm for the individual's age group and educational level.

Physical Illnesses and Impairments

We used the Burvill Physical Illness Scale[24] to ask about the presence of 13 common health problems affecting different systems including breathlessness, blackouts, arthritis, weakness, and hearing difficulties. If participants said they had such a problem, we then asked if it "troubled them a lot." Impairment score was of 13 for health problems that troubled them a lot.

Disability

We used 11 items from the brief World Health Organization Disability Assessment Schedule to assess disability over the past 30 days in different activities such as getting around, self-care,

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getting along with people, and participation in society.[25] The participant self-rated each activity from 0 (no difficulty) to 4 (very severe/unable to do activity at all). The potential range was 0 to 44.

We conducted all interviews in Thai and gathered written informed consent from all participants (Kings College research ethics committee No. 05/05-68; Mahidol University institutional review board 2005).

STATISTICAL ANALYSES

A comparison of the sample that completed follow-up with those who did not was carried out assessing differences using *t* tests and χ^2. A logistic regression was used to predict the probability of loss to follow-up. Inverse weighting for probability of household selection and for loss to follow-up was applied to all analyses. We included geographical "strata" as a covariate in all analyses.

We carried out initial investigations of associations between individual baseline characteristics and depression at follow-up using *t* tests and χ^2 tests as appropriate and including adjustment for baseline depression status using logistic regression. Individual cross-sectional associations of baseline characteristics with child migration status at baseline were also conducted using *t* tests and χ^2 tests. Child migration status was defined as some children inside district vs no children inside district. A logistic regression model was used to assess the impact of child migration at baseline on the odds of depression at follow-up, according to the validated EURO-D cutoff point. The model was built adding possible confounders in incremental blocks: demographics, wealth, impairment and disability, nonfinancial support (from children and others), and financial support (remittances).

Next, we incorporated changes between baseline and follow-up. Change in child migration status was defined as no change, at least 1 child leaving the district, or at least 1 child returning to the district in the time from baseline to follow-up. We investigated baseline predictors of child movement individually using χ^2 and analysis of variance tests and together in a multivariable regression. In the multivariable logistic regression of movement on depression at follow-up, we adjusted for baseline covariates as described earlier plus marital status at follow-up, change in impairment, and change in disability. We did not adjust for changes in covariates that could be a consequence of child movement, eg, family wealth or remittances. We used Stata version 9 for Windows (StataCorp).

RESULTS

Of 1111 respondents who formed the baseline sample, 982 (88%) participated at the 1-year follow-up and 960 (86%) provided complete data. The main reasons for 151 not completing follow-up measures were absence despite up to 3 visits (39 [26%]), illness (35 [23%]), death (34 [22%]), or moved (28 [19%]). Only 7 (5%) refused to take part. Although several characteristics were individually associated with being missing at follow-up, age (odds ratio [OR], 1.03; 95% CI, 1.01-1.06), cognitive impairment (failed 2 tests vs no impairment: OR, 4.76; 95% CI, 2.94-7.60), and disability (OR, 1.03; 95% CI, 1.00-1.05) remained significant predictors in multivariable regression. Inverse weighting to account for loss to follow-up was included in subsequent analyses; it had little effect on the results.

CHARACTERISTICS OF SAMPLE AT BASELINE AND ASSOCIATION WITH DEPRESSION AT FOLLOW-UP

As seen in **Table 1**, the mean age of the study participants at baseline was 69 years (range, 60-93 years) and 55% were female. Of the 503 working, 60% were agricultural workers; 22%, in unskilled manual or domestic work; 3%, in craft-related work; and 15%, in skilled work. One hundred fifty-five (16%) had all their children migrated from the district, 651 (68%) had some but not all children living in the district, and 154 (16%) had all children living in the district. Of the 155 with all children living out of the district, for 73.2% the nearest child was in Bangkok or another province (at least 100 km away or more), for 24.6% the nearest child was in the same province (between 15 km and 145 km away), and for 2.2% the nearest child was in another country. As shown in Table 1, most talking with children was done face to face with the mean weekly telephone calls being 2.5 per week; 25% of participants never used the telephone. Fifty percent of participants saw a child daily, 25% saw a child 12 times or less per year, and 10% saw a child 3 times or less per year.

