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Measuring income for catastrophic cost estimates: Limitations and policy implications of current approaches

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ABSTRACT

There is increasing global policy interest in estimating catastrophic costs incurred by households because of ill health, and growing need for information on disease-specific household cost data. There are several methodological approaches used to estimate income and no current consensus on the best method for estimating income in the context of a survey at the health facility. We compared six different approaches to estimate catastrophic cost among patients attending a health facility in South Africa. We used patient cost and income data collected June 2014–March 2015 from 66 participants enrolled in a clinical trial in South Africa (TB FastTrack) to explore the variation arising from different income estimation approaches and compared the number of households encountering catastrophic costs derived for each approach. The total proportion of households encountering catastrophic costs varied from 0% to 36%, depending on the estimation method. Self-reported mean annual income was significantly lower than permanent income estimated using an asset linking approach, or income estimated using the national average. A disproportionate number of participants adopting certain coping strategies, including selling assets and taking loans, were unable to provide self-reported income data. We conclude that the rapid methods for estimating income among patients attending a health facility are currently inconsistent. Further research on methods for measuring income, comparing the current recommended methods to 'gold standard' methods in different settings, should be done to identify the most appropriate measurement method.

1. Introduction

Costs incurred as a result of ill-health can aggravate household vulnerability (Alam and Mahal, 2014; Wagstaff and Lindelow, 2014). They can also contribute to delays in diagnosis, reduced adherence, and poorer health outcomes (Wingfield et al., 2014). Tuberculosis (TB) patients often encounter substantial costs in the form of out-of-pocket payments and lost income. In recognition of the impact of these costs, the End TB Strategy introduced a TB-specific indicator of financial risk protection; this is labelled "catastrophic total costs due to TB", and includes medical and non-medical direct costs and income losses (Lönnroth et al., 2014). The End TB Strategy targets specify that no patient encounters catastrophic total costs due to TB by the year 2020 (World Health Organization, 2015).

The indicator of 'total catastrophic costs due to TB' is relatively new and requires a different measurement approach and definition of 'catastrophic' compared to that used for general catastrophic health expenditure measured in the context of health financing. This paper aims to inform guidance on the measurement of catastrophic total costs due to TB from a sample of patients interviewed as part of a facility-based survey. We compare estimates of the prevalence of catastrophic cost using six approaches. We highlight the implications of these measurement approaches on the identification of catastrophic costs and resulting policy.

1.1. Background

To support countries seeking to meet the target of zero catastrophic costs due to TB by 2020 (World Health Organization, 2015), the World Health Organisation (WHO) TB Programme established a Task Force in

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2015 to develop a generic protocol for estimating the prevalence of catastrophic costs, building on methods used in previous studies of patient costs to provide guidance to countries on estimating catastrophic cost (World Health Organization, 2017a). The aim of the 'catastrophic total cost' measure as described in the WHO handbook is to capture where health-related costs are likely to have a substantial impact on the household's ability to pay for basic subsistence needs; this is represented in terms of total costs as a proportion of household capacity to pay. For global monitoring of the End TB Strategy catastrophic cost indicator, the WHO has chosen to use a threshold of 20% of annual household income. This threshold is currently used by National TB Programmes (NTP) implementing the WHO survey for annual reports to WHO (World Health Organization, 2017b), however countries are also encouraged to undertake sensitivity analyses around the threshold.

In the context of health financing, the numerator for the "catastrophic expenditures" equation has been traditionally measured as direct out-of-pocket expenditure (Xu et al., 2005). However, over half of the economic burden encountered by households during an episode of TB comes in the form of lost income and lost productivity due to illness or time spent care-seeking (indirect costs) (Tanimura et al., 2014). The indicator of 'catastrophic costs due to TB' therefore includes indirect costs. Indirect costs are most commonly estimated through two approaches: first, household income can be estimated before and after the TB episode; any direct income loss due to TB is then captured by taking the difference. Second, the number of hours spent seeking care or otherwise unable to work due to TB can be estimated, and the value of these hours approximated with an estimate of the earning capacity of the patient for that time (e.g. hourly income). The first approach captures only the loss of paid work, while the second approach captures all time off work necessitated by symptoms and treatment seeking (but may not include any household mitigation of that loss).

There are several potential indicators of household capacity to pay for health care, including: permanent income, current income, and wealth [INSERT LINK TO ONLINE FILE 1]. The indicator of 'catastrophic costs due to TB' is intended to capture where costs associated with TB impose an economic burden that is non-recoverable, beyond typical day-to-day wealth management. Theoretically, permanent income is the best comparator to reach this aim. Measures of permanent income will more appropriately reflect the impact of health costs on the total resources available to the household, thus capturing any potential long-term depletion in financial wellbeing in the household. According to the permanent income hypothesis, permanent income can be captured through consumption expenditure (Friedman, 1957), as consumption stays relatively constant according to one's socio-economic status (Garvy, 1948). A consumption expenditure module should therefore appropriately capture ability to pay for health-related costs.

