You've Got a Friend in Me: How Social Networks and Mobile Phones Facilitate Healthcare Access Among Marginalised Groups in Rural Thailand and Lao PDR

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Abstract

The seeming "ubiquity" of mobile phones has spawned a wave of interventions that use mobiles as platforms for health service delivery (mHealth). Operating in more than 100 countries, mHealth interventions commonly aspire to make healthcare more inclusive and efficient. Yet, mobile phone diffusion also stimulates locally emerging forms of health-related phone use that could create new digital inequalities among marginalised groups or compete with mHealth and other technology-based development interventions.

We aim to inform this subject by asking, "*How do mobile phone use and social support networks influence rural treatment-seeking behaviours among marginalised groups?*" We hypothesise that (1) resource constraints drive marginalised groups towards informal healthcare access, and that (2) mobile phone use and social support networks facilitate access to formal healthcare with a bias towards private doctors. Analysing representative survey data from 2,141 Thai and Lao villagers with descriptive statistics and multilevel regression models, we demonstrate that: (a) health-related phone use is concentrated among less marginalised groups, while social support networks are distributed more equitably; (b) marginalised villagers are more likely to utilise informal healthcare providers; and (c) mobile phones and social support networks are linked to increased yet delayed formal healthcare access that is directed towards public healthcare.

We conclude that mobile phone diffusion has a mildly positive association with rural healthcare access especially in the more resource-constrained Lao health system, and it does not (yet) appear to crowd out social support. However encouraging, this is problematic news for mHealth and technology-based development interventions. The potential behavioural consequences of "informal mHealth" reinforce the notion that mobile phones are a non-neutral platform for mHealth and development interventions. The long-term implications require more research, but the literature suggests that increasing phone-aided healthcare facilitation could undermine local social support networks and leave already marginalised rural dwellers in yet more precarious circumstances.

Keywords

Marginalisation; technology diffusion; social support; mobile phones; healthcare; Thailand; Laos; rural areas; mHealth; survey

1 Introduction

"*We must make sure that innovation and technology helps to reduce the inequities in our world, instead of becoming another reason people are left behind* [sic]."

Dr Tedros Adhanom Ghebreyesus, Director-General, World Health Organization (WHO, 2019:v)

In light of common claims about the "ubiquity" of mobile phones around the globe and especially in low- and middle-income countries (LMICs), mobile phones and smartphone apps have received extensive attention as tools to revolutionise healthcare and contribute to the achievement of universal healthcare coverage. Notions like the "tremendous impact on emerging markets" (Manjunath *et al.*, 2011:4) and the "potential to transform the face of health service delivery across the globe" (WHO, 2011:1) through "harnessing this technology for improving the health of populations" (Krishna *et al.*, 2009:239) have shaped narratives and practice for nearly a decade. In line with the technological enthusiasm, the WHO (2016) report that 109 countries in 2016 operated at least one government-sanctioned phone-based health service delivery and surveillance programme (also referred to as mHealth; typically emergency hotlines and call centres).

The narratives are now gradually moving away from hyper-optimistic claims about the potential of mobile technology. Recently published guidelines by the World Health Organization (WHO) state for example that health interventions based on digital technology like mobile phones "should not exclude or jeopardize the provision of quality non-digital services in places where there is no access to the digital technologies or they are not acceptable or affordable for target communities" (WHO, 2019:xi).

Similarly, in the context of access to healthcare and education in LMICs, the Pathways for Prosperity Commission on Technology and Inclusive Development (2019:37) notes, among others, that, "If the same social norms that prohibit girls from walking longer distances to attend secondary school also limit their access to mobile technology (which could offer an alternative education medium), inequalities will not merely remain but may even be exacerbated." Also the often-cited problem of rapid and uncoordinated mHealth pilot studies ("pilotitis") especially in LMICs appears to be waning as programmes mature and countries integrate them better into their national health policies and digital strategies (Labrique *et al.*, 2013; WHO, 2016).

Despite the growing nuance in the rhetoric and practice on mHealth, and notwithstanding the growing evidence base (Labrique *et al.*, 2013), a major problem in understanding the role of mHealth remains: We know worryingly little about the role of *mobile phones themselves* as platforms for health service delivery in LMICs. Existing mHealth evaluations rather focus on impacts brought about by adding a service onto the platform, assuming that the platform is neutral or otherwise beneficial. However, emerging yet nascent social research on the role of health-related mobile phone use suggests that a large spectrum of "informal mHealth" emerges indigenously with the diffusion of mobile technology (Hampshire *et al.*, 2015). mHealth research does not normally investigate how external intervention would fit into (or duplicate, or disrupt) this fluid landscape of people's healthcare solutions, nor what consequences emerging phone-aided health behaviours entail. Some of the uses could indeed be inequitable (e.g. over-utilising scarce healthcare resources that are then unavailable to digitally excluded groups) or outright harmful (consuming e.g. misleading health information), in which case mHealth could reproduce existing inequalities, create new forms of exclusion, or just undo harms created by informal health-related uses.

Our research question therefore is, "*How do mobile phone use and social support networks influence rural treatment-seeking behaviours among marginalised groups?*" In the spirit of the opening quote, we frame our analysis within the concept of marginalisation to explore whether mobile phone diffusion

opens or closes opportunities among excluded groups. In addition, to expand our understanding of landscapes of solutions with which newly diffused mobile phones may interact, we will also examine the relative importance of social support networks in people's healthcare choices. Our study builds on a programme of work initiated in India and China, which we extended to the contexts of Thailand and Lao PDR. We focus specifically on rural areas where healthcare access tends to be more constrained than in cities.

Through this analysis, we aim to contribute to the narrow knowledge base on the healthcare consequences of mobile phone diffusion to add further nuance to the discourse in the field of mHealth. Our research interest in marginalisation and the relationship between technology diffusion and social support networks contributes also to the policy-relevant literature on the social implications of technology diffusion (e.g. Aker & Mbiti, 2010; Unwin, 2009a). In particular, our analysis demonstrates that marginalisation was indeed associated with lower rates of formal healthcare access, especially in the more resource-constrained context of rural Lao PDR. Although mobile phones were distributed less equitably than health-related social support, both mobile phones and social support were linked to disproportionate uptake of public healthcare among marginalised groups. However, in line with previous findings, we also detected a consistent association between these facilitators and the delay until patients accessed public and private healthcare providers.

In the next section, we develop our research hypotheses through a review the literature on marginalisation as a multidimensional concept; through the inter-relationships between healthcare access, marginalisation, social support, and technology; and through our previous work in this area.

2 Background

2.1 Poverty and Marginalisation

While historically the income-centric definition of poverty had been pervasive (evident e.g. in the 'bottom of the pyramid' approach to poverty alleviation, Peredo *et al.*, 2018), the contemporary consensus in development research and practice is that poverty is a multidimensional concept (Alkire & Foster, 2011; Rahnema, 2010; World Bank, 2018a). Marginalisation and marginality are closely related to multidimensional poverty, sometimes used as explanatory frameworks, and sometimes as synonyms, for multidimensional poverty.[1] The main difference between marginality and marginalisation is that, if marginality is regarded as "the position of people on the edges, preventing their access to resources and opportunities, freedom of choices, and the development of personal capabilities;" then marginalisation can be considered to be the process in which people are pushed towards these "social, political, economic, ecological, and biophysical" edges of society (Sahli, 1981; von Braun & Gatzweiler, 2014:3). For the purposes of this paper, however, we treat marginalisation and marginality synonymously as a state of affairs (unless otherwise indicated as a process). Our conception of marginalisation comprises multiple dimensions of disadvantage that situate people at economic, social, and spatial margins of society, with a particular emphasis on structural (i.e. non-individual) forms of exclusion, like discrimination or remoteness of location (von Braun & Gatzweiler, 2014).

In practice, the operationalisation and measurement of multidimensional poverty and its structural determinants vary considerably – both in terms of indicators and the levels on which they apply (Abebaw & Admassie, 2014; Ahmed *et al.*, 2014; Alkire & Foster, 2011; Azeem *et al.*, 2018; Berman

[1] Similarly, close links and overlaps exist between marginalisation and the concepts of deprivation, vulnerability, and sustainable livelihoods.

& Phillips, 2000; Kumar, 2014; Pattanaik & Xu, 2018; Steinert *et al.*, 2018; Sumner & Mallett, 2013). Among recent contributions to this field are for example Samuel *et al.* (2018), who discuss the role of social isolation as an often-neglected facet of multidimensional poverty, exemplifying their arguments with cases of South Africa and Mozambique. Another example is Graw and Husmann (2014). Speaking to measurement on different levels, the authors assess marginalisation through indicators on the national level through per-capita income and political stability, and on the sub-national level through the prevalence of stunting and the travel time to the nearest city (alongside a soil quality indicator to approximate ecosystem conditions). Espinoza-Delgado and Klasen (2018) further argue that multidimensional poverty analyses typically focus on the household as a unit of analysis, while assessments of intra-household inequality and gender-sensitive research require an individual-level analysis. Moreover, in the context of Uganda, Datzberger (2018) provides an example of how the various dimensions of marginalisation interact, as structural factors spanning social, economic, and political dimensions (e.g. social aspirations, labour market conditions, corruption) prevented poor people in Uganda to benefit from educational reforms (similar to the notion of fractal poverty traps; Barrett & Swallow, 2006).

As described further in Section 3, we operationalised marginalisation in this study through five indicators along three dimensions: social marginalisation (education and belonging to a minority group in a village), economic marginalisation (household assets), and spatial marginalisation (remoteness and travel time to nearest town). We consider healthcare access as our outcome variable and mobile phone use and social support networks as determinants of primary interest. We are conscious of the fact that marginalisation dimensions should ideally be grounded in the local context (Rahnema, 2010), and that they extend potentially much further than the three dimensions we focus on here – in principle, factors like healthcare access, use of technology, and access to social support networks can reasonably fall under the definition of marginalisation (Abebaw & Admassie, 2014; Samuel *et al.*, 2018; van Dijk,

2005; von Braun & Gatzweiler, 2014). We therefore review the interrelationship of these factors in the following parts of this section.

2.2 Healthcare Access and its Links to Marginalisation, Social Support Networks, and Technology

Access to healthcare is a prominent subject in public health and medical anthropology. This concept considers the actual or potential utilisation of available services as part of a spectrum that variously includes healthcare needs and demand, treatment-seeking processes, access to and utilisation of healthcare (incl. barriers to access), and the ensuing health outcomes and other socio-economic consequences (Andersen, 1995; Bigdeli *et al.*, 2012; Chuma *et al.*, 2010; Gulliford *et al.*, 2002; Levesque *et al.*, 2013). Empirical research in public health and medical anthropology has established a long list of factors influencing healthcare access, including, for example, the nature, severity, and stage of a patient's illness and their socio-economic background and health beliefs; trust in and perceptions of the health provider quality; or societal perceptions of the health condition (Beals, 1976; Kroeger, 1983; Nyamongo, 2002; Shaikh *et al.*, 2008; Ward *et al.*, 1997). Marginalisation and multidimensional poverty in their various interpretations have become a theme in healthcare access research as well (Barbosa & Cookson, 2019; Dupas, 2011; Obrist *et al.*, 2007; Ribera & Hausmann-Muela, 2011).

One of the growing topics in healthcare access research is the role of social networks (Chuang & Schechter, 2015; Perkins *et al.*, 2015). For example, Neely and Ponshunmugam (2019) demonstrate in a South African case study how rural dwellers' healthcare access is not only a function of their distance to health facilities as a form of spatial marginalisation, but also of a lack of healthcare resources, transport conditions, and historically and politically shaped kinship networks. Another example is Herberholz and Phuntsho (2018), who analyse survey data from Bhutan and document that healthcare choices especially in rural areas are affected by social capital (measured as the number of close social

network ties and the ability to trust and borrow money from them). Similar to the study by Pescosolido *et al.* (1998) on mental health and social networks in Puerto Rico, the authors find for instance that rural Bhutanese dwellers with extensive social networks have lower utilisation of higher-tier formal healthcare providers. However – like most research in this area (Pitkin Derose & Varda, 2009) – associations between social capital and treatment-seeking behaviour are only indirect (i.e. no direct measure of social network utilisation during an illness) and the direction of the documented impacts is mixed. The nature of social network influences among marginalised groups in LMICs remains thus inconclusive and requires further research.

Another field of growing interest is the role of information and communication technology (ICT) in healthcare access in LMICs. We focus here on mobile phones as a type of ICT that is diffusing rapidly around the globe (teledensity now exceeds 100 mobile subscriptions per 100 people in both developed and developing countries according to ITU, 2019b), and which has experienced the fasted growth within ICT and development (ICTD) research (Gomez *et al.*, 2012). Medical research contributions to this field have expanded rapidly into the terrain of how best to utilise phones as platforms for health service delivery and for promoting healthy behaviour especially among marginalised populations (Aranda-Jan *et al.*, 2014; Free *et al.*, 2013a; Free *et al.*, 2013b; Lee *et al.*, 2016; Mbuagbaw *et al.*, 2015; van Heerden *et al.*, 2012).[2] A similar emphasis on the instrumental use of ICT for development exists in the social sciences (Aker & Mbiti, 2010; Unwin, 2009b). However, social research also considers the broader development implications of technology diffusion (Donner, 2009; Gagliardone, 2015; Jensen, 2007), and it is becoming increasingly theorised and critical with research that interrogates persistent inequalities and the social role of mobile phones in general as well as in healthcare in particular (De´ *et al.*, 2018; Gomez *et al.*, 2012; Heeks & Wall, 2018; Jeffrey & Doron,

[2] These sources are indicative of a large body of literature, comprising more than 100 systematic reviews and reviews of reviews.

2013; Kleine, 2013; Lupton, 2014; Sein *et al.*, 2019). For the purposes of this paper, two important gaps in the ICTD literature relating to the social consequences of technology diffusion are worth discussing further.

The first gap is the relationship between social networks and the spread of mobile phones.[3] A small but growing number of studies indicate that the increasing use of mobile phones changes social network structures away from local friendship connections towards kinship networks (Miritello *et al.*, 2013; Saramäki *et al.*, 2014). An example of such research is Garretson *et al.* (2018), who provide indicative (yet inconclusive) evidence from high-income groups in urban Kenya that social interaction had become increasingly mediated by mobile phones, whereby the authors attribute the gradual friendship-to-family network shift to the coinciding rapid diffusion of mobile phones. Further evidence is provided through a recent analysis in Tanzania by Riley (2018), which demonstrates how mobile money services facilitate the transfer of remittances especially during crises and thereby help rural households to cushion the impact of rainfall shocks – but without spill-overs to other households in the same community. The study argues that the financial facilitation enabled by the mobile phone service could strengthen household-centric family networks at the expense of community-level support networks (Riley, 2018). More generally, the yet sparse research in this area suggests that mobile phone diffusion could affect social support networks in subtle ways by increasing the attention on one's closest contacts (Ling, 2008), which could create new divisions and inequalities among the rural poor.

The second gap is the impact of mobile phone diffusion on healthcare access outside of specific health interventions. This nascent literature addresses the local emergence of phone-aided healthcare access and its consequences on behaviour, equity, and health outcomes. One of the first large-scale

[3] We focus here primarily on the impact of mobile technology diffusion on social networks. For arguments regarding the role of the social context in shaping mobile phone diffusion, see e.g. Hahn and Kibora (2008); for arguments in the context of specific ICTD interventions, see e.g. Renken and Heeks (2018).

assessments of such emerging mobile phone use is Khatun *et al.* (2014), who report that 1.9% of 2,581 surveyed patients in Bangladesh contacted a health provider through a phone (most interactions take place face-to-face). A larger extent of health-related mobile phone use is observed by Hampshire *et al.* (2015), who surveyed 4,626 youths aged 8 to 25 years across Ghana, Malawi, and South Africa, finding that around one-third of their respondents used a mobile phone for their own or someone else's illness in the 12 month-period before their survey. These phones were used, among others, to contact family members for help or to find information online. However, like most studies in this area, the authors do not provide evidence on the consequences of this emerging mobile phone use.[4]

Our own research in this area has involved systematic assessments of the healthcare consequences of this informal health-related mobile phone use in rural India and rural China. In Haenssgen and Ariana (2017b), we analyse cross-sectional survey data from 800 villagers across both countries, detect a wide range of informal uses among 20% of the field site population in China and 7.5% in India, and find that these uses are linked to increased healthcare utilisation but also more delays to care – especially among more privileged segments of the rural population. Haenssgen (2018) expands this work with panel data from rural India. The study finds evidence consistent with the claim that the rural health system adapted to rapid mobile phone diffusion between 2005 and 2012 and increasingly excluded poor households without mobile phones from healthcare access.

In summary, marginalisation and multidimensional poverty link to the study of healthcare access, especially in the context of barriers to formal healthcare utilisation. The areas of social network and technological impacts on healthcare access are growing fast but continue to be inconclusive and patchy. Especially the role of social and digital exclusion – their interactions as well as their individual

[4] A follow-up publication documents the informal health-related use of mobile phones among community health workers, suggesting that this bridged gaps in access to healthcare but could also put the health workers at a disadvantage, e.g. financially (Hampshire *et al.*, 2017).

247 impact on healthcare access in LMICs – continues to be under-researched despite their importance for
248 understanding the socio-technological change that we are witnessing around the world. This study
249 aims to fill this gap by building on prior research on informal health-related mobile phone use and
250 expanding the analysis towards the role of social support networks. In the following sub-section, we
251 will develop and explain the research hypotheses that guided our analysis.

252 **2.3 Hypotheses**

253 What would we expect to happen in rural contexts where mobile phones are becoming increasingly
254 prevalent? Based on our review of the relationship between marginalisation, social networks,
255 technology diffusion, and healthcare utilisation, we explain in this section our two hypotheses.[5]

256 Firstly, not everyone in rural areas of LMICs is poor and marginalised. More privileged groups have
257 a broader array of solutions (e.g. vehicles, money, social and professional networks, phones) that
258 facilitate their access to healthcare. Marginalised groups lack this diversity of means, which impedes
259 their utilisation especially of formal (public and private) healthcare providers. We therefore
260 hypothesise in the first instance that marginalised groups are more likely to depend on informal
261 healthcare providers like local traditional healers or grocery stores that sell non-prescription
262 medication over-the-counter. More specifically, we hypothesise that this pattern of healthcare access

[5] The two main hypotheses in this paper relate to the following hypotheses of the larger research project (Haenssgen *et al.*, 2018b):

H1. Marginalised groups have fewer means to access formal treatment, which increases their likelihood to rely on over-the-counter medicines including antibiotics as an alternative solution.

H2. Technology use increases access to formal healthcare providers but is directed towards those who are more inclined to prescribe antibiotics.

is manifest in utilisation rates as well as the time it takes marginalised groups to reach a formal healthcare provider:

H1. Marginalised groups have fewer means to access formal treatment, driving them towards increased informal healthcare access.

H1a) Marginalisation links positively to informal healthcare access and negatively to formal healthcare access.

H1b) Marginalised groups experience longer delays to formal healthcare access.

Secondly, the rapid spread of mobile phones across LMICs influences the manifestation and patterns of marginalisation in rural areas, but the process of diffusion tends to evolve along, and reproduce, socio-economic gradients. Health-related mobile phone use helps individuals to overcome access constraints, opening a broader set of treatment options and sources of information – provided they are not among the most marginalised groups. We argue that a similar effect arises from local social support networks, which, however, are distributed more equitably and provide facilitation for a larger group of marginalised people. All this does not mean that facilitated healthcare access (be it through mobile phones or social networks) is automatically more beneficial for individuals. Rather, our previous research and the literature lead us to hypothesise that the conspicuous performance of private healthcare providers and the signal of quality associated with user fees can drive health behaviours towards private rather than public health services (Dupas, 2011; Leventhal *et al.*, 2008), whereby increased service uptake need not necessarily be economically efficient nor medically desirable:

H2. Social support and phone use help marginalised groups overcome constraints in accessing formal healthcare, but facilitation is directed towards private providers.

H2a) Facilitators like social support and phone use entail more and faster access to formal healthcare providers.

H2b) Private healthcare access increases disproportionately when marginalised groups involve social support and mobile phones.

H2c) Social support and phone use are less influential among non-marginalised groups.

We describe the methodology to test these hypotheses in the following section.

3 Material and Methods

3.1 Research Design and Data Collection

This paper arose from a broader social research project in the field of antimicrobial resistance (Haenssgen *et al.*, 2018b), for which we selected Southeast Asia as a high-risk region (Ashley *et al.*, 2014; Chereau *et al.*, 2017). We chose the cases of Chiang Rai in Thailand and Salavan in Lao PDR because both sites had diverse ethnic groups (more than ten in each site), varied geographies (plateaus and mountainous areas), and they were among the poorest provinces in their respective countries (Coulombe *et al.*, 2016; National Statistical Office, 2016). At the same time, Thailand as a middle-income country had a larger economy, more formalised healthcare provision, and better health outcomes than Lao PDR as a low-income country (World Bank, 2018b) – which provided opportunities for comparative analyses. We focused specifically on rural settings, where formal and informal health systems experience greater infrastructural, human resource, financial, and regulatory constraints, and where economic, social, and spatial marginalisation are more widespread. Among the rural population, we considered specifically adults (aged 18 years and above). The total rural adult population in Chiang Rai was 522,000; the rural adult population in Salavan was 190,000 (Lao Statistics Bureau, 2015, 2016; National Statistical Office, 2012).

We collected cross-sectional survey data between November 2017 and May 2018 in a three-stage stratified cluster random survey design.[6] Stage 1 comprised the random selection of six primary sampling units (PSUs) in five purposively sampled districts in each site (Fig. 1 illustrates the PSUs in each site). The PSUs were selected from a geo-coded list of 3,100 villages (National Geospatial-Intelligence Agency, 2017), and we substituted selections that did not correspond to actual villages or that were not visible on satellite maps with a random replacement from the sampling frame (64 replacements in total, mostly concentrated in two districts in Salavan where the quality of the geo-coded list was more variable). The PSU sample was stratified by the median distance to the nearest urban area in each district (i.e. 50% of the PSU sample were above the median distance). To ensure sufficient representation, one PSU could contain more than one administrative village; if the first-chosen village contained less than 600 houses, then adjacent villages would be included. The 30 PSUs therefore corresponded to 69 administrative villages in Chiang Rai and 65 in Salavan.

[6] The research was reviewed and approved by the University of Oxford Tropical Research Ethics Committee (Ref. OxTREC 528-17), the Mae Fah Luang University Research Ethics Committee on Human Research in Thailand (Ref. REH 60099), and the National Ethics Committee for Health Research in Lao PDR (Ref. NEHCR 074). We received permission to access the study villages from local security authorities and villages leaders, obtained informed verbal consent from all study participants, and compensated the survey respondents with small financial token of appreciation equivalent to GBP 1.00.

