

## Determinants of health care utilisation: the case of Timor-Leste

Lorna Guinness<sup>a,\*</sup>, Repon C. Paul<sup>b</sup>, Joao S. Martins<sup>c</sup>, Auguste Asante<sup>b</sup>, Jennifer A. Price<sup>b</sup>, Andrew Hayen<sup>d</sup>, Stephen Jan<sup>e</sup>, Ana Soares<sup>c</sup> and Virginia Wiseman<sup>a,f</sup>

<sup>a</sup>Department of Global Health and Development, London School of Hygiene & Tropical Medicine, 15–17 Tavistock Place, London, WC1H 9SH, UK; <sup>b</sup>School of Public Health and Community Medicine, University of New South Wales, Samuels Building, Kensington, NSW 2052, Australia; <sup>c</sup>Faculty of Medicine and Health Sciences, National University of East Timor, Rua Jacinto Candido, Dili, Timor-Leste; <sup>d</sup>Faculty of Health, University of Technology Sydney, Ultimo 2007; <sup>e</sup>The George Institute for Global Health, Level 5, 1 King Street, Newtown, NSW 2042, Australia; <sup>f</sup>Kirby Institute, University of New South Wales, Level 6, Wallace Wurth Building High Street, Kensington, NSW 2052, Australia

\*Corresponding author: Tel: +447926674052; E-mail: lornaguinness@gmail.com

Received 30 January 2018; revised 29 April 2018; editorial decision 22 May 2018; accepted 24 May 2018

**Background:** Health financing and delivery reforms designed to achieve universal health coverage (UHC) need to be informed by an understanding of factors that both promote access to health care and undermine it. This study examines the level of health care utilisation in Timor-Leste and the factors that drive it.

**Methods:** Data from a nationally representative cross-sectional survey of health care utilisation in 1712 households were used to develop multilevel models exploring how need and predisposing and enabling factors explain health care utilisation at both primary and secondary care facilities.

**Results:** Need was found to be the key driver in seeking both primary care and hospital services. Rural households were less likely to go to hospital (odds ratio 0.7) than urban households. The poorest quintile was also less likely to use more expensive hospital services than other socio-economic groups.

**Conclusions:** Understanding the determinants of seeking health care in Timor-Leste is of considerable policy significance, because health care is free at the point of use. Our findings indicate that the public resources for health care are subsidising the rich more than the poor. Health care reforms in Timor-Leste need to reduce the ‘other’ costs of health care, such as distance barriers, to address these inequities.

**Keywords:** equity, financing, health care utilisation, Southeast Asia, Timor-Leste, universal health care coverage

### Background

Underpinning United Nations (UN) Sustainable Development Goal number three is the aim of achieving universal health coverage (UHC).<sup>1</sup> In Southeast Asia, partly as a result of economic growth, there has been significant progress towards this goal.<sup>2</sup> Beyond Thailand, UHC-driven health care reforms are also being put in place in Vietnam, Indonesia and Cambodia using different approaches,<sup>3–7</sup> from the largely tax-based system in Thailand to multiple health insurance funds in Indonesia and Cambodia.<sup>2,4,6–8</sup> The region is also characterised by varying levels of economic development, poverty, health outcomes and access to health services<sup>2</sup> and the progress towards UHC is variable.<sup>6</sup> The evolving systems of financial protection in the region can provide valuable lessons on moving forward with health

system reforms and, in particular, to what degree different UHC policies impact the utilisation of health services.

Timor-Leste is an example of a Southeast Asian country with a tax-based health system in which health services are provided free at the point of use. Elsewhere, the removal of price barriers at the point of service, such as user fees, has been shown to have a positive impact on utilisation.<sup>9–12</sup> However, utilisation of health services is affected by a complex set of behavioural, social and economic characteristics.<sup>13–16</sup> Like many other countries, Timor-Leste has not succeeded in eradicating inequalities in the use of health services.<sup>17</sup> Additional factors that affect utilisation include supply-side issues, such as the availability of medicines and trained health workers, as well as individual and contextual constraints, such as income, and access to affordable and reliable transportation.<sup>18–24</sup> An individual’s preferences

(such as type, location and perceived quality of health services) and social, demographic and economic factors such as age, gender, level of education and ethnicity also play a role.<sup>23,25,26</sup> The interplay of these factors means that inequities in health care use, such that the better off use health services more than the poor, can be sustained despite the removal of price barriers<sup>12,18,22,24</sup> and that other interventions may be required to help redress the balance.<sup>26</sup>

To develop policy that can address the continued inequality in health care utilisation in Timor-Leste, we sought to explore further and identify the factors driving the inequity in health care utilisation. We used a multilevel logistical model based on the international literature on health care utilisation and nationally representative data to identify and confirm the factors behind the pattern of health care utilisation in Timor-Leste.