However, pragmatically most surveys estimating catastrophic costs for specific diseases are conducted with patients attending a health facility, as disease prevalence is often too low to make household surveys efficient. Interviewing at the facility, often as part of clinical trials, introduces substantial time and cost restrictions on the survey. Short-form consumption expenditure questionnaires are not available for many contexts, and the limited time available often prevents full consumption expenditure surveys. The risk of survey fatigue for patients interviewed at a health facility is also much higher and large sample sizes are often not possible (Sweeney et al., 2016). Researchers have therefore opted to take various approaches to estimate 'capacity to pay', with the large majority using self-reported current annual income in the denominator of the catastrophic costs equation (Barter et al., 2012) WHO recommendations currently suggest equivalence between current income and annual household expenditure.

Estimates of current income are subject to variation arising from different methods of measurement (diary vs. recall), recall periods, levels of detail in questions soliciting income, and level of respondent (individual vs. household). There is some evidence that each of these factors can lead to bias in income measurement. Bias can manifest in the form of error in reporting (i.e. due to recall error, telescoping, rounding error, cognitive errors, survey fatigue or misreporting), or in the form of non-response (Beegle et al., 2012; Browning et al., 2014; Deaton, 2001; Deaton and Grosh, 1999; Foster and Lound, 1993; Gibson, 2016; Jolliffe, 2001; Moore et al., 2000; Pudney, 2008; Winter 2002, 2004). While it is possible to adjust analysis for partially observed data (i.e. through multiple imputation, mean imputation, or other assumed values) (Brick and Kalton, 1996; Sinharay et al., 2001), income data is susceptible to non-response not at random, making many forms of imputation likely inappropriate. Survey design is key in efforts to limit the amount of missing data.

Another potential solution to the problem of bias in small facility-based surveys is using a proxy for income, either by assuming the national average income for all participants or by using household assets as a proxy for permanent income. Where national survey data exist, it is possible to use principal components analysis or multiple correspondence analysis (MCA) to compute factor weights at the national scale, which can then be applied to asset data for a smaller survey. This approach allows researchers to estimate permanent income without the large expense of conducting a national survey (Gwatkin et al., 2005; McKenzie, 2005; Wagstaff et al., 2007). There are some limits associated with this approach, however; assets are slow-changing and therefore may not capture changes in household economics accurately, particularly for the lowest quintile (Booysen et al., 2008; Harttgen and Vollmer, 2011).

Finally, the issue of income measurement can be avoided entirely by adopting an indicator of financial catastrophe which is not dependent on estimating TB-related costs as a proportion of capacity to pay. Following indications that financial catastrophe is linked with coping strategies (Madan et al., 2015), presence of these strategies could be used as an indicator of catastrophic cost.

2. Methods

2.1. Study design

We present and compare estimates of catastrophic cost using a range of existing methods to represent household capacity to pay for TB services, in the absence of a full consumption questionnaire. We use data from a patient costing study nested within the TB FastTrack study, a pragmatic, cluster randomised trial with 24 primary healthcare clinics randomised to implement algorithm-guided empirical TB treatment for ambulant HIV-positive adults who had a low CD4 count and were not yet on TB or HIV treatment (Fielding et al., 2015). Patients in the intervention arm were started on TB treatment if indicated by the study algorithm, and ART initiation was promoted either two weeks after the start of TB treatment, or at the earliest opportunity if TB treatment was not indicated; in the control arm, clinic staff initiated TB treatment and/or ART according to routine practice. Patient cost data was collected between June 2014 and March 2015. The patient cost study was not designed to draw any conclusions on the impact of the TB Fast Track intervention on income or cost. Ninety-nine participants were recruited from a pragmatic sub-selection of 17 study facilities in Bojanala Platinum (28 participants), City of Ekurhuleni (9 participants), City of Tshwane (48 participants), and Greater Sekhukhune districts (14 participants). Bojanala Platinum and Greater Sekhukhune are both rural districts, located in North West and Limpopo provinces respectively. City of Tshwane and City of Ekurhurleni are peri-urban districts, both located in Gauteng province. All municipalities had high unemployment rates in 2011, ranging from 24.2% in City of Tshwane to 50.9% in Sekhukhune (Statistics South Africa, 2014a).

Participants were interviewed for this study at their 6-month follow-up trial visit. Questionnaires were adapted from the USAID Tool to Estimate Patient Costs for TB (USAID et al., 2008), and included a series of questions about patient demographics, asset holdings, health care seeking behaviour, costs associated with seeking care, and income