At baseline, 246 (25%) exceeded the EURO-D cut point for clinically significant depression with a prevalence of 27% in those with at least 1 child in the district and 16% in those with all children out of the district. At follow-up, 22% were depressed with a prevalence of 24% in those with at least 1 child in the district and 9% in those with all children out of the district. At follow-up, 5% had cognitive impairment on 2 or more tests, and 47% had 2 or more limiting physical impairments. Between baseline and follow-up, 6% changed their marital status. Sixty-six percent had no change or an improvement in physical impairments, 34% had a worsening in impairments, and 51% had a worsening in disability.

As shown in Table 1, many of the baseline characteristics considered were associated with greater odds of depression at follow-up after adjustment for baseline depression.

CHARACTERISTICS OF SAMPLE AT BASELINE AND ASSOCIATION WITH HAVING ALL CHILDREN MIGRATED

Table 2 shows differences at baseline between parents with all their children migrated out of the district compared with parents with at least 1 child in the district. Those with all their children migrated were more likely to be younger ($t = 5.473$; $P < .001$), married ($\chi^2_2 = 16.75$; $P < .001$), still working ($\chi^2_1 = 10.89$; $P = .001$), and more educated ($\chi^2_3 = 93.19$; $P < .001$) and have less disability ($t = 3.22$; $P = .001$). Although parents with all their children migrated received a lower level of total actual social support from children, they were no more likely to perceive less adequate support.

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Table 1. Characteristics of the Sample at Baseline by Depression Status at Follow-up

Characteristic at Time 1	No. (%) Total (n = 960)	Depression at Time 2: Not Depressed (n = 747)	Depression at Time 2: Depressed (n = 213)	*P* Value	*P* Value Adjusted for Baseline Depression
Age, y, mean (SD)	69 (6.7)	69 (6.7)	71 (6.7)	<.001	.06
Sex					
M	429 (45)	368 (49)	62 (30)	<.001	.001
F	530 (55)	379 (51)	151 (71)		
Marital status					
Single/divorced/separated	47 (5)	38 (5)	9 (4)	<.001	.01
Married	552 (58)	453 (61)	99 (46)		
Widowed	361 (38)	256 (34)	105 (49)		
Work status					
Working	503 (52)	409 (55)	94 (44)	.006	.09
Not working/homemaker	457 (48)	338 (45)	119 (56)		
Education, y					
0	264 (28)	175 (23)	89 (42)	<.001	<.001
1-3	155 (16)	117 (16)	38 (18)		
4	457 (48)	374 (50)	83 (39)		
5-16	84 (9)	81 (11)	3 (1)		
Physical impairment score, mean (SD)	1.8 (1.8)	1.5 (1.6)	2.7 (2.0)	<.001	<.001
Disability score, mean (SD)	5.9 (5.8)	5.0 (5.1)	9.0 (6.9)	<.001	.01
Cognitive impairment score, mean (SD)	0.16 (0.46)	0.15 (0.44)	0.20 (0.52)	.16	.25
No. of live children, mean (SD)	4.7 (2.4)	4.6 (2.3)	5.3 (2.5)	<.001	.009
Education, child, y, mean (SD)	9.4 (5.1)	9.9 (5.1)	7.7 (4.5)	<.001	<.001
Frequency of talking to children					
Daily	665 (70)	501 (67)	164 (77)	.047	.06
Weekly	132 (14)	107 (14)	25 (12)		
Monthly	72 (8)	60 (8)	12 (6)		
<Monthly	87 (9)	75 (10)	12 (6)		
Support from children (of 7), mean (SD)	4.7 (1.9)	4.6 (1.9)	5.0 (1.6)	.003	.003
Support from others (of 10), mean (SD)	1.1 (1.5)	1.0 (1.5)	1.3 (1.6)	.04	.01
Support to children (of 5), mean (SD)	2.04 (1.2)	2.03 (1.2)	2.06 (1.2)	.83	.53
Perceived support from children					
Inadequate support	87 (9)	61 (8)	26 (12)	.03	.53
Moderately adequate support	490 (51)	373 (50)	117 (55)		
Highly adequate support	381 (40)	311 (42)	70 (33)		
Wealth, mean (SD)	3.1 (1.6)	3.2 (1.6)	2.6 (1.4)	<.001	<.001
Total remittances and expenses, baht, mean (SD)	240 000 (33 000)	26 000 (35 000)	20 000 (26 000)	.04	.04
Severe life events, mean (SD)	0.72 (1.05)	0.59 (0.90)	1.18 (1.35)	<.001	.001
Children outside district					
Some/all children living within district	805 (84)	606 (81)	199 (93)	<.001	<.001
No children living within district	155 (16)	141 (19)	14 (7)		
Child living arrangement					
All children outside district	155 (16)	141 (19)	14 (7)	<.001	<.001
At least 1 outside district, 1 inside district, none in household	303 (32)	219 (29)	84 (39)		
At least 1 outside district, 1 in household	348 (36)	272 (36)	76 (36)		
All in district, none in household	50 (5)	36 (5)	14 (7)		
All in district, at least 1 in household	104 (11)	79 (11)	25 (12)		