### Brief description of health care financing in Timor-Leste

Timor-Leste is a newly independent, lower middle-income nation in Southeast Asia with a population of 1.2 million that is growing at 3.2% per year.<sup>27</sup> It is predominantly (74%) rural, characterised by small-scale subsistence farmers.<sup>28</sup> The Timorese consist of many distinct ethnic groups, with the number of languages spoken (32) being a reflection of both this ethnic mix and Timor-Leste's colonial history.<sup>29</sup> The state is emerging from decades of civil war, with poorer economic indicators than most countries in the region (Table 1). In 2015, gross national income was US\$5080 per capita and gross domestic product growth was 4% per year (dollars are valued at purchasing power parity).<sup>27</sup> The discovery of oil provided revenues that have boosted the economy and capital development, including strengthening the health care system.<sup>17,30</sup>

Timor-Leste operates a predominantly publicly financed and provided health system. Health services are provided free at the point of use and, as a result, proportionate government contributions to health care spending are large (90% of total health

care expenditures).<sup>17</sup> However, the absolute amount of government spending on health care is low, at US\$101 per capita (see Table 1). This may mean that the low level of out-of-pocket payments compared with other countries in the region (see Table 1) is also an indication of limited infrastructure and the availability of health services rather than low-cost access to a full range of health care services. Further, Timor-Leste's health sector is heavily dependent on external funding, and World Bank data (accessed 2016) show that the share of government funding for health care has been falling since 2011.<sup>17</sup> This is concerning in a country still considered to be in a post-conflict period,<sup>29</sup> where health status indicators are persistently lower than in other countries in the region (see Table 1).<sup>27</sup>

There is a three-tier health care delivery system, with a national hospital in Dili (the capital) providing tertiary care, 5 referral hospitals at the district level providing secondary services and a network of 66 community health centres (CHCs) and 205 health posts delivering primary health care services located across the 13 districts in the country. In addition, the CHCs undertake special monthly outreach programmes known locally as *Servisu Integrado du Saude Comunitade (SISCa)*.<sup>31</sup> Services are designed such that everyone should have a health service within a 1 h walk. The private health system remains relatively underdeveloped, although the Ministry of Health (MoH) estimates that about 25% of basic health services are delivered by private providers (both for profit and not for profit).<sup>31</sup>

## Materials and methods

### Conceptual framework

We use Andersen's behavioural model (BM) of health care utilisation as a framework for exploring individual utilisation of health care services in Timor-Leste.<sup>32–34</sup> First developed for the USA, it has been applied in high-, low- and middle-income countries to explore variations in health care utilisation and examine equity in health care usage patterns.<sup>18,33–36</sup> The BM includes

**Table 1.** Key economic and health indicators for Timor-Leste and the Southeast Asia region

	Timor-Leste	Indonesia	Thailand	Cambodia	Vietnam
GNI per capita (PPP\$ international; 2014)	5080	10 190	14 870	3080	5350
GDP growth rate per annum (%; 2014)	4.2	3.7	0.5	5.3	4.9
Population (million; 2014)	1.2	254.5	67.7	15.3	90.7
Infant mortality rate per 1000 live births (2014)	45	23	11	25	17
Maternal mortality rate (2015 modelled estimate per 100 000 live births)	215	126	20	161	54
Total health care expenditure per capita (PPP\$; 2014)	101	299	950	183	390
Government share of total health care expenditure (%; 2014)	90.4	37.8	86.0	22.0	54.1
Government health care expenditure as a share of total government expenditure (%; 2014)	2.4	5.7	23.3	6.1	14.2
Private health care expenditure (% of total health care expenditure; 2014)	9.6	62.2	14.0	78.0	45.9
External resources for health (% of total health care expenditure; 2014)	31.6	1.1	0.5	16.2	2.7

PPP=purchasing power parity.  
Source: World Bank data.<sup>49</sup>

both individual and contextual determinants of health services use. At the individual level, it focuses on three primary determinants of health care use: predisposing, enabling and need factors (see Figure 1).

Underlying the Andersen model is the assumption that an equitable distribution of health services is achieved if ‘illness as defined by a patient or her family is the primary determinant of how services are distributed’.<sup>34</sup> This suggests that equity in health care utilisation is achieved when need for health services has a strong positive association with health service use, whereas inequity arises when ‘enabling characteristics’, such as the ability to pay, distance to health services and income, have a stronger influence on the decision to use health services.<sup>18,20</sup> By understanding how these factors differentially influence utilisation, the model identifies the extent to which there is an equitable distribution in health services use, and thus policy can be better shaped to improve access to health care for the poor.

