

Measuring catastrophic costs due to tuberculosis in Viet Nam

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SUMMARY

INTRODUCTION: Progress towards ending tuberculosis (TB) in Viet Nam includes monitoring the costs borne by patients through periodic facility-based surveys.

OBJECTIVE: To document the magnitude of costs incurred by TB-affected households and establish a baseline for the top End TB indicator in Viet Nam.

METHODS: A national survey with retrospective data collection and projection among 735 participants in 20 stratified clusters was conducted in 2016. Each patient was interviewed on costs, time loss, coping measures and asset ownership. Total costs were expressed as a proportion of annual household income.

RESULTS: In Viet Nam, 63% of households affected by TB or multidrug-resistant TB (MDR-TB) experienced costs that were >20% of their annual household

income. The mean patient costs were respectively US\$1054 and US\$4302 per episode of TB and MDR-TB. The most significant drivers of mean costs were income loss reported and purchase of special foods, nutritional supplements, travel and accommodation.

CONCLUSIONS: The proportion of households experiencing catastrophic total costs due to TB in Viet Nam is high, which poses a barrier to TB diagnosis and treatment. Based on study results, programme and partners need to identify key areas for policy action and work towards a national policy guide on intervention to reduce TB patient costs.

KEY WORDS: TB; cost; catastrophic; patient costs; Viet Nam

VIET NAM is a lower middle-income country and ranks fifteenth among the 30 countries with the highest tuberculosis (TB) incidence globally.¹ Ending TB in Viet Nam will require health and social policies that remove barriers to diagnosis, treatment and adherence in affected patients.² Financial and economic barriers are high among TB and multidrug-resistant TB patients (MDR-TB).³ Studies from other countries have shown that TB episode costs can represent up to half of their annual income.⁴ While some patient costs may remain unknown to policy makers, they are very real and tangible for patients and their families.³ To overcome access and adherence barriers, as well as to minimise the economic burden for TB patients, it is therefore essential to address both direct and indirect costs. Interventions are needed to address high medical costs, as well as costs of food and transport, and lost earnings. Both health financing and delivery models, as well as social protection mechanisms (such as job protection, paid sick leave, social welfare payments, or other transfers in cash or kind), therefore need to be considered.²

Costs faced by patients affected by TB were not

systematically monitored in Viet Nam or in other high TB burden countries before 2015. The End TB Strategy (2015–2030) includes among its top three targets the elimination of catastrophic costs due to TB faced by TB patients or their households, a target to be achieved by 2020.⁵

Since 2000, the Vietnamese government has created and adjusted health financing policies to improve equity, efficiency and development. The broad orientation of health financing was decided upon in the 1990s through the development of a health insurance scheme and decentralisation of public finances. In 2014, Viet Nam spent 13 billion US dollars (\$US) in health care, US\$142 per capita, of which 37% were out-of-pocket expenditures by households.⁶ These levels, much higher than the 15% benchmark associated with likely worsening of financial protection levels, point to a higher probability of Vietnamese households incurring large health expenditures. TB remains a high priority health programme in Viet Nam with considerable political leadership and funding. Sputum smear TB diagnostic testing and first-line anti-tuberculosis

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drugs are provided free of charge to all TB patients. Ancillary drugs and hospitalisation fees are either covered by the Global Fund Project, Social Health Insurance (SHI) or are paid out-of-pocket by households. By 2020, it is expected that all Vietnamese citizens will be covered by SHI, which will compensate for the financial burden associated with the diagnosis and treatment of TB.

The Viet Nam National TB Control Programme (NTP) collaborated with the World Health Organization (WHO) to conduct the first national survey on the costs borne by TB-affected patient households. The survey was among the first to apply the new WHO-recommended protocol and to adapt its instrument.⁷ The objectives of the present study were to identify the main cost drivers to help guide cost mitigation policies and reduce financial barriers to care and treatment adherence and to establish a baseline for the WHO End TB indicator of zero TB-affected households with catastrophic costs in Viet Nam.

STUDY POPULATION AND METHODS

The survey design, objective and methodology were adapted from the WHO protocol.⁷ A national-level cross-sectional survey with retrospective data collection and projection was proposed for the present study. We used the cluster sampling probability proportional to 2015 notifications, enhanced by stratification by three zones (North, Central, South). The sample size was 720 TB patients in 20 clusters (district TB units, DTUs). The survey population included all patients (including children accompanied by a guardian) who were on drug-susceptible (DS-TB) or MDR-TB treatment in the sampled DTUs. All consenting patients on treatment for over 14 days during the survey period (July–October 2016) were eligible.⁷

Each patient was interviewed once and reported retrospectively on costs, time loss, coping measures and asset ownership during the current phase. For patients interviewed during their intensive phase of TB or MDR-TB treatment, data on pre-diagnosis costs and time loss were collected. Extrapolation for time and costs within the phase, beyond it and until planned treatment completion using median values reported by survey patients allowed us to capture diagnosis and treatment costs borne by patients per TB or MDR-TB episode, defined as the period from self-reported onset of TB-related symptoms until the end of treatment or death. Results reporting was adjusted for sampling design.