CHILD MIGRATION STATUS AT BASELINE AND ASSOCIATION WITH DEPRESSION AT FOLLOW-UP

As shown in **Table 3**, having all children migrated out of the district at baseline was associated with lower odds of depression at follow-up (OR, 0.40; $P = .005$) after adjustment for baseline depression and geographical strata. This association remained after additionally adjusting for age, sex, marital status, number of children, education, wealth, impairment, disability, support from others, support from children, and remittances (OR, 0.46; $P = .046$).

We looked at a more detailed breakdown of children's living arrangements to see if the greater risk of depression for those with some or no children away compared with those with all children away was only in those without a coresident child. For example, the lack of a negative impact of migration may be limited only to those who coreside with children. We defined the following 5 nonoverlapping groups:

1. All children out of the district.
2. All children in the district, at least 1 of whom is in the household.
3. All children within the district but none in the household.

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Table 2. Characteristics of the Sample According to Child Migration Status at Baseline Time 1

Characteristic at Time 1	Child Migration Status at Time 1, No. (%): At Least 1 Child Inside District	Child Migration Status at Time 1, No. (%): No Children Inside District	*P* Value
Age, y, mean (SD)	70 (6.8)	67 (5.9)	<.001
Sex			
M	338 (42)	92 (59)	<.001
F	467 (58)	63 (41)	
Marital status			
Single/divorced/separated	36 (5)	11 (7)	<.001
Married	444 (55)	108 (70)	
Widowed	325 (40)	36 (23)	
Work status			
Working	403 (50)	100 (65)	.001
Not working/homemaker	402 (50)	55 (35)	
Education, y			
0	243 (30)	21 (14)	<.001
1-3	139 (17)	16 (10)	
4	382 (47)	75 (48)	
5-16	41 (5)	43 (28)	
Physical impairment score, mean (SD)	1.8 (1.8)	1.6 (1.7)	.052
Disability score, mean (SD)	6.1 (6.0)	4.5 (4.7)	.001
Cognitive impairment score, mean (SD)	0.16 (0.5)	0.16 (0.4)	.97
No. of live children, mean (SD)	5.0 (2.3)	3.0 (1.8)	<.001
Education, child, y, mean (SD)	8.9 (5.0)	12.0 (4.8)	<.001
Frequency of talking to children			
Daily	661 (82)	4 (3)	<.001
Weekly	102 (13)	30 (20)	
Monthly	28 (3)	44 (29)	
<Monthly	12 (1)	75 (49)	
Support from children (of 7), mean (SD)	5.1 (1.6)	2.7 (1.9)	<.001
Support from others (of 10), mean (SD)	1.0 (1.4)	1.5 (1.8)	<.001
Support to children (of 5), mean (SD)	2.2 (1.2)	1.4 (1.0)	<.001
Perceived support from children			
Inadequate	67 (8)	20 (13)	.15
Moderately adequate	418 (52)	72 (47)	
Highly adequate	319 (40)	62 (40)	
Wealth, mean (SD)	3.0 (1.6)	3.2 (1.8)	.36
Total remittances and expenses, baht, mean (SD)	25 000 (33 000)	23 000 (35 000)	.54
Severe life events, mean (SD)	0.73 (1.04)	0.67 (1.08)	.60