### Sampling

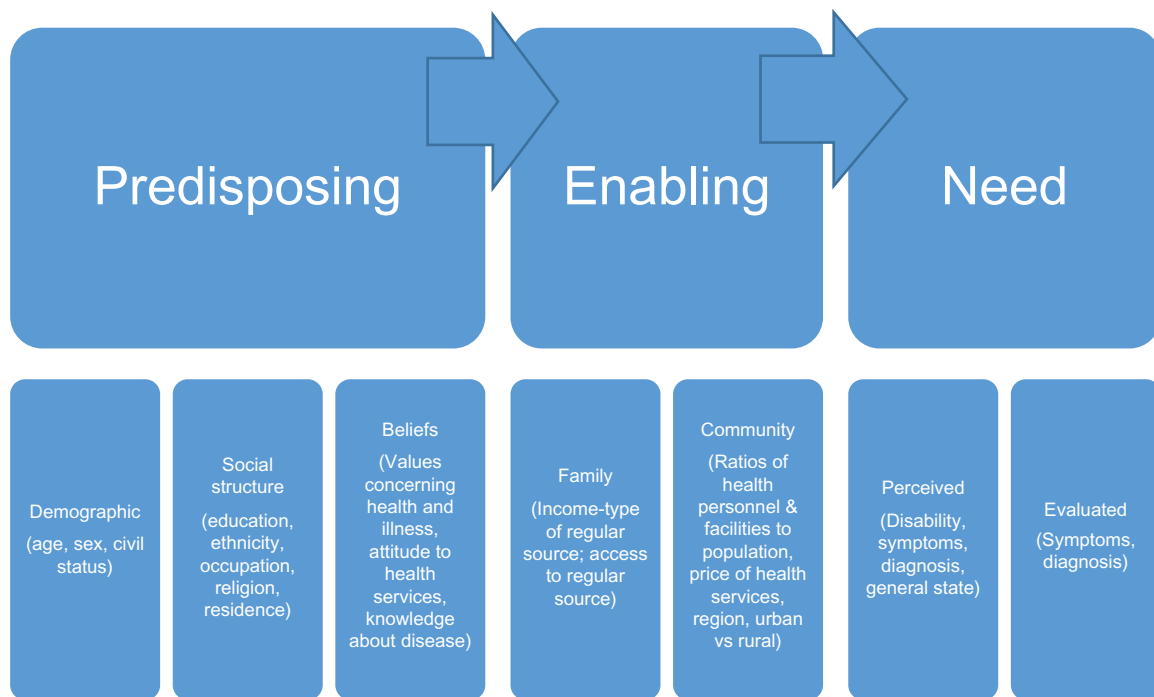
We carried out a nationally representative cross-sectional survey of 1712 households between November 2014 and February 2015 across the 13 districts in Timor-Leste. This sample size enabled the determination of prevalence for characteristics with a 95% confidence interval (CI) and a precision of  $\pm 3\%$ . It also allowed at least 80% power and a significance level of 5% to be able to detect differences of 7% for comparisons between urban and rural areas. In each selected household, the primary caregiver or head of the household was interviewed.

A two-stage sampling procedure was used to select the households, following the study protocol.<sup>21</sup> For sampling

purposes, the 13 districts were grouped into five clusters from which 150 representative urban and rural enumeration areas (EAs) were selected. Within each cluster we selected the allocated number of EAs based on the sampling methods used and provided by the Timor-Leste Directorate of Statistics to generate a nationally representative sample. Eleven households were then randomly selected from each EA. There were approximately five extra surveys per district to provide a buffer against incomplete surveys. In the end, these were included in the analysis, pushing the total household sample to 1712, with all household members then enrolled in the study. Prior to the survey, eight in-depth interviews with health care providers and eight focus group discussions at the household level were carried out to better understand health care utilisation patterns and to inform survey design.<sup>36</sup>

### Data collection

Using an electronic questionnaire, the household survey collected data on individual utilisation of health services, age and gender of household members, asset holdings of the household, need for and types of health services used and presence of chronic disease. The questionnaire was developed using the Questionnaire Development System (QDS) 3.0 (software developed by NOVA Research Company; <http://www.novaresearch.com/QDS/>). The survey was translated into Tetum and piloted in one rural and one urban site before revision and rollout. Ten enumerators and two supervisors were provided with 1 week of training on electronic data collection, including how to enter data directly onto laptop computers. The supervisors were provided with additional training and software to enable them to



**Figure 1.** Andersen behavioural model of health care utilisation. Source: Adapted from<sup>34</sup>.

download and open completed surveys to check data quality. In addition, secondary data on the distribution of health service facilities and other health service characteristics, including quality of care, were collected to complement the primary data collection.

### Variables and models

To explore factors affecting utilisation, and therefore equity, of health care provision at different levels of the health system, we built two models using Andersen's BM framework.<sup>18,33</sup> The models looked at the use of primary health services (model 1) and the use of hospital services (model 2). In both models, the dependent variable was health care utilisation, defined as having visited a primary health care provider in the last month (model 1) or a hospital within the last year (model 2) for each individual in the household. Both models are based on

Andersen's three sets of determinants of health care use: predisposing, enabling and need factors. Table 2 describes the set of variables considered. Characteristics that are likely to predispose individuals to different levels of health care use are age and gender. Enabling factors considered for the model were area of residence (urban/rural), education level, asset quintile, presence of a health centre within the community, presence of a hospital within the district and perceived quality of care.