Patient costs

Paper-based data were collected based on an adapted WHO generic instrument.⁸ The questionnaire comprised patient information, questions on resource

utilisation, time spent seeking and receiving care, direct medical, direct non-medical and indirect costs, household and individual income and coping mechanisms. Patients were asked only about their current treatment phase to minimise recall bias.

Count of poor households

We counted the number of TB-affected households with a daily reported household income below the poverty line ('extreme poverty' defined as US\$ 1.90 at 2011 purchasing power parity) before and after the disease.⁹ The count was based on income reported pre-diagnosis and at the time of treatment (intensive or continuation). We converted to current Vietnamese dong and inflated to 2015 levels using the Consumer Price Index.¹⁰

Income

In addition to cost data collected at the facility level, we collected and estimated two alternative measures of living standards for the affected households. One used reported monthly household income, and the second derived an estimate based on reported asset ownership and dwelling characteristics. Asset questions were designed based on the 2014 Vietnamese Living Standards Survey using items that best predicted annual household income.¹¹

Extrapolation

Following WHO methodology,⁷ a single interview was administered per patient at a single point during the disease episode (after a minimum of 14 days into the treatment phase). The median direct costs for DS-TB and MDR-TB survey participants per phase were calculated and used to extrapolate direct costs for the phase not reported. In the sensitivity analysis, the use of mean values instead of the median was explored.

Catastrophic costs

Each household was given a binary value for whether or not they had incurred catastrophic total costs due to TB, as defined by the WHO threshold of 20% of the annual income.⁸ In addition, other cut-offs were used for the sensitivity analysis and for varying thresholds by income quintile. The relationship between catastrophic costs and the perception of the seriousness of cost impact was examined.

Coping with the disease

The study also aimed to assess 'dissaving' among TB-affected households. The correlation between high total cost due to TB illness in relation to income and seemingly irreversible coping strategies was examined and informed the fine-tuning of WHO survey methodology.⁸

Data management and analysis

Paper data collection was uploaded by the central

Table 1 Descriptive statistics and selected sociodemographic characteristics of the National TB Patients Costing Survey by MDR-TB status and overall, Viet Nam, 2016

Variables	MDR-TB (n = 58) n (%)	DS-TB (n = 677) n (%)	All (n = 735) n (%)
Sex			
Male	47 (81.0)	511 (75.4)	558 (75.9)
Female	11 (19.0)	166 (24.6)	177 (24.1)
Age, years, median [IQR]	41 [31–51]	48 [35–58]	47 [35–58]
Phase			
Intensive	24 (41.4)	336 (49.6)	360 (49.0)
Continuation	34 (58.6)	341 (50.4)	375 (51.0)
Recorded HIV status			
Positive	3 (5.1)	7 (1.0)	10 (1.4)
Negative	54 (93.2)	597 (88.2)	651 (88.5)
Unknown	1 (1.7)	73 (10.8)	74 (10.1)
Retreatment status			
New	16 (27.6)	633 (93.5)	649 (88.3)
Retreatment/relapse	42 (72.9)	44 (6.5)	86 (11.7)
Reported monthly household income pre-TB, mean (95%CI)	368 (293–442)	318 (271–364)	322 (275–369)
Sociodemographic characteristics of survey sample, %			
Patient's education status			
Not yet started school	3.5	3.4	3.4
Primary school	24.6	32.0	31.4
Secondary school	47.4	33.4	34.5
High school and above	24.7	31.2	30.6
Patient was main income earner before disease	54.6	53.2	53.3
Occupation pre-disease			
Government officer	0	4.2	3.8
Private/NGO officer	24.6	20.4	20.7
Self-employed	36.8	42.2	41.8
No primary employment/other	38.6	33.2	33.7
Proportion living under poverty line, % (95%CI)	3.4 (4.1–22)	3.8 (1.2–11)	3.7 (1.3–10)

TB = tuberculosis; MDR-TB = multidrug-resistant TB; DS-TB = drug-susceptible TB; IQR = interquartile range; HIV = human immunodeficiency virus; CI = confidence interval; NGO = non-governmental organisation.

NTP unit into an internet-based mobile data collection and management system. All data cleaning and analysis was performed using Stata 13.0 (StataCorp, College Station, TX, USA). The WHO's standardised analytical approach and associated generic analysis programme were adapted.¹² Recommended minimum reporting outputs were followed to allow upcoming cross-country comparisons.⁸ Sociodemographic characteristics of TB and MDR-TB patients included in the survey, as well as the model of care of survey sample, are described below.

Ethics approval

The study protocol was approved by the Institutional Review Board of the National Lung Hospital, Hanoi, Viet Nam, and the WHO Western Pacific Office Ethics Review Board, Manila, The Philippines.

RESULTS

Table 1 shows descriptive statistics for the study population. All 735 sampled patients (677 DS-TB cases and 58 MDR-TB cases) agreed to participate in the survey. Of these, 558 (75.9%) were male; 49% were in the intensive phase of treatment. Average reported monthly household income before TB diagnosis was US\$322.

In 2016, MDR-TB patients had on average 675 (95% confidence interval [CI] 255–1093) visits to the health post (for directly observed treatment [DOT], follow-up, drug pick-up or to seek diagnosis) and experienced 8.2 weeks (95%CI 1.1–15.4) of treatment delay. Conversely, DS-TB patients visited a health facility 77 times during treatment and had 6.4 weeks (95%CI 5.0–7.2) of treatment delay. MDR-TB patients devoted on average 1596 h (95%CI 1264–1926) in seeking or receiving treatment, compared with 413 h (95%CI 323–503) by DS-TB patients (Table 2).

Households with DS-TB patients incurred a mean cost of US\$1054 (95%CI 917–1191) for the episode. Income change accounted for US\$508 (95%CI 403–613), followed by travel, accommodation, food and nutritional supplements for US\$412, with medical costs amounting to US\$134. MDR-TB-affected households incurred on average US\$4302 throughout the episode. Travel, accommodation, food and nutritional supplements accounted for the largest share (US\$2134) of these costs, followed by income changes (US\$1376). Medical costs amounted to US\$791, an equivalent to 2.1 months of monthly household income. Table 3 shows that patient costs are normally distributed, with extremely high non-medical pre-diagnosis costs and household income

Table 2 Model of care and hours lost seeking or accessing care according to the National TB Patients Costing Survey, Viet Nam, 2016

	MDR-TB (n = 58) mean (95%CI)	DS-TB (n = 677) mean (95%CI)	All (n = 735) mean (95%CI)
Hospitalisation			
Hospitalised at time of interview, %	1.5 (0.1–17)	0.5 (0.8–2.7)	0.5 (0.2–1.7)
Hospitalised during current phase, %	48 (25–72)	9 (5.7–14)	12 (8.6–17)
Time hospitalised during current phase, days	20 (7.5–32)	20 (9.3–30)	20 (9.5–30)
Time hospitalised in previous episodes, days	26 (–)*	32 (28–36)	30 (22–38)
Ambulatory care			
Number of visits per episode: total	675 (255–1093)	77 (49–106)	126 (70–181)
Number of visits: DOT	453 (294–611)	58 (29–86)	90 (47–133)
Number of visits: follow-up	18 (11–26)	2.4 (1.3–3.4)	3.6 (2.6–4.7)
Number of visits: drug pick up	203 (0–523)	16 (5.4–28)	32 (0–66)
Number of visits pre-diagnosis [†]	0.6 (0.01–1.2)	2.0 (1.5–2.6)	1.9 (1.4–2.5)
Number of visits pre-diagnosis (private facility) [‡]	0	2.0 (0.8–3.1)	2.0 (0.8–3.1)
Treatment duration			
Intensive phase, months	7.1 (6.3–7.7)	2.1 (2.0–2.1)	2.5 (2.4–2.6)
Continuation phase, months	12.9 (12–13)	4.1 (4.0–4.2)	4.8 (4.6–5.1)
Treatment delay, weeks			
	8.2 (1.1–15.4)	6.4 (5.0–7.2)	6.2 (5.0–7.4)
Time lost seeking or accessing care and reported individual income			
Time lost by patient, h	1596 (1264–1926)	413 (323–503)	509 (415–602)
Time lost by care giver, h	196 (94–298)	29 (5.3–54)	43 (19–67)
Working hours lost: intensive phase minus before TB	8.9 (1.1–17)	15 (10–20)	15 (9.2–20)
Working hours lost: continuation phase minus before TB	15 (8.9–20)	22 (16–28)	21 (16–27)
Individual monthly (labour) income reported by patient, \$US			
Pre-diagnosis	200 (142–258)	150 (117–183)	155 (123–186)
At time of interview	132 (0–338)	98 (49–148)	102 (44–158)

* Missing standard error because of stratum with single sampling unit.

[†] Public and private.[‡] Includes pharmacy/drugstore, herbalist/traditional practitioners, private clinic, private hospital.

TB = tuberculosis; MDR-TB = multidrug-resistant TB; CI = confidence interval; DS-TB = drug-susceptible TB; DOT = directly observed treatment.

for MDR-TB, which affected the mean and width of the CIs. A breakdown of best estimate costs from symptom onset to treatment initiation is given in Figure 1.

Coping strategies used by households to alleviate the economic burden and social consequences, such as food insecurity, school disruption, divorce, work days lost and social exclusion, are shown in Table 4.

More than one third resorted to borrowing, using savings or selling assets. TB-affected households also reported a loss of work days (74%), loss of jobs (18%) and household food insecurity (22%).

A comparison of the total costs described above and annual household income showed that 63% of all households affected by either TB or MDR-TB faced disease costs that were >20% of their income (Table

Table 3 Estimated mean total costs borne by TB-affected households in Viet Nam, 2016 \$US*[†]

Costs	MDR-TB (n = 57) mean (95%CI)	DS-TB (n = 672) mean (95%CI)	All (n = 729)* mean (95%CI)
Pre-diagnosis			
Medical	155 (148–161)	40 (31–49)	63 (58–67)
Non-medical*	165 (45–285)	40 (26–55)	50 (34–66)
Post-diagnosis			
Medical	636 (399–874)	94 (64–124)	137 (94–180)
Travel	394 (87–699)	36 [17–55]	65 (31–98)
Accommodation	43 (3–82)	4.7 (1.3–8.2)	7.8 (3.2–12)
Food	1058 (876–1240)	230 (174–285)	296 (219–373)
Nutritional supplements	474 (226–723)	100 (61–140)	131 (93–167)
Non-medical	1969 (1424–2514)	371 (272–471)	500 (384–615)
Household income loss	1376 (619–2134)	508 (403–613)	577 (473–683)
Total medical costs	791 (552–1030)	134 (95–172)	186 (136–237)
Total non-medical costs	2134 (1524–2745)	412 (312–514)	550 (441–659)
Total indirect costs: household income loss	1376 (619–2134)	508 (403–613)	577 (473–683)
Total costs	4302 (2923–5681)	1054 (917–1191)	1314 (1120–1508)

* n = 729 reported instead of 735 as per the 'output approach' of reporting indirect costs and total costs.

[†] All costs converted to US dollars (\$US) using the average annual exchange rate during the data collection period.

TB = tuberculosis; MDR-TB = multidrug-resistant TB; CI = confidence interval; DS-TB = drug-susceptible TB.

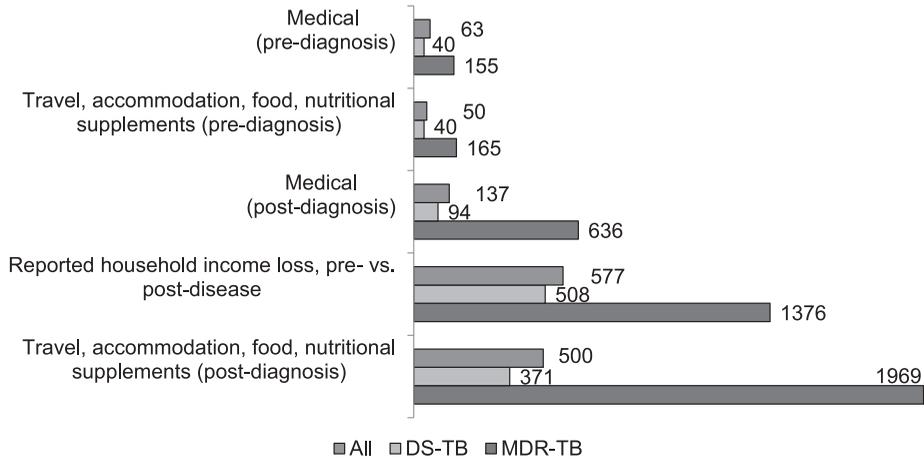


Figure 1 Estimated mean total costs borne by TB-affected patients, Viet Nam, 2016 (in 2016 \$US). * *Based on reported income pre- minus post-TB loss to measure indirect costs, National TB Patients Costing Survey, Viet Nam, 2016. DS-TB = drug-susceptible tuberculosis; MDR-TB = multidrug-resistant TB.

5). Not surprisingly, catastrophic costs affected the poorest quintile (83%) disproportionately compared with the wealthiest (41%). This difference was primarily driven by the difference in lost income, whereas direct costs did not increase significantly across quintiles (not shown). When stratifying results by resistance status, the proportion rose to 98% for MDR-TB and fell to 60% for DS-TB.

Overall, 27.7% of households perceived the financial impact of anti-tuberculosis treatment as serious and very serious (Table 4). To classify this same proportion of households as catastrophic, we would have to set our threshold at 50% of annual household income (Figure 2). Table 5 shows the proportion of households that experienced direct medical costs that exceeded various proportions of annual household income (68%, 95%CI 62–75 vs. 63%, 95%CI 58–67).

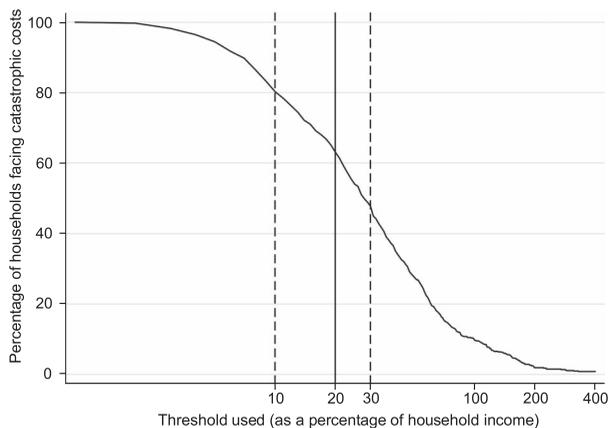


Figure 2 Impact of changing threshold to define catastrophic costs with proportion of catastrophic costs among households affected by TB or MDR-TB, National TB Patients Costing Survey, Viet Nam, 2016 (n = 735). TB = tuberculosis; MDR-TB = multidrug-resistant TB.

Breadwinners had higher costs and a higher proportion of catastrophic costs than non-breadwinners. The mean total cost for breadwinners was higher (US\$1178 vs. 973 and US\$4422 vs. 4282 for DS-TB and MDR-TB, respectively). Before being affected by the disease, 3.7% (95%CI 1.3–10) of households (MDR-TB, 3.4% and DS-TB, 3.8%) were extremely poor (Table 1). After the disease struck, 21.3% of households (MDR-TB, 74% and DS-TB, 16.7%) fell below the poverty line (data not shown).

DISCUSSION

Our study shows that catastrophic costs continue to affect TB patients in Viet Nam, most predominantly the poor, which increases inequities. Comparison with a previous assessment showed that the mean episode cost for DS-TB in 2016 was only slightly higher than in 2010 (US\$1054 vs. US\$1021). The proportion of indirect costs with respect to the total cost of the episode is now lower (44% in 2016 vs. 84% in 2010),¹³ regardless of the method used to estimate indirect costs. This reduction may result from policy changes after 2011 intended to reduce travel, accommodation and hospitalisation costs for TB patients and guardians. These included private-public mix initiatives, shortening of DS-TB regimens from 8 to 6 months, an expansion of the Viet Nam NTP network and initial provision of socio-economic support to TB patients in each district.¹³ For DS-TB patients, recourse to coping mechanisms did not change substantially from 2010 to 2016. One in four TB-affected households resorted to loans in 2016, compared with 17% in 2010, and only around 5% sold assets in 2010 and 2016 to compensate for TB-related costs. In 2016, a larger proportion of households fell below the poverty line compared with 6 years before.

Table 4 Proportion of TB-affected households reporting dissaving mechanisms and social consequences, Viet Nam, 2016

	Income quintiles					Overall % (95%CI)
	Poorest % (95%CI)	Moderately poor % (95%CI)	Average % (95%CI)	Moderately wealthy % (95%CI)	Wealthiest % (95%CI)	
'Dissaving' strategies						
Loan	36 (24–49)	36 (24–49)	29 (19–41)	21 (14–30)	13 (6.2–26)	25 (18–33)
Use of savings	21 (5–53)	15 (3–48)	15 (4.9–39)	13 (5.6–26)	17 (8.6–31)	16 (5.0–38)
Sale of assets	5.1 (2.4–10)	6.4 (4.0–10)	6.4 (3.3–12)	5.7 (1.8–16)	5.3 (1.4–17)	5.8 (4.0–8.2)
Any of the three above	42 (28–58)	47 (37–57)	38 (24–53)	36 (27–45)	27 (21–34)	38 (30–46)
Food insecurity	40 (19–66)	27 (15–45)	26 (6.5–63)	16 (4.8–43)	4.2 (0.1–19)	22 (8.7–49)
Divorce or separated from spouse/partner	0	1 (2–8)	0.57 (0.05–5.7)	1.3 (0.1–10)	0	0.7 (0.05–2)
Loss of job	9.6 (3.6–23)	14 (5–35)	19 (10–32)	20 (14–27)	27 (11–53)	18 (9.8–30)
Child interrupted schooling	0.7 (0.07–6.1)	4.5 (1.3–14)	2.1 (6–7.2)	100 (–)	0.73 (0.36–13)	1.6 (0.05–4.6)
Social exclusion	0	0	0	0	0	0
Any days of work lost	59 (49–69)	71 (55–82)	78 (68–85)	84 (76–90)	80 (72–86)	74 (70–78)
Self-reported impact						
No impact	8.8 (4.6–16)	12 (5.6–25)	14 (7.3–25)	18 (10–28)	19 (11–30)	14 (8.9–22)
Little impact	23 (10–43)	22 (13–36)	27 (12–50)	26 (13–41)	27 (15–45)	25 (15–38)
Moderate impact	37 (22–56)	32 (18–51)	30 (18–47)	36 (21–55)	32 (20–48)	34 (22–48)
Serious impact	23 (16–34)	27 (19–36)	26 (17–37)	19 (12–29)	17 (5.7–40)	23 (16–30)
Very serious impact	7.8 (2–27)	6.7 (1–33)	2.4 (0.5–11)	2.5 (0.6–10)	4.5 (0.6–26)	4.7 (1.0–19)
Household received social protection after TB diagnosis	4.5 (0.9–19)	6.2 (2–15)	6.3 (2–21)	8.1 (3.7–17)	7.3 (1.8–25)	6.5 (2.9–14)

TB = tuberculosis; CI = confidence interval.

The main cost drivers behind the substantial episode costs in 2016 were different for DS-TB and MDR-TB: non-medical costs in the case of MDR-TB patients and household income loss for DS-TB patients. This is partly explained by the WHO methodology: income loss was capped at 12 months,

while non-medical costs were extrapolated for the treatment (i.e., 2 months for MDR-TB). The disconnection between the proportion of households with costs >20% of their annual income and that of households with perceived impact of 'serious' or 'very serious' needs to be further investigated.

Table 5 Proportion of TB-affected households who experienced catastrophic costs, Viet Nam, 2016

Threshold	Income quintiles					Overall % (95%CI)
	Poorest % (95%CI)	Moderately poor % (95%CI)	Average % (95%CI)	Moderately wealthy % (95%CI)	Wealthiest % (95%CI)	
Proportion of households experiencing costs above various thresholds of annual income						
20%	83 (72–91)	69 (58–78)	60 (48–71)	57 (42–70)	41 (32–50)	63 (58–67)
30%	70 (56–81)	52 (40–65)	44 (28–61)	40 (25–55)	29 (15–48)	48 (40–55)
40%	54 (35–72)	41 (30–54)	32 (19–47)	27 (21–33)	17 (7.6–32)	35 (26–45)
Proportion of households experiencing direct medical costs above various thresholds of annual household income						
10%	37.6 (20–58)	13.4 (7.5–23)	9.7 (4.9–18)	7.5 (4.0–14)	4.8 (0.9–22)	15 (10–22)
20%	21 (11–37)	7.7 (4.1–14)	4.8 (1.8–12)	3.3 (0.7–14)	1.6 (0.2–12)	7.9 (4.7–13)
40%	9.9 (4.2–21)	3.7 (1.3–10)	0	0	0	2.8 (1.0–7.4)
Proportion of households experiencing total costs above various thresholds of annual income, MDR-TB						
20%	100 (–)*	100 (–)*	100 (–)	100 (–)*	89 (16–99)	98 (73–99)
30%	100 (–)*	100 (–)*	100 (–)	100 (–)*	89 (16–99)	98 (73–99)
40%	100 (–)*	100 (–)*	100 (–)*	77 (0.9–100)	68 (8.4–98)	89 (53–98)
Proportion of households experiencing direct medical costs above various thresholds of annual household income, MDR-TB						
10%	100 (–)*	100 (–)*	100 (–)*	47 (0.9–99)	38 (5.7–86)	77 (58–89)
20%	100 (–)*	64 (17–94)	85.4 (–)*	24 (0.7–94)	11 (0.5–74)	56.2 (41.6–70.7)
40%	62 (14–94)	30 (6.1–73)	0	0	0	21.3 (12–35)
Proportion of households experiencing total costs above various thresholds of annual income, DS-TB						
20%	82 (71–89)	66 (56–75)	58 (46–69)	53 (38–67)	36 (29–44)	59.6 (55–64)
30%	67 (53–78)	47 (35–60)	41 (25–58)	34 (20–51)	23.3 (11–42)	43 (36–51)
40%	49.7 (30–70)	35 (24–47)	28.7 (17–44)	22 (17–28)	11.7 (6.0–21)	30 (22–38)
Proportion of households experiencing direct medical costs above various thresholds of annual household income, DS-TB						
10%	31.6 (15–55)	3.9 (1.8–7.8)	5.2 (2.7–10)	3.9 (1.5–10)	1.6 (0.1–16)	9.5 (5.3–17)
20%	13.5 (4.5–34)	1.6 (2.6–8.9)	0.7 (.03–15)	1.4 (0.3–6.0)	0.9 (0.7–8.2)	3.7 (1.1–11)
40%	4.9 (0.7–26)	0.8 (0.1–7.8)	0	0	0	1.2 (0.2–6.0)

* Missing standard error because of stratum with single sampling unit or one row category.

TB = tuberculosis; CI = confidence interval; MDR-TB = multidrug-resistant TB; DS-TB = drug-susceptible TB.

Our study contributes to the WHO's global monitoring of the End TB indicator, alongside other countries implementing WHO survey methodology.^{7,8} In Asia, the proportion of TB-affected households with catastrophic costs was 35% in the Philippines,¹ 36% in Indonesia,¹⁴ 60% in Myanmar¹ and 63% in Viet Nam.

Policy dissemination and recommendations

Building on these results, the NTP has defined a roadmap for 2017–2020 involving non-health actors to address access barriers, an operational research plan and a commitment to periodically monitor TB patient costs. The roadmap aims to enable policy guidance and interventions to reduce and compensate for patients' costs. It includes the establishment of a charity fund for TB patients, strengthening the collaboration between the Ministry of Health and the Ministry of Labour and Social Affairs, costing of ambulatory TB services for inclusion in the SHI and advocating for donor support for TB-specific patient support. Measures put in place are described elsewhere.¹

Given the high post-disease costs associated with nutritional supplements, additional food, travel and accommodation, the removal of (or a reduction in) any one of the abovementioned costs would lower the financial burden imposed on patients. Planned interventions need to bring care closer to the patient (active case finding, contact investigation or partnership with public and private providers), eliminate medical costs (comprehensive package for ambulatory care) and reduce income losses due to TB (advocate for SHI coverage and inclusion of TB-specific social protection elements in upcoming donor applications). Improved selection of DOT providers, use of video-observed treatment, employment of precision medicine to inform the use of shorter MDR-TB regimens or the use of bedaquiline or an effective application of an Internet-based information system would contribute to lowering the financial and economic barriers to TB care.

Limitations

Our study had four main limitations. First, resources were not sufficient in 2016 to improve upon the basic WHO-recommended cross-sectional survey design. Including a second interview would have allowed us to validate evidence and replace crude extrapolation methods. For the larger cost drivers such as non-medical costs, post-diagnosis assumptions would have benefited from validation. Second, following a WHO survey design, the survey targeted patients accessing care at public or private facilities within the NTP network.⁸ While none of the sampled facilities were private, the pre-diagnosis pathway included private providers. Patients who seek care in the private sector may face different costs and may have

different socio-economic status. Third, as no additional questions were posed to non-breadwinners during data collection to mitigate reporting bias, the costs for half of the sample were systematically under-reported, reinforcing the conservativeness of results presented. Fourth, itemised medical costs were not reported comprehensively. Lessons learnt in this survey can be used in the next repeat survey to monitor progress against the 2016 baseline.

CONCLUSIONS

The proportion of TB-affected households facing costs of more than 20% of their annual income in Viet Nam is high, posing unnecessary barriers to access diagnosis and treatment. The Viet Nam NTP and its partners should pay increasing attention to alleviating the financial and economic burden experienced by households affected by TB and MDR-TB.

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References

- 1 World Health Organization. Global tuberculosis report, 2017. Geneva: WHO/HTM/TB/2017.23. Geneva, Switzerland: WHO, 2017.
- 2 Lönnroth K, Glaziou P, Weil D, Floyd K, Uplekar M, Raviglione M. Beyond UHC: monitoring health and social protection coverage in the context of tuberculosis care and prevention. *PLOS Med* 2014; 11: e1001693.
- 3 Hirotsugu A. Hidden out-of-pocket payments can burden patient's families but are under-recognized. *BMJ* 2015; 351: h4990.
- 4 Tanimura T, Jaramillo E, Weil D, Raviglione M, Lönnroth K. Financial burden for tuberculosis patients in low- and middle-income countries: a systematic review. *Eur Respir J* 2014; 43: 1763–1775.
- 5 World Health Organization. End TB Strategy. Geneva, Switzerland: WHO, 2017. http://www.who.int/tb/post2015_strategy/en/ Accessed May 2018.
- 6 World Health Organization. Global health expenditure database. Geneva, Switzerland: WHO, 2017. <http://apps.who.int/nha/database> Accessed May 2018.
- 7 World Health Organization. Protocol for survey to determine direct and indirect costs due to TB and to estimate proportion of TB-affected households experiencing catastrophic total costs due to TB field testing version. Geneva, Switzerland: WHO,