Table 3. Child Migration Status at Baseline as a Predictor of Depression at Follow-up, Weighted for Household Selection and Loss to Follow-up

	Model	Sample Size	OR (95% CI)	*P* Value
Basic adjustment[a]	All children out of district at baseline vs at least 1 child in district at baseline	959	0.403 (0.214-0.758)	.005
Fully adjusted[b]	All children out of district at baseline vs at least 1 child in district at baseline	956	0.455 (0.210-0.985)	.046

Abbreviation: OR, odds ratio.
[a] Adjusted for depression at time 1 and strata.
[b] Additionally adjusted for age, sex, marital status, wealth, impairment, disability, support to others, nonfinancial support from children, remittances, and number of children.

4. At least 1 child in the district, at least 1 child out of the district, and no children in the household.

5. At least 1 child in the district, at least 1 of whom is in the household, plus at least 1 child out of the district.

We found that there was little difference in odds of depression after a year between the different arrangements when there was at least 1 child living within the household (**Table 4**). We also found having all children living out of the district still indicated a lower odds of depression compared with having all children in the district with at least 1 in the household (Table 4).

CHILD MOVEMENT IN THE FOLLOW-UP YEAR AND DEPRESSION

For 743 (77%) of the sample, there had been no change in residence of their children in or out of the district in

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Table 4. Children's Living Arrangements at Baseline as a Predictor of Parents' Depression at Follow-up, Weighted for Household Selection and Loss to Follow-up[a]

	Weighted for Household and Loss to Follow-up	OR (95% CI)	*P* Value
Basic adjustment[b]	All children in district, none in household vs all children in district, at least 1 of whom is in the household	0.921 (0.407-2.086)	.84
	At least 1 child out of district, at least 1 child in household vs all children in district, at least 1 of whom is in the household	0.683 (0.387-1.206)	.19
	At least 1 child outside district, at least 1 in district, none in household vs all children in district, at least 1 of whom is in the household	0.947 (0.530-1.696)	.86
	All children out of district vs all children in district, at least 1 of whom is in the household	0.323 (0.147-0.710)	.005
Fully adjusted[c]	All children in district, none in household vs all children in district, at least 1 of whom is in the household	0.700 (0.272-1.804)	.46
	At least 1 child out of district, at least 1 child in household vs all children in district, at least 1 of whom is in the household	0.560 (0.292-1.077)	.08
	At least 1 child outside district, at least 1 in district, none in household vs all children in district, at least 1 of whom is in the household	0.737 (0.367-1.479)	.39
	All children out of district vs all children in district, at least 1 of whom is in the household	0.329 (0.123-0.872)	.03

Abbreviation: OR, odds ratio.
[a] Children in the household also are in the district but not all children in the district will be in the same household.
[b] Adjusted for depression at time 1 and strata.
[c] Additionally adjusted for age, sex, marital status, wealth, impairment, disability, support to others, nonfinancial support from children, remittances, and number of children.

Table 5. Child Movement as a Predictor of Depression at Follow-up, Weighted for Household, and Loss to Follow-up

Variables in the Model	Child Movement Comparison	OR (95% CI)	*P* Value
Depression at time 1, strata (n = 959)	At least 1 child moved away vs no children moved at all	0.991 (0.506-1.941)	.98
	At least 1 child returned home vs no children moved at all	1.754 (1.082-2.844)	.02
Depression; strata; age; sex; marital status; household wealth; impairment; disability; number of children; support from child, from others, and to child; remittances (quartiles) at time 1 (n = 956)	At least 1 child moved away vs no children moved at all	1.108 (0.538-2.283)	.78
	At least 1 child returned home vs no children moved at all	1.752 (1.044-2.938)	.03
Depression; strata; age; sex; marital status; household wealth; impairment; disability; number of children; support from child, from others, and to child; remittances (quartiles) at time 1, change in impairment, cognition, marital status at time 2 (n = 956)	At least 1 child moved away vs no children moved at all	1.096 (0.467-2.572)	.83
	At least 1 child returned home vs no children moved at all	1.716 (0.989-2.976)	.06