Need characteristics capture the need for health care and refer to the severity of illness or incapacity. The need for care may be either that perceived by the individual or that evaluated by the delivery system.<sup>37</sup> To identify health care need in the study population, we collected data on whether anyone in the household had been sick but not attended health services in the last 12 months. However, this was measured at the household level and could not be linked to the individual data. In addition, this level of need was found to be low (149/1712) and in most cases

**Table 2.** Variables used to describe health service utilisation in Timor-Leste using the Andersen framework

Variables	Definition	Source	Level
<b>Dependent variable</b>			
Model 1: Utilisation of primary care	Having visited a primary health care provider in the last month	Household survey	Individual
Model 2: Utilisation of hospital services	Having visited a hospital within the last year	Household survey	Individual
<b>Independent variables</b>			
<b>Predisposing factors</b>			
Age (y)	Age of the individual at the time of the survey	Household survey	Individual
Sex	Gender of the individual	Household survey	Individual
<b>Enabling factors</b>			
Area of residence	Resident in an urban or rural community	Household survey	Community
Education level	Individual educational attainment classified as completed secondary education, completed primary education, some primary education or no education	Household survey	Individual
Asset index	An asset index derived from an asset ownership questionnaire (see Table 3 for a list of assets)	Household survey	Household
Availability of primary health services <sup>a</sup>	Have a health centre for primary health services within the community	Ministry of Health records combined with household survey area code	Community
Availability of hospital services <sup>a</sup>	Have a referral hospital within the district	Ministry of Health records combined with household survey district code	District
<b>Need</b>			
Have a chronic illness	A household member is reported to have a chronic disease	Household survey	Individual
Individual needs but does not seek care	In the last 12 months a household member has been ill but not sought health care	Household survey	Household

<sup>a</sup>Availability of health care providers within a district is used as a proxy for quality of care in the district, as fewer qualified providers is assumed to be associated with lower quality care.

(59.7%) the rationale for not seeking care was that the person was not sick enough, i.e. there was no 'need' (see Supplementary Appendix B). We therefore chose to use the presence of a chronic illness as the preferred measure of need.<sup>18</sup>

### Data analysis

Multilevel logistic regression models were developed to identify the determinants of using health services and to account for clustering effects at various levels of hierarchy of the data. Conventional methods that ignore clustering effects are reported to overestimate the precision of the estimates.<sup>19,38,39</sup> The data have four levels that are likely to impact the level of health care utilisation: household (n=1712), community (n=149), subdistrict (n=47) and district (n=13). The household level did not have a significant random effect and therefore was excluded from the analysis.

We generated summary statistics on each of the variables for the models (see Table 3). Preliminary univariable analysis was then carried out to examine the relationship between the utilisation (dependent) variables, with the independent variables, grouped as predisposing factors, enabling factors and need in Tables 2 and 3 (see Appendix A). For a variable to be included in the final models, a p-value <0.25 was required in its univariable model (see Supplementary Appendix A), otherwise they were excluded.<sup>40,41</sup> Finally, as chronic patients are more likely to visit the hospital at older ages, an interaction term was included for chronic disease and age for the relationship between these variables. The analysis was carried out using Stata version 13 (StataCorp, College Station, TX, USA).

## Results

### Participant characteristics

Of the total individuals in the study, the average age was 24.8 y, 49.7% were female and nearly 70% lived in rural areas (see Table 3). A total of 28% had received no education, whereas 29% had completed secondary education. Approximately 55% of participants reported Tetum as their main language, 22% of participants identified an alternative local Timorese language (e.g., Fataluku, Kemak, Makassae or Galoli) to be their main language and 23.5% of participants spoke another language, including one of the 'working' languages (e.g., Bahasa, English or Portuguese). Nearly half the population were receiving some form of government grant. Twenty percent of individuals lived in communities with a primary health care facility. A total of 14% of individuals had used a health service in the past year, 4.8% had used hospital services in the past year and 12.5% had used primary care services in the past month.

### Regression models

The results of both models are presented in Table 4. In the case of model 1, users of primary care were significantly more likely to be <5 y old than any other age group and were less likely to be male (odds ratio [OR] 0.61, p<0.01). In terms of enabling characteristics, users of primary health care services were significantly more likely to live in a rural area (OR 1.27, p=0.054)

**Table 3.** Summary statistics for the sample and levels of utilisation of primary health services and hospitalisation in the previous 12 months (N=9843)

Variables	n (%)	Level
<b>Predisposing factors</b>		
Age (y)		Individual
<5	957 (9.7)	
5-14	2833 (28.8)	
15-59	5319 (54.1)	
≥60	728 (7.4)	
Sex		Individual
Female	4892 (49.7)	
Male	4951 (50.3)	
<b>Enabling factors</b>		
Area of residence		Community
Urban	3028 (30.8)	
Rural	6815 (69.2)	
Education level <sup>a</sup>		Individual
None	2762 (28.1)	
Some primary	1599 (16.3)	
Completed primary	2617 (26.6)	
Completed secondary	2858 (29.0)	
Asset		Household
Refrigerator	1729 (17.6)	
Landline phone	1678 (17.1)	
Mobile phone	8982 (91.3)	
Smart phone	964 (9.8)	
Computer	930 (10.0)	
Internet	168 (1.7)	
Motorbike	3278 (33.3)	
Car or truck	270 (2.7)	
Bank account	2910 (29.6)	
Credit card	307 (3.1)	
Grants from government	4643 (47.2)	
Have a health centre for primary health services within the community	1926 (19.8)	Community
Have a reference hospital within the district	4570 (46.4)	District
<b>Need</b>		
Have a chronic illness	442 (4.4)	Individual
<b>Utilisation</b>		
Any health services	1398 (14.2)	Individual
Primary health services in the past month	1,232 (12.5)	Individual
Hospital services in the past 12 months	476 (4.8)	Individual

<sup>a</sup>Education status of children <15 y of age was replaced by the education status of the household head since the children will not be responsible for making the health care decisions.

and to have completed secondary education rather than primary education (OR 0.83, p=0.062) or not having been to school at all (OR 0.75, p<0.01). In model 2, users of hospital services

**Table 4.** Odds ratio and random effects parameters from a multilevel weighted regression model for use of any health services, primary health services and hospital services

Variable	Model 1: use of primary health services, odds ratio (95% CI) (N=9697)	p-Value	Model 2: use of hospital services, odds ratio (95% CI) (N=9831)	p-Value
<b>Predisposing factors</b>				
Age (y)				
<5	Ref		Ref	
5–14	0.20 (0.16–0.24)	0.000	0.46 (0.32–0.67)	0.000
15–59	0.21 (0.17–0.25)	0.000	0.54 (0.39–0.76)	0.000
≥60	0.41 (0.30–0.56)	0.000	1.2 (0.74–0.67)	0.525
Sex				
Female	Ref		Ref	
Male	0.61 (0.53–0.70)	0.000	0.75 (0.61–0.92)	0.004
<b>Enabling factors</b>				
Area of residence (%)				
Urban	Ref		Ref	
Rural	1.27 (1.0–1.6)	0.054	0.70 (0.50–0.98)	0.040
Education level <sup>a</sup>				
Completed secondary or more	Ref		Ref	
Completed primary	0.83 (0.69–1.0)	0.062	0.70 (0.53–0.95)	0.023
Some primary	0.97 (0.78–1.2)	0.819	1.09 (0.80–1.50)	0.569
None	0.75 (0.61–0.93)	0.008	0.84 (0.62–1.15)	0.278
Asset quintile				
5 (richest)	Ref		Ref	
4	1.1 (0.85–1.37)	0.542	0.86 (0.61–1.21)	0.384
3	1.0 (0.81–1.30)	0.799	0.86 (0.63–1.18)	0.360
2	1.1 (0.87–1.37)	0.444	0.97 (0.71–1.32)	0.841
1 (poorest)	1.1 (0.81–1.36)	0.710	0.64 (0.42–0.97)	0.033
Have a health centre for primary health services within the community				
No	Ref		–	
Yes	1.03 (0.81–1.31)	0.828	–	
Have a reference hospital within the district				
No	–		Ref	
Yes	–		1.32 (0.92–1.89)	0.131
<b>Need</b>				
Chronic illness				
No	Ref		Ref	
Yes	13.0 (8.2–20.62)	0.000	6.17 (3.54–10.75)	0.000
Interaction: age group × chronic illness				
<5 y	0.38 (0.13–1.13)	0.081	0.63 (0.15–2.66)	0.526
5–14 y	0.85 (0.41–1.76)	0.658	2.27 (0.94–5.5)	0.069
15–59 y	1.02 (0.60–1.76)	0.927	2.07 (1.08–3.97)	0.029
≥60 y	Omitted			
<b>Random effects parameters</b>				
Level 4: district-level standard deviation	0.07 (0.00–2.3)		–	
Level 3: subdistrict standard deviation	0.22 (0.10–0.46)		0.37 (0.20–0.70)	
Level 2: community-level standard deviation	0.32 (0.22–0.48)		0.45 (0.30–0.69)	
Level 1: household-level standard deviation <sup>b</sup>	–		–	

<sup>a</sup>Education status of children <15 y was replaced by the education status of the household head.

<sup>b</sup>The household level did not have a significant random effect and therefore was excluded from the analysis.

were more likely to be <5 y old and less likely to be male (OR 0.75,  $p < 0.01$ ). Hospital users were less likely to be rural (OR 0.70,  $p < 0.05$ ). They were more likely to have a referral hospital in their district, although this was not significant (OR 1.32,  $p = 0.131$ ), and to have completed secondary education rather than primary education (OR 0.70,  $p < 0.05$ ). Hospital users were also significantly less likely to be in the poorest asset quintile than in the richest ( $p < 0.05$ ). Finally, in both models, those with chronic disease were more likely to be using health services than those without, with the OR for using primary health care services (OR 13.0,  $p < 0.05$ ) higher than that for hospital users (OR 6.17,  $p < 0.05$ ).

## Discussion

Using a nationally representative sample of households, this study shows that despite the availability of services that are free at the point of use, the distribution of health care service utilisation in Timor-Leste is not equitable, as defined by Andersen's BM, such that predisposing factors are the key drivers of health care utilisation.<sup>17</sup> The results also provide policymakers in Timor-Leste with further evidence that health care utilisation varies significantly across different educational levels and areas of residence, and at different levels of the health care system.

The Andersen model hypothesises that, alongside need, a set of predisposing and enabling factors will influence health care utilisation. Our analysis has used this approach to identify and quantify the level of influence of each of these factors in health care use. Our models show the importance of gender as a predisposing factor, with women being the most likely to use primary care or hospital services, even with other predisposing factors and enabling factors of residence, education level and asset quintile taken into account. This finding is in line with health care utilisation studies elsewhere and is most probably driven by the need for maternal and child health services.<sup>18,20,23</sup>

Andersen's framework suggests that if enabling factors (such as area of residence, educational level or socio-economic group) are more important than need or predisposing factors in shaping levels of utilisation, then there is an equity problem in the health services under study.<sup>20</sup> Very few households reported not accessing care when sick (Table 2), indicating a low level of unmet need identified in our survey and that there is a degree of equity in access to health care. To look into equity further, we used a proxy measure for health care need, the presence of a chronic disease, in our analyses. Chronic disease was found to have a large and significant impact on whether to seek health care services, as would be expected. Those with a chronic disease were 13 times more likely to attend a primary care provider in the last month and 6.2 times more likely to visit a hospital in the past 12 months, so this was the major predictor of health care utilisation.

The models in our study also reveal the importance of Andersen's enabling factors. Importantly, rural respondents are 1.3 times more likely to seek health care in a primary care facility than urban residents and less likely to seek health care in a hospital than urban residents (OR 0.70), the poorest quintile is less likely to seek care in a hospital than the richest (OR 0.60) and those with a hospital within their district are 1.32 times

more likely to use hospital services than those without. Government health care expenditures are weighted in favour of the hospital level<sup>42</sup> and only 19.8% of the households had a primary health centre within the community. This suggests a higher level of subsidy to urban residents and those in the richest quintile. As we did not look at quality of care, the extent to which this represents inequity in access to quality care is unknown.

Our model was limited in a number of aspects. Andersen's standard model also includes a variable for quality of care as an enabling factor for accessing health care. Our study did not include quality in the model. A structural measure of quality, in the form of the number of physicians per district, was considered for inclusion in the models but was found not to have a significant effect on utilisation and was subsequently excluded. Further multilevel modelling, including additional analysis of quality of care is recommended as an important next step. Similarly, 'need' is an inherently complex term with many different meanings. In this study, the term was based on the number of chronic illnesses, a relatively easy-to-obtain measure that does not rely on the respondents' perception of need or the ability to pay for the services needed.<sup>43</sup> This definition, despite widespread use,<sup>44</sup> could be challenged on the basis that it does not reflect the full range of health problems that affect the local population and may also be missing the value of preventive care.<sup>45</sup> In addition, chronic illness can be associated with other factors that can drive health care utilisation, such as socio-economic status, and in poorer countries can be linked to wealth. As a result, those in higher income groups may be over-represented in our sample of individuals that need health services. A further caveat to this study relates to the issue that Timor-Leste has a low level of health care expenditure and a small number of skilled personnel per capita.<sup>42</sup> In a situation where the system is under-resourced, levels of utilisation may be lower across income groups and different geographical regions, and therefore may not show much disparity.

During 25 y of conflict, Timor-Leste's health system suffered from the destruction of its infrastructure.<sup>30</sup> Since gaining independence in 2002, investment has enabled the number of hospital beds per 1000 population to increase.<sup>27</sup> Although the health care worker density remains low (lower than the WHO-recommended threshold), efforts are also under way to address these shortages under a bilateral agreement with Cuba for training doctors.<sup>27,46</sup> Elsewhere, studies have shown that transport services investment is as important, if not more important, for ensuring equity in access to health services, particularly where ambulatory services are not available.<sup>21,47,48</sup> Our findings show that rural populations are not accessing secondary health services to the same extent as urban populations. In implementing the 2011–30 National Health Sector Strategy and under its new policy of decentralisation, we welcome that the government of Timor-Leste is exploring innovative ways to bring health care to more isolated areas and closer to the population. Rural road infrastructure development should also be a priority, and donor partners can help through grants such as the rural development component of the European Union's aid budget for 2014–20. Such improvements in roads and public transport will not only help smooth the path to UHC but will also provide benefits to other sectors of the economy.

## Conclusions

The Andersen model is a useful way to identify potential causes of inequity in health care service utilisation. Overall equity in utilisation in Timor-Leste hides inequalities in access to different types of services and a potential underutilisation of health care services across all income groups. Health care reforms in Timor-Leste now need to focus on maximising the enabling factors associated with improved health care utilisation by improving access to secondary care to reduce these inequalities. This study further confirms that provision of free health services at the point of use is not always sufficient to ensure a more equitable distribution of health care service utilisation.

## Supplementary data

Supplementary data are available at International Health online (<https://academic.oup.com/inthealth>).