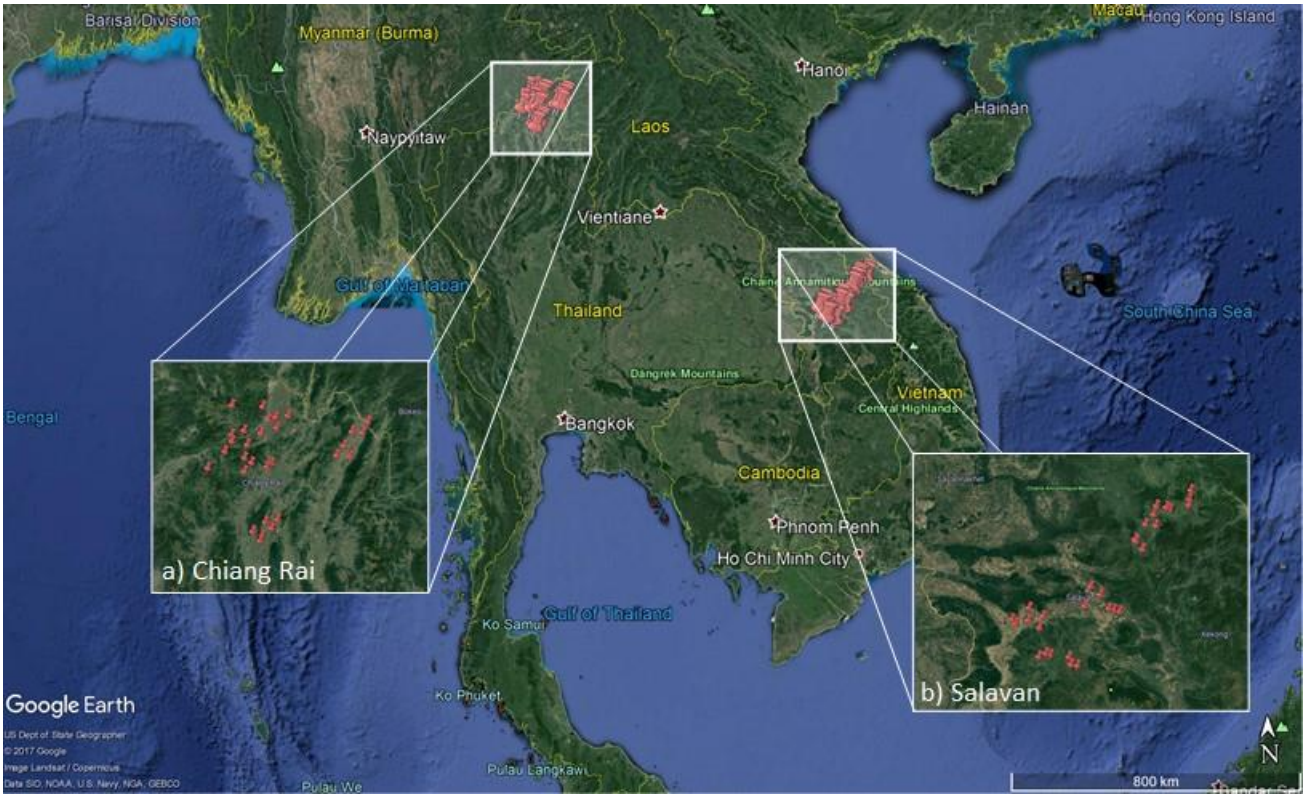


Fig 1. Field Sites and Sampled Villages in Thailand and Lao PDR.

Source: Haenssgen *et al.* (2018b:4)

In Stage 2, we enumerated all residential dwellings in each PSU using satellite maps provided by *Google Maps* and *Bing Maps* (Google Inc., 2017; Haenssgen, 2015; Microsoft Corporation, 2017). This process yielded approximately 30,000 enumerated structures, from which we selected 5% but at least 30 houses per PSU in an interval sample with a random starting point (the interval helping to ensure spatial representativeness in each PSU). The identification of dwellings benefitted from the research team's prior knowledge of the field sites, the availability of *Google Maps Street View* in Chiang Rai, and additional scoping visits to selected PSUs in both sites. The accuracy of identifying dwelling units rather than other types of houses ranged from 50% to 94% per PSU (79% on average). During the survey, invalid selections (i.e. non-residential buildings) or unavailable dwellings were substituted with their nearest available neighbour to retain spatial representativeness, which was the case for 471 houses in Chiang Rai and 270 in Salavan.

In the final Stage 3, all household members in the selected dwellings were enumerated in the field, and one adult respondent was selected for every five eligible household members. A household was defined as a residential unit that shares a kitchen; eligible members were those who had typically resided in this household for at least six months prior to the survey and who were available for an interview. The field team performed up to two visits to each sampled house, and they were encouraged to make appointments or locate the selected household member in or around the village (or in nearby urban areas, if feasible) if they were unavailable at the first visit. Household members who declined the invitation to participate in the survey were substituted with a randomly selected replacement from the same household (7 in Chiang Rai, 12 in Salavan). The randomisation was implemented through tablets running the survey software *SurveyCTO* (Dobility Inc., 2017).

The total sample selected through this three-stage process included 1158 villagers in Chiang Rai and 983 in Salavan. The surveys were implemented by locally recruited field teams that comprised six to eight field investigators plus two survey supervisors. Survey training involved five days of full-time classroom and field training for the field investigators, and an additional five days for survey supervisors. The survey supervisors monitored the recruitment and data collection process, a project research officer conducted additional spot-checks and provided ongoing refresher training for the survey team; and the principal investigator monitored the data collection process and data quality remotely via *SurveyCTO* monitoring tools. In less than 20 instances, incomplete or corrupted data required field investigators and survey supervisors to revisit a respondent.

Our survey instrument was a 45-minute health behaviour questionnaire administered face-to-face in Thai and Lao. The questionnaire was based on earlier qualitative research on health behaviour in Southeast Asia, and its development was supported through field testing and cognitive interviewing (cognitive interviews not reported here; Willis, 2015). Language difficulties arose due to the ethnic diversity in the field in 228 instances, which were resolved by recruiting local translators within the villages. Treatment-seeking behaviour was recorded if a respondent or a child under their supervision

363 experienced an acute illness or accident-related injury in the two months prior to the survey. We
364 recorded 608 such illness episodes in Chiang Rai and 356 in Salavan.

365 **3.2 Variables and Data**

366 The questionnaire covered demographic and socio-economic information, knowledge and attitudes
367 about local healthcare providers and antibiotics, and treatment-seeking behaviour (enclosed in the
368 supplemental material). The main variables of interest in this study related to marginalisation,
369 treatment-seeking behaviour, and its determinants (see Table 1 for summary statistics; a detailed
370 description of each variable used in this paper is provided in Appendix Table A1).

371 Our operationalisation of marginalisation had three dimensions and five indicators. The first dimension
372 was "social marginalisation," which we assessed through two indicators. The first indicator was
373 education, where we defined a person to be marginalised if s/he had received no formal education at
374 all (as opposed to at least one completed year of schooling). The second indicator was ethnicity,
375 specifically whether the ethnic group of the respondent represented less than 20% of the population in
376 the village. The logic of this dimension was that an individual belonging to an ethnic minority group
377 might have been more likely to face impediments in accessing healthcare if this group was also a
378 minority in the same village. The second dimension was "economic marginalisation," which we
379 defined as individuals belonging to the bottom household wealth quintile in their respective site (i.e.
380 Chiang Rai or Salavan). The third dimension was "spatial marginalisation," which we assessed with
381 two indicators on the village level. The first indicator was travel time, which indicated situations of
382 marginalisation if it exceeded more than 30 minutes by car to the nearest town. The second indicator
383 was a semi-quantitative assessment of village remoteness by the survey team (peri-urban, rural,
384 remote), whereby we assessed "remote" villages as marginalised.

385

386 *Table 1*. Sample Description.

	Variable (Unit)	Total			Chiang Rai			Salavan		
		n	Mean	Std. Dev.	*n*	Mean	Std. Dev.	*n*	Mean	Std. Dev.
	Female (0/1)	2141	0.55	(0.50)	1158	0.57	(0.50)	983	0.53	(0.50)
	Age (years)	2141	46.08	(16.40)	1158	51.99	(15.05)	983	39.12	(15.16)
Marginalisation	Education (0/1)	2141	0.30	(0.46)	1158	0.27	(0.44)	983	0.33	(0.47)
Marginalisation	Ethnicity (0/1)	2141	0.09	(0.29)	1158	0.08	(0.27)	983	0.11	(0.31)
Marginalisation	Wealth (0/1)	2141	0.30	(0.46)	1158	0.22	(0.42)	983	0.38	(0.49)
Marginalisation	Travel time (0/1)	2139	0.32	(0.47)	1158	0.25	(0.43)	981	0.41	(0.49)
Marginalisation	Remoteness (0/1)	2139	0.20	(0.40)	1158	0.11	(0.31)	981	0.32	(0.47)
Marginalisation	Marginalisation index (0-1)	2139	0.24	(0.24)	1158	0.19	(0.24)	981	0.31	(0.24)
Healthcare preferences	Shops selling medicine (0/1)	2141	0.46	(0.50)	1158	0.69	(0.46)	983	0.19	(0.39)
Healthcare preferences	Traditional healers (0/1)	2141	0.48	(0.50)	1158	0.34	(0.47)	983	0.65	(0.48)
Healthcare preferences	Pharmacies (0/1)	2141	0.55	(0.50)	1158	0.53	(0.50)	983	0.57	(0.50)
Healthcare preferences	Private clinics/hospitals (0/1)	2141	0.64	(0.48)	1158	0.83	(0.37)	983	0.42	(0.49)
Healthcare preferences	Public primary care (0/1)	2141	0.83	(0.37)	1158	0.88	(0.32)	983	0.78	(0.42)
Healthcare preferences	Public hospitals (0/1)	2141	0.94	(0.23)	1158	0.95	(0.22)	983	0.94	(0.24)
Characteristics of illness episodes	Illness episode of child (0/1)	964	0.23	(0.42)	608	0.18	(0.39)	356	0.31	(0.46)
Characteristics of illness episodes	Self-rated severity (1,2,3)	964	1.72	(0.74)	608	1.64	(0.76)	356	1.85	(0.67)
Characteristics of illness episodes	Duration (days)	964	7.53	(10.52)	608	7.64	(11.92)	356	7.35	(7.59)
Characteristics of illness episodes	Process steps (number)	964	2.27	(1.11)	608	2.13	(1.10)	356	2.51	(1.09)
Characteristics of illness episodes	Public healthcare (0/1)	964	0.41	(0.49)	608	0.32	(0.47)	356	0.58	(0.49)
Characteristics of illness episodes	Private healthcare (0/1)	964	0.22	(0.42)	608	0.26	(0.44)	356	0.16	(0.37)
Characteristics of illness episodes	Informal healthcare (0/1)	964	0.09	(0.29)	608	0.11	(0.31)	356	0.06	(0.25)
Characteristics of illness episodes	Health-related phone use (0/1)	964	0.20	(0.40)	608	0.24	(0.43)	356	0.12	(0.33)
Characteristics of illness episodes	Health-related social support (0/1)	964	0.71	(0.45)	608	0.70	(0.46)	356	0.74	(0.44)
Public access	Duration until access (days)	398	2.21	(9.52)	192	2.96	(13.54)	206	1.51	(1.94)
Public access	Steps until access (number)	398	1.69	(0.67)	192	1.67	(0.75)	206	1.71	(0.58)
Public access	Phone use before/during access (0/1)	398	0.19	(0.39)	192	0.26	(0.44)	206	0.13	(0.34)
Private access	Duration until access (days)	216	1.72	(0.78)	159	1.74	(0.73)	57	1.67	(0.89)
Private access	Steps until access (number)	216	2.26	(6.80)	159	2.51	(7.77)	57	1.58	(2.58)
Private access	Phone use before/during access (0/1)	216	0.21	(0.41)	159	0.25	(0.44)	57	0.09	(0.29)
Informal access	Duration until access (days)	88	1.25	(2.28)	65	1.08	(2.16)	23	1.74	(2.56)
Informal access	Steps until access (number)	88	1.57	(0.72)	65	1.49	(0.69)	23	1.78	(0.80)
Informal access	Phone use before/during access (0/1)	88	0.13	(0.33)	65	0.14	(0.35)	23	0.09	(0.29)

387 *Notes.* Unweighted statistics.
388

389 The five indicators of marginalisation accounted for up to 41% of the sample in each site and they
390 were weakly correlated with each other (see Section 5.1 for more details). The strongest correlation
391 existed between the two spatial indicators with a correlation coefficient of 0.59 (significantly different
392 from zero at $p < 0.01$), wealth and education (0.35, $p < 0.01$), and wealth and remoteness (0.19, $p <$

0.01).[7] We aggregated these five indicators – comprising both absolute and relative forms of marginalisation on the individual, household, and village level – into an overall marginalisation index ranging from 0 [no indication of marginalisation] to 1 [all five indicators of marginalisation present]. We were conscious that these indicators were only proxies of a more complex and relational concept (which also has historical and political components), but they nonetheless enabled a first (and consistent) glimpse into the relationship between marginalisation and treatment-seeking behaviour.

Aside from marginalisation, an important part of our data related to treatment seeking. For those respondents who indicated an illness or injury in the past two months (and only those who had recovered again by the time of the survey), we elicited overarching information about the self-perceived severity of the episode. As a determinant of behaviour, we argue that self-perceived severity is more decisive for treatment decisions than externally assessed severity (Leventhal *et al.*, 2008).[8] Each illness episode was captured as a sequence of "steps" from the moment when a discomfort or injury was detected. We recorded treatment decisions and duration of each of these steps, from which we could calculate the total illness duration as well as the various healthcare providers accessed during the illness episode.

The principal influences on treatment-seeking behaviour of interest were the involvement of support networks and mobile phones use during an illness. Illness-related mobile phone use was assessed at every step of the treatment-seeking process (helping to gauge which practices took place before and after different types of healthcare access). Illness-related social support involved any person who provided any kind of help (see Section 5.3 for details) and covered the complete illness episode to reduce cognitive demands on the respondent.

[7] Hypothesis test using Šidák adjustment, taking into account the number of hypothesis tests performed in pairwise comparison.

[8] Other control variables were respondent age and sex, as indicated in the results sections.

3.3 Analysis

We followed the empirical strategy of Haenssgen and Ariana (2017a) and Haenssgen and Ariana (2017b). In brief, we first contextualised the research with a description of the case study using macro-level secondary data and literature. We then carried out a descriptive statistical analysis of our survey data to document living conditions, patterns of marginalisation, treatment-seeking behaviour, and the various ways in which people use mobile phones and activate their social support networks during an illness. All descriptive statistics were weighted using census data to be representative for the rural populations of Chiang Rai and Salavan (Heeringa *et al.*, 2010). As part of the descriptive statistical analysis, we examined whether people with health-related mobile phones use and social support were less marginalised than people who did not experience such support, testing for statistical differences with Pearson X^2 tests for binary indicators of marginalisation and two-sided *t*-tests for the total marginalisation index.

To test our research hypotheses, we estimated healthcare access models for public, private, and informal healthcare. Owing to the different health system conditions in our field sites, we stratified the analysis along the sub-samples of Chiang Rai and Salavan before analysing the pooled sample. Models that estimated the probability of healthcare access drew on the sample of all respondents, whereas models estimating the delay to access were situated on the illness-level and only used the sub-sample of responses that accessed the respective type of care (e.g. the delay to public healthcare could not be estimated for respondents who did not access any public provider).

We estimated multi-level regression models of healthcare access because of the hierarchical structure of our data (i.e. illness episodes nested in individuals, nested in villages, nested in districts, nested in sites). Owing to the nature of the dependent variables, we estimated multilevel logistic regression models for the probability of accessing healthcare, and multilevel negative binomial models for the

duration until healthcare access.[9] We estimated 3-level models for the respective site samples (individual, village, and district level), and 4-level models for the pooled sample (as before, plus site level). The three-level specifications for the (1) logistic and (2) negative binomial random intercept regression models were:

$$\text{logit}[P(y = 1 \mid \boldsymbol{x}_{ijk}, \zeta_{jk}^{(2)}, \zeta_{k}^{(3)})] = (\zeta_{jk}^{(2)} + \zeta_{k}^{(3)}) + \boldsymbol{\beta}\boldsymbol{x}_{ijk} \quad (1)$$

$$P(y_{ijk} \mid \boldsymbol{x}_{ijk}, \alpha, \zeta_{jk}^{(2)}, \zeta_{k}^{(3)}) = ([\Gamma(y_{ijk} + \alpha^{-1})] / [\Gamma(y_{ijk} + 1)\Gamma(\alpha^{-1})])\, [\alpha^{-1} / (\alpha^{-1} + \mu_{ijk})]^{\alpha^{-1}}\, [\mu_{ijk} / (\alpha^{-1} + \mu_{ijk})]^{y_{ijk}} \quad (2)$$

In both models, subscripts *i*, *j*, and *k* denote individuals, villages, and districts; random intercept terms are denoted by $\zeta_{jk}^{(2)}$ and $\zeta_{k}^{(3)}$; and the matrix of covariates is denoted by $\boldsymbol{x}_{ijk}$. We also estimated all these models in single-level specifications (standard errors calculated with bootstrap estimation using 5,000 replications, adjusted for clustering at village level). For consistency and comparability, we reported multilevel models wherever possible, even if variance component tests indicated that the multi-level specification did not add value over single-level models.

The covariates included control variables for illness severity, gender, and age, and whether the illness was experienced by the respondent or a child under their supervision. For Hypothesis 1, the main independent variables of interest were the individual marginalisation indicators and the aggregate marginalisation index. According to Hypotheses 1a and 1b, we expected positive associations between marginalisation and the probability to access informal healthcare (and/or negative associations with public and private healthcare), and, conversely, negative associations between marginalisation and the

[9] We also estimated multilevel Poisson regression models for the number of steps until a healthcare provider was reached. However, these models were statistically insignificant and were omitted from reporting.

458 delay until informal healthcare providers were reached (and/or positive associations with public and
459 private healthcare).

460 For Hypothesis 2, we limited the analysis of marginalisation to the aggregate index to limit complexity
461 and considered health-related mobile phone use and social support as main variables of interest.
462 Positive associations between these variables and public/private healthcare access (and negative
463 associations for access delays) would be consistent with Hypothesis 2a irrespective of the degree of
464 marginalisation of the patient. However, Hypotheses 2b and 2c required us to gauge the role of mobile
465 phones and social support in relation to marginalisation. We were therefore especially interested in the
466 interactions between marginalisation on the one hand, and health-related mobile phone use
467 (PHONxMARG) and social support (SUPPxMARG) on the other hand. Positive interaction terms
468 would thereby indicate that a combined effect of being marginalised and using phones for health-
469 related issues is associated with a higher probability of access or a longer access delay.

470 # 4 Case Context

471 ## 4.1 Development Context

472 In preparation for the analysis, this section provides a brief macro overview of the development and
473 health system context of Thailand and Lao PDR, and the relative position of Chiang Rai and Salavan
474 therein. Table 2 compares main development and health indicators between the two countries (the
475 World Bank averages for LMICs are included to put these figures in perspective). Latest available data
476 from the World Bank showed relatively higher socio-economic indicators in Thailand. Extreme
477 poverty at USD $1.90/day (in purchasing power parity) in Thailand had been near zero for more than
478 a decade and 8% lived below USD $5.50/day (i.e. the standard poverty line in upper-middle-income
479 countries), while Lao PDR reported 23% and 85%, respectively. These differences were also visible
480 in other indicators, as Lao PDR exhibited relatively lower rates of literacy and access to basic sanitation

despite gradual improvements. According to data from the International Telecommunication Union (ITU), mobile subscription teledensity in Thailand was also more than three times higher than in Lao PDR. However, the low teledensity reported by ITU for Lao PDR contrasted with 2015 data from Coulombe *et al.* (2016), who estimated that, for example, 85% of the population in Salavan province owned a mobile phone (ranging from 84% to 98% per province). However, as far as the World Bank data are concerned, Thailand's development indicators were above the LMIC average, whereas Lao PDR's indicators tended to rank below.

Table 2. Development and Health Indicators.

	Thailand	Lao PDR	LMIC average
GDP per capita (US$ PPP)	$17,910 (2017)	$7,038 (2017)	$11,013 (2017)
Poverty rate (US$1.90/day, PPP)	0% (2017)	23% (2012)	12% (2015)
Poverty rate (US$5.50/day, PPP)	8% (2017)	85% (2012)	55% (2015)
Literacy rate (% of adult population)	93% (2015)	85% (2015)	84% (2016)
Mobile phone subscriptions (per 100 people)	176 (2017)	54 (2017)	99 (2017)
Access to at least basic sanitation (% of population)	95% (2015)	73% (2015)	62% (2015)
Total health expenditure (US$ PPP per capita)	$635 (2016)	$155 (2016)	$534 (2016)
Out-of-pocket health expenditure (US$ PPP per capita)	$77 (2016)	$72 (2016)	$219 (2016)
External health expenditure (US$ PPP per capita)	$1 (2016)	$28 (2016)	$7 (2016)
Life expectancy at birth (years)	75 (2017)	67 (2017)	71 (2017)
Under-5 mortality rate (per 1,000 live births)	10 (2017)	63 (2017)	43 (2017)

Source: ITU (2019a); World Bank (2018b).
Notes. Values in parentheses are year of latest available data. GDP is "gross domestic product;" PPP is "purchasing power parity."

Chiang Rai and Salavan belonged some of the poorest regions in their respective countries. For example, Salavan's poverty headcount ratio in 2015 was estimated at 48%, making it the poorest province in Lao PDR (Coulombe *et al.*, 2016). Similarly, Chiang Rai was situated in Thailand's poorest region, whose average household income was 30% below the national average of THB 26,915 (approx. GBP 650) (National Statistical Office, 2016). Both sites had a majority rural population – 89% of 397,000 inhabitants in Salavan and 61% out of 1.2 million in Chiang Rai (Lao Statistics Bureau, 2015; National Statistical Office, 2012) – and were similarly geographically and ethnically diverse, with highland and mountainous terrain and more than ten ethnic groups each (based on our survey data). In addition, both sites also had extensive yet porous borders with neighbouring countries, which often

involved cross-border medical treatment especially from Lao PDR to Thailand (Apidechkul *et al.*, 2016; Bochaton, 2015; High, 2009; Sakboon, 2007).

4.2 Health System Context

The structure of the public health service delivery in Thailand and Lao PDR is comparable on paper, but the differences in practice are considerable. Both systems have a hospital at the provincial level to oversee health services (in our case, Chiang Rai Prachanukroh Hospital and Salavan Provincial Hospital). Service delivery on the district level is coordinated by the District Health Office (covering 50,000 people on average in Thailand and 30,000–70,000 people in Lao PDR), on the sub-district level by primary care units (covering on average 5,000 people in Thailand and 7,000 people in Lao PDR), and on the village level through village health volunteers (Akkhavong *et al.*, 2014; Jongudomsuk *et al.*, 2015). However, the macro data presented in Table 2 indicated more extensive funding and more favourable health outcomes in Thailand compared to Lao PDR. Thai per capita health expenditure was more than four times higher than Lao PDR's, the latter of which comprised 46% out-of-pocket expenditure from households and 17% external expenditure (Thailand: 12% and 0%, respectively). These figures reflected on health outcomes, whereby the estimated life expectancy at birth was eight years higher and the under-five mortality rate was 53 deaths per 1,000 live births lower than in Lao PDR.

Thailand has been able to achieve progress with ambitious universal healthcare policies especially from 2002 onwards, which involved the establishment of public primary care units in every sub-district and a reduction of out-of-pocket expenditure (Jongudomsuk *et al.*, 2015; Rieger *et al.*, 2017). But effective coverage has remained patchy especially among informal workers, and people have continued to depend at least partially on social support to cover healthcare expenditure (Neelsen *et al.*, 2019). A further complication was that low-cost or free health services were only free for Thai citizens. Support schemes for indigenous, stateless, or indigenous groups such as those in Chiang Rai existed

but have been changing regularly and were difficult to navigate, and interactions between public healthcare providers and these groups often faced social and linguistic frictions (Haenssgen *et al.*, 2018a; Sakboon, 2007). The modernisation and pharmaceuticalisation trends in the Thai health system have also gradually (though yet incompletely) shifted healthcare provision from traditional healing to public healthcare, complemented by an extensive private healthcare sector (Bennett & Tangcharoensathien, 1994; Chuengsatiansup *et al.*, 2000; Jongudomsuk *et al.*, 2015).