Abbreviation: OR, odds ratio.

the follow-up period; 144 (15%) had experienced at least 1 child moving back into the district; and 73 (8%) had experienced at least 1 child moving out of the district. The rates of depression varied by child movement status; 20% of those with no change in the number of children living away were depressed at follow-up compared with 33% of those who had a child return and 23% of those who had a child leave. Bivariable analysis showed that those who had a child return had more children, life events, and depression and less education and wealth than those who experienced no child movement between baseline and follow-up. A multinomial logistic regression of child movement indicated that depression score at baseline was significantly predictive of having a child return compared with no movement but not associated with a child leaving. As seen in **Table 5**, the multivariable regression analysis indicated that having a child return was associated with an increased risk of depression compared with having no child movement (OR, 1.75; 95% CI, 1.08-2.84 adjusted for baseline depression and strata only). Adjustment for potential confounding baseline factors had little impact on the magnitude of this effect. After additionally accounting for changes in impairment, disability, and marital status over the same period, the OR for depression in those who had a child return to the area fell slightly to 1.72 (95% CI, 0.99-2.98) and the difference was not statistically significant compared with those with no child movement.

COMMENT

For rural-dwelling older parents in Thailand, we found, contrary to our hypothesis, that parents with all children migrated from the district at baseline had less than half the odds of depression at 1-year follow up (OR, 0.46)

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compared with parents with no or only some children migrated, even after adjusting for depression at baseline, geographical strata, number of children, physical impairments, household wealth, and other potential confounding variables. The lack of a negative effect of child out-migration did not differ for those with or without a child in the household. Parents with all their children migrated were no less likely to perceive adequate support from children compared with parents with 1 or more children living in the district. Contrary to our second hypothesis, we found that parents who had a child move back to their district in the study year had an increased odds of depression at follow-up compared with parents who did not experience any change in child residence in or out of their distinct, though the OR of 1.72 was no longer significant once changes since baseline in impairment, disability, and marital status were accounted for.

The likelihood of major selection biases is small because the sample was obtained through stratified random sampling and the sampling design was built into the analysis. The sample size was smaller (n = 959) compared with the sample who provided data in round 1 (n = 1111). The main reasons for loss to follow-up were absence despite up to 3 visits (26%), illness (23%), and death (22%). We applied inverse weighting to account for loss to follow-up. Although there is always the chance of measurement error, the construct of depression and our approach to measurement were seen as valid by the local mental health providers.[20] The depression scale was applied by trained interviewers blind to the study hypothesis. Our measure of exposure was children's location outside the district, which is a well-recognized local boundary. Most children had been away for more than 10 years so parents and/or informants were confident in their responses. We were able to cross-check children's location with historical data on the household going back 7 years.

We were able to control for a large number of important potential confounding variables but there could be residual confounding by severity of health problems. Although we controlled for baseline depression, depression score was higher in those who went on to have a child move back in the study year, so reverse causality may play a small part in explaining our findings.

To our knowledge, this is the first prospective study and supports our previous cross-sectional findings that point toward advantages rather than disadvantages for older parents living in migrant households in this Southeast Asian context. One possible explanation is preexisting differences between migrant and nonmigrant households. We controlled for many measures but others were left uncontrolled because we lacked relevant data, for example, differences in coping, personality, and individual or family psychiatric history between migrant and nonmigrant households. If this were the case, lack of migration may be an indicator but not a cause of depression. Healthy people are more likely to migrate and it could follow that parents of migrants have strengths that have encouraged their children to migrate and resiliencies to cope with separation.[26] Child migration could thus be viewed by such parents not as "loss" but as a family diversification strategy, a positive choice that they are likely to have been involved in. Parents with all children migrated had often adapted positively as has been described previously,[27] eg, owning or sharing a neighbor's mobile telephone to keep in touch, passing news through social networks, and taking pleasure from short visits from children at key public holidays: "My children always come on New Year or Chinese New Year to see their mom" (man aged 73 years); "During Songkran festival my children and grandchildren come back, all gather here" (woman aged 67 years).