**Authors' contributions:** LG drafted the manuscript and participated in the interpretation of the analysis and the design of the study. RP performed the regression analysis and contributed to writing the manuscript. JM participated in the design and implementation of the data collection and helped in the interpretation of the analysis results. AA participated in the design and coordination of the study and helped write the manuscript. JAP participated in the design of the study and implementation of data collection. AH participated in the running and interpretation of the regression analysis. SJ participated in the design of the study and writing the manuscript. AS contributed to the design of the study and implementation of data collection. VW conceived the study, participated in its design and coordination, and helped write the manuscript.

**Acknowledgements:** We would like to thank all the health workers and community members for their time, contributions and support.

**Funding:** This research was funded by the Department of Foreign Affairs and Trade through the Australian Development Awards Scheme under an award titled 'An assessment of equity in health care financing in Timor-Leste and Fiji'. The views expressed in the publication are those of the authors and not necessarily those of the Department of Foreign Affairs and Trade or the Australian government. The Commonwealth of Australia accepts no responsibility for any loss, damage or injury resulting from reliance on any of the information or views contained in his publication.

**Competing interests:** None declared.

**Ethical approval:** The study was approved by the Human Research Ethics Committee of the University of New South Wales (HC13269) and the Timor-Leste Ministry of Health (MS/UNSW/VI/218).

## References

- United Nations. Transforming our world: the 2030 Agenda for Sustainable Development. New York: United Nations, 2015. <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>.
- Tangcharoensathien V, Patcharanarumol W, Ir P et al. Health-financing reforms in southeast Asia: challenges in achieving universal coverage. *Lancet* 2011;377(9768):863–73.
- Annear PL, Grundy J, Ir P et al. The Kingdom of Cambodia: Health System Review. Manila: World Health Organization Regional Office for the Western Pacific, 2015.
- Li C, Yu X, Butler JRG et al. Moving towards universal health insurance in China: performance, issues and lessons from Thailand. *Soc Sci Med* 2011;73(3):359–66.
- Hsiao WC, Shaw RP, Fraker A et al. Social health insurance for developing nations. Washington, DC: World Bank, 2007. [https://cdn1.sph.harvard.edu/wp-content/uploads/sites/100/2012/09/hsiao\\_and\\_shaw\\_2007\\_-\\_shi\\_for\\_developing\\_nations.pdf](https://cdn1.sph.harvard.edu/wp-content/uploads/sites/100/2012/09/hsiao_and_shaw_2007_-_shi_for_developing_nations.pdf).
- Lagomarsino G, Garabrant A, Adyas A et al. Moving towards universal health coverage: health insurance reforms in nine developing countries in Africa and Asia. *Lancet* 2012;380(9845):933–43.
- Simmonds A, Hort K. Institutional analysis of Indonesia's proposed road map to universal health coverage. Working paper 33. Nossal Institute for Global Health, University of Melbourne, 2013. [http://ni.unimelb.edu.au/\\_\\_data/assets/pdf\\_file/0004/834457/WP\\_33.pdf](http://ni.unimelb.edu.au/__data/assets/pdf_file/0004/834457/WP_33.pdf).
- Ministry of Health, Republic of Indonesia. Health financing and universal health coverage compilation of policy notes. Australia Indonesia Partnership for Health Systems Strengthening. Government of Indonesia & Australian Government, 2015.
- Ensor TIM, Cooper S, Ensor T. Review article Overcoming barriers to health service access: influencing the demand side. *Health Policy Plan* 2004;19(2):69–79.
- Jacobs B. The impact of the introduction of user fees at a district hospital in Cambodia. *Health Policy Plan* 2004;19(5):310–21.
- Jacobs B, Price NL, Oeun S. Do exemptions from user fees mean free access to health services? A case study from a rural Cambodian hospital. *Trop Med Int Health* 2007;12(11):1391–401.
- Masiye F, Kaonga O, Kirigia JM. Does user fee removal policy provide financial protection from catastrophic health care payments? Evidence from Zambia. *PLoS One* 2016;11(1):e0146508.
- Wagstaff A. Benefit-incidence analysis: are government health expenditures more pro-rich than we think? *Health Econ* 2012;21(4):351–66.
- Akazili J, Garshong B, Aikins M et al. Progressivity of health care financing and incidence of service benefits in Ghana. *Health Policy Plan* 2012;27(Suppl 1):i13–22.
- Ensor T, Cooper S. Overcoming barriers to health service access: influencing the demand side. *Health Policy Plan* 2004;19(2):69–79.
- Jacobs B, Ir P, Bigdeli M et al. Addressing access barriers to health services: an analytical framework for selecting appropriate interventions in low-income Asian countries. *Health Policy Plan* 2012;27(4):288–300.
- World Bank. Health equity and financial protection report – Timor-Leste. Washington, DC: World Bank, 2014. <http://documents.worldbank.org/curated/en/959881467992506455/pdf/103445-WP-P146116-Timor-Leste-Health-Equity-and-Financial-Protection-Report-FINAL-PUBLIC.pdf>.
- Babitsch B, Gohl D, von Lengerke T. Re-visiting Andersen's Behavioral Model Of Health Services Use: a systematic review of studies from 1998–2011. *Psychosoc Med* 2012;9:Doc11.
- Glei DA, Goldman N, Rodriguez G. Utilization of care during pregnancy in rural Guatemala: Does obstetrical need matter? *Soc Sci Med* 2003;57(12):2447–63.
- López-Cevallos DF, Chi C. Health care utilization in Ecuador: a multi-level analysis of socio-economic determinants and inequality issues. *Health Policy Plan* 2010;25(3):209–18.



- 21 Wiseman V, Scott A, Conteh L et al. Determinants of provider choice for malaria treatment: experiences from The Gambia. *Soc Sci Med* 2008;67(4):487–96.
- 22 Park JM. Equity of access under Korean universal health insurance. *Asia Pac J Public Health* 2015;27(2):NP914–24.
- 23 Chakraborty N, Islam MA, Chowdhury RI et al. Determinants of the use of maternal health services in rural Bangladesh. *Health Promot Int* 2003;18(4):327–37.
- 24 Abu-Bakar A, Samsudin S, Regupathi A et al. The effect of health insurance on health care utilization: evidence from Malaysia. Presented at the International Soft Science Conference 2016.
- 25 Morris, SA, Devlin, N, Parkin, D et al. *Economic analysis in healthcare*. Chichester: John Wiley & Sons, 2012.
- 26 Peters DH, Garg A, Bloom G et al. Poverty and access to health care in developing countries. *Ann N Y Acad Sci* 2008;1136(1):161–71.
- 27 World Bank. World Bank open data. <http://data.worldbank.org/> [accessed 27 October 2014].
- 28 Ministry of Finance, Timor-Leste. *Strategic Development Plan 2011–30*. Dili, Timor Leste: Ministry of Finance, 2011.
- 29 Taylor-Leech K. Language and identity in East Timor. *The discourses of nation building*. *Lang Probl Lang Plan* 2008;32(2):153–80.
- 30 McCall C. East Timor striving for universal access to health care. *Lancet* 2014;384(9953):1491–2.
- 31 Ministry of Health, Timor-Leste. *National Health Sector Strategic Plan 2011–2030*. Dilli, Timor Leste: Ministry of Health, 2011.
- 32 Andersen R. *A behavioral model of families' use of health services*. Chicago: Center for Health Administration Studies, 1968.
- 33 Aday LA, Andersen R. A framework for the study of access to medical care. *Health Serv Res* 1974;9(3):208–20.
- 34 Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. *Milbank Mem Fund Q Health Soc* 1973;51(1):95–124.
- 35 Ali KJ, Noman ANK. Determinants of demand for health care in Bangladesh: an econometric analysis. *World J Soc Sci* 2013;3(6):153–63.
- 36 Price J. 'I go I die, I stay I die. Better to stay and die in my house'. Understanding the barriers to accessing hospital services in Timor-Leste. *BMC Health Serv Res* 2016;16(1):535.
- 37 Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Heal Soc Behav* 1995;36(1):1–10.
- 38 Subramanian SV, Delgado I, Jadue L et al. Income inequality and health: multilevel analysis of Chilean communities. *J Epidemiol Community Health* 2003;57(11):844–8.
- 39 Daniels MJ, Gatsonis C. Hierarchical generalized linear models in the analysis of variations in health care utilization. *J Am Stat Assoc* 1999;94(445):29–42.
- 40 Khan U, Janjua N, Akhtar S et al. Case-control study of risk factors associated with hepatitis C virus infection among pregnant women in hospitals of Karachi Pakistan. *Trop Med Int Heal* 2008;13(6):754–61.
- 41 Hosmer D, Lemeshow S. *Applied logistic regression*. Hoboken, NJ: John Wiley & Sons, 2000.
- 42 Fabricant S. *Economic inputs to the Timor Leste Health Design*. Canberra: Health Resource Facility for Australia's Aid Program, 2013.
- 43 Hoffer CR, Schuler EA. Measurement of health needs and health care. *Am Sociol Rev* 1948;13(6):719.
- 44 Fries JF, Koop CE, Sokolov J et al. Beyond health promotion: reducing need and demand for medical care. *Health Aff* 1998;17(2):70–84.
- 45 Ooms G, Van Damme W, Baker BK et al. The 'diagonal' approach to Global Fund financing: a cure for the broader malaise of health systems? *Global Health* 2008;4:6.
- 46 Asante AD, Martins N, Otim ME et al. Retaining doctors in rural Timor-Leste: a critical appraisal of the opportunities and challenges. *Bull World Health Org* 2014;92(4):277–82.
- 47 Bohren MA, Hunter EC, Munthe-Kaas HM et al. Facilitators and barriers to facility-based delivery in low- and middle-income countries: a qualitative evidence synthesis. *Reprod Health* 2014;11:71.
- 48 Atuoye KN, Dixon J, Rishworth A et al. Can she make it? Transportation barriers to accessing maternal and child health care services in rural Ghana. *BMC Health Serv Res* 2015;15:333.
- 49 World Bank. World Bank open data <http://data.worldbank.org/>.