Despite a gradual process towards decentralisation, formalisation, and inclusion, the Lao health system had remained chronically under-funded and under-staffed (Akkhavong *et al.*, 2014; Ministry of Health, 2013; Qian *et al.*, 2016). These general problems were accentuated yet further in Salavan, which exhibited on of the lowest healthcare worker density in Lao PDR (Sa-angchai *et al.*, 2016). Market-based since 1995, the financing model of the Lao healthcare system had fuelled out-of-pocket expenditure, while social protection schemes to improve inclusion and service coverage had made only slow progress (Akkhavong *et al.*, 2014). Part of the financing and service gaps had been covered (or, some might argue, perpetuated) through external support like clinics run by non-governmental organisations, but also by the common model of public healthcare workers running private clinics after or during their official working hours (aside from growing numbers of untrained medical practitioners and informal medicine vendors, Akkhavong *et al.*, 2014). Continuing gaps in formal healthcare provision had also provided continued space for traditional medicine. For instance, Sydara *et al.* (2005) found that 77% of their survey respondents in Champasak (Salavan's neighbouring province) used traditional medicine either in isolation or in combination with modern medicines. However, as in Chiang Rai, the role of traditional appeared to be declining – a recent study by Mayxay *et al.* (2013) documented that only 1.4% of patients with respiratory infections across rural and urban Lao PDR consulted a traditional healer in the first instance (esp. in situations where no other healthcare provider was available). Furthermore, where healthcare delivery gaps persisted in rural border areas, another avenue not present in Chiang Rai was cross-border treatment seeking. However, the costs and social

relationships that were required for cross-border treatment made it a less tangible option for the most marginalised of the rural population (Bochaton, 2015).

In short, despite their diverse social and geographic environments and comparable public health services structure, Chiang Rai and Salavan had contrasting economic and infrastructural contexts but also exhibited different degrees of fragmentation and inclusion in their pluralistic health systems. These differences were partly reflected in the relatively better health outcomes of Thailand, but marginalised groups in both Chiang Rai and Salavan remained prone to exclusion from formal healthcare services.

5 Descriptive Statistical Analysis: Healthcare, Marginalisation, and Treatment-Seeking Behaviour

5.1 Living Conditions and Patterns of Marginalisation

The village characteristics within the study sites are summarised in Table 3, including census data from 2010 (Chiang Rai) and 2015 (Salavan) for comparison. An average village in the Chiang Rai sample had an estimated population of 582 inhabitants, whereas Salavan villages were relatively smaller with 453 inhabitants. The Chiang Rai villages in the sample also tended to have smaller households, a higher share of female dwellers, and a lower share of people in working age compared to Salavan. Mobile phones were owned by the majority of households in the study sites, whereby the survey data indicated a household ownership rate of 97% per village in rural Chiang Rai and 75% per village in Salavan.

The most common dimension of marginalisation in Chiang Rai was education with 25% of the rural population, whereas 44% of the rural Salavan population fell into the category of spatial marginalisation in terms of travel time to the nearest city. The average degree of marginalisation in the survey villages is depicted in Fig. 2, which reflected the conditions of Chiang Rai and Salavan as

574 relatively poor provinces in Thailand and Lao PDR. The Chiang Rai sample of 69 administrative
575 villages had comparatively low rates of marginalisation, with 48% of villages having an average
576 marginalisation index of less than 0.1 and 88% less than 0.5. However, a small group of eight villages
577 (12%) exhibited a high concentration of marginalisation of up to 0.85 on average at the village level.
578 Rates of marginalisation were more uniformly distributed in the Salavan sample, which corresponded
579 to widespread hardship in the low-income country setting of Lao PDR. Only 20% of the 65 villages
580 had an average marginalisation of less than 0.1 and 78% less than 0.5. While the average
581 marginalisation was higher in Salavan, it was less polarised than in Chiang Rai: the three worst-
582 performing villages in Salavan had an average index of 0.71; compared to 0.78 in the Chiang Rai
583 sample.

584

585 *Table 3.* Characteristics of Survey Villages Compared to Provincial Average.

	Survey data		Census data	
	Chiang Rai	Salavan	Chiang Rai (2010)	Salavan (2015)
Village size	582[a]	453[a]	594[b]	369[b]
Household size	3.5	5.7	3.0	5.9
Female population share	51.4%	46.2%	50.0%	50.1%
Dependency ratio[c]	0.5	0.9	0.4	0.6[d]
Households owning mobile phones	96.7%[e]	75.4%[e]	86.4%	81.6%

586 Source: Primary survey data, National Statistical Office (2012), Lao Statistics Bureau (2016).
587 *Notes*. For each site, survey results represented simple average of administrative villages (69 in Chiang Rai, 65 in Salavan), wherein
588 individual population-weighted statistics were aggregated on the village level.
589 [a.] Estimated based on enumerated household members and residential structures in each village, adjusted by share of incorrectly identified
590 housing structures.
591 [b.] For comparability, village numbers based on data from National Geospatial-Intelligence Agency (2017).
592 [c.] Non-working-age population divided by working-age population (15-64 years).
593 [d.] Lao PDR national average for rural areas.
594 [e.] Average of village-level mobile phone diffusion. On the household level, the diffusion of mobile phones was 96.3% in Chiang Rai and
595 80.7% in Salavan.
596

597 These patterns were similar on the individual level. The average marginalisation index in Chiang Rai
598 was with 0.18 significantly lower than the average index of 0.28 in Salavan ($p < 0.01$), and the share
599 of respondents with a zero marginalisation index in Chiang Rai was with 54% nearly twice as large as
600 the share of 29% in Salavan. Yet, 6% of the Chiang Rai sample had an index score of 0.8 or 1.0,
601 compared to 5% in Salavan, indicating that multidimensional marginalisation existed in both sites. The

correlations of the marginalisation indicators in Table 4 further indicated that nine out of ten indicator combinations in Chiang Rai were positively correlated and statistically significant ($p < 0.01$), while in Salavan only two out of three statistically significant correlations were positive. In combination, these patterns suggested that, if marginalisation in rural Chiang Rai was present, it was more likely to be multidimensional. In rural Salavan, marginalisation was more common but also more evenly distributed across the population.

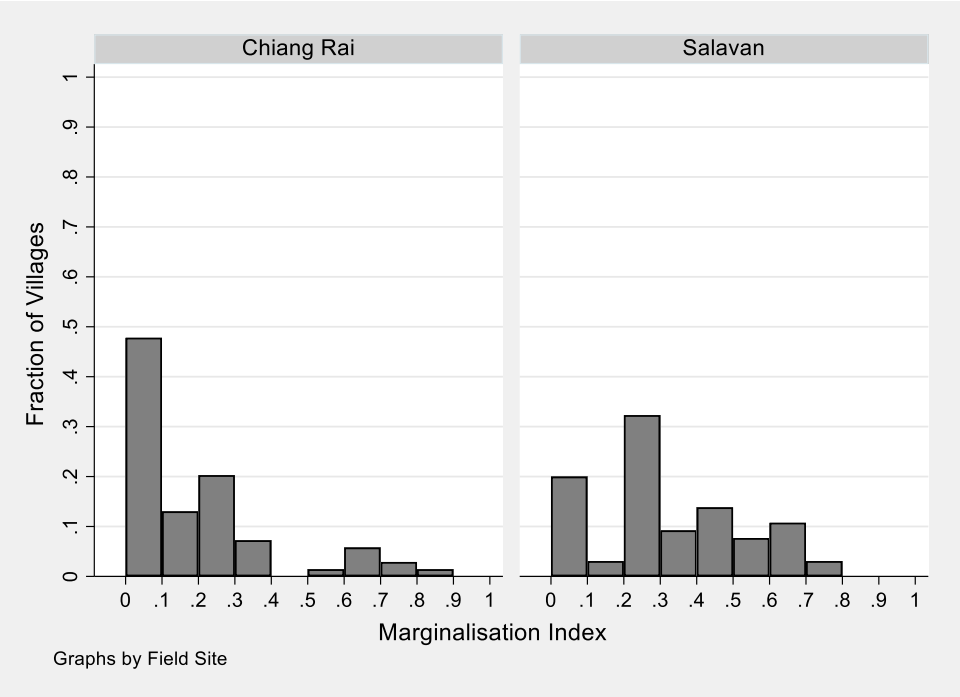


Fig. 2. Village-Level Marginalisation by Field Site.

Notes. Sub-PSU level (i.e. administrative villages). Chiang Rai: $n = 69$; Salavan: $n = 65$. Individual population-weighted statistics were aggregated on the village level.

Table 4. Pairwise Correlation of Marginalisation Dimensions, by Field Site.

	Chiang Rai					Salavan				
	Education	**Ethnicity**	**Wealth**	**Travel time**	**Remote-ness**	**Education**	**Ethnicity**	**Wealth**	**Travel time**	**Remote-ness**
Education	1.00					1.00				
Ethnicity	0.13***	1.00				-0.06	1.00			
Wealth	0.36***	0.13***	1.00			0.33***	-0.08	1.00		
Travel time	0.11***	0.03	0.22***	1.00		0.02	0.07	-0.12***	1.00	
Remoteness	0.29***	0.13***	0.40***	0.59***	1.00	0.06	0.04	-0.01	0.58***	1.00

Notes. Hypothesis tests with Šidák adjustment for more conservative estimates, taking into account the number of hypothesis tests performed in the pairwise comparison. Population-weighted statistics, accounting for complex survey design.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

5.2 Local Healthcare Landscapes

Both field sites had a wide range of formal and informal healthcare providers. In the following, we examine which preferences our respondents expressed for different healthcare providers (for receiving consultation, advice, or medicine), and which choices they actually made during recent episodes of acute illnesses or accidents. Among people who experienced a recent illness or accident (45% of the total sample), the preferred healthcare providers in both sites were private hospitals and primary care units (96% and 91% in Chiang Rai, 94% and 74% in Salavan; light-blue bars in Fig. 3).[10] In Chiang Rai, also private clinics (86%) and shops selling over-the-counter medication (73%) were commonly expressed as preferred sources of treatment; Salavan respondents expressed a relatively stronger preference for traditional healers (66%) and registered pharmacies (61%). Alas, the expressed preferences bore only remote resemblance to actual healthcare choices during acute illnesses and injuries (dark-blue bars in Fig. 3). The largest share of healthcare utilisation in Chiang Rai involved private clinics (23% of illness episodes), followed by public primary care units (18%) and public hospitals (15%). In Salavan, 40% of the illness episodes involved a public primary care unit, 20% involved a public hospital, and 10% a pharmacy.[11] Despite the varying patterns between sites and between stated preferences and reported healthcare choices, the data indicated pluralistic healthcare systems in both sites that were navigated as such.

[10] We collected this information for every participant in the survey. The expressed preferences on the individual level (as opposed to the sub-sample of people who had a recent illness) were not substantially different; they had the same rank order and differed by between zero and six percentage points.

[11] The disjunction between preferences and choices may be partly due to the exclusion of chronic conditions from the treatment-seeking patterns.

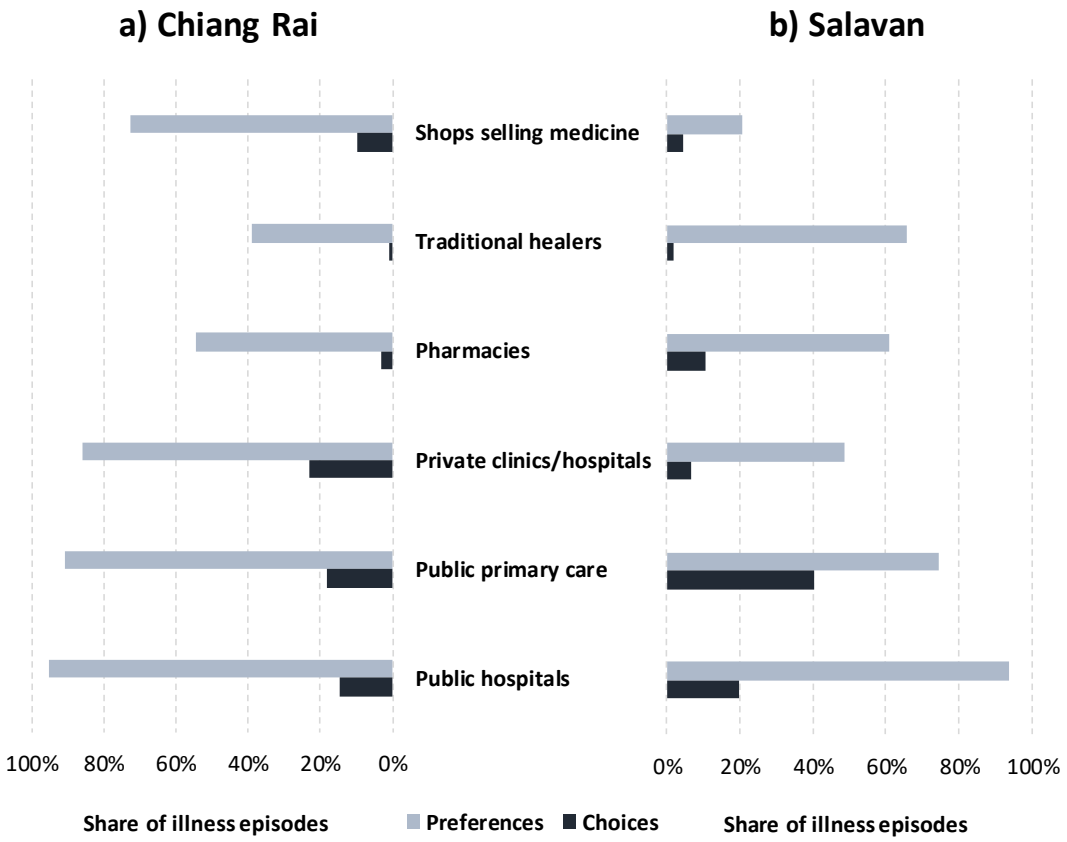


Fig. 3. Reported Healthcare Provider Preferences and Actual Healthcare Choices During Illness.

Notes. Illness-episode level (healthcare preferences on individual level including people without illness episodes were not systematically different from illness-level response pattern). Multiple responses per instance possible. Population-weighted statistics, accounting for complex survey design. Chiang Rai: n = 608; Salavan: n = 356.

5.3 Illness Episodes: Navigating the Health System

Health behaviour in the field sites was complex, as patients reported 99 unique treatment-seeking sequences in Chiang Rai for acute illnesses and accidents, and 67 in Salavan (depicted in Appendix Figure A1). The most common trajectory in Chiang Rai involved the single step of "self-care and rest" (23.5% of the Chiang Rai sample), followed by the sequence "self-care – private healthcare provider – self-care" (6.6%). In Salavan, the sequence "self-care – public primary care – self-care" was the most common with 15.4% of the sample; self-care alone ranked second with 10.4% of the sample.[12]

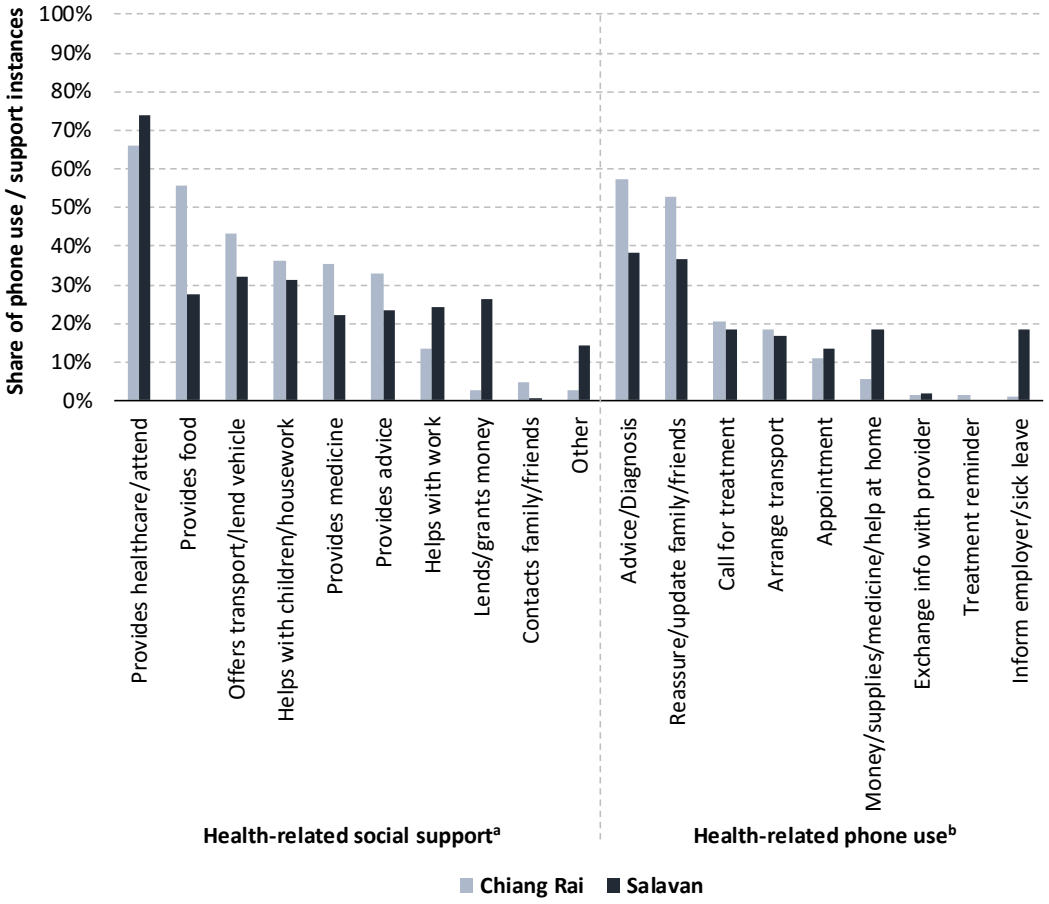
[12] Unweighted statistics owing to step-level (rather than illness-level) analysis of sequences.

Social support networks and mobile phones intersected these treatment-seeking processes regularly. With 69% of all treatment-seeking processes in Chiang Rai and 70% Salavan, the activation of social support networks was similarly common in both sites. These networks involved especially household members and relatives (91% of social support cases in Chiang Rai, 97% in Salavan), while social contacts outside the extended family were only activated in 10% of all cases in both sites. The main reasons for support networks to be involved (left panel in Fig. 4) were the provision of healthcare or attending to the patient. Other common tasks were bringing food and supplies for the patients (esp. in Chiang Rai, e.g. if patients were hospitalised), helping with transport and household chores, or bringing medicine to the patient. One in four contacts in Chiang Rai and one in three in Salavan also specifically offered health-related advice. In the context of Salavan, where marginalisation was more widespread and health expenditure occurred more often out-of-pocket, social contacts also provided money relatively frequently (26% of all cases).

Health-related mobile phone use was less frequent than the involvement of social support, taking place in 26% of all illness episodes in Chiang Rai and in 15% in Salavan (34% and 28% if general conversations about health were included in the indicator). The right panel in Fig. 4 shows the range of health-related purposes to which mobile phones were being put (by the patients themselves or somebody else on their behalf). These purposes related primarily to advice and diagnosis (e.g. by calling a family member or looking symptoms up on the Internet) and to reassuring and updating family members about the progression of the illness. Less common purposes included calls to summon providers to the patients, transport arrangements, and appointments with healthcare providers. Lao patients also reported that phones were used to arrange for supplies like money or medicine to be brought to the patient, or to inform employers and schools of absence and to request sick leave. As far as mobile phone functions are concerned, phone calls were used in more than 90% of all cases of health-related mobile phone use in both sites, followed by mobile data in 28% of cases in Chiang Rai and 12% in Salavan. Only a small minority of cases involved text messages or other functions like

673 reminders. A further observation during our field research was that villagers in Salavan typically left
674 their mobile phones at home when they left their house for agricultural work, thereby rendering it
675 essentially akin to a fixed-line phone.

676



677

678 *Fig. 4*. Functions of Health-related Phone Use and Support Networks.

679 *Notes.* Population-weighted statistics, accounting for complex survey design. Multiple responses per instance possible.
680 [a.] Illness-episode level, including only instances in which other people were involved during the illness. Chiang Rai: $n = 426$; Salavan:
681 $n = 262$.
682 [b.] Illness-step level, including only instances in which health-related mobile phone use occurred (excluding non-health-related phone
683 use and general conversations about health on the phone). Chiang Rai: $n = 218$; Salavan: $n = 60$.
684

685 These data demonstrate that social support networks were more commonly involved in treatment-
686 seeking processes than health-related phone use. Although they appeared to fulfil slightly different
687 purposes, the spectrum of uses to which social support and mobile phones were put suggested that they

688 played a facilitating role in people's treatment-seeking processes. Were more privileged rural groups
689 also more likely to experience facilitation from social support networks and through mobile phones?

690 Fig. 5 examines if this is the case by comparing the five marginalisation indicators and the overall
691 index between people who did and who did not report health-related mobile phone use and social
692 support. Negative values (bars pointing to the right) indicate that phones/contacts were associated with
693 less marginalised groups; positive values (bars pointing to the left) indicate higher degrees of
694 marginalisation for health-related phone use and social support. The figure demonstrates that the
695 relatively small group of health-related phone users was systematically less marginalised than non-
696 users; the difference of which was statistically significant across several indicators in Salavan. In
697 contrast, although health-related social support networks were activated widely, people who did not
698 realise this option were not clearly more or less marginalised (in Chiang Rai, they were significantly
699 less marginalised according to the education indicator, $p < 0.1$). These data suggest that mobile phones
700 were more likely to be used among privileged groups, whereas social support had a more egalitarian
701 character. However, as Table 5 indicates, only a minority of cases in both field sites involved mobile
702 phones without additional social support networks, which suggested that an inequitable distribution of
703 mobile phones could only have a limited impact. The next section examines in detail how social
704 networks and mobile phones were linked to treatment-seeking patterns.

705

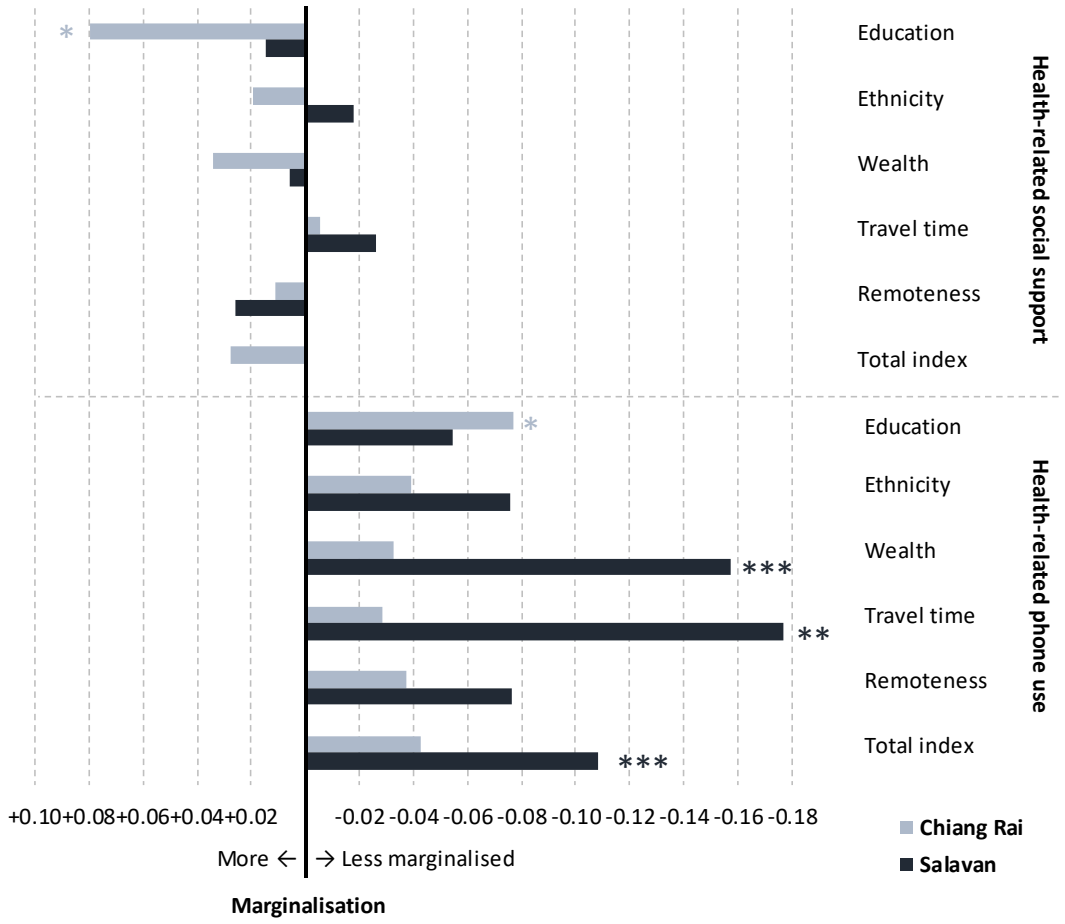


Fig. 5. Differences in Marginalisation Between (1) Patients Using Phones and (2) Patients With Health-Related Social Support Compared to People who (1) do not use Phones and (2) Involve Social Support Networks.

Notes. Illness-episode level. Chiang Rai: $n = 608$; Salavan: $n = 356$. Hypothesis tests using Pearson X^2 tests for binary variables (i.e. individual dimensions of marginalisation) and two-sided *t*-tests for total marginalisation index. Population-weighted statistics, accounting for complex survey design.
$^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 5. Overlap Between People who use Mobile Phones and Involve Others During Illness.

		Health-related phone use			
		Chiang Rai		Salavan	
		No	Yes	No	Yes
Other people involved	No	27.4%	3.9%	27.9%	2.0%
	Yes	46.5%	22.3%	56.7%	13.5%

Notes. Illness-episode level. Population-weighted statistics, accounting for complex survey design. Chiang Rai: $n = 608$; Salavan: $n = 356$.

6 Regression Analysis: Determinants of Healthcare Access and Delays

6.1 Marginalisation

We first considered the role of marginalisation and its individual dimensions as determinants of healthcare access and the duration until healthcare providers were reached. In Table 6, we present the regression results for access to healthcare; in Table 7 for the duration until patients reached the various healthcare providers. For both tables, we present multi-level models, or single-level regression models in case the multi-level regressions did not converge.[13] Overall, we found that marginalisation was systematically associated with healthcare access, suggesting that more marginalised groups tended to access more informal and less private healthcare. However, we did not identify a systematic statistical relationship between marginalisation and public healthcare access or the duration until any kind of care had been accessed.

[13] The significance of the associations described in this and the following section were only weakly sensitive to the multi- or single-level model specifications. The conclusions of this analysis do not vary substantively if either specification was chosen.

Table 6. Access to Healthcare and Marginalisation: Regression Results.

		Dependent Variable																	
		Chiang Rai						Salavan						Pooled Sample					
		Public Care		Private Care		Informal Care		Public Care		Private Care		Informal Care		Public Care		Private Care		Informal Care	
	(Model Number)	(1)	(2)	(3)	(4)	(5)[a]	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Marginalisation	Social (education)	-0.40		0.18		-0.14		-0.10		-0.86		0.11		-0.23		-0.14		0.03	
		(0.28)		(0.28)		(0.34)		(0.36)		(0.61)		(0.64)		(0.23)		(0.25)		(0.31)	
	Social (ethnicity)	0.83**		-0.61		-1.31**		-0.24		-0.03		-0.01		0.53*		-0.43		-0.68	
		(0.35)		(0.41)		(0.67)		(0.46)		(0.55)		(0.84)		(0.28)		(0.33)		(0.50)	
	Economic (wealth)	0.58**		-0.10		-0.27		-0.20		-0.73		0.98		0.31		-0.27		-0.08	
		(0.27)		(0.28)		(0.35)		(0.41)		(0.60)		(0.73)		(0.22)		(0.25)		(0.31)	
	Spatial (travel time)	-0.60		0.36		0.79***		0.61		-1.23**		3.26**		0.05		-0.50		1.37***	
		(0.38)		(0.43)		(0.26)		(0.53)		(0.50)		(1.58)		(0.36)		(0.33)		(0.37)	
	Spatial (remoteness)	0.55		-1.43**		0.44		0.14		0.32		-0.45		0.24		-0.17		-0.20	
		(0.52)		(0.63)		(0.47)		(0.58)		(0.53)		(1.40)		(0.43)		(0.41)		(0.42)	
	Marginalisation Index		0.68		-0.90*		0.75		0.17		-2.66**		3.34**		0.69		-1.43***		1.37**
			(0.49)		(0.53)		(0.59)		(0.88)		(1.11)		(1.56)		(0.48)		(0.50)		(0.62)
Illness severity		1.02***	0.98***	0.42***	0.41***	-0.08	-0.07	0.63***	0.64***	-0.16	-0.18	0.60	0.63	0.93***	0.91***	0.28**	0.28**	-0.02	-0.01
		(0.13)	(0.13)	(0.12)	(0.12)	(0.18)	(0.18)	(0.21)	(0.21)	(0.26)	(0.27)	(0.44)	(0.42)	(0.11)	(0.11)	(0.11)	(0.11)	(0.16)	(0.16)
Adult/child (1 = child)		0.96***	0.96***	0.28	0.27	-1.22*	-1.19**	0.30	0.29	-0.05	-0.07	0.09	-0.03	0.64***	0.64***	0.14	0.13	-0.64*	-0.65*
		(0.25)	(0.25)	(0.26)	(0.26)	(0.70)	(0.49)	(0.29)	(0.29)	(0.36)	(0.36)	(0.59)	(0.58)	(0.19)	(0.19)	(0.21)	(0.21)	(0.33)	(0.33)
Gender (1 = female)		0.25	0.21	0.10	0.13	0.18	0.14	0.42	0.37	-0.49	-0.53	0.58	0.41	0.28*	0.23	-0.06	-0.04	0.27	0.23
		(0.21)	(0.20)	(0.20)	(0.20)	(0.27)	(0.27)	(0.30)	(0.29)	(0.36)	(0.35)	(0.65)	(0.62)	(0.17)	(0.16)	(0.17)	(0.17)	(0.25)	(0.24)
Age		0.01	-0.00	0.01	0.01*	-0.01	-0.01	0.01	0.01	-0.01	-0.01	-0.02	-0.02	0.00	-0.00	0.01	0.01	-0.00	-0.00
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant		-4.24***	-3.84***	-2.37***	-2.61***	-0.64	-0.69	-1.63*	-1.44*	-0.76	-0.69	-7.08***	-5.94***	-3.01***	-2.78***	-2.22***	-2.29***	-2.18***	-2.15***
		(0.63)	(0.60)	(0.63)	(0.61)	(1.02)	(0.84)	(0.93)	(0.85)	(1.04)	(1.05)	(1.97)	(1.70)	(0.62)	(0.59)	(0.60)	(0.58)	(0.72)	(0.70)
Pseudo R^2						0.05													
Variance Component Test		0.08	0.00	0.08	0.04		0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.02
Log likelihood		-324.0	-330.2	-334.4	-337.6	-195.6	-201.3	-200.3	-201.4	-132.3	-134.5	-67.0	-69.5	-539.1	-541.6	-483.4	-483.9	-277.8	-284.2
X^2		82.51	74.01	22.35	16.65	18.30	7.71	15.46	13.41	15.17	10.31	10.43	8.95	87.56	84.07	17.20	16.30	22.62	9.37
N_1 **(Individuals)**		608	608	608	608	608	608	356	356	356	356	356	356	964	964	964	964	964	964
N_2 **(Villages)**		30	30	30	30		30	30	30	30	30	30	30	60	60	60	60	60	60
N_3 **(Districts)**		5	5	5	5		5	5	5	5	5	5	5	10	10	10	10	10	10
N_4 **(Sites)**														2	2	2	2	2	2

Notes. Coefficients reported. Standard errors in parentheses. Analysis at illness-episode level.

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

[a.] Single-level models reported because multi-level models did not converge. Standard errors calculated with bootstrap estimation using 5,000 replications and clustered at village level.

Table 7. Duration Until Healthcare Access and Marginalisation: Regression Results.

		Dependent Variable																	
		Chiang Rai						Salavan						Pooled Sample					
		Public Care		Private Care		Informal Care[a]		Public Care		Private Care		Informal Care[a]		Public Care		Private Care		Informal Care	
	(Model Number)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Marginalisation	Social (education)	0.62		0.15		-0.11		-0.07		-1.71		0.81		0.20		-0.11		0.14	
		(0.41)		(0.39)		(1.38)		(0.20)		(1.04)		(9.41)		(0.20)		(0.35)		(0.49)	
	Social (ethnicity)	-0.15		-0.26		0.80		0.17		-0.57		-1.77		0.05		-0.36		-0.31	
		(0.42)		(0.52)		(15.45)		(0.27)		(1.01)		(13.32)		(0.25)		(0.46)		(0.94)	
	Economic (wealth)	-0.03		-0.11		1.52		0.04		0.21		-0.01		-0.09		0.09		0.74	
		(0.33)		(0.40)		(1.70)		(0.24)		(0.81)		(8.72)		(0.20)		(0.33)		(0.47)	
	Spatial (travel time)	-0.38		-0.96**		-0.41		-0.21		0.71		-0.35		-0.21		-0.38		-0.49	
		(0.53)		(0.45)		(0.65)		(0.24)		(0.58)		(15.62)		(0.29)		(0.42)		(0.40)	
	Spatial (remoteness)	0.24		0.63		-1.21		-0.08		0.18		-0.31		0.02		0.38		-0.27	
		(0.70)		(0.73)		(7.08)		(0.26)		(0.58)		(8.24)		(0.34)		(0.48)		(0.56)	
	Marginalisation Index		0.35		-0.42		-0.07		-0.35		0.89		-0.14		-0.02		-0.13		0.23
			(0.61)		(0.64)		(1.28)		(0.46)		(1.02)		(4.09)		(0.40)		(0.58)		(0.74)
Illness severity		0.31*	0.35**	0.55***	0.52***	0.46	0.27	0.03	0.02	-0.17	-0.10	0.89	1.02	0.21*	0.22**	0.43***	0.43***	0.56**	0.58***
		(0.18)	(0.18)	(0.16)	(0.16)	(0.29)	(0.45)	(0.12)	(0.12)	(0.34)	(0.36)	(5.76)	(1.24)	(0.11)	(0.11)	(0.15)	(0.15)	(0.23)	(0.22)
Adult/child (1 = child)		-0.93***	-0.86***	-0.75**	-0.75**	0.04	-0.25	-0.51***	-0.51***	-0.30	-0.47	0.48	0.26	-0.65***	-0.63***	-0.63**	-0.62**	0.29	0.26
		(0.34)	(0.33)	(0.35)	(0.34)	(2.90)	(3.00)	(0.18)	(0.18)	(0.45)	(0.46)	(9.11)	(1.61)	(0.18)	(0.18)	(0.28)	(0.27)	(0.52)	(0.50)
Gender (1 = female)		-0.29	-0.20	-0.01	0.13	0.26	0.41	0.08	0.09	0.50	0.28	-1.08	-0.48	-0.09	-0.05	0.22	0.20	0.15	0.23
		(0.29)	(0.28)	(0.28)	(0.25)	(0.50)	(0.45)	(0.18)	(0.17)	(0.46)	(0.47)	(12.00)	(3.97)	(0.16)	(0.16)	(0.23)	(0.22)	(0.39)	(0.39)
Age		-0.00	0.00	-0.01	-0.01	0.05*	0.04*	-0.00	-0.00	0.02	0.02	0.01	0.02	0.00	0.01	-0.00	-0.00	0.04**	0.03**
		(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.40)	(0.08)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant		1.67*	1.08	1.25	1.02	-3.91	-2.68	1.12**	1.12**	-0.21	0.21	-1.49	-2.24	0.91*	0.74	0.58	0.62	-2.79**	-2.94***
		(0.97)	(0.91)	(0.81)	(0.79)	(3.56)	(3.47)	(0.48)	(0.45)	(0.91)	(0.96)	(21.57)	(6.32)	(0.49)	(0.46)	(0.63)	(0.61)	(1.15)	(1.14)
Pseudo R^2						0.10	0.05					0.21	0.14						
Variance Component Test		0.11	0.00	0.20	0.03			0.09	0.07	0.47	0.42			0.00	0.00	0.15	0.06	0.24	0.37
Log likelihood		-365.7	-367.1	-302.9	-305.3	-80.8	-85.1	-338.0	-338.6	-91.9	-94.9	-32.5	-35.5	-725.4	-726.4	-402.2	-402.9	-123.4	-126.0
X^2		16.99	14.72	24.00	17.98	7.89	6.12	9.94	8.70	9.15	3.00	1.20	0.83	23.08	21.16	17.48	16.22	20.16	13.17
N_1 (Individuals)		192	192	159	159	65	65	206	206	57	57	23	23	398	398	216	216	88	88
N_2 (Villages)		30	30	30	30			29	29	16	16			59	59	46	46	34	34
N_3 (Districts)		5	5	5	5			5	5	5	5			10	10	10	10	9	9
N_4 (Sites)														2	2	2	2	2	2

Notes. Coefficients reported. Standard errors in parentheses. Analysis at illness-episode level.

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

[a.] Single-level models reported because multi-level models did not converge. Standard errors calculated with bootstrap estimation using 5,000 replications and clustered at village level.

738 The regression results in Table 6 suggest that, marginalisation linked to most forms of healthcare
739 access, with the exception of public healthcare access in Salavan (where neither the coefficients of the
740 individual dimensions nor of the overall index were statistically significant). Although one or more of
741 the individual dimensions were associated with healthcare access, no systematic pattern emerged.
742 Among the perhaps surprising results in this regard was that the wealth dimension was only statistically
743 significant for public healthcare access in Chiang Rai ($p < 0.05$, Model 1; perhaps due to the binary
744 nature of the wealth indicator), and that the ethnicity dimension was negatively associated with
745 informal healthcare access in Chiang Rai ($p < 0.05$; Model 5; possibly as informal healthcare access
746 may have been more restricted for minority groups *in their own village*). When aggregated into the
747 overall index, the links between marginalisation and healthcare access were more limited. In the site
748 sub-samples, marginalisation had a significant positive association with private healthcare access in
749 Chiang Rai ($p < 0.1$; Model 4), and, in Salavan, a negative association with private healthcare access
750 and a positive association with informal healthcare access ($p < 0.05$; Models 10 and 12). In the pooled
751 sample, marginalisation was again linked negatively to private and positively to informal healthcare
752 access ($p < 0.01$ and $p < 0.05$; Models 16 and 18).

753 To illustrate the link between marginalisation and healthcare access, consider that at sample means,
754 the predicted probability of a patient in Chiang Rai accessing private healthcare was 2.9 percentage
755 points lower if they exhibited three instead of two dimensions of the marginalisation index (20.4% vs.
756 23.3%). In Salavan, the same patient would have a 3.5 percentage point lower predicted probability of
757 private healthcare access (6.8% vs. 10.3%), but a 4.0 percentage point higher rate of informal access
758 (12.5% vs. 8.5%). The inverse relationship between informal healthcare in Salavan and private
759 healthcare access in Chiang Rai and Salavan as a function of marginalisation is depicted in Fig. 6, and
760 appeared to be driven especially by spatial dimensions of marginalisation (see Table 6). Free public
761 healthcare in both field sites appeared to be less sensitive at least to our multidimensional specification
762 of marginalisation.

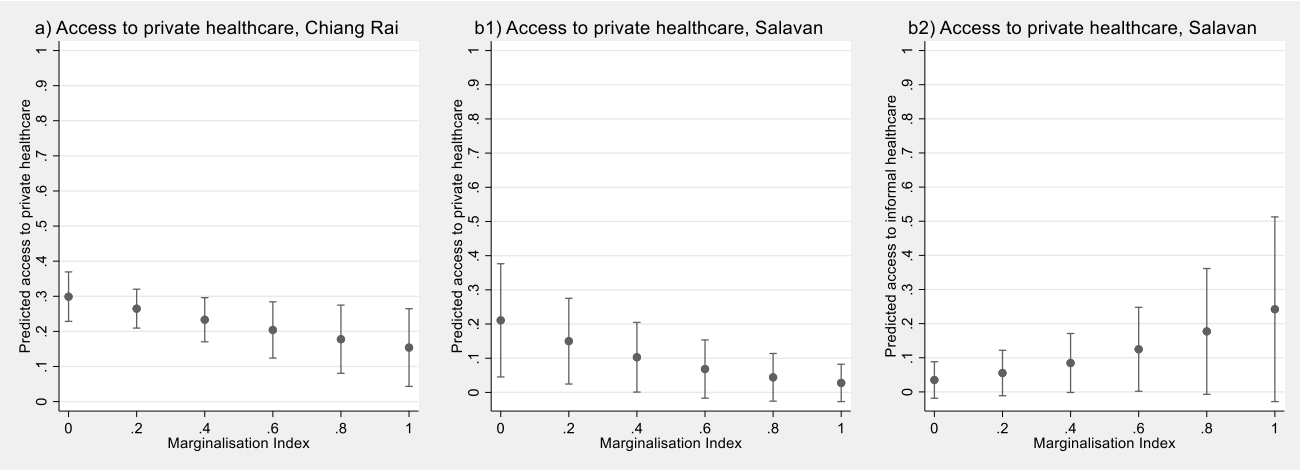


Fig. 6. Predicted Access to Private and Informal Healthcare as a Function of Marginalisation, Chiang Rai and Salavan.

Notes. Illness-episode level. Panel a: $n = 608$; Panels b1 and b2: $n = 356$. Predicted results of Models 4, 10, and 12 in Table 6. Error bars indicating 95% confidence interval.

Among the other control variables, the self-perceived severity of the illness/accident and whether the episode was experienced by a child or adult emerged repeatedly as statistically significant predictors. Severity was positively associated with public and private healthcare access in Chiang Rai and in the pooled sample, and with public healthcare access in Salavan. The adult/child dummy was only statistically significant in the Chiang Rai sample and the pooled sample, where being a child was linked to more public and less informal healthcare access. Age and gender of the respondent (i.e. the patient or caregiver of an ill child) were not related to healthcare access.

In contrast, Table 7 indicates that marginalisation was not systematically associated with the time elapsed until patients accessed public, private, or informal healthcare providers – neither in its individual dimensions nor as overall index. Among the control variables, especially illness episodes of children were associated with shorter delays until reaching public ($p < 0.01$) and private healthcare ($p < 0.05$) in Chiang Rai and the pooled sample, and public healthcare in Salavan ($p < 0.01$). In Chiang Rai and the pooled sample, higher age was also associated with longer delays until accessing informal healthcare ($p < 0.1$ in Chiang Rai; $p < 0.05$ in pooled sample), albeit not for other forms of healthcare

784 access. Contrary to intuition, the severity of illnesses was not linked to shorter durations to healthcare
785 access in any model, and it exhibited statistically significant positive associations with public and
786 private healthcare access in Chiang Rai and all forms of healthcare access in the pooled sample.[14]

787 **6.2 Health-Related Phone Use and Social Support**

788 As the final step in our analysis, this section presents the regression models linking mobile phone use
789 and social support to rural treatment-seeking behaviour. Following the structure of the preceding
790 section, the main results are again presented in separate tables for access to healthcare (Table 8) and
791 duration until patients reached the various healthcare providers (Table 9). For both tables, we limited
792 the presentation of the models to either the either the basic models with the marginalisation index,
793 health-related phone use, and social support as independent variables, or the interaction models if the
794 PHONxMARG and SUPPxMARG interaction terms were statistically significant at least at the 10-
795 percent level (see Appendix Tables A2 and A3 for the complete set of models). For simplicity, we
796 omitted from reporting the control variables (age, gender, illness severity, dummy for adult/child
797 illness) and the constant term; the full specifications including coefficients for control variables are
798 presented in the supplemental material.

799

[14] A possible interpretation is that more severe cases involved bed-ridden patients treated at home and the prospect of more expensive treatment. Later analysis in the next section will also link mobile phone use systematically to delayed access, but note that the correlation between the severity and health-related mobile phone use was weak, with correlation coefficients of 0.17 in Chiang Rai and 0.07 in Salavan.

Table 8. Access to Healthcare and Situational Facilitators: Main Regression Results.

	Dependent Variable										
	Chiang Rai				Salavan			Pooled Sample			
	Public Care[a]		Private Care	Informal Care	Public Care	Private Care	Informal Care	Public Care[a]		Private Care	Informal Care
(Model Number)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
Marginalisation Index	0.43	-1.25	-0.83	0.73	0.02	-1.98*	3.31**	0.42	-0.50	-1.34***	1.69***
	(0.56)	(1.00)	(0.54)	(0.59)	(0.95)	(1.15)	(1.58)	(0.52)	(0.79)	(0.50)	(0.65)
Health-related phone use	0.10	0.43*	0.46**	-0.22	0.12	1.34**	-0.13	0.16	0.64***	0.44**	0.35
	(0.30)	(0.23)	(0.22)	(0.33)	(0.62)	(0.63)	(0.89)	(0.27)	(0.20)	(0.20)	(0.41)
Health-related social support	0.45*	-0.02	0.37	0.08	0.70**	0.88**	-0.39	0.57***	0.19	0.52**	-0.03
	(0.25)	(0.30)	(0.24)	(0.30)	(0.32)	(0.42)	(0.59)	(0.19)	(0.26)	(0.20)	(0.26)
PHONxMARG	1.90*				9.26***	-15.73**		2.86***			-3.31*
	(1.09)				(3.47)	(6.25)		(1.06)			(1.78)
SUPPxMARG		2.68**							1.76**		
		(1.06)							(0.79)		
(control variables [age, gender, illness severity, dummy for adult/child illness], constant term, and multilevel variance parameters omitted)											
Variance Component Test	<0.01	<0.01	0.04	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Log likelihood	-324.6	-322.5	-333.9	-201.0	-188.5	-126.6	-69.3	-526.8	-528.3	-477.6	-281.7
X^2	79.28	80.90	23.10	8.18	28.45	20.23	9.24	100.61	100.21	27.88	13.72
N_1 **(Individuals)**	608	608	608	608	356	356	356	964	964	964	964
N_2 **(Villages)**	30	30	30	30	30	30	30	60	60	60	60
N_3 **(Districts)**	5	5	5	5	5	5	5	10	10	10	10
N_4 **(Sites)**								2	2	2	2

Notes. Coefficients reported. Standard errors in parentheses. Analysis at illness-episode level.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.
[a.] Both PHONxMARG and SUPPxMARG models yielded statistically significant interaction terms.

Table 9. Duration Until Healthcare Access and Situational Facilitators: Main Regression Results.