2015. http://www.who.int/tb/advisory_bodies/impact_measurement_taskforce/meetings/tf6_background_5a_patient_cost_surveys_protocol.pdf Accessed May 2018.
- 8 World Health Organization. Tuberculosis patient cost surveys: a handbook. Geneva, Switzerland: WHO, 2017. http://www.who.int/tb/publications/patient_cost_surveys/ Accessed May 2018.
- 9 World Bank. Ending extreme poverty and sharing prosperity: progress and policies. Policy Research Note No 3. Washington DC, USA: World Bank, 2015. <http://www.worldbank.org/en/research/brief/policy-research-note-03-ending-extreme-poverty-and-sharing-prosperity-progress-and-policies> Accessed May 2018.
- 10 World Bank. Consumer price index. In: The World Bank Data. Washington DC, USA: World Bank, 2017. <https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=VN> Accessed May 2018.
- 11 General Statistics Office of Viet Nam. Household living standards survey 2014. Hanoi, Viet Nam: GSO, 2016. http://www.gso.gov.vn/default_en.aspx?tabid=515&idmid=5&ItemID=18411 Accessed May 2018.
- 12 Siroka A, Garcia Baena I. Tuberculosis patient cost survey: generic analysis. Geneva, Switzerland: World Health Organization, 2016.
- 13 Mauch V, Bonsu F, Gyapong M, et al. Free tuberculosis diagnosis and treatment are not enough: patient cost evidence from three continents. *Int J Tuberc Lung Dis* 2013; 17: 381–387.
- 14 Fuady A, Houweling T A J, Mansyur M, Richardus J H. Catastrophic total costs in tuberculosis-affected households and their determinants since Indonesia's implementation of universal health coverage. *Infect Dis Poverty* 2018; 7: 3.

R É S U M É

INTRODUCTION : Les progrès vers l'élimination de la tuberculose (TB) au Viet Nam incluent le suivi des coûts à la charge des patients à travers des enquêtes périodiques basées dans des structures de santé.

OBJECTIF : Documenter l'ampleur des coûts supportés par les ménages affectés par la TB et déterminer une mesure de référence pour l'un des trois indicateurs principaux de la Stratégie pour mettre fin à la TB au Viet Nam.

MÉTHODE : Une enquête nationale avec recueil rétrospectif de données et projection a été réalisée en 2016 auprès de 735 participants stratifiés en 20 grappes. Chaque patient a été interrogé à propos des coûts, de la perte de temps, des mesures d'adaptation et de sa possession de biens. Les coûts totaux ont été exprimés en pourcentage du revenu annuel du foyer.

RÉSULTATS : Des ménages affectés par la TB ou la TB

multirésistante (TB-MDR) au Viet Nam, 63% ont subi des coûts qui ont dépassé 20% de leur revenu annuel. Le montant moyen par patient a été de US\$1054 et US\$4302 par épisode de TB et de TB-MDR, respectivement. Les principaux facteurs des coûts moyens sont la perte de revenus ainsi que l'amélioration de l'alimentation et les suppléments nutritionnels, les frais de déplacement et de logement.

CONCLUSION : La proportion de foyers subissant des coûts totaux catastrophiques à cause de la TB au Viet Nam est élevée et entrave le diagnostic et le traitement de la TB. Devant ces résultats, le programme et ses partenaires doivent identifier les domaines majeurs d'action politique et de travail vers un guide national de politique consacré à une intervention de réduction des coûts de la TB pour les patients.

R E S U M E N

MARCO DE REFERENCIA: El progreso hacia el fin de la tuberculosis (TB) en Viet Nam incluye la supervisión de los costos asumidos por los pacientes, mediante encuestas periódicas realizadas en los establecimientos de salud.

OBJETIVO: Documentar la magnitud de los costos contraídos por los hogares afectados por la TB y definir un valor de referencia en Viet Nam, para el indicador del objetivo la Estrategia Fin a la Tuberculosis de que no haya ninguna familia que haga frente a costos catastróficos debido a esta enfermedad.

MÉTODOS: En el 2016 se llevó a cabo una encuesta nacional con recogida de datos retrospectivos y proyecciones a 735 participantes estratificados en 20 conglomerados. Se interrogó a cada paciente sobre los costos, el tiempo perdido, las medidas para hacerles frente y la propiedad de bienes. Los costos totales se expresaron como un porcentaje del ingreso familiar anual.

RESULTADOS: Un 63% de los hogares afectados por la TB o la TB multirresistente (TB-MDR) en Viet Nam afrontó costos superiores al 20% de su ingreso familiar anual. El costo promedio individual por episodio de TB fue de US\$1054 y de US\$4302 por episodio de TB-MDR. Los principales factores que determinaron los costos fueron la pérdida de ingresos referida, la alimentación especial, los complementos nutricionales y los gastos de transporte y alojamiento.

CONCLUSIONES: En Viet Nam, una proporción considerable de hogares afronta costos totales extremadamente altos debido a la TB, lo cual genera obstáculos al diagnóstico y el tratamiento de la enfermedad. Según estos resultados, es preciso que el programa y los asociados definan las principales esferas que exigen políticas públicas y trabajen en la elaboración de una orientación de las políticas nacionales de intervención encaminadas a disminuir los costos a los pacientes con TB.