Contextual factors also supported older people. Ninety-seven percent of study villages had electricity; 94%, a cell phone signal; and 97%, tap water, although only 23% had tap water suitable for drinking. Many older people had developed strong ties in the study communities over a long period, deriving social support from village neighbors and friends. "When I was sick, if my nephew is absent, I can ask anyone nearby to take me to the doctor" (woman aged 67 years). This existence of strategic support may have enabled adult children to out-migrate in the first place.

Benefits associated with migration are the other key explanation for our findings. We found that having all children out-migrated was strongly associated with receiving more remittances, providing both short-term aid and an increased sense of security and family solidarity. Most older Thai people do not receive a pension but rely on children as a main source of income.[28] Migration of children will also reduce the number of family dependents and, thus, expenses.[14] Further benefits are the social status and pride associated with successful migration of children[17] and the relief of children being self-sufficient. "I do not envy those whose children stay at home. My children leave for their living. If not, they do not have money." (woman aged 67 years). Depression prevalence reduced from baseline to follow-up in those who were successfully followed up. This is not necessarily attributable to depression improving with age as (1) we cannot separate age and period effects and (2) it might be measurement artifact, ie, a kind of learning effect with respect to repeated exposure to depression symptom assessment. In Mexico, family members of out-migrants were found more likely than those without migrant relatives to have substance use disorders and suicidal behavior.[29] However, family members studied there were all younger than 65 years and included wives. Mexican women left behind by migrant husbands are known to report significant family and personal stressors.[30]

We found that parents who had a migrant child return to the district in the study year had more depression at follow-up than those who did not experience child movement. This may be because the child was returning in response to a decline in mental health of the parent.[31] The effect of child movement was no longer significant after controlling for changes in impairment, disability, and marital status (mostly widowhood) over the same period. Some parents described feeling a burden in the adjustment period after their child had returned. Children also move back because of problems in their lives such as job loss, divorce, or a health problem. One female participant aged 75 years whose child and

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grandchildren had returned after divorce found this difficult: "Now my heart is so stubborn. Many children, many problems. I have to be tolerant." Borges and colleagues[29] reported an association between substance use disorder and return migration to Mexico, supporting the notion that return migration can be due to failure in the destination setting.

How specific are our findings likely to be to Thailand? The 22.2% prevalence of depression that we found, as measured by a scale, is somewhat lower than in other low-income countries (26%-36%).[3,32] Thai culture differs from many other countries in the region, such as more flexibility about the sex of the child that older parents choose to live near and having more equal inheritance between female and male children.[28,33]

Limitations of our study include the relatively short follow-up: there was not much child movement in 1 year. Because of the random sampling, most of the sample is relatively young. It is not possible to comment on whether the effect found would be the same for the older old; indeed, evidence from Thailand suggests serious challenges for filial support when parents reach advanced ages.[27] We found anecdotally that some older people with no children in the district described getting food, goods, and physical care from children living in adjacent districts but we do not have systematic data on this. It is not clear how far these results will extrapolate to communities with more limited access to infrastructure such as mobile telephone signal and electricity. A further consideration is that our definition of an out-migrant child was living beyond the district. Districts had a radius of 15 km or more. In our preparatory qualitative work before the study hypotheses were finalized, older people perceived that their children had "moved out" when the children were not staying in the same village and when they were not seen every day. The district boundary of 15 km or more was viewed locally as a "very far" distance that could not be covered by foot without great effort. Fewer than 6% of households in the sample owned a car, although 74% owned a motorcycle. As it emerged, for most parents (72%) with all children living out of the district, the nearest child was living in another province, a distance of more than 100 km, and given the size of the province, many of those with a child in the same province were still more than 50 km away. Only 2% were living overseas so our findings cannot be extrapolated to international migration. While it could be argued that the phenomenon we have examined overlaps with "empty nest syndrome," we would argue that the context of a rural agrarian society with little formal welfare, little access to cars, and traditional reliance on filial support contrasts with a high-income country where most older people have a pension and access to medical and social welfare and personal transport.

We have found that Thai parents with all children internally migrated are, for the most part, neither abandoned nor have increased risk of depression. Having all children migrated and staying migrated predicted lower odds of depression in older parents. These prospective findings are consistent with previous cross-sectional work[12,27] that challenged the view that older people are being deserted in rural areas of low- and middle-income countries.[10] As migration has become even more common, rural older parents whose children do not migrate may be at greater risk of depression than those with migrant children. Research is needed to further understand risks for depression in older people in rural areas and to develop and test interventions to reduce the burden of depression.

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REFERENCES

1. Beekman AT, Copeland JR, Prince MJ. Review of community prevalence of depression in later life. *Br J Psychiatry*. 1999;174:307-311.
2. Castro-Costa E, Dewey M, Stewart R, Banerjee S, Huppert F, Mendonca-Lima C, Bula C, Reisches F, Wancata J, Ritchie K, Tsolaki M, Mateos R, Prince M. Prevalence of depressive symptoms and syndromes in later life in ten European countries: the SHARE study. *Br J Psychiatry*. 2007;191(5):393-401.
3. Guerra M, Ferri CP, Sosa AL, Salas A, Gaona C, Gonzales V, de la Torre GR, Prince M. Late-life depression in Peru, Mexico and Venezuela: the 10/66 population-based study. *Br J Psychiatry*. 2009;195(6):510-515.
4. Kohn R, Epstein-Lubow G. Course and outcomes of depression in the elderly. *Curr Psychiatry Rep*. 2006;8(1):34-40.
5. Magruder KM, Calderone GE. Public health consequences of different thresholds for the diagnosis of mental disorders. *Compr Psychiatry*. 2000;41(2)(suppl 1):14-18.
6. Walters K, Breeze E, Wilkinson P, Price GM, Bulpitt CJ, Fletcher A. Local area deprivation and urban-rural differences in anxiety and depression among people older than 75 years in Britain. *Am J Public Health*. 2004;94(10):1768-1774.
7. Chen R, Copeland JRM, Wei L. A meta-analysis of epidemiological studies in depression of older people in the People's Republic of China. *Int J Geriatr Psychiatry*. 1999;14(10):821-830.
8. Judd F, Cooper A-M, Fraser C, Davis J. Rural suicide: people or place effects? *Aust N Z J Psychiatry*. 2006;40(3):208-216.
9. Singh GK, Siahpush M. Increasing rural-urban gradients in US suicide mortality, 1970-1997. *Am J Public Health*. 2002;92(7):1161-1167.
10. United Nations. Report of the Second World Assembly on Ageing: Madrid, 8-12 April 2002. New York, New York: United Nations; 2002.
11. King R, Vullnetari J. Orphan pensioners and migrating grandparents: the impact of mass migration on older people in rural Albania. *Ageing Soc*. 2006;26(5):783-816. doi:http://dx.doi.org/10.1017/S0144686X06005125.
12. Abas MA, Punpuing S, Jirapramukpitak T, Guest PT, Tangchonlatip K, Leese M,

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Prince M. Rural-urban migration and depression in ageing family members left behind. *Br J Psychiatry*. 2009;195(1):54-60.
13. Knodel J, Chayovan N, Siriboon S. The familial support system of Thai elderly: an overview. *Asia Pac Popul J*. 1992;7(3):105-126.
14. Yoddumnern-Attig B, Sethaput C, Pluemchareon S, Boonchaiwattana J. *Adolescent Migrants and Reproductive Health in Greater Mekong Sub-region: Are They Equipped to Protect Themselves Against Sexual and Reproductive Health Risks?* Nakhon Pathom, Thailand: Institute for Population and Social Research; 2007.
15. Institute for Population and Social Research. *Report of Baseline Survey (2000)*. Nakhon Pathom, Thailand: Institute for Population and Social Research, Mahidol University; 2001.
16. Institute for Population and Social Research. *Report of Round 3 Census (2002)*. Nakhon Pathom, Thailand: Institute for Population and Social Research, Mahidol University; 2004.
17. Knodel J, Saengtienchai C. Rural parents with urban children: social and economic implications of migration for the rural elderly in Thailand. *Popul Space Place*. 2007;13(3):193-210. doi:10.1002/psp.436.
18. Prince MJ, Reischies F, Beekman AT, Fuhrer R, Jonker C, Kivela SL, Lawlor BA, Lobo A, Magnusson H, Fichter M, van Oyen H, Roelands M, Skoog I, Turrina C, Copeland JR. Development of the EURO-D scale: a European, Union initiative to compare symptoms of depression in 14 European centres. *Br J Psychiatry*. 1999; 174:330-338.
19. Prince M, Acosta D, Chiu H, Copeland J, Dewey M, Scazufca M, Varghese M; 10/66 Dementia Research Group. Effects of education and culture on the validity of the Geriatric Mental State and its AGECAT algorithm. *Br J Psychiatry*. 2004; 185:429-436.
20. Jirapramukpitak T, Darawuttimaprakorn N, Punpuing S, Abas M. Validation and factor structure of the Thai version of the EURO-D scale for depression among older psychiatric patients. *Aging Ment Health*. 2009;13(6):899-904.
21. Abas MA, Vanderpyl J, Robinson E. Socioeconomic deprivation and extended hospitalization in severe mental disorder: a two-year follow-up study. *Psychiatr Serv*. 2008;59(3):322-325.
22. Ganguli M, Chandra V, Gilby JE, Ratcliff G, Sharma SD, Pandav R, Seaberg EC, Belle S. Cognitive test performance in a community-based nondemented elderly sample in rural India: the Indo-U.S. Cross-National Dementia Epidemiology Study. *Int Psychogeriatr*. 1996;8(4):507-524.
23. Welsh KA, Butters N, Mohs RC, Beekly D, Edland S, Fillenbaum G, Heyman A. The Consortium to Establish a Registry for Alzheimer's Disease (CERAD), Part V: a normative study of the neuropsychological battery. *Neurology*. 1994;44 (4):609-614.
24. Burvill PW, Mowry B, Hall WD. Quantification of physical illness in psychiatric research in the elderly. *Int J Geriatr Psychiatry*. 1990;5(3):161-170. doi:10.1002 /gps.930050304.
25. Epping-Jordan J, Ustun T. The WHODAS-II: leveling the playing field for all disorders. *WHO Mental Health Bulletin*. 2000;6:5-6.
26. Marsella A, Ring E. Human migration and immigration: an overview. In: Adler L, Gielen U, eds. *Migration: Immigration and Emigration in International Perspective*. Westport, CT: Praeger Publishers; 2003.
27. Knodel J, Kespichayawattana J, Saengtienchai C, Wiwatwanich S. How left behind are rural parents of migrant children? evidence from Thailand. *Ageing Soc*. 2010;30(05):811-841. doi:10.1017/S0144686X09990699.
28. Knodel J, Ofstedal MB. Patterns and determinants of living arrangements. In: Hermalin AI, ed. *The Well-being of the Elderly in Asia: a Four-Country Comparative Study*. Ann Arbor: The University of Michigan Press; 2002:143-184.
29. Borges G, Medina-Mora ME, Breslau J, Aguilar-Gaxiola S. The effect of migration to the United States on substance use disorders among returned Mexican migrants and families of migrants. *Am J Public Health*. 2007;97(10):1847-1851.
30. Salgado De Snyder VN, Diaz-Guerrero R. *Enduring Separation: The Psychosocial Consequences of Mexican Migration to the United States*. Westport, CT: Praeger Publishers/Greenwood Publishing Group; 2003:143-157.
31. Zimmer Z, Knodel J. Return migration and the health of older aged parents: evidence from rural Thailand. *J Aging Health*. 2010;22(7):955-976.
32. Alvarado BE, Zunzunegui MV, Béland F, Sicotte M, Tellechea L. Social and gender inequalities in depressive symptoms among urban older adults of Latin America and the Caribbean. *J Gerontol B Psychol Sci Soc Sci*. 2007;62(4):S226-S236.
33. Chamratrithirong A, Morgan SP, Rindfuss RR. Living arrangements and family formation. *Soc Forces*. 1988;66(4):926-950. doi:10.2307/2579429.

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