	Dependent Variable								
	Chiang Rai			Salavan			Pooled Sample		
	Public Care	Private Care	Informal Care[b]	Public Care	Private Care[b]	Informal Care[b]	Public Care	Private Care	Informal Care
(Model Number)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Marginalisation Index	0.47	-0.39	-0.06	0.02	1.80*	0.57	0.08	0.02	0.28
	(0.58)	(0.60)	(0.91)	(0.48)	(0.93)	(0.69)	(0.38)	(0.52)	(0.76)
Health-related phone use[a]	0.69**	1.07***	0.12	0.95***	1.39***	2.14***	0.63***	1.09***	0.21
	(0.34)	(0.26)	(0.53)	(0.34)	(0.51)	(0.63)	(0.20)	(0.24)	(0.53)
Health-related social support	-0.23	0.30	0.84	-0.01	2.43***	0.25	-0.10	0.66**	0.64
	(0.36)	(0.32)	(0.53)	(0.19)	(0.78)	(0.47)	(0.19)	(0.28)	(0.40)
PHONxMARG[a]				-2.35**		-161.22***			
				(1.15)		(8.13)			
(control variables [age, gender, illness severity, dummy for adult/child illness], constant term, and multilevel variance parameters omitted)									
Pseudo R^2			0.06		0.10	0.23			
Variance Component Test	0.04	0.51		0.20			<0.01	0.46	0.35
Log likelihood	-364.9	-297.1	-83.9	-334.7	-87.1	-31.6	-721.2	-390.6	-124.3
X^2	19.67	36.71	16.66	16.86	16.91	1166.67	31.39	43.21	16.71
N_1 **(Individuals)**	192	159	65	206	57	23	398	216	88
N_2 **(Villages)**	30	30		29			59	46	34
N_3 **(Districts)**	5	5		5			10	10	9
N_4 **(Sites)**							2	2	2

Notes. Coefficients reported. Standard errors in parentheses. Analysis at illness-episode level.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.
[a.] Phone use variable specific to type of healthcare access, e.g. "health-related phone use prior to accessing public healthcare" rather than "any health-related phone use."
[b.] Single-level models reported because multi-level models did not converge. Single-level models reported because multi-level models did not converge. Standard errors calculated with bootstrap estimation using 5,000 replications and clustered at village level.

Table 8 documents the main results of the multi-level regression models of access to healthcare. Overall, the results indicated that, with the inclusion of mobile phones and social support, the marginalisation index retained a statistically significant association (independently or as part of an interaction term) with public healthcare access in Chiang Rai, and with all forms of healthcare access in Salavan as well as in the pooled sample. Furthermore, mobile phones or social support were significantly linked with public and private healthcare access in both individual samples and to all types of healthcare access in the pooled sample.

The specific results for health-related mobile phone use and social support permitted the following observations. In Chiang Rai, Salavan, and the pooled sample, mobile phone use was positively associated with public healthcare access through the interaction terms ($p < 0.1$, Model 1; $p < 0.01$, Models 5 and 8). The positive interaction coefficients suggested that public healthcare utilisation was higher among marginalised individuals if they also used a mobile phone. Social support had a similar relationship with public healthcare access in Chiang Rai and the pooled sample ($p < 0.05$, Models 2 and 9), whereas the association between social support and public healthcare access in the Salavan sample was positive and statistically significant ($p < 0.05$, Model 5) but independent of the marginalisation index. For private healthcare, mobile phone use and social support did not interact with marginalisation in Chiang Rai and the pooled sample but where independently related to higher private healthcare access in the pooled sample ($p < 0.05$, Model 10). Health-related phone use also had a positive and statistically significant association with private healthcare access in Chiang Rai ($p < 0.05$, Model 3). However, the PHONxMARG interaction was statistically significant ($p < 0.05$, Model 6) and negative for private healthcare access in Salavan, suggesting that more marginalised groups had utilised private providers at a lower rate if they also used mobile phones. Informal healthcare access was only linked to health-related mobile phone use in the pooled sample (Model 11), where the

836 interaction term was negative and statistically significant ($p < 0.1$) – suggesting that phone users had
837 less informal healthcare access with increasing marginalisation.

838 We illustrate these relationships in Figs. 7 and 8. Fig. 7 depicts the interaction between marginalisation
839 and health-related mobile phone use in the Salavan sub-sample, including the predicted access to
840 public (Panel a) and private healthcare providers (Panel b) as a function of the marginalisation index
841 (predictions at sample means). Light-grey markers represent health-related phone use and dark-grey
842 markers represent healthcare episodes without phone use. The predicted values shown in the graphs
843 indicated near-universal public and near-absent private healthcare access for people with two or more
844 dimensions of marginalisation (i.e. a marginalisation index score of 0.4 or higher). Fig. 8 draws on the
845 pooled sample results to provide further illustration, showing the relationship between marginalisation
846 and health-related phone use (Row a) and health-related social support (Row b) for public (Column
847 1), private (Column 2), and informal healthcare access (Column 3). As in the previous figure, light-
848 grey markers indicate health-related phone use (Row a) or social support (Row b). The predicted rates
849 of healthcare access using the pooled sample suggested that mobile phone use and social support
850 related to marginalisation in similar ways (with the exception of informal healthcare access, where
851 access among marginalised phone users was predicted to be lower than among non-users).

852 In Table 9, we focus again on the duration until healthcare access. We present single-level regression
853 results for Models 3, 5, and 6, which did not converge owing to small sample sizes. Although the
854 previous section indicated no direct relationship between marginalisation and the duration until
855 healthcare access, when health-related mobile phone use and social support were added to the models,
856 especially phone use emerged as a predictor of the duration until healthcare access. Independently of
857 marginalisation, phone use was statistically significant and positive for public and private healthcare
858 in Chiang Rai ($p < 0.05$, Model 1; $p < 0.01$, Model 2) and in the pooled sample ($p < 0.01$, Models 7
859 and 8). This indicated that people using mobile phones for health-related purposes also experienced
860 longer delays until they accessed public and private care. Moreover, the PHONxMARG interaction

term was statistically significant and negative in Salavan for public ($p < 0.05$, Model 4) and private healthcare access ($p < 0.01$, Model 6). The negative interaction terms thereby indicated that faster healthcare access was present among phone users with a marginalisation index of 0.6 or higher accessing public providers, or a marginalisation index of 0.2 or higher accessing informal care. Among non-marginalised groups, health-related mobile phone use was linked to longer durations. In contrast, social support was linked only to private healthcare in Salavan ($p < 0.01$, Model 5) and the pooled sample ($p < 0.05$, Model 8) – and in a similar direction as health-related mobile phone use. Considering the pooled sample, the results indicated that mobile phone use was associated with 1.6 days slower access to public healthcare and 2.9 days slower private healthcare access compared to illnesses where no mobile phones were used (model predictions). Social support in the pooled sample was associated with 1.2 additional days until private healthcare access.

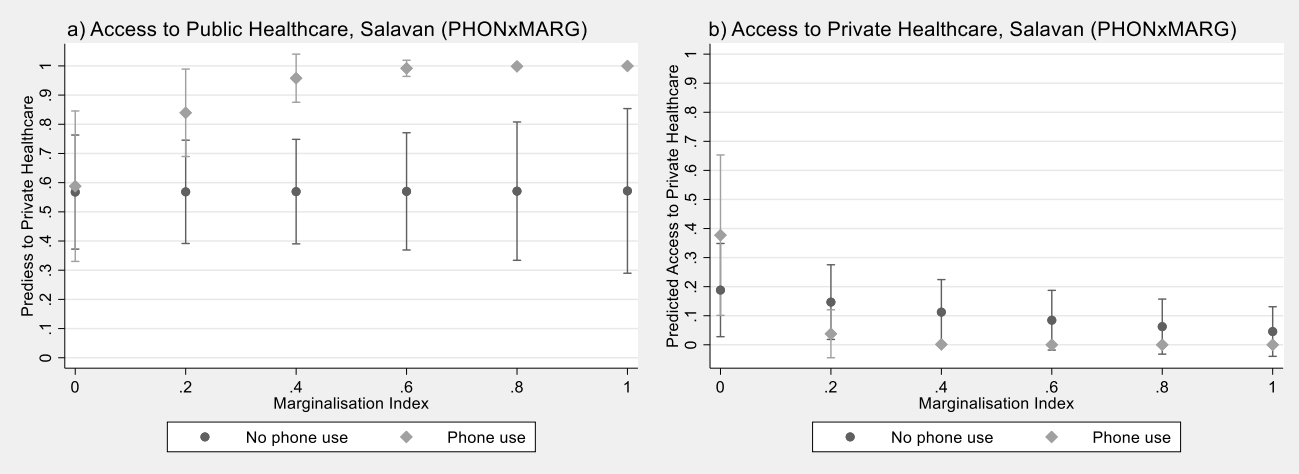


Fig. 7. Predicted Access to Public and Private Healthcare as a Function of Marginalisation and Health-Related Mobile Phone Use, Salavan.

Notes. Illness-episode level. $n = 356$. Predicted results of Models 5 and 6 in Table 8. Error bars indicating 95% confidence interval.

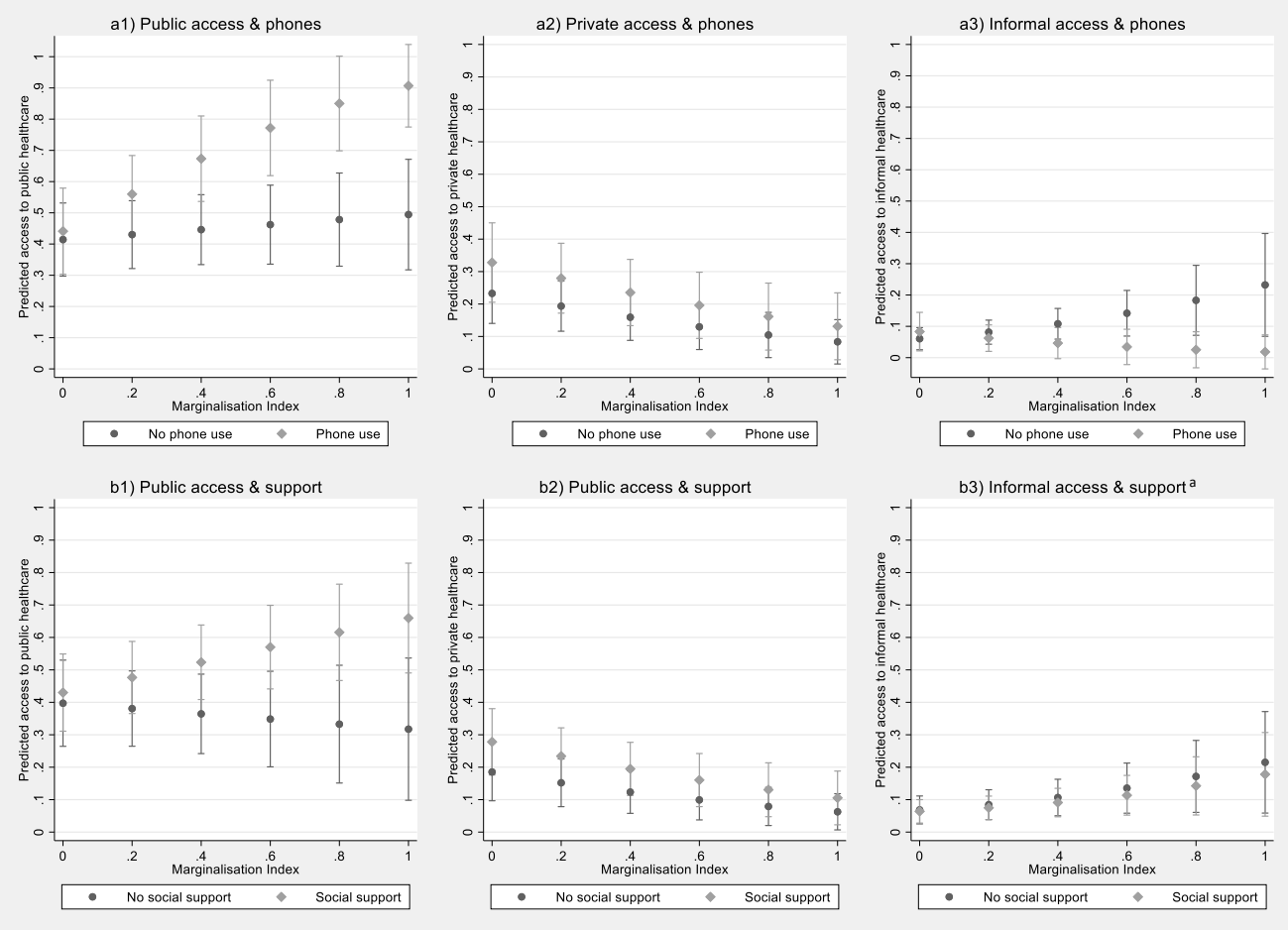


Fig. 8. Predicted Access to Healthcare as a Function of Marginalisation, Health-Related Mobile Phone Use, and Social Support; Pooled Sample.

Notes. Illness-episode level. n = 964. Predicted results of Models 8, 9, 10, and 11 in Table 8. Error bars indicating 95% confidence interval.

[a.] Results are not statistically significant at $p < 0.1$ and is included for illustration only.

7 Discussion

7.1 Limitations

Our interpretations and conclusions are subject to two main sets of limitations. The first set related to the survey sample. On the one hand, our representative samples spoke specifically to the living conditions of the rural populations during the dry post-monsoon season, when accessibility especially to remote and mountain villages was easier and safer. Together with harvest cycles, seasonal outmigration, and changing epidemiological patterns (Greer *et al.*, 2018; Haenssgen *et al.*, 2018a), this

could mean that marginalisation and constraints in healthcare access manifested themselves differently during other seasons and that our results may be relatively conservative. On this basis, we could speculate that the monsoon season introduces more constraints and risks, thereby amplifying the role of health-related social support and mobile phone use. On the other hand, as a rural survey in Chiang Rai and Salavan, we could not make claims about health behaviours in urban areas or other regions of the world.

Secondly, the static analysis of cross-sectional data could shed only very little light on causal relationships and on the evolving and bi-directional link between marginalisation and health behaviour. From a static perspective, we could argue for instance that longer healthcare episodes may prompt patients to use a mobile phone in order to find more viable healthcare solutions. However, most of the incidences of health-related phone uses occurred early in the process: 48% of all health-related mobile phone use took place in the first illness step; 77% in the first two steps.[15] Over the long term, the relationship between healthcare access, mobile technology diffusion, social networks, and marginalisation could be recursive: If mobile phones and social support helped people manage their health better, then they might be less subject to catastrophic health expenditure and health outcomes and less likely to experience a process of marginalisation, which would in turn affect their relationship to health-related social support and mobile phone use. The current data only enabled a glimpse at this network of relationships, underlining the need for more extensive research on the multidimensional implications of mobile phone diffusion and social support.

[15] These patterns followed the more general distribution of steps in the treatment-seeking process. Across all illness episodes in the sample, health-related mobile phone as a share of each step was relatively constant with between 11% and 15% of each step (between Steps 1 and 6, after which no phone occurs any longer).

7.2 Main Findings

We summarise our findings in Table 10. Our results provided support for Hypothesis H1a that marginalisation linked positively to informal healthcare access and negatively to formal healthcare access, in particular private healthcare providers. We did not find evidence in support of Hypothesis H1b that marginalised groups experienced longer delays to formal healthcare access. The evidence is therefore moderately consistent with the overarching Hypothesis H1 that marginalised groups had fewer means to access formal treatment, driving them towards increased informal healthcare access.

The evidence relating to Hypothesis H2 was more mixed. Hypothesis H2a stated that facilitators like social support and phone use entailed more and faster access to formal healthcare providers. The evidence presented in this paper was consistent with this hypothesis insofar as that, broadly speaking, mobile phone use was associated with more access to formal healthcare and less access to informal healthcare. Social support, too, was linked positively to public and private healthcare access, but no association with informal healthcare access emerged. However, we observed little indication that these factors contributed to faster access. Hypothesis H2b posited that private healthcare access increased disproportionately when marginalised groups mobilised social support and mobile phones. Our data suggested that marginalised groups had instead relatively more access to *public* healthcare if they were aided by phones and social support, and the evidence in Salavan even hinted at substitution away from private towards public healthcare. Although mobile phone use appeared to coincide with increased private healthcare access more generally, this relationship was similar for marginalised and non-marginalised groups. Finally, according to Hypothesis H2c, social support and phone use should have been less influential among non-marginalised groups, for which we find partial support in our data. In terms of healthcare utilisation, especially the rate of public healthcare access was higher among marginalised phone users and people receiving social support, whereas private healthcare access was more likely to be independent of either factor. In the low-income context of rural Salavan, mobile phone use was also associated with faster treatment-seeking among marginalised groups. We can

936 therefore conclude that the evidence was partly consistent with H2: the patterns support the notion that
937 social support and phone helped marginalised groups overcome constraints in accessing formal
938 healthcare, but they were not specifically directed towards private providers.

939

940 *Table 10.* Evidence in Relationship to Research Hypotheses.

Hypothesis		Evidence
H1	***Marginalised groups have fewer means to access formal treatment, driving them towards increased informal healthcare access.***	**Partial support:** Informal healthcare access more common with increasing marginalisation, but no discernible link to access delays.
H1a)	*Marginalisation links positively to informal healthcare access and negatively to formal healthcare access.*	**Consistent support:** Lower private and higher informal healthcare utilisation among marginalised groups, but also isolated evidence of increased public healthcare utilisation.
H1b)	*Marginalised groups experience longer delays to formal healthcare access.*	**No support:** Duration until healthcare access not associated with marginalisation.
H2	***Social support and phone use help marginalised groups overcome constraints in accessing formal healthcare, but facilitation is directed towards private providers.***	**Partial support:** Disproportionate uptake of formal healthcare among marginalised phone users / receivers of social support, but not directed towards private providers.
H2a)	*Facilitators like social support and phone use entail more and faster access to formal healthcare providers.*	**Partial support:** Phones and social support associated with more formal and less informal access, but also larger delays.
H2b)	*Private healthcare access increases disproportionately when marginalised groups involve social support and mobile phones.*	**No support:** Disproportionate uptake of public healthcare access among marginalised groups.
H2c)	*Social support and phone use are less influential among non-marginalised groups.*	**Partial support:** Disproportionate uptake of formal healthcare among marginalised phone users / receivers of social support and faster access in Salavan; but also parallel patterns in which non-/ marginalised groups experienced similar relationships.

941 ### 7.3 Relationship to Literature

942 Considering the limitations outlined above, we find support for our findings in the nascent literature
943 on the social and behavioural implications of mobile phone diffusion and social networks. Like
944 previous studies (Hampshire *et al.*, 2015; Mechael, 2006), we have documented a wide spectrum of
945 health-related mobile phone uses. In all documented cases known to us, informal emergence and
946 ungoverned diffusion of health-related phone use appeared to outweigh any institutionalised mobile-
947 phone-based services like health hotlines, appointment systems, or dedicated smartphone apps. Studies
948 considering marginalisation as a determinant – for example in our own research or in the recent study
949 of health-related Internet use in rural China by Li *et al.* (2019) – further highlight the regressive nature
950 of health-related digital technology use, which could create new forms of inequality and exclusion
951 among the rural poor (Haenssgen, 2018; Haenssgen & Ariana, 2017b).

Our documented patterns of delayed access with health-related phone use were counter-intuitive especially in light of transaction cost arguments (Dammert *et al.*, 2014; Higgs *et al.*, 2014), but they could be explained with consistent claims that mobile phones provide a sense of safety among their users (i.e. knowing that there is always an escape in case of emergency, see e.g. Gagliardone, 2015; Ling, 2012; Souter *et al.*, 2005). Altered risk perceptions could then potentially entail a form of "behavioural disinhibition" or risk compensation among patients, which could manifest itself in delayed access to healthcare (Hedlund, 2000). Behavioural experiments that variously alter patients' risk perceptions would offer an opportunity to investigate this hypothesis further.

Our study also diverged from our previous research. While health-related phone use was more common among privileged groups, our data suggested that especially marginalised groups experienced disproportionately higher formal healthcare utilisation if their behaviour was phone aided. We further anticipated that health-related mobile phone use would crowd out local social support networks despite their potential complementarities (Riley, 2018), rendering healthcare access increasingly difficult for the extremely marginalised (i.e. multidimensionally poor). Our data indicated instead a notable overlap and similar directions between mobiles and social support, suggesting that any such transition had not yet taken place. Trends could not be detected within our cross-sectional analysis and would rather require a longitudinal micro-level panel data set (covering e.g. a period of five years) that considers changes and inter-relationships of treatment seeking, technology use, social network composition, and multidimensional poverty. In addition to analysing ego-networks of social support, future research could furthermore explore how social network position and the distribution of health-related behaviour within a community shaped individuals' healthcare access.

8 Conclusion

Speaking to the practice of mHealth and to the development literature on the diffusion of digital technologies, this article asked, "*How do mobile phone use and social support networks influence rural*

treatment-seeking behaviours among marginalised groups?" We framed our research within the theme of marginalisation, using representative health behaviour survey data from the relatively resource-constrained contexts of rural Chiang Rai and Salavan. We hypothesised that marginalised groups are driven into informal healthcare utilisation, and that health-related phone use and social support help overcome some of the underlying constraints yet with a bias towards private healthcare providers. Our analysis provided partial support for these hypotheses, whereby the disproportionate uptake of public healthcare among marginalised groups with social and mobile phone support was especially notable. Counterintuitive, though in line with our earlier findings from India and China (Haenssgen & Ariana, 2017b) was the consistent link between health-related phone use and delayed access to healthcare.

Some of the differences between the Chiang Rai and Salavan could be explained by their health system composition. If our argument holds (and we require more extensive and longitudinal research of this kind to establish our claims firmly), then marginalised groups tended to utilise private healthcare providers to a lesser extent in both sites. In Chiang Rai's relatively more affluent context and more inclusive healthcare system, phone use acted in the same direction as the privilege of not being marginalised. In Salavan, contrary to our expectations, mobile phone use was linked to a seeming substitution of private healthcare access to public healthcare. If we assumed a causal relationship, then this could suggest that reduced access barriers enabled Salavan villagers to act on their preferences for public over private services – even though both kinds of providers involved user fees. However, in both cases, social support especially from family and friends had similar though weaker associations with healthcare access as health-related mobile phone use, but social support was distributed more equitably than phone use in the rural populations.

Although these findings might seem encouraging overall, the relatively widespread health-related mobile phone use and its behavioural consequences are – in our assessment – not necessarily good news for mHealth practitioners. While widespread use indicates a degree of technological readiness (Hampshire *et al.*, 2015; Khatun *et al.*, 2015), we argue that it is also evidence that the "vessels" of

technological solutions to healthcare are no longer empty (Polgar, 1963). New solutions are likely to stand in competition with existing ones. Given the growing evidence base on "informal mHealth," researchers and practitioners can no longer assume that digital healthcare solutions are implemented in a vacuum. We therefore recommend that mHealth interventions targeting the general population should always be preceded by a people-centric analysis of existing solutions to solve the problem in question as part of feasibility studies and subsequent evaluations.

Our study therefore contributes in particular to the empirical understanding of emerging health-related phone use in context and complements the recent WHO guidance on digital interventions for health system strengthening (WHO, 2019). By shedding light on the local adaptation of diffusing technology and its social consequences, we also contribute to the broader body of work on ICT and development. And yet, our research raised more questions than it asked. The perhaps most important point is whether the opportunity to use mobile phones for healthcare access excludes marginalised non-users in the long term. Based on the existing literature (Riley, 2018), we would assume that phone-facilitated support crowds out community-level social support, leaving already marginalised rural dwellers in yet more precarious circumstances. Another question is whether and how the existing patterns of informal health-related phone use and social support shape the implementation process and success of formal mHealth interventions. Lastly, open questions how technology diffusion shapes human behaviour and development. Neighbouring fields like "mEd" (the use of mobile phones to improve educational attainment) may experience similar complications as the ones raised in our study, which promises a lively research agenda in the years ahead.

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Appendix

Table A1. Variable Description.

	Variable	Description
	Female	Binary variable: Sex of respondent (R); [1] if female.
	Age	Continuous variable: Age in years.
Marginalisation	Education	Binary variable: [1] if R reported not having completed at least one year of formal education.
	Ethnicity	Binary variable: [1] if R ethnic group reported by R represented less than 20% of the population in R's respective village.
	Wealth	Binary variable: [1] if R falls into the bottom wealth quintile of the rural provincial population. Calculated separately per field site, based on average of 17 household assets and amenities.
	Travel time	Binary variable: [1] if travel time between R's village and nearest town exceeded more than 30 minutes by car (based on *Google Maps* and survey team travel to village)
	Remoteness	Binary variable: [1] village was classified as "remote" in a semi-quantitative assessment comprising categories "peri-urban," "rural," and "remote." (Consensus assessment among survey team members)
	Marginalisation index	Continuous variable: Sum of all five individual marginalisation indicators, normalised to scale from [0] to [1].
Healthcare preferences	Shops selling medicine	Binary variable for each type of healthcare provider: [1] if R reported considering the respective type of healthcare provider for consultation/treatment, advice, medicines, or other form of health service provision (e.g. check-ups).
	Traditional healers	
	Pharmacies	
	Private clinics/hospitals	
	Public primary care	
	Public hospitals	
Characteristics of illness episodes	Illness episode of child	Binary variable: [1] if illness episode was experienced by child under R's supervision.
	Self-rated severity	Ordinal variable: [1] if illness is reported as "mild;" [2] as "moderate;" [3] as "severe."
	Duration	Continuous variable: Total duration of illness episode in days, calculated as sum of duration of individual steps in illness episode. (note: minimum unit per step is one day)
	Process steps	Continuous variable: Total number of discrete healthcare steps in illness episode.
	Public healthcare	Binary variable: [1] if R reported accessing health centre or hospital during illness episode.
	Private healthcare	Binary variable: [1] if R reported accessing private clinic, hospital, or pharmacy.
	Informal healthcare	Binary variable: [1] if R reported accessing grocery store or traditional healer (excluding self-care and care from family and friends).
	Health-related phone use	Binary variable: [1] if R reported any phone use related to the illness (excl. general conversations), carried out by R or any other person at any step.
	Health-related social support	Binary variable: [1] if R reported that any of R's personal contacts was involved in the illness by providing advice or help.
Public access	Duration until access	Continuous variable: Duration in days until R accessed public healthcare provider.
	Steps until access	Continuous variable: Number of discrete healthcare steps until R accessed public healthcare provider.
	Phone use before/during access	Binary variable: [1] if R reported health-related phone use in steps before or while accessing public healthcare provider.
Private access	Duration until access	Continuous variable: Duration in days until R accessed private healthcare provider.
	Steps until access	Continuous variable: Number of discrete healthcare steps until R accessed private healthcare provider.
	Phone use before/during access	Binary variable: [1] if R reported health-related phone use in steps before or while accessing private healthcare provider.
Informal access	Duration until access	Continuous variable: Duration in days until R accessed informal healthcare provider.
	Steps until access	Continuous variable: Number of discrete healthcare steps until R accessed informal healthcare provider.
	Phone use before/during access	Binary variable: [1] if R reported health-related phone use in steps before or while accessing informal healthcare provider.

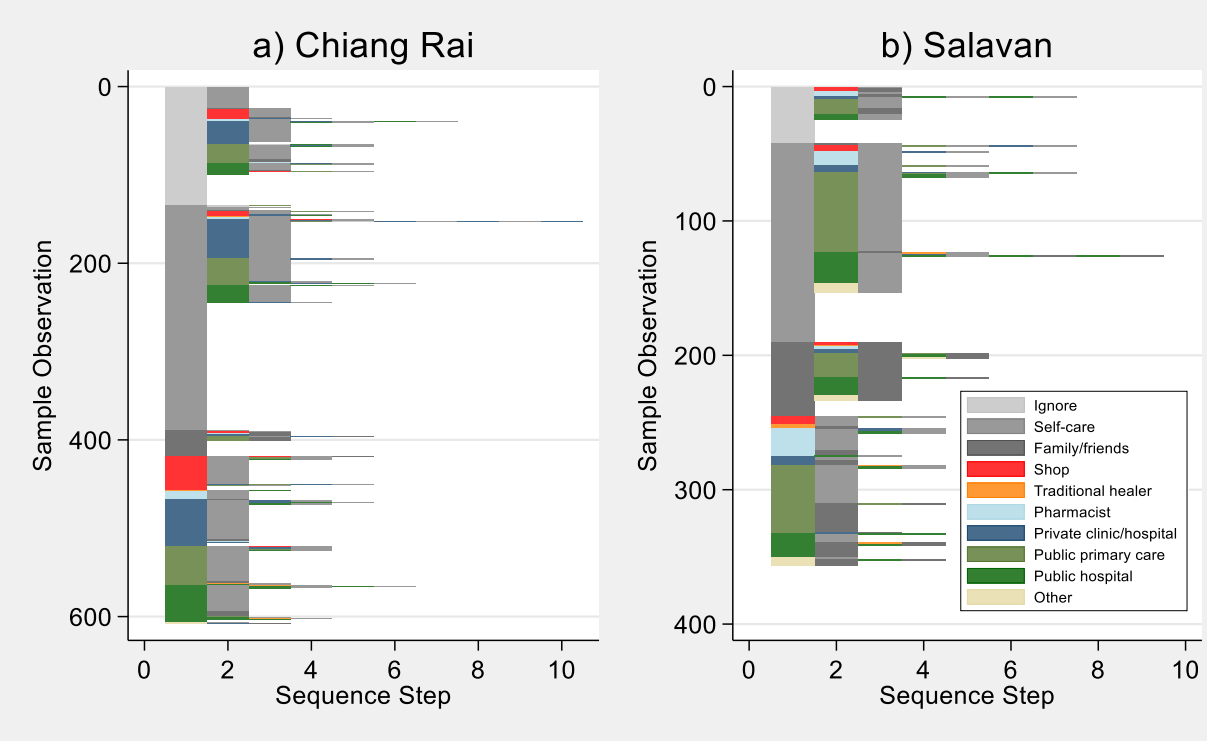

Fig. A1. Range of Treatment-Seeking Sequences Reported in the Survey.

Notes. Illness-episode level. Unweighted statistics. "Other" category including e.g. health volunteers. Chiang Rai: n = 608; Salavan: n = 356.

Table A2. Access to Healthcare: Regression Results.

	Dependent Variable																								
	Chiang Rai									Salavan									Pooled Sample						
	Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care		
	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB
(Model Number)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Marginalisation Index	0.79	0.43	-1.25	-0.83	-0.97	-0.72	0.73	1.04*	1.08	0.43	0.02	0.41	-2.65**	-1.98*	-2.68	3.31**	3.61**	2.47	0.83*	0.42	-0.50	-1.34***	-1.30**	-1.30	1.33**	1.69***	1.64*
	(0.51)	(0.56)	(1.00)	(0.54)	(0.59)	(0.90)	(0.59)	(0.63)	(0.91)	(0.93)	(0.95)	(1.44)	(1.13)	(1.15)	(1.99)	(1.58)	(1.62)	(2.35)	(0.50)	(0.52)	(0.79)	(0.50)	(0.53)	(0.84)	(0.63)	(0.65)	(0.91)
Health-related phone use	0.44*	0.10	0.43*	0.46**	0.36	0.47**	-0.22	0.18	-0.22	1.41***	0.12	1.41***	0.00	1.34**	0.00	-0.13	1.42	-0.09	0.64***	0.16	0.64***	0.44**	0.48*	0.44**	-0.24	0.35	-0.24
	(0.23)	(0.30)	(0.23)	(0.22)	(0.28)	(0.22)	(0.33)	(0.42)	(0.33)	(0.45)	(0.62)	(0.45)	(0.46)	(0.63)	(0.46)	(0.89)	(1.22)	(0.90)	(0.20)	(0.27)	(0.20)	(0.20)	(0.25)	(0.20)	(0.31)	(0.41)	(0.31)
Health-related social support	0.48*	0.45*	-0.02	0.37	0.36	0.40	0.08	0.10	0.20	0.65**	0.70**	0.64	0.82**	0.88**	0.81	-0.39	-0.52	-0.85	0.59***	0.57***	0.19	0.52**	0.52**	0.53**	-0.05	-0.03	0.07
	(0.25)	(0.25)	(0.30)	(0.24)	(0.24)	(0.29)	(0.30)	(0.30)	(0.39)	(0.32)	(0.32)	(0.51)	(0.41)	(0.42)	(0.58)	(0.59)	(0.61)	(1.11)	(0.19)	(0.19)	(0.26)	(0.20)	(0.20)	(0.26)	(0.26)	(0.26)	(0.37)
PHONxMARG		1.90*			0.60			-2.41			9.26***			-15.73**			-8.50			2.86***			-0.24			-3.31*	
		(1.09)			(1.01)			(1.81)			(3.47)			(6.25)			(6.18)			(1.06)			(0.98)			(1.78)	
SUPPxMARG			2.68**			-0.16			-0.55			0.03			0.04			1.17			1.76**			-0.06			-0.47
			(1.06)			(1.00)			(1.09)			(1.45)			(2.02)			(2.45)			(0.79)			(0.89)			(0.97)
(control variables [age, gender, illness severity, dummy for adult/child illness], constant term, and multilevel variance parameters omitted from reporting)																											
Variance Component Test	0.00	0.00	0.00	0.04	0.04	0.05	0.07	0.06	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
Log likelihood	-326.2	-324.6	-322.5	-333.9	-333.8	-333.9	-201.0	-200.0	-200.9	-193.0	-188.5	-193.0	-132.4	-126.6	-132.4	-69.3	-68.0	-69.2	-530.8	-526.8	-528.3	-477.6	-477.6	-477.6	-283.9	-281.7	-283.8
X^2	77.90	79.28	80.90	23.10	23.29	23.20	8.18	10.12	8.51	26.11	28.45	26.11	13.90	20.23	13.89	9.24	10.71	9.33	97.51	100.61	100.21	27.88	28.02	27.94	9.89	13.72	10.18
N_1 (Individuals)	608	608	608	608	608	608	608	608	608	356	356	356	356	356	356	356	356	356	964	964	964	964	964	964	964	964	964
N_2 (Villages)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	60	60	60	60	60	60	60	60	60
N_3 (Districts)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	10	10	10	10	10	10	10	10	10
N_4 (Sites)																			2	2	2	2	2	2	2	2	2

Notes. Coefficients reported. Standard errors in parentheses. Analysis at illness-episode level.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table A3. Duration Until Healthcare Access: Regression Results.

	Dependent Variable																								
	Chiang Rai									Salavan								Pooled Sample							
	Public Care			Private Care			Informal Care[b]			Public Care			Private Care[b,c]		Informal Care[b]			Public Care			Private Care			Informal Care		
	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB
(Model Number)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Marginalisation Index	0.47	0.49	0.22	-0.39	-0.42	-1.43	-0.06	0.02	1.37	-0.29	0.02	0.97	1.80*	1.92	0.20	0.57	-1.22*	0.08	0.17	0.19	0.02	0.08	-1.52	0.28	0.49	1.08
	(0.58)	(0.62)	(1.14)	(0.60)	(0.68)	(1.27)	(0.91)	(0.92)	(1.37)	(0.46)	(0.48)	(1.01)	(0.93)	(2.85)	(0.89)	(0.69)	(0.71)	(0.38)	(0.40)	(0.73)	(0.52)	(0.57)	(1.24)	(0.76)	(0.73)	(1.21)
Health-related phone use[a]	0.69**	0.71	0.69**	1.07***	1.05***	1.07***	0.12	0.39	0.08	0.41*	0.95***	0.42*	1.39***	1.40***	0.84	2.14***	1.26	0.63***	0.76***	0.63***	1.09***	1.14***	1.09***	0.21	0.72	0.16
	(0.34)	(0.45)	(0.34)	(0.26)	(0.34)	(0.26)	(0.53)	(0.71)	(0.54)	(0.22)	(0.34)	(0.22)	(0.51)	(0.51)	(0.62)	(0.63)	(0.79)	(0.20)	(0.28)	(0.20)	(0.24)	(0.30)	(0.24)	(0.53)	(0.67)	(0.53)
Health-related social support	-0.23	-0.24	-0.29	0.30	0.30	0.10	0.84	0.82	1.37**	-0.02	-0.01	0.43	2.43***	2.46**	0.03	0.25	-1.16	-0.10	-0.10	-0.06	0.66**	0.66**	0.38	0.64	0.60	0.97*
	(0.36)	(0.36)	(0.43)	(0.32)	(0.32)	(0.39)	(0.53)	(0.54)	(0.69)	(0.19)	(0.19)	(0.38)	(0.78)	(1.02)	(0.51)	(0.47)	(1.05)	(0.19)	(0.19)	(0.28)	(0.28)	(0.28)	(0.35)	(0.40)	(0.39)	(0.55)
PHONxMARG[a]		-0.09			0.10			-2.35			-2.35**					-161.22***			-0.57			-0.30			-5.71	
		(1.21)			(1.21)			(3.69)			(1.15)					(8.13)			(0.79)			(1.16)			(4.49)	
SUPPxMARG			0.30			1.32			-2.11			-1.46		-0.13			2.60			-0.14			1.86			-1.16
			(1.23)			(1.41)			(1.76)			(1.05)		(2.87)			(1.83)			(0.78)			(1.34)			(1.34)
(control variables [age, gender, illness severity, dummy for adult/child illness], constant term, and multilevel variance parameters omitted from reporting)																										
Pseudo R^2							0.06	0.07	0.07				0.10	0.10	0.15	0.23	0.18									
Variance Component Test	0.04	0.04	0.03	0.51	0.51	0.43				0.17	0.20	0.19						0.00	0.00	0.00	0.46	0.46	0.41	0.33	0.47	0.35
Log likelihood	-364.9	-364.9	-364.8	-297.1	-297.0	-296.6	-83.9	-83.8	-83.3	-336.8	-334.7	-335.8	-87.1	-87.1	-34.9	-31.6	-33.9	-721.2	-720.9	-721.2	-390.6	-390.5	-389.5	-124.7	-123.8	-124.3
X^2	19.67	19.71	19.75	36.71	36.70	37.43	16.66	17.82	21.13	12.46	16.86	14.44	16.91	16.87	69.18	1166.67	93.46	31.39	31.94	31.41	43.21	43.44	44.48	16.10	17.63	16.71
N_1 (Individuals)	192	192	192	159	159	159	65	65	65	206	206	206	57	57	23	23	23	398	398	398	216	216	216	88	88	88
N_2 (Villages)	30	30	30	30	30	30				29	29	29						59	59	59	46	46	46	34	34	34
N_3 (Districts)	5	5	5	5	5	5				5	5	5						10	10	10	10	10	10	9	9	9
N_4 (Sites)																		2	2	2	2	2	2	2	2	2

Notes. Coefficients reported. Standard errors in parentheses. Analysis at illness-episode level.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.
[a.] Phone use variable specific to type of healthcare access, e.g. "health-related phone use prior to accessing public healthcare" rather than "any health-related phone use."
[b.] Single-level models reported as multi-level models did not converge.
[c.] PHONxMARG interaction model omitted because interaction term predicted failure perfectly.

1. Village Checklist (GPS coordinates of village and facilities) (to be completed by supervisor)

What kind of facility would you like to record?

A. District Number		[*code entered automatically*]
B. Village Number		[*code entered automatically*]
C. Village centre	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
D. Village head's house	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
E. Local shop	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
F. Market	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
G. Temple	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
H. School	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
I. Bus stop	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
J. Health facility Specify (public, private, pharmacy, local store, traditional healer, etc.): _____	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
	c) Who is staffing the facility?	Total staff: ___ Staff at time of visit: _____
	d) Does the provider have antibiotics available?	Yes .....1 No 0

Interview data [*Record observation*]		
i. District Number		[*code entered automatically*]
ii. PSU Number		[*code entered automatically*]
iii. Household number		Number: _____
iv. Household coordinates	a) Latitude	[*coordinates entered automatically*]
	b) Longitude	[*coordinates entered automatically*]
v. What type is this house most similar to?		1...  2...  3... 
vi. Time of visit	a) First visit	[*time entered automatically*]
	b) Second visit	[*time entered automatically*]

List all persons aged 18+ years in household

Hello, I'm a researcher working for the Mahidol-Oxford Tropical Medicine Research Unit. We are interested in the lives and health behaviours of villagers across Thailand and Lao PDR. We are selecting participants randomly and would like to choose one or two members of your household. In order to choose and ask them to participate, could you please tell us who lives here? [provide PIS on request]

[*1 respondent per every 5 household members will be selected randomly from this list*]

Name	Nickname	Sex (M / F)	Age	Available for interview today? (Yes / No)

Statement of consent (Respondent will receive participant information sheet and verbal consent will be taken)
Thank you for participating. You will receive a small token of gratitude for your participation at the end of the interview.

vii.Date of interview	[*date entered automatically*]
viii.Time of interview begin	[*time entered automatically*]
ix.Respondent name	Respondent name: _____
x.Interviewer code	[*code entered automatically*]

Part I: Personal and Household Characteristics
Let us begin with a few questions about yourself and your household.

1. [*record as observed*] Sex		Female..... 1 Male 0
2. How old are you? [*in years*] [*If respondent cannot give exact age, ask for approximate age and code in range: 18-24, 25-34, 35-44, 45-59, 60 and older*]		Age in years: _____
3. Please indicate what kind of work you do. If you have more than one occupation at one time or throughout the year, please begin with the one in which you spend the most time and name up to three. If you do not have an occupation, please also mention whether you are still a student, retired, or unemployed.	a) Main occupation	Occupation: _____
	b) Side occupation	Occupation: _____
	c) Side occupation	Occupation: _____
4. What is your mother tongue?		Mother tongue: _____
5. [In Thailand:] Can you speak Thai? [In Laos:] Can you speak Lao?		Yes ..... 1 No 0
6. What is the highest grade of schooling that you completed? [*excluding informal education and pre-school education such as nursery and kindergarten, but including grade school, high school, vocational training, tertiary education, etc.*]		Highest grade: ___
7. Are you the head of your household?		Yes .....1 No 0
7.1. [*if no*] What is the name of your household head?		Name: _____

8. What is your current marital status?	Never married ..... 1 Currently married ..... 2 Cohabiting ..... 3 Separated / divorced ..... 4 Widowed 5	
9. Are there any close family members of yours [children, spouse, siblings, parents] who live elsewhere? [***select "no" if not applicable***]	**9.1.** Do your parents live outside of this village? [***do not count parents-in-law***]	At least 1 person outside village .... 1 All inside village / not applicable.... 0
	9.2. Does your spouse live outside of this village?	At least 1 person outside village .... 1 All inside village / not applicable.... 0
	9.3. Do you have siblings who live outside of this village? [***do not count brothers-in-law and sisters-in-law***]	At least 1 person outside village .... 1 All inside village / not applicable.... 0
	9.4. Do you have children who live outside of this village?	At least 1 person outside village .... 1 All inside village / not applicable.... 0

Part II: Social Networks [for network census villages only]
I will now ask you some questions about your interactions with other people within and outside of your village.

10. **[Round I of network survey only]** Where do you spend most of your time interacting with other people from your village?	a) Field: ___ b) Temple: ___ c) Local store: ___ d) Market: ___ e) Children's schools: ___ f) Home: ____ g) Workplace: ___ h) Village event/s: _____ i) Other site: ___

11. [Round I of network survey only] Outside your household, with whom do you interact on a regular basis? (May be anyone from both inside and outside of the village, and through any platform which might not require a face-to-face interaction)

	a) What is the nickname of the person?	b) How is this person related to you? [*give examples if respondent is unsure about answer categories*]	c) What is the sex of this person?	d) Where does this person live?	e) What is the name of the household head of this person?	f) How often do you interact with this person?	g) How do you interact with this person? [*Mark all that apply*]	h) Do your conversations relate to health and well-being?
11.1. Contact 1	Nickname _____ Name _____	Spouse..... 1 Parent..... 2 Child ..... 3 Sibling..... 4 Other relative ..... 5 Neighbour..... 6 Friend (if not neighbour)..... 7 Other villager..... 8 Other (specify) _..... 9	Female...1 Male 0	In village ..... 1 (specify: _____) Outside village .. 2	Name of household head _____	Daily or more often .....4 Weekly or few times/week .....3 Monthly or few times/month ...2 Yearly or few times/year .....1 Less often or never.....0	Face-to-face... 1 Voice call..... 2 Messenger ..... 3 Other (specify) _____ 4	Yes ..... 1 No 0
11.2. Contact n	Nickname Name	1 2 3 4 5 6 7 8 9	1 0	1 2	Name	0 1 2 3 4	1 2 3 4	1 0

11a. [Round II of network survey only] When we last visited you, you told us that you interact regularly with [*names*]. Has anything changed since last time?	Yes .....1 → **[update social network question 11]** No 0
11i. [Round I of network survey only] Is there anybody in your household with whom you talk about health and well-being? [***Mark all that apply***]	[***mark all names from household roster that apply***]

[*For network survey village respondents in Round 2*]

12. An education activity has recently taken place in your village.

12.1. Did you participate in any of the activities?	Yes ..... 1 Yes, but not throughout ..... 2 No ..... 3 Don't know / prefer not to say 4
12.2. Did you talk with anybody about the activity in your village? [*"Talking" can involve any conversation including asking for information, informing about the educational activity, or discussing it (regardless of actual attendance)*]	a) Nickname 1: _____ b) Full name 1: _____ c) Relationship 1: 1 2 3 4 5 6 7 a) Nickname n: _____ b) Full name n: _____ c) Relationship n: 1 2 3 4 5 6 7 [***Relationship codes***] Household member ..... 1 Family member outside HH ..... 2 Other relative ..... 3 Neighbour ..... 4 Friend other than neighbour ..... 5 Other villager ..... 6 Other (specify) _ 7
[*If respondent indicates conversation in Q 12.2*] **12.3.** What subjects did you talk about in respect to the activity? [***mark all that apply***]	Going to doctor when sick ..... 1 Anti-inflammatories/antibiotics ..... 2 Germs ..... 3 Using medicines correctly ..... 4 Activity in general ..... 5 Games/awards ..... 6 Song/Story/Play ..... 7 Money/compensation ..... 8 Other (specify) ____ 9

Part III: Healthcare Seeking Thank you for this. Now we come to a part where I will ask you some questions about health and health providers around here.

13. I would now like to ask you about the sources of health advice and medicine or other treatment that are available to you. Please think about all the places where you can go to get advice, treatment, or drugs if you (or your children) are sick.

Do you consider the following providers when you (or your children) feel unwell?

[***Mark all that apply***]

13.1. Drug dispensary, other local store selling medicine	Consultation ..... 1 Medical advice ..... 2 Access to medicine ..... 3 Other reason(s) ..... 4 Don't consider this provider ..... 98 Don't know such a provider 99
13.2. Traditional healer	Consultation ..... 1 Medical advice ..... 2 Access to medicine ..... 3 Other reason(s) ..... 4 Don't consider this provider ..... 98 Don't know such a provider 99
13.3. Pharmacist	Consultation ..... 1 Medical advice ..... 2 Access to medicine ..... 3 Other reason(s) ..... 4 Don't consider this provider ..... 98 Don't know such a provider 99
13.4. Private clinic	Consultation ..... 1 Medical advice ..... 2 Access to medicine ..... 3 Other reason(s) ..... 4 Don't consider this provider ..... 98 Don't know such a provider 99
13.5. Private hospital	Consultation ..... 1 Medical advice ..... 2 Access to medicine ..... 3 Other reason(s) ..... 4 Don't consider this provider ..... 98 Don't know such a provider 99
13.6. Health volunteer	Consultation ..... 1 Medical advice ..... 2 Access to medicine ..... 3 Other reason(s) ..... 4 Don't consider this provider ..... 98 Don't know such a provider 99
13.7. Public primary care unit	Consultation ..... 1 Medical advice ..... 2 Access to medicine ..... 3 Other reason(s) ..... 4 Don't consider this provider ..... 98 Don't know such a provider 99

	13.8. Public hospital	Consultation ..... 1 Medical advice..... 2 Access to medicine..... 3 Other reason(s) ..... 4 Don't consider this provider..... 98 Don't know such a provider 99
	13.9. Other providers or Internet? Specify: _____	Consultation ..... 1 Medical advice..... 2 Access to medicine..... 3 Other reason(s) ..... 4 Don't consider this provider..... 98 Don't know such a provider 99

14. Now if you think again, is there anyone else with whom you talk about health?

	a) What is the nickname of the person?	b) What is the full name of the person?	c) How is this person related to you? [*give examples if respondent is unsure about answer categories*]	d) What is the sex of this person?	e) Where does this person live?	f) What is the name of the household head of this person?	g) How often do you interact with this person?	h) How do you interact with this person? [*Mark all thatapply*]
14.1. Contact 1	Name _____	Name _____	Spouse..... 1 Parent ..... 2 Child ..... 3 Sibling..... 4 Other relative ..... 5 Neighbour..... 6 Friend (if not neighbour)..... 7 Other villager..... 8 Other (specify) _..... 9	Female ..1 Male 0	In village ..... 1 (specify: _____) Outside village .. 2	Name of household head _____	Daily or more often .....4 Weekly or few times/week .....3 Monthly or few times/month ...2 Yearly or few times/year .....1 Less often or never.....0	Face-to-face..... 1 Voice call..... 2 Messenger ..... 3 Other (specify) _____ 4
14.2. Contact n	Name	Name	1 2 3 4 5 6 7 8 9	1 0	1 2	Name	0 1 2 3 4	1 2 3 4

15. Did you or a child in your household have an acute illness (not a chronic, long-term condition that comes again and again) or an accident in the last two months? If yes, I will ask you about these illnesses one-by-one. [*if no, continue with Question 19*]	No.....0 ➔ [*Q 16*] Yes.....1 ⬇
[*if yes*:] **15.a** [Confirm if this episode is for respondent or child]	Respondent .....1 ➔ [*Q 15.1*] Child 2
15.b How old is the child?	Age in years: _____
15.c Is the child female or male	Female .....1 Male 0
15.1. Can you please describe the symptoms or problem in your own words?	Description of condition: _____
15.2. Did [you / the child] receive a diagnosis of the illness from any medical provide, friend, or internet source? If so, can you please describe the diagnosis of the illness if you received any and where [you / the child] received it? [***note: the diagnosis might be given by any medical provider including untrained and informal. Record all diagnoses if more than one.***]	a) Diagnosis 1: _____ b) Medical provider 1: 1 2 3 4 5 6 7 8 a) Diagnosis n: _____ b) Medical provider n: 1 2 3 4 5 6 7 8 [***Response codes***] Drug dispensary, other local store selling medicine .....1 Traditional healer.....2 Pharmacist .....3 Private clinic.....4 Private hospital .....5 Primary care unit .....6 Public hospital.....7 Other providers or Internet? Specify: _____.....8
15.3. When did [you / the child] experience the accident/discomfort (for the first time)	Onset: ___ days / _____ weeks / _____ months ago
15.4. Would you describe the illness/accident as "mild," "moderate," or "severe"?	Mild.....1 Moderate.....2 Severe 3

15.5. Can you please explain the stages of the treatment? I will ask you step-by-step what you did, starting from the moment [you / the child] first experienced a discomfort.

	15.5.1. Step 1 (detection)	Step n
a) What kind of help or treatment did you get at this stage? [*if unsure, specify*]	Ignored /did nothing .....1 Self-care (sleep, rest, medicine at home) .....2 Care from family and friends (full-time).....3 Treated/consulted at a traditional healer .....4 Treated/cons. at a pharmacist.....5 Treated/cons. at shop selling drugs.....6 Treated/cons. at priv. clinic/hospital .....7 Treated/cons. at primary care unit.....8 Treated/cons. at a gvt. Hospital.....9 Other (specify) _____.....10	1 2 3 4 5 6 7 8 9 10
b) Where did this activity take place?	At home .....1 Less than 10 min. from home.....2 10 to 29 min. .....3 30 to 59 min. .....4 60 to 119 min. .....5 2 hours or more from home.....6	1 2 3 4 5 6
c) How did [you / the child] get to the place of the activity? [***select "at home" according to prior responses***]	At home .....1 Walk .....2 Own bicycle .....3 Own motorcycle / Three-wheeler .....4 Own car / four-wheeler .....5 Taxi or other hired ride.....6 Public transport.....7 Other (specify) ___ 8	1 2 3 4 5 6 7 8
d) How long did this stage last? [***let respondent choose category; if <1 day, code "1" day***]	Duration: ___ days ___ weeks ___ months	___ days ___ weeks __ months
e) Can you please name or describe all the medicines that you received or were prescribed during this step? [***include medicine stored at home if "self-care at home"***] [***continue for all medicines received, then complete Questions g to k for each medicine individually***]	 Medicine 1: Name/description: _____ Medicine n: Name/description: _____	Medicine 1 Medicine n
f) For how long did [you / the child] take the medicine? [***let respondent choose category; if more than one repeated episode, indicate total duration***] [***for each medicine individually***]	Duration: ___ days ___ weeks ___ months	___ days ___ weeks __ months

g) How often per day did [you / the child] take the medicine? [*calculate into daily use according to respondent's chosen frequency*] [*for each medicine individually*]	Frequency: ___ times daily	___ times daily
h) What dosage did [you / the child] normally take? [*let respondent choose category according to type of medicine*] [*for each medicine individually*]	Dosage ___ tablets / capsules ___ drops (for liquid medicine) ___ spoons (for liquid medicine) ____ shots/injections (for intravenous medicine) per time administered	___ tablets ___ drops ___ spoons ___ shots

i) Did [you / the child] take the medicine exactly as it was recommended to you by the person who prescribed/sold them [*for each medicine individually*]	Yes ..... 1 No ..... 0 Did not receive advice ..... 9 Don't know 99	1 2 9 99
j) Did [you / the child] finish the medicine? [*for each medicine individually*]	Yes ..... 1 No 0	1 0
k) Did you or anybody else use a mobile phone during this stage <u>in connection with your condition</u>? [*if no, go to next step*]	Yes ..... 1 No ..... 0 ➔ [*next step*]	1 0
l) What was the purpose of using the mobile phone? [*Mark all that apply*]	Ask for advice ..... 1 Call for treatment ..... 2 Arrange transport ..... 3 Appointment ..... 4 Reassure family/friends ..... 5 Ask for money/supplies ..... 6 Provider contacting me for information ..... 7 Treatment reminder ..... 8 Other (specify) _ 9	1 2 3 4 5 6 7 8 9
m) Which mobile phone functions did you or anybody else use? [*Mark all that apply*]	Call ..... 1 SMS ..... 2 Internet, messenger ..... 3 Alarm, calendar, reminder, etc. ..... 4 Other (specify) _ 5	1 2 3 4 5

15.6. [Have you / has the child] now recovered from the illness/accident?	Yes ..... 1 No 0
15.7. Was anybody of your personal relationships involved in providing advice or help <u>during the illness</u>? [*record up to ten names*]	Yes ..... 1 No 0
[*For district survey*] **15.7.b** How are these people related to you? [*Mark all that apply*]	Spouse ..... 1 Parent ..... 2 Child ..... 3 Sibling ..... 4 Other relative ..... 5 Neighbour ..... 6 Friend (if not neighbour) ..... 7 Other villager ..... 8 Other (specify) _ 9
15.7.c What kind of support did they provide? [*Mark all that apply*]	Providing healthcare/attending ..... 11 Providing advice ..... 12 Providing medicine ..... 13 Lending/granting money ..... 21 Transportation/Lending vehicle ..... 22 Contacting family/friends ..... 23 Providing food ..... 31 Helping with children/housework ..... 32 Helping with jobs/agriculture work (feeding animals/tending crops/covering shifts, etc.) 33 Other (specify) _ 99

[*For network survey*]	a) What is the name of the person?	b) How is this person related to you?	c) What kind of support was provided? [*mark all that apply*]
15.7.1. Contact 1	Name: _____	Spouse ..... 1 Parent ..... 2 Child ..... 3 Sibling ..... 4 Other relative ..... 5 Neighbour ..... 6 Friend (if not neighbour) ..... 7 Other villager ..... 8 Other (specify) _ 9	Providing healthcare/attending ..... 11 Providing advice ..... 12 Providing medicine ..... 13 Lending/granting money ..... 21 Transportation/Lending vehicle ..... 22 Contacting family/friends ..... 23 Providing food ..... 31 Helping with children/housework ..... 32 Helping with jobs/agriculture work (feeding animals/tending crops/covering shifts, etc.) 33 Other (specify) _ 99
15.7.2. Contact n	Name	1 2 3 4 5 6 7 8 9	11 12 13 21 22 23 31 32 33 99

15.8. Did you have another acute illness (not a chronic, long-term condition that comes again and again) or an accident in the last two months? [*if yes, complete another sheet for Question 15*]	Yes ..... 1 ➔ [*Q 15*] No ..... 0 ⬇

16. I would now like to ask you your opinion about medicine. There are no right or wrong answers, I only want to understand what you think. Consider the following medicines:

16.1. Have you seen these medicines before?	Yes..... 1 No ..... 0 ➔ [*Q 16.4*]
16.2. What do you call this medicine?	Antibiotics ท่านเรียกยานี้ว่าอะไร..... 11 Anti-inflammatory ยาแก้อักเสบ..... 12 Germ killer ยาฆ่าเชื้อ..... 13 Amoxy / Amoxicillin อะม็อกซี่/อะม็อกซี่ซิลลิน..... 14 Sore throat medicine ยาแก้เจ็บคอ..... 15 Cough medicine ยาแก้ไอ..... 16 Pain reliever ยาแก้ปวด..... 17 Fever reliever ยาแก้ไข้..... 18 Other (specify: ____) อื่นๆ (โปรดระบุ)..... 98 Germ preventer / antibiotic ຢາຕ້ານເຊື້ອ..... 21 Amok ຢາຕ້ານເຊື້ອ..... 22 Ampi ຢາແອມປິ..... 23 Tetra ຢາເຕຕ້າ..... 24 Gulolam ກູໂລລາມ..... 25 Sepasin ເຊພາຊິນ..... 26 Other (specify: __)..... 99
16.3. What symptoms or illnesses would you use this medicine for?	Fever ..... 1 Cough ..... 2 Sore throat..... 3 Inflammation ..... 4 Cold, flu, runny nose ..... 5 Diarrhoea ..... 6 Headache ..... 7 Stomach ache ..... 8 Muscle pain, other aches..... 9 Skin diseases, rashes, lumps ..... 10 Wounds..... 11 Urinary tract infections..... 12 Every kind of sickness..... 13 Whatever the doctor suggests ..... 14 Don't know / prefer not to say ..... 98 Other (specify: __)..... 99
16.4. Is there any situation for which you would buy this medicine?	Desirable attitude/knowledge..... 1 Undesirable attitude/knowledge ..... 0 No attitude / refuse to answer (respondent is aware, but doesn't reveal attitude)..... 97 Answer does not apply to question (respondent may be aware/unaware; satisficing)..... 98 Not aware of this medicine (awkward, cannot answer but does not try to satisfy) 99
16.5. Do you prefer other remedies such as herbs or cough syrup to this medicine for [sore throat]?	Desirable attitude/knowledge..... 1 Undesirable attitude/knowledge ..... 0 No attitude / refuse to answer (respondent is aware, but doesn't reveal attitude)..... 97 Answer does not apply to question (respondent may be aware/unaware; satisficing)..... 98 Not aware of this medicine (awkward, cannot answer but does not try to satisfy) 99
16.6. If you were prescribed this medicine by a doctor and did not finish the course, would you keep it for future use?	Desirable attitude/knowledge..... 1 Undesirable attitude/knowledge ..... 0 No attitude / refuse to answer (respondent is aware, but doesn't reveal attitude)..... 97 Answer does not apply to question (respondent may be aware/unaware; satisficing)..... 98 Not aware of this medicine (awkward, cannot answer but does not try to satisfy) 99
16.7. Have you heard about drug resistance? (**16.7a** using alternative term "lueng yah" in Lao)	Yes ..... 1 No 2
16.8. What do you think is drug resistance? (**16.8a** using alternative term "lueng yah" in Lao)	Bacteria are resistant to medicine..... 1 Antibiotics become less effective if used wrongly/too much..... 2 Medicine in general becomes less effective if used wrongly/too much..... 3 Being stubborn to take medicine..... 4 Being addicted to medicine..... 5 Drug allergy ..... 6 Lueng yah (drug resistance) ..... 7 Answer does not relate to drug resistance..... 8 Other (specify)..... 98 "Don't know"..... 99
16.9. Can your drug resistance ("*due yah*") spread to other people, for example if you sneeze on them?	Desirable attitude/knowledge..... 1 Undesirable attitude/knowledge ..... 0 No attitude / refuse to answer (respondent is aware, but doesn't reveal attitude)..... 97 Answer does not apply to question (respondent may be aware/unaware; satisficing)..... 98 Not aware of this medicine (awkward, cannot answer but does not try to satisfy) 99

Part IV: Household assets

We now come to the last part. Can you please provide me with some information about your household?

17. How many rooms does this house have apart from toilet and hallways?	Number of rooms: _____
18. What is the electricity situation in your household on a typical day?	Power at all times, no power cuts (90-100%) ..... 1 Power most of the time, occasional power cuts (>50%) ..... 2 Power sometimes, frequent power cuts (<50%) ..... 3 No electricity 4
19. What kind of toilet does this house have and is it shared with other people in this community? ***[if more than one, choose "best" toilet] [use show card to facilitate answers]***	Unshared flush toilet (e.g. piped sewer system, septic tank, pour flush toilet) ..... 1 Shared (flush or non-flush) toilet with other community members or public toilet 2 No facility, Bush, Field, or others 3
20. What is the drinking water source of this house and is it shared with other people in this community? [***use show card to facilitate answers***]	Water piped into house or yard ..... 1 Water not directly piped into house or yard (e.g. well, borehole, water from spring, rainwater, tanker truck, surface water including rivers, bottled water, etc.)2
21. What kind of fuel does this household use for cooking?	Improved fuel source (e.g. Electricity, gas stove, etc.) ..... 1 Unimproved fuel source (e.g. Coal / Lignite, Charcoal, Wood, Straw / Shrubs / Grass, Animal dung, Agricultural crop residue) ..... 2 No food cooked in household 3

22. I will now ask you for some items in your household. Please tell me…	Number of items in household:	
	22.1. Have you got a *functioning* **radio** in your household? If so, how many?	__
	22.2. Have you got a *functioning* **TV** in your household? If so, how many?	__
	22.3. Have you got a *functioning* **rice cooker** in your household? If so, how many?	__
	22.4. Have you got a *functioning* **landline telephone** in your household? If so, how many?	__
	22.5. Have you got a *functioning* **mobile phone** in your household? If so, how many?	__
	22.6. Have you got a *functioning* **computer** in your household? If so, how many?	__
	22.7. Have you got a *functioning* **bicycle** in your household? If so, how many?	__
	22.8. Have you got a *functioning* **scooter, motorcycle, or tricycle** in your household? If so, how many?	__
	22.9. Have you got a *functioning* **car or truck** in your household? If so, how many?	__
	22.10. Have you got a *functioning* **tractor** in your household? If so, how many?	__
	22.11. Have you got a *functioning* **refrigerator or freezer** in your household? If so, how many?	__

23. How long does it normally take you to get to the following places?	**23.1.** How long does it take to get to the nearest market?	Less than 10 minutes ..... 1 10 to 29 minutes ..... 2 30 to 59 minutes ..... 3 60 to 119 minutes ..... 4 2 hours or more 5
	23.2. How long does it take to get to the village hall or the village head's house?	Less than 10 minutes ..... 1 10 to 29 minutes ..... 2 30 to 59 minutes ..... 3 60 to 119 minutes ..... 4 2 hours or more 5
	23.3. How long does it take to get to the nearest public or private doctor?	Less than 10 minutes ..... 1 10 to 29 minutes ..... 2 30 to 59 minutes ..... 3 60 to 119 minutes ..... 4 2 hours or more 5
24. What is your religion?		No religion ..... 0 Buddhist ..... 1 Christian ..... 2 Muslim ..... 3 Spirit (religious belief in Lao) ..... 4 Other (Specify) _____ ..... 5 Don't know 99
25. What is your nationality?		Thai ..... 1 Lao ..... 2 Myanmar/Burmese ..... 3 Chinese ..... 4 Other (Specify) _____ ..... 9 Don't know 99

26. What is your ethnic background?	Thai .....1 Tai Yai.....2 Akha (E-Koh).....3 Pakakeryor (Karen).....4 Lahu (Muser) .....5 Lisu (Lisaw) .....6 Hmong (Meaw) .....7 Mien (Yao) .....8 Burmese.....9 Yunnan (Jin Haw).....10 Tai Lue (Tai) .....11 Lao.....21 Kathuic.....22 Bahnaric Khmer.....23 Tai Thai.....24 Other (Specify) _____.....30 Don't know 99
xi. Interview end time	[***time entered automatically***]
Thank you very much for participating in this survey. [***give gift to respondent***]	
Part V: Interviewer observations [to be completed by interviewer after interview]	
xii. Was the interview completed?	Yes.....1 Yes, with difficulties .....2 No 3
xiii. Was someone else present during the interview? [***mark all that apply***]	Survey supervisor .....1 Other household or family member .....2 Medical practitioner.....3 Government officer.....4 Other (specify) ____.....5 No one 0
xiv. What is your evaluation of the accuracy and trustworthiness of the informant's answers?	Very good .....1 Satisfactory.....2 Doubtful.....3 Very low.....4
xv. Were there any unusual circumstances during the interview?	Please describe: _____

TABLE 1: Type of treatment

	Dependent Variable																											
	Chiang Rai									Salavan									Pooled Sample									
	Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care		
	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Marginalisation Index	0.79	0.43	-1.25	-0.83	-0.97	-0.72	0.73	1.04*	1.08	0.43	0.02	0.41	-2.65**	-1.98*	-2.68	3.31**	3.61**	2.47	0.83*	0.42	-0.50	-1.34***	-1.30**	-1.30	1.33**	1.69***	1.64*
	(0.51)	(0.56)	(1.00)	(0.54)	(0.59)	(0.90)	(0.59)	(0.63)	(0.91)	(0.93)	(0.95)	(1.44)	(1.13)	(1.15)	(1.99)	(1.58)	(1.62)	(2.35)	(0.50)	(0.52)	(0.79)	(0.50)	(0.53)	(0.84)	(0.63)	(0.65)	(0.91)
Health-related social support	0.48*	0.45*	-0.02	0.37	0.36	0.40	0.08	0.10	0.20	0.65**	0.70**	0.64	0.82**	0.88**	0.81	-0.39	-0.52	-0.85	0.59***	0.57***	0.19	0.52**	0.52**	0.53**	-0.05	-0.03	0.07
	(0.25)	(0.25)	(0.30)	(0.24)	(0.24)	(0.29)	(0.30)	(0.30)	(0.39)	(0.32)	(0.32)	(0.51)	(0.41)	(0.42)	(0.58)	(0.59)	(0.61)	(1.11)	(0.19)	(0.19)	(0.26)	(0.20)	(0.20)	(0.26)	(0.26)	(0.26)	(0.37)
Health-related phone use	0.44*	0.10	0.43*	0.46**	0.36	0.47**	-0.22	0.18	-0.22	1.41***	0.12	1.41***	0.00	1.34**	0.00	-0.13	1.42	-0.09	0.64***	0.16	0.64***	0.44**	0.48*	0.44**	-0.24	0.35	-0.24
	(0.23)	(0.30)	(0.23)	(0.22)	(0.28)	(0.22)	(0.33)	(0.42)	(0.33)	(0.45)	(0.62)	(0.45)	(0.46)	(0.63)	(0.46)	(0.89)	(1.22)	(0.90)	(0.20)	(0.27)	(0.20)	(0.20)	(0.25)	(0.20)	(0.31)	(0.41)	(0.31)
Self-rated severity	0.89***	0.90***	0.88***	0.32**	0.32**	0.32**	-0.06	-0.05	-0.05	0.61***	0.73***	0.61***	-0.19	-0.30	-0.19	0.64	0.51	0.65	0.82***	0.84***	0.83***	0.19	0.19	0.19	0.02	0.01	0.02
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.18)	(0.18)	(0.18)	(0.22)	(0.23)	(0.22)	(0.27)	(0.28)	(0.27)	(0.42)	(0.44)	(0.42)	(0.11)	(0.11)	(0.11)	(0.12)	(0.12)	(0.12)	(0.16)	(0.16)	(0.16)
Female	0.15	0.15	0.13	0.07	0.07	0.07	0.16	0.15	0.16	0.36	0.23	0.36	-0.60*	-0.49	-0.60*	0.42	0.65	0.41	0.17	0.15	0.16	-0.10	-0.10	-0.10	0.24	0.24	0.25
	(0.21)	(0.21)	(0.21)	(0.20)	(0.20)	(0.20)	(0.28)	(0.28)	(0.28)	(0.30)	(0.31)	(0.30)	(0.36)	(0.37)	(0.36)	(0.62)	(0.65)	(0.62)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.25)	(0.25)	(0.25)
Age	-0.00	-0.00	-0.00	0.01*	0.01*	0.01*	-0.01	-0.01	-0.01	0.01	0.01	0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.00	-0.00	-0.00	0.01	0.01	0.01	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Illness episode of child	0.90***	0.91***	0.94***	0.24	0.25	0.24	-1.24**	-1.25**	-1.24**	0.27	0.36	0.27	-0.19	-0.30	-0.19	0.03	-0.03	0.07	0.60***	0.62***	0.62***	0.07	0.07	0.07	-0.66*	-0.68**	-0.66*
	(0.26)	(0.26)	(0.26)	(0.27)	(0.27)	(0.27)	(0.50)	(0.50)	(0.50)	(0.30)	(0.30)	(0.30)	(0.37)	(0.38)	(0.37)	(0.59)	(0.60)	(0.60)	(0.20)	(0.20)	(0.20)	(0.22)	(0.22)	(0.22)	(0.34)	(0.34)	(0.34)
PHONxMARG		1.90*			0.60			-2.41			9.26***			-15.73**			-8.50			2.86***			-0.24			-3.31*	
		(1.09)			(1.01)			(1.81)			(3.47)			(6.25)			(6.18)			(1.06)			(0.98)			(1.78)	
SUPPxMARG			2.68**			-0.16			-0.55			0.03			0.04			1.17			1.76**			-0.06			-0.47
			(1.06)			(1.00)			(1.09)			(1.45)			(2.02)			(2.45)			(0.79)			(0.89)			(0.97)
Constant	-3.15***	-3.06***	-2.76***	-2.55***	-2.53***	-2.57***	-1.89***	-1.99***	-1.99***	-1.89**	-1.95**	-1.88**	-1.39	-1.51	-1.38	-5.77***	-5.80***	-5.53***	-2.54***	-2.45***	-2.24***	-2.46***	-2.47***	-2.47***	-2.76***	-2.87***	-2.85***
	(0.49)	(0.50)	(0.51)	(0.49)	(0.49)	(0.51)	(0.60)	(0.61)	(0.64)	(0.85)	(0.87)	(0.90)	(1.02)	(1.04)	(1.07)	(1.55)	(1.54)	(1.61)	(0.57)	(0.58)	(0.59)	(0.50)	(0.50)	(0.52)	(0.58)	(0.58)	(0.61)
N	608	608	608	608	608	608	608	608	608	356	356	356	356	356	356	356	356	356	964	964	964	964	964	964	964	964	964
Log likelihood	-326.15	-324.56	-322.51	-333.93	-333.75	-333.91	-201.00	-199.95	-200.87	-193.01	-188.46	-193.01	-132.35	-126.61	-132.35	-69.26	-68.01	-69.15	-530.83	-526.82	-528.28	-477.61	-477.59	-477.61	-283.87	-281.72	-283.76
X^2	77.90	79.28	80.90	23.10	23.29	23.20	8.18	10.12	8.51	26.11	28.45	26.11	13.90	20.23	13.89	9.24	10.71	9.33	97.51	100.61	100.21	27.88	28.02	27.94	9.89	13.72	10.18
Prob > X^2	0.00	0.00	0.00	0.04	0.04	0.05	0.07	0.06	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01

Standard errors in parentheses

*p < 0.1, **p < 0.05, ***p < 0.01

TABLE 2: Duration until treatment

	Dependent Variable																											
	Chiang Rai									Salavan									Pooled Sample									
	Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care		
	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Marginalisation Index	0.47	0.49	0.23	-0.39	-0.42	-1.43	-0.06	0.02	1.37	-0.29	0.02	0.97	1.80	1.80	1.92	0.20	0.57	-1.22	0.08	0.17	0.19	0.02	0.08	-1.52	0.28	0.49	1.08
	(0.58)	(0.62)	(1.14)	(0.60)	(0.68)	(1.27)	(1.42)	(1.45)	(13.47)	(0.46)	(0.48)	(1.01)	(1.97)	(1.19)	(32.95)	(27.08)	(9.25)	(111.45)	(0.38)	(0.40)	(0.73)	(0.52)	(0.57)	(1.24)	(0.76)	(0.73)	(1.21)
Health-related social support	-0.23	-0.23	-0.29	0.30	0.30	0.10	0.84	0.82	1.37	-0.02	-0.01	0.43	2.43	2.43	2.46	0.03	0.25	-1.16	-0.10	-0.10	-0.06	0.66**	0.66**	0.38	0.64	0.60	0.97*
	(0.36)	(0.36)	(0.43)	(0.32)	(0.32)	(0.39)	(1.23)	(1.45)	(3.50)	(0.19)	(0.19)	(0.38)	(4.96)	(4.96)	(8.34)	(30.82)	(11.94)	(55.06)	(0.19)	(0.19)	(0.28)	(0.28)	(0.28)	(0.35)	(0.40)	(0.39)	(0.55)
Health-related phone use	0.69**	0.72	0.69**	1.07***	1.05***	1.07***	0.12	0.39	0.08	0.41*	0.95***	0.42*	1.39	1.39	1.40	0.84	2.14	1.26	0.63***	0.76***	0.63***	1.09***	1.14***	1.09***	0.21	0.72	0.16
	(0.34)	(0.45)	(0.34)	(0.26)	(0.34)	(0.26)	(1.50)	(4.01)	(1.66)	(0.22)	(0.34)	(0.22)	(3.04)	(4.48)	(3.38)	(36.00)	(10.02)	(45.81)	(0.20)	(0.28)	(0.20)	(0.24)	(0.30)	(0.24)	(0.53)	(0.67)	(0.53)
Self-rated severity	0.30*	0.30*	0.30*	0.33**	0.33**	0.32**	0.20	0.19	0.21	0.02	0.00	0.02	0.13	0.13	0.13	0.88	0.20	0.95	0.19*	0.19*	0.19*	0.24*	0.24*	0.23*	0.47**	0.42*	0.49**
	(0.18)	(0.18)	(0.18)	(0.16)	(0.16)	(0.16)	(0.39)	(0.39)	(0.71)	(0.12)	(0.11)	(0.12)	(0.46)	(0.47)	(0.66)	(4.87)	(1.76)	(12.51)	(0.11)	(0.11)	(0.11)	(0.14)	(0.14)	(0.14)	(0.23)	(0.24)	(0.24)
Female	-0.14	-0.14	-0.15	0.00	0.00	0.02	0.41	0.40	0.37	0.09	0.08	0.09	-0.14	-0.14	-0.14	-0.33	0.19	-0.74	-0.02	-0.03	-0.02	-0.01	-0.01	0.00	0.20	0.26	0.24
	(0.29)	(0.29)	(0.29)	(0.24)	(0.24)	(0.24)	(0.50)	(0.50)	(0.73)	(0.17)	(0.17)	(0.17)	(0.47)	(0.48)	(0.57)	(17.22)	(8.58)	(46.31)	(0.16)	(0.16)	(0.16)	(0.21)	(0.21)	(0.21)	(0.39)	(0.39)	(0.39)
Age	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.04*	0.04*	0.04*	-0.00	-0.00	-0.00	0.02	0.02	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.03**	0.03**	0.03**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.96)	(0.31)	(1.29)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Illness episode of child	-0.74**	-0.74**	-0.73**	-0.47	-0.47	-0.45	-0.52	-0.57	-0.62	-0.47***	-0.46***	-0.50***	-0.66	-0.66	-0.66	0.19	0.60	0.36	-0.57***	-0.56***	-0.57***	-0.48*	-0.49*	-0.47*	0.26	0.26	0.25
	(0.33)	(0.33)	(0.33)	(0.33)	(0.33)	(0.33)	(3.24)	(3.42)	(5.41)	(0.18)	(0.18)	(0.18)	(0.52)	(0.47)	(0.59)	(14.96)	(7.16)	(17.70)	(0.18)	(0.18)	(0.18)	(0.26)	(0.26)	(0.26)	(0.49)	(0.48)	(0.49)
PHONxMARG		-0.09			0.10			-2.35			-2.35**			0.00			-163.86			-0.57			-0.30			-5.71	
		(1.21)			(1.21)			(21.76)			(1.15)			(0.00)			(171.30)			(0.79)			(1.16)			(4.49)	
SUPPxMARG			0.30			1.32			-2.11			-1.46			-0.13			2.60			-0.14			1.86			-1.16
			(1.23)			(1.41)			(13.46)			(1.05)			(33.00)			(144.87)			(0.78)			(1.34)			(1.34)
Constant	0.36	0.35	0.41	-0.24	-0.23	-0.10	-3.08*	-3.11	-3.50	0.52	0.46	0.15	-3.05	-3.05	-3.08	-1.97	-1.74	-1.09	0.12	0.09	0.09	-0.63	-0.66	-0.42	-2.95***	-2.94***	-3.19***
	(0.76)	(0.76)	(0.78)	(0.60)	(0.61)	(0.62)	(1.73)	(1.95)	(3.78)	(0.42)	(0.42)	(0.50)	(4.96)	(4.99)	(8.26)	(55.07)	(20.19)	(87.98)	(0.40)	(0.40)	(0.43)	(0.48)	(0.49)	(0.50)	(0.91)	(0.90)	(0.96)
N	192	192	192	159	159	159	65	65	65	206	206	206	57	57	57	23	23	23	398	398	398	216	216	216	88	88	88
Log likelihood	-364.85	-364.85	-364.82	-297.05	-297.04	-296.59	-83.91	-83.80	-83.26	-336.79	-334.68	-335.82	-87.09	-87.09	-87.09	-34.93	-31.62	-33.85	-721.20	-720.94	-721.18	-390.56	-390.53	-389.54	-124.70	-123.83	-124.33
X^2	19.67	19.71	19.75	36.71	36.70	37.43	5.37	5.19	3.66	12.46	16.86	14.44	4.44	7.18	4.52	0.08	66.15	0.03	31.39	31.95	31.41	43.21	43.44	44.47	16.09	17.63	16.71
Prob > X^2	0.04	0.04	0.03	0.51	0.51	0.43				0.17	0.20	0.19							0.00	0.00	0.00	0.46	0.46	0.41	0.33	0.47	0.35
Pseudo R^2							0.06	0.07	0.07				0.10	0.10	0.10	0.15	0.23	0.18									

Standard errors in parentheses

*p < 0.1, **p < 0.05, ***p < 0.01

TABLE 1: Type of treatment

	Dependent Variable																											
	Chiang Rai									Salavan									Pooled Sample									
	Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care		
	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	
Marginalisation Index	0.59	0.24	-1.46	-0.74	-0.85	-0.49	0.57	0.84**	0.88	1.43	1.11	1.51	-2.49*	-1.86	-2.59	2.73*	3.06**	2.59	0.90*	0.59	-0.18	-1.11**	-1.07**	-0.92	1.05**	1.36***	1.24*	
	(0.60)	(0.60)	(1.05)	(0.45)	(0.52)	(1.26)	(0.36)	(0.37)	(0.70)	(1.01)	(1.04)	(1.49)	(1.42)	(1.35)	(1.77)	(1.48)	(1.53)	(5.20)	(0.52)	(0.55)	(0.70)	(0.44)	(0.50)	(1.00)	(0.42)	(0.45)	(0.68)	
Health-related social support	0.45**	0.42**	-0.06	0.35	0.35	0.41	0.08	0.10	0.19	0.59**	0.61**	0.61	0.53*	0.53**	0.51	-0.34	-0.35	-0.42	0.55***	0.54***	0.20	0.44**	0.44**	0.48	-0.06	-0.04	0.02	
	(0.22)	(0.22)	(0.27)	(0.28)	(0.27)	(0.40)	(0.25)	(0.25)	(0.39)	(0.26)	(0.26)	(0.41)	(0.28)	(0.26)	(0.46)	(0.38)	(0.36)	(2.77)	(0.16)	(0.16)	(0.22)	(0.21)	(0.20)	(0.33)	(0.22)	(0.22)	(0.36)	
Health-related phone use	0.33	-0.00	0.32	0.45**	0.37	0.45**	-0.22	0.13	-0.22	0.63**	-0.36	0.63**	0.25	1.36***	0.25	0.05	1.28*	0.05	0.38*	-0.03	0.38*	0.45***	0.48**	0.45**	-0.19	0.32	-0.19	
	(0.29)	(0.42)	(0.29)	(0.18)	(0.28)	(0.18)	(0.28)	(0.39)	(0.28)	(0.31)	(0.53)	(0.32)	(0.61)	(0.39)	(0.61)	(0.46)	(0.75)	(0.47)	(0.22)	(0.33)	(0.21)	(0.17)	(0.24)	(0.18)	(0.24)	(0.35)	(0.24)	
Self-rated severity	0.85***	0.86***	0.85***	0.32***	0.32***	0.32***	-0.06	-0.05	-0.05	0.71***	0.79***	0.71***	-0.37	-0.46*	-0.37	0.16	0.10	0.16	0.78***	0.80***	0.79***	0.16	0.16	0.16	-0.01	-0.01	-0.01	
	(0.12)	(0.12)	(0.12)	(0.11)	(0.10)	(0.10)	(0.19)	(0.18)	(0.19)	(0.19)	(0.21)	(0.20)	(0.27)	(0.24)	(0.27)	(0.25)	(0.24)	(0.25)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.15)	(0.14)	(0.15)	
Female	0.17	0.17	0.14	0.05	0.05	0.05	0.14	0.14	0.15	0.13	0.06	0.13	-0.41	-0.33	-0.41	0.48	0.52	0.49	0.14	0.13	0.13	-0.09	-0.09	-0.08	0.22	0.22	0.23	
	(0.20)	(0.19)	(0.20)	(0.18)	(0.17)	(0.17)	(0.26)	(0.27)	(0.27)	(0.23)	(0.22)	(0.23)	(0.38)	(0.35)	(0.38)	(0.59)	(0.55)	(0.60)	(0.14)	(0.14)	(0.14)	(0.17)	(0.17)	(0.17)	(0.23)	(0.24)	(0.24)	
Age	-0.00	-0.00	-0.00	0.01	0.01	0.01	-0.01	-0.01	-0.01	-0.00	-0.01	-0.00	-0.00	0.00	-0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00	0.01	0.01	0.01	-0.00	-0.00	-0.00	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Illness episode of child	0.93***	0.94***	0.97***	0.17	0.17	0.16	-1.22*	-1.23*	-1.22*	0.02	0.06	0.02	-0.02	-0.10	-0.02	0.16	0.11	0.17	0.48***	0.50***	0.51***	0.07	0.07	0.06	-0.59	-0.60	-0.59	
	(0.24)	(0.24)	(0.24)	(0.31)	(0.32)	(0.31)	(0.68)	(0.70)	(0.68)	(0.27)	(0.27)	(0.27)	(0.24)	(0.24)	(0.25)	(0.64)	(0.52)	(0.64)	(0.18)	(0.18)	(0.18)	(0.21)	(0.21)	(0.21)	(0.44)	(0.46)	(0.46)	
PHONxMARG		1.81			0.48			-2.10			6.65**			-12.46***			-6.37**			2.26*			-0.18			-2.87		
		(1.46)			(0.96)			(1.94)			(2.61)			(3.21)			(2.81)			(1.26)			(0.88)			(1.78)		
SUPPxMARG			2.67***			-0.33			-0.48			-0.10			0.12			0.19			1.45**			-0.24			-0.29	
			(1.02)			(1.38)			(1.14)			(1.21)			(1.51)			(4.93)			(0.65)			(1.08)			(0.95)	
Constant	-3.05***	-2.97***	-2.66***	-2.36***	-2.34***	-2.41***	-1.81***	-1.89***	-1.89***	-1.79***	-1.80***	-1.81***	-0.56	-0.64	-0.54	-4.13**	-4.18**	-4.09	-2.82***	-2.75***	-2.56***	-1.81***	-1.82***	-1.85***	-2.23***	-2.33***	-2.29***	
	(0.49)	(0.51)	(0.51)	(0.41)	(0.42)	(0.44)	(0.49)	(0.51)	(0.56)	(0.64)	(0.66)	(0.69)	(0.74)	(0.68)	(0.85)	(1.62)	(1.64)	(3.36)	(0.40)	(0.41)	(0.42)	(0.40)	(0.40)	(0.42)	(0.50)	(0.52)	(0.56)	
N	608	608	608	608	608	608	608	608	608	356	356	356	356	356	356	356	356	356	964	964	964	964	964	964	964	964	964	
Log likelihood	-330.55	-328.94	-326.76	-337.07	-336.95	-337.01	-202.08	-201.20	-201.97	-224.80	-221.11	-224.80	-146.49	-141.49	-146.49	-79.58	-78.59	-79.58	-560.01	-556.90	-557.85	-490.89	-490.87	-490.85	-286.66	-284.75	-286.61	
X^2	108.63	108.85	112.48	35.48	41.50	36.05	5.80	10.59	6.89	43.41	32.99	41.83	21.51	55.69	19.49	7.62	18.89	6.46	149.48	155.77	158.79	23.21	26.09	22.70	12.14	15.81	12.51	
Pseudo R^2	0.13	0.13	0.14	0.04	0.04	0.04	0.02	0.03	0.02	0.07	0.09	0.07	0.06	0.10	0.06	0.07	0.08	0.07	0.14	0.15	0.15	0.04	0.04	0.04	0.03	0.03	0.03	

Standard errors in parentheses

*p < 0.1, **p < 0.05, ***p < 0.01

TABLE 2: Duration until treatment

	Dependent Variable																											
	Chiang Rai									Salavan									Pooled Sample									
	Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care			Public Care			Private Care			Informal Care		
	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB	NoInt	IntA	IntB
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	
Marginalisation Index	0.43	0.46	0.39	-0.53	-0.58	-1.34	-0.06	0.02	1.37	-0.59	-0.29	0.77	1.80	1.80	1.92	0.20	0.57	-1.22	0.13	0.25	0.59	-0.01	0.05	-1.42	-0.05	0.09	0.96	
	(0.43)	(0.57)	(3.83)	(0.54)	(0.61)	(3.21)	(1.39)	(1.48)	(14.44)	(0.50)	(0.56)	(0.98)	(2.68)	(1.50)	(33.42)	(31.27)	(8.10)	(134.51)	(0.34)	(0.40)	(0.73)	(0.48)	(0.52)	(2.18)	(0.79)	(0.83)	(2.70)	
Health-related social support	-0.19	-0.19	-0.20	0.38	0.38	0.24	0.84	0.82	1.37	0.01	0.02	0.50	2.43	2.43	2.46	0.03	0.25	-1.16	-0.04	-0.04	0.10	0.73**	0.73**	0.48	0.71*	0.68	1.12	
	(0.37)	(0.36)	(0.47)	(0.35)	(0.35)	(0.45)	(1.16)	(1.40)	(3.57)	(0.17)	(0.17)	(0.32)	(4.94)	(4.97)	(8.37)	(36.26)	(10.65)	(53.79)	(0.18)	(0.18)	(0.32)	(0.32)	(0.33)	(0.44)	(0.40)	(0.49)	(1.20)	
Health-related phone use	0.97*	1.00	0.97*	1.12***	1.09**	1.13***	0.12	0.39	0.08	0.50*	1.03**	0.50*	1.39	1.39	1.40	0.84	2.14	1.26	0.89**	1.07**	0.88**	1.13***	1.18***	1.15***	0.09	0.52	0.04	
	(0.56)	(0.62)	(0.56)	(0.33)	(0.45)	(0.33)	(1.82)	(4.26)	(1.52)	(0.26)	(0.47)	(0.27)	(2.97)	(3.13)	(4.33)	(58.81)	(11.43)	(44.25)	(0.37)	(0.45)	(0.36)	(0.29)	(0.37)	(0.31)	(0.85)	(2.43)	(0.88)	
Self-rated severity	0.38**	0.38**	0.38*	0.37**	0.37*	0.36*	0.20	0.19	0.21	-0.01	-0.03	-0.01	0.13	0.13	0.13	0.88	0.20	0.95	0.26*	0.25*	0.26*	0.26	0.26	0.25	0.32	0.30	0.34	
	(0.19)	(0.19)	(0.20)	(0.19)	(0.19)	(0.19)	(0.47)	(0.39)	(0.48)	(0.14)	(0.14)	(0.15)	(0.48)	(0.61)	(0.59)	(4.34)	(1.48)	(11.20)	(0.14)	(0.14)	(0.14)	(0.17)	(0.17)	(0.16)	(0.28)	(0.29)	(0.29)	
Female	0.03	0.03	0.03	0.01	0.01	0.02	0.41	0.40	0.37	0.11	0.10	0.11	-0.14	-0.14	-0.14	-0.33	0.19	-0.74	0.11	0.10	0.12	-0.04	-0.04	-0.03	0.27	0.30	0.32	
	(0.33)	(0.32)	(0.33)	(0.31)	(0.30)	(0.30)	(0.56)	(0.52)	(0.51)	(0.13)	(0.13)	(0.13)	(0.53)	(0.47)	(0.46)	(19.46)	(8.29)	(68.85)	(0.19)	(0.19)	(0.19)	(0.25)	(0.24)	(0.24)	(0.38)	(0.38)	(0.41)	
Age	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.04*	0.04*	0.04*	0.00	0.00	0.00	0.02	0.02	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04***	0.04***	0.04***	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(1.09)	(0.33)	(1.21)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Illness episode of child	-0.79*	-0.79*	-0.79*	-0.40	-0.40	-0.38	-0.52	-0.57	-0.62	-0.39*	-0.39*	-0.42**	-0.66	-0.66	-0.66	0.19	0.60	0.36	-0.59***	-0.58***	-0.61***	-0.46**	-0.46**	-0.45**	-0.07	-0.04	-0.09	
	(0.42)	(0.40)	(0.43)	(0.30)	(0.31)	(0.31)	(3.21)	(5.55)	(3.73)	(0.21)	(0.20)	(0.21)	(0.85)	(0.90)	(0.71)	(18.23)	(6.10)	(17.36)	(0.22)	(0.21)	(0.22)	(0.21)	(0.21)	(0.21)	(0.34)	(0.44)	(0.38)	
PHONxMARG		-0.14			0.18			-2.35			-2.41			0.00			-163.86			-0.77			-0.31			-4.49		
		(2.10)			(1.44)			(22.69)			(1.50)			(0.00)			(819.44)			(1.14)			(1.37)			(20.98)		
SUPPxMARG			0.06			1.02			-2.11			-1.58*			-0.13			2.60			-0.56			1.72			-1.46	
			(3.85)			(3.23)			(14.48)			(0.86)			(33.42)			(152.61)			(0.75)			(2.23)			(2.80)	
Constant	0.12	0.11	0.13	-0.33	-0.32	-0.23	-3.08*	-3.11	-3.50	0.49	0.46	0.08	-3.05	-3.05	-3.08	-1.97	-1.74	-1.09	0.11	0.09	0.01	-0.68	-0.70	-0.50	-3.19***	-3.18***	-3.53**	
	(0.74)	(0.76)	(0.80)	(0.52)	(0.54)	(0.58)	(1.72)	(1.89)	(3.83)	(0.52)	(0.48)	(0.50)	(5.06)	(5.00)	(8.28)	(64.19)	(19.88)	(84.01)	(0.48)	(0.49)	(0.51)	(0.45)	(0.45)	(0.49)	(0.96)	(1.05)	(1.49)	
ln(α)	0.88***	0.88***	0.88***	0.33	0.33	0.32	0.47	0.47	0.40	-0.57	-0.65**	-0.59*	-0.19	-0.19	-0.19	-15.08	-16.85	-19.54	0.43*	0.42*	0.43*	0.34	0.33	0.32	0.14	0.09	0.10	
	(0.27)	(0.28)	(0.28)	(0.29)	(0.30)	(0.30)	(4.68)	(5.22)	(11.41)	(0.39)	(0.33)	(0.34)	(23.64)	(13.74)	(20.95)	(5582.38)	(230.38)	(3350.89)	(0.23)	(0.24)	(0.24)	(0.23)	(0.23)	(0.23)	(35.96)	(5.94)	(3.51)	
N	192	192	192	159	159	159	65	65	65	206	206	206	57	57	57	23	23	23	398	398	398	216	216	216	88	88	88	
Log likelihood	-366.47	-366.46	-366.47	-297.73	-297.72	-297.44	-83.91	-83.80	-83.26	-338.59	-336.30	-337.50	-87.09	-87.09	-87.09	-34.93	-31.62	-33.85	-726.80	-726.40	-726.55	-391.31	-391.28	-390.39	-122.92	-122.33	-122.33	
X^2	15.43	14.78	16.22	21.45	21.08	20.66	4.60	5.04	4.39	13.27	13.85	21.03	1.10	5.98	3.91	0.07	68.33	0.03	19.84	19.11	19.86	29.99	27.34	26.19	15.31	12.27	12.46	
Pseudo R^2	0.05	0.05	0.05	0.07	0.07	0.07	0.06	0.07	0.07	0.02	0.03	0.02	0.10	0.10	0.10	0.15	0.23	0.18	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.08	

Standard errors in parentheses

*p < 0.1, **p < 0.05, ***p < 0.01