OXFORD JOURNAL
OF STUDENT
SCHOLARSHIP

The Economic Cost of Diagnostic Delay and Self-Medication in Rural and Semi-Urban India: A Narrative Review

Shivanjali Sapra
shivanjalisapra@gmail.com

ABSTRACT

Delayed care-seeking and unsupervised self-medication have been well documented behaviors among the underserved population in India, with their economic consequences, in addition to their clinical or epidemiological impact, having been comparatively lesser studied as a whole body of evidence. This is a narrative review of 28 English-language, peer-reviewed studies identified through a structured search of PubMed/PMC, Dimensions.ai and Semantic Scholar, along with a hand-search, that sought to answer the question, what does the literature say about the direct and indirect economic cost of delayed care-seeking and self-medication among rural and semi-urban populations in India? Four themes emerged. First, self-medication is not a lack of knowledge, but is more a structural adaptation to overcome access barriers, and has been shown to be reduced by financial protection interventions. Secondly, the diagnostic delay in India is largely due to the predominant private-sector first approach to care-seeking that results in high out-of-pocket expenses incurred prior to accessing free public health systems. Third, catastrophic health expenditure is well documented in all tribal, informal-sector and elderly rural subpopulations, but the literature typically describes expenditure levels and their demographic drivers, without following the pathway of behaviour, delay or self-medication that led to the expenditures. Fourth, the national survey data confirms these patterns at the population level, but a key methodological insight indicates that the actual amount of out-of-pocket costs is likely to be about a quarter of the total cost when measured using traditional household-recall measures. The association between delayed and/or substandard care seeking and adverse economic outcomes for the household is consistently plausible and, to date, has been very rarely examined as a single causal pathway in a single study, deserving further primary research and setting the agenda for this review.

Keywords: diagnostic delay, self-medication, out-of-pocket expenditure, catastrophic health expenditure, rural India, health economics

INTRODUCTION

Although India offers universal healthcare insurance, the health financing system is still highly dependent on out-of-pocket payments and the financial burden of care is highest among the rural and semi-urban population (Pradhan et al., 2017). Delayed care-seeking (when patients delay seeking qualified health care

after symptoms occur) and self-medication (when people use medicines without qualified health care supervision, often informally sourced medicines) are two behaviours at the centre of this exposure. The economic impact, that is, the cost of delay or self-medication to the household that indulges in it (Kanougiya et al., 2026; Rathod et al., 2023) and the cost of catastrophic expenditure, documented largely independently in parallel in the literature, are far less consistently measured.

The difference between these is important for policy decisions - a common non-economic behaviour is a different problem to a common expensive one. In rural settings, patients often reach tertiary health services weeks after the onset of clinical conditions, typically cardiac patients, who have tried to manage their ailments on their own, and whose clinical condition and financial resources are already compromised. Patients in rural settings frequently reach tertiary care services weeks after the onset of clinical conditions, especially cardiac-related conditions, who have tried to manage their condition themselves, with both clinical prognosis and financial resources already compromised. To quantify this pattern, it is necessary to combine elements from a literature that is segmented by disease (tuberculosis, cancer, cardiac disease), outcome measure (OOP expenditure, catastrophic expenditure, productivity loss), and population (tribal groups, the rural elderly, informal-sector workers).

This review tries to answer the question: What are the direct and indirect economic cost of delayed care-seeking and self-medication without supervision on under-served population in rural and semi-urban India?

It's interesting to ask why this is a better question to be answered by synthesizing existing evidence rather than by doing a new primary study. There are three arguments for doing this. First, the literature itself is fractured in just this way: no existing dataset and, perhaps, no feasible single field study, can measure out-of-pocket cost, productivity loss and diagnostic delay for tuberculosis, cancer and cardiac disease, for tribal, informal-sector, and elderly subpopulations, all at once; a synthesis is the only way that can even reveal that this fragmentation exists, let alone how far the literature has travelled toward measuring the delay-cost relationship end to end. Secondly, the genuine conflicts in this literature (for example, as presented in Section 3.1, over the relationship between self-medication and socioeconomic status, or in Section 4, over the difference between explanations of delay based on health-system structure and explanations based on sociocultural barriers) are disagreements between studies in the literature, not disagreements within a single study; they cannot be resolved by the addition of one more primary study to the pile because a single new study will contribute one additional data point to an already inconsistent picture. This review is what they need. Third, and most practically, the access barriers to the elderly subpopulations that this review addresses—tribal, informal-sector, and rural—are the very same groups that are most difficult to access in the field and thus to study. A synthesis can be done much quicker and at lower cost than new fieldwork, and can now generate an immediately testable causal model (see Section 4) to direct future fieldwork to those areas if it is to be done. The review is not primary research, but primary research that is necessary. In this sense, the review is an attempt to transform 28 separate pieces of evidence into a single evidence base and a proposed causal pathway, and it is a single pathway—one additional disconnected study—that the review as a whole provides.

This review is not systematic or comprehensive in the PRISMA sense, as it was not pre-registered. Rather than summarizing the available English-language, peer-reviewed literature in a non-thematic, uncritical way, it seeks to offer a transparent, themed, and critical summary of the literature, explicitly addressing the areas of consensus, diversity, and lack of support for a confident conclusion.

Search strategy, screening process and inclusion criteria are described in Section 2. In Section 3, the synthesis is organized around four themes: self-medication and its monetary aspects; diagnostic delay and its monetized cost; out-of-pocket and catastrophic expenditure within subpopulations of rural and underserved populations; and national-scale data, and a critical methodological note. Cross-cutting tensions, gaps and limitations are discussed in Section 4, while Section 5 provides implications for research and policy.

METHODS

Search Strategy

Three databases were searched: PubMed/PMC, Dimensions.ai, and Semantic Scholar. The main Boolean string employed in all the sources was: ("self-medication" OR "diagnostic delay") AND ("economic burden" OR "out-of-pocket" OR "catastrophic expenditure") AND ("rural India" OR "India"). A supplementary string-based hand-search of Google Scholar was also performed to ensure that no relevant studies were missed due to the primary string being limited to keywords specific to India or cost, as is the case with many title-level keyword screening methods (see Section 4 for further discussion).

Screening and Eligibility

The first level of screening of the records was performed at the title level in all three databases to exclude non-article record types (conference abstracts, proceedings) and to exclude records that contained no India-specific geographic signal. The remaining records were then examined to see if there was a delay/self-medication signal and an economic-outcome signal. Records that met this level were then evaluated at the abstract or full text stage against the following inclusion criteria: (a) peer-reviewed journal article published in English, (b) study population residing in a rural, semi-urban, tribal or otherwise underserved area of India, and (c) at least one quantified or qualitatively substantive relationship between delayed care-seeking or self-medication and an economic outcome (out-of-pocket expenditure, catastrophic expenditure, productivity/income loss, or financial burden). (d) Published between 1st January 2016 to 31st July 2026.

Exclusions at this stage included: studies with only an urban study population (even if the region suggested otherwise), studies reporting the economic burden without any delay connection or self-medication connection, studies reporting delay or self-medication without any economic outcome, and studies with a very narrow study population, such as university students, which was not representative

of the rest of the population that was not served by the study. Two studies were filtered out at the full-text verification phase due to the specific mention of urban area in the study population, even though the region was suggested by their title (Rathod et al., 2023; George, 2023).

Search yield and Final Inclusion

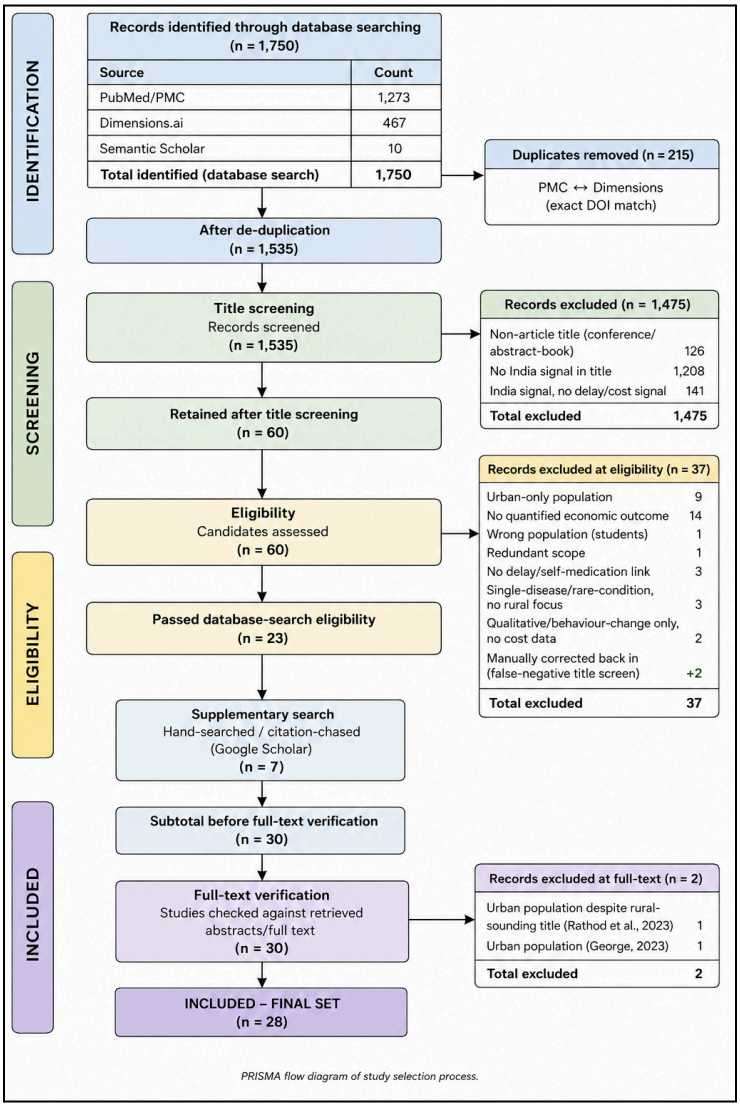

Figure 1. PRISMA Flow Diagram of the Study Selection and Screening Process

There were 215 duplicate records that were identified across the three databases (1273 from PubMed/PMC, 467 from Dimensions.ai and 10 from Semantic Scholar) and removed by exact DOI match, resulting in a total of 1535 unique records. A total of 60 records were selected for more in-depth evaluation by the title-level screening process. The 28 studies that remained were the result of a full-text

and abstract-level eligibility assessment, with seven additional studies that were hand-searched. The two papers retained in the set but not empirical field studies are one a theoretical/game-theoretic paper (Malik et al., 2022) and two others are a narrative review (Kulal et al., 2025), or an instrument validation (Ghosal et al., 2023) paper. These are presented as secondary evidence rather than as primary evidence, and are marked as such in the synthesis below.

THEMATIC SYNTHESIS

Table 1 shows the setting, key finding and thematic classification of the 28 studies included, prior to the full narrative synthesis that follows in the subsections below.

Study	Setting	Key finding	Theme
Kanougiya et al. (2026)	Rural Tamil Nadu, n = 520, age 55+	41.7% self-medicated in the past 3 months; driven by injury/joint pain, not chronic disease	Self-medication
Dror et al. (2016)	Rural Uttar Pradesh and Bihar, cluster RCT	Community-based health insurance causally reduced self-medication while improving financial protection	Self-medication
Malik et al. (2022)	India, national (theoretical model)	SES disparity and health expenditure drive antibiotic self-medication patterns	Self-medication
Prasad et al. (2021)	India, national survey	Informal providers increase reach but raise household out-of-pocket expenditure	Self-medication
Rathi et al. (2020)	40 presumptive MDR-TB patients, India	Median pretreatment out-of-pocket cost $171, exceeding median annual income, before free treatment begins	Diagnostic delay
Chandra et al. (2021)	110 TB patients, Ballabgarh	76% first sought private care; median total delay 34.5 days	Diagnostic delay
Basa and Venkatesh (2016)	261 tribal TB patients, Mayurbhanj, Odisha	Patient and health-system delay determinants examined among tribal DOTS patients	Diagnostic delay
Samal et al. (2026)	TB patients, rural and tribal Odisha	"Fragmented care pathways" model; many providers navigated before program entry	Diagnostic delay
G S et al. (2026)	331 TB patients, Mysuru, South India	Nearly two-thirds experienced diagnostic delay; private-first consultation strongest predictor (AOR 15.80)	Diagnostic delay
Kulal et al. (2025)	India, cervical cancer (narrative review)	Synthesizes financial, awareness, and infrastructure barriers to diagnosis	Diagnostic delay
Reddy et al. (2025)	Rural Andhra Pradesh, pregnant women	Undiagnosed thyroid disorders linked to out-of-pocket expenditure burden	Diagnostic delay

Kuthari et al. (2025)	150 breast cancer patients, India	Quantifies delays across access and treatment intervals	Diagnostic delay
Ghosh et al. (2026)	Rural North 24 Parganas, West Bengal	Out-of-pocket and catastrophic expenditure explicitly linked to delayed healthcare seeking	OOP/catastrophic expenditure
Viramgami et al. (2020)	Rural informal-sector families	Informal sector needs social-security protection to reduce out-of-pocket burden	OOP/catastrophic expenditure
Solanki et al. (2025)	598 tribal elderly, Visakhapatnam, Andhra Pradesh	46.3% acute illness; 81.6% used government facilities	OOP/catastrophic expenditure
Ghosal et al. (2023)	Tribal groups (PVTGs), Odisha (instrument study)	Validated questionnaire for measuring healthcare-seeking behavior and out-of-pocket expenditure among PVTGs	OOP/catastrophic expenditure
Paulraj et al. (2025)	Urban and rural Puducherry	Out-of-pocket and catastrophic expenditure prevalence estimated against a 2016 baseline	OOP/catastrophic expenditure
Pandey and Singh (2017)	Elderly (n = 404), Lucknow district	Catastrophic expenditure assessed among the elderly	OOP/catastrophic expenditure
Murmu et al. (2025)	Tribal population (n = 522), Bankura, rural West Bengal	40% delayed care beyond 3 days; 60% cited cost as a barrier	OOP/catastrophic expenditure
Goswami et al. (2022)	Rural central India, oral cancer	Catastrophic expenditure documented among households managing oral cancer treatment	OOP/catastrophic expenditure
Cascade-of-care study (2024)	241 participants, Puducherry primary health centres	Delay in cancer symptom care-seeking linked to downstream cost impact	OOP/catastrophic expenditure
Siva et al. (2025)	India, NCD patients (44-study systematic review)	Out-of-pocket burden highest for hemodialysis and cardiac interventions	OOP/catastrophic expenditure
Pradhan et al. (2017)	India, NSSO 71st round (national)	Socioeconomic differentials in out-of-pocket expenditure and catastrophic expenditure on accidental injury	National data/methodology
Kumar et al. (2026)	India, NSS 79th round (national)	AYUSH usage 52.9% urban versus 46.3% rural	National data/methodology
Ahmad and Aggarwal (2017)	Informal-sector households, India	Economic burden of health shocks; gap between formal and informal worker expenditure	National data/methodology
Prinja et al. (2022)	India, national (methodology study)	Standard household-recall methods undercount medicine out-of-pocket expenditure by 25 to 26% versus facility exit interviews	National data/methodology
Beza et al. (2021)	Low- and middle-income countries (29-study systematic review)	Female gender, rural location, and public transport reliance predict longer acute coronary syndrome prehospital delay	Comparative delay context

Bang et al. (2021)	Rural Gadchiroli, Maharashtra	Women and older adults lose more workdays and incur higher out-of-pocket expenditure for pain	Productivity loss

Self-medication as structural adaptation, not knowledge deficit

The self-medication literature coalesces around a message that introduces a definitional twist to the typical public-health discourse on the 'awareness deficit'. Kanougiya et al. (2026) surveyed 520 adults aged 55+ in five villages of rural Tamil Nadu and found that 41.7% of people have self-medicated, with a strong association with recent injury and joint pain, but not with chronic disease status, nor with caste, income or gender. This does not fit well within a socioeconomic-deprivation framework, but rather within an access-and-continuity framework, with individuals self-medicating because the perceived level of symptom severity is less than the burden of accessing the formal care system.

In a rare example of experimental instead of observational evidence in this review, Dror et al. (2016) provide complementary causal evidence from a cluster randomized trial of community-based health insurance (CBHI) in rural Uttar Pradesh and Bihar: households with access to CBHI experienced less self-medication and greater financial protection, suggesting that the behavior serves as a rational financial hedge that diminishes when the formal-care risk is reduced, externally.

The mechanism of the process is provided implicitly by the field studies, which Malik et al. (2022) provide. Instead of relying on field data, the authors model the dynamic interaction between SES disparities and health-expenditure patterns through a game-theoretic model, which places the use of antibiotics for self-medication in a feedback loop between financial constraint, self-treatment, and the ensuing risk of antimicrobial resistance. It is not prevalence or cost data; it is theoretical scaffolding modelling.

Along the theme of informal healthcare providers, Prasad et al. (2021) show that a reliance on informal providers not only expands the reach of healthcare services, but also raises household OOP expenditure, as the informal sector is not economically costless to avoid formal providers, but rather sits at the conceptual intersection between self-medication and diagnostic delay.

Self-medication in rural and underserved India is not simply a behaviour that can be changed through health education, but rather an adaptive strategy to structural access constraints, as it is a behaviour that is measurably influenced by financial-protection interventions (Dror et al., 2016), and not necessarily diagnosis-driven, but symptom-driven (Kanougiya et al., 2026). A true debate exists between the minimal socioeconomic gradient of Kanougiya et al. and the modelled SES discrepancy of Malik et al. (2022), which remains unresolved in the literature, most plausibly a scale difference. There are no direct estimates of the cost of a self-medication episode for the four studies outlined here, as there are in the delay literature for formal care-seeking (Section 3.2).

Diagnostic delay as a quantifiable, private-sector-first phenomenon

The most quantitative convergent evidence in this theme is found in the review. In two studies, conducted in two different settings and about half a decade apart, Chandra et al. (2021) and G S et al. (2026) independently found that in both settings, patients overwhelmingly sought private providers prior to entering the free public pathway for TB (76% in Ballabgarh), and that the choice of first-seek of care provider, not symptom severity or awareness, is the strongest predictor of prolonged delay (AOR 15.80 in Mysuru). The median total delay is 34.5 days (patient delay 7 days, health-system delay 16 days) and the authors do express an analysis of the delay-cost association.

Nearly a decade later, both Basa and Venkatesh (2016) and Samal et al. (2026) present evidence to explain why people seek care from the private sector even after the government DOTS pathway has become the preferred approach for TB treatment in Odisha: TB care delivery is, in Samal et al.'s words, a "fragmented care pathway in a layered TB care system" with multiple providers between the patient's doorstep and the government DOTS pathway, even for motivated TB seekers. The determinants of patient-side and health system-side delay in the tribal population is further documented by Basa and Venkatesh's previous study of 261 tribal TB patients in Mayurbhanj, with less cost granularity compared to more recent studies.

Rathi et al. (2020) were the most prescriptive estimates of the monetary cost of delay: 40 presumed MDR-TB patients had a median OOP before treatment of $105 (direct) and $51 (indirect), significantly higher than a median annual income, before entering into free-of-charge treatment as per the National Tuberculosis Elimination Programme (NTEP). This is the most transparent empirical link in the literature between “delay” and “catastrophic cost” – namely that delay actually creates the financial exposure to the household that is described in Theme 3.

The trend is not just the case of tuberculosis. Kuthari et al (2025) measure delays between accessibility and treatment in 150 breast cancer patients, and Reddy et al (2025) associate undiagnosed thyroid disorders and OOPE burden to rural areas of Andhra Pradesh. A narrative review (Kulal et al. 2025), rather than a primary study, aggregates the cervical-cancer diagnostic-delay barriers from a sociocultural perspective (e.g., stigma and screening uptake), which differs somewhat from the health-system-structure perspective (fragmentation, provider layering) that dominates the tuberculosis literature. These framings are not mutually exclusive, but there is no study that brings both together in a single disease category.
The evidence overwhelmingly supports that private-sector-first approaches to care-seeking are the principal source of delay in both tuberculosis and, less conclusively, cancer, and that this is because of the fragmentation of health systems. The strongest single evidence that comes from the review is from Rathi et al., 2020, who demonstrated the costs attributable to pre-diagnosis delay alone are greater than the annual household income even for nominally free treatment. The principal gap: Most other delay studies

report only duration and predictors, but not the marginal cost of delay as such, but rather the cost of treatment.

Out-of-pocket and catastrophic expenditure among rural and underserved subpopulations

This is the largest cluster in the review, with 10 studies, but it is also the theme where the link between delay or self-medication is most frequently made, with no evidence provided within the same study. One partial exception is the study by Ghosh et al. (2026) in the six Gram Panchayats of rural North 24 Parganas, West Bengal, where the framing specifies that the mechanism is a cause of "increased financial strain, potential poverty, and delayed healthcare seeking.

The most directly matched evidence within studies is provided by Murmu et al. (2025). A cross-sectional study of 522 tribal adults in Bankura district, West Bengal, found cost as a specific impediment for 60%, transport as a barrier for 75%, waiting time for 70%, and distance for 65% of participants, with 40% saying they put off seeking care for more than three days. Those who preferred modern medicine (OR 4.41) were also more likely to recover, while men, higher education/income, and business occupation were associated with increased likelihood of using modern healthcare, and women, lower education/income, and distance were associated with increased likelihood of using mixed or traditional modalities. This is the only study that clearly reveals the two dimensions of the household decision, delay and cost.

A set of studies defines catastrophic expenditure as extreme and systematically replicated in unique under-resourced sub-populations. A high proportion of the literature shows that people in other parts of the country continue to be dependent on the public system despite the high OOP costs, with 46.3% of the 598 tribal elderly in Visakhapatnam, AP reporting acute illness (Solanki et al. 2025). At the same time, an increase in social-security protection is needed for the rural informal-sector families to lower the OOP burden, as concluded by the authors of Viramgami et al. (2020). This cluster is completed by the study of Pandey and Singh (2017) for the geriatric population in Lucknow; and Paulraj et al. (2025) of urban and rural comparison of Puducherry, which confirms the presence of catastrophic expenditure, its pattern according to facility choice and insurance status, and the persistence over time seen in the other studies.
Goswami et al. (2022) take this theme further into oncology and report catastrophic expenditure for households affected by oral cancer in rural central India; a 2024 cascade-of-care study of primary health centres in Puducherry finds delay in seeking care for early cancer warning signs to impact downstream costs. Building on the 44 studies, collated by Siva et al. (2025), of the burden of OOP in patients with NCDs, there is a disease-specific gradient; OOP is particularly high in hemodialysis and cardiac interventions, where delay has the greatest impact, but no specific quantification of this chain.

Ghosal et al. (2023) is methodologically rather than empirically: a validated questionnaire to measure delay-cost linkage in healthcare-seeking, utilization and OOP expenditure among PVTGs in Odisha, which future studies could turn to for more direct measurement.

The same determinants of high OOP burden appear across the three subpopulations of tribal, informal-sector, and elderly rural populations, and these are indeed converging: lack of insurance, need for private facilities versus government facilities that are not available, and transport/distance barriers. The central limitation: most studies measure catastrophic-expenditure outcomes and demographic determinants, not the individual steps in the behavioural pathway that brings them about. There are two studies that make that mechanism explicit (Ghosh et al. 2026; Murmu et al. 2025) and are significantly over-represented in the number of anchor citations.

National-scale data, a critical measurement caveat, and the thin indirect-cost literature

The above localized patterns are also supported by two studies based on the India National Sample Survey (NSS) infrastructure at the national scale. Using the NSSO 71st round data, Pradhan et al. (2017) study the socioeconomic differentials in OOP and catastrophic expenditure on accidental injury. Analysis of NSS 79th round (2022-23) data by Kumar et al. also shows a rural-urban AYUSH utilization gap (46.3% rural vs. 52.9% urban) which is similar to the access-barrier patterns recorded locally across Theme 3. In Theme 3, Ahmad and Aggarwal (2017) confirm this at the national level, and show that, beyond the overall level of health-related expenditure, there are significant differences between informal-sector and formal-sector workers in terms of catastrophic-expenditure risk, with the former being particularly vulnerable.

The most important implication for the other cost data presented in this review is the methodological study by Prinja et al. (2022), which demonstrated that the OOP amount for medicine expenditure using the NSS approach is, on average, about 25-26% lower than that based on the facility-exit-interview approach. Most studies in Theme 3 are based on household-survey or recall methods of data collection, suggesting that the catastrophic-expenditure burden reported in this review is likely to be an underestimation rather than an overestimation of actual household cost.

While not specific to India, Beza et al. (2021) showed that female gender, rural location, and public transport use were each independently associated with longer prehospital ACS delay in 29 studies, implying a similar mechanism in rural India, though not necessarily proven.

Lastly, Bang et al. (2021) was the only review that explicitly quantified productivity losses – in terms of lost workdays – as a separate indirect-cost category. The authors focus on cases of back and extremity pain in adults in rural Gadchiroli, Maharashtra and discover that women and older adults are more likely to report lost workdays and higher OOP for the same pain conditions, filling a category of pain that is explicitly mentioned in the guiding question for this review but which is largely ignored by the rest of the evidence base.

The findings presented in Themes 2 to 3 are regional, disease-specific and are confirmed by evidence from across the country that is representative of the population as a whole and supports the assumption that the cost figures used in this review are conservative and not out of reach. This review is conducted across 28 studies, the thinnest dimension being the productivity-loss / indirect-cost category with only one study (Bang et al., 2021) in this category.

DISCUSSION

The evidence base, considered together, provides a general answer to the guiding question: yes, care seeking and self-medication delays are associated with real economic cost for both rural and underserved populations of India, whether measured as OOP expenditure before treatment (Rathi et al., 2020), catastrophic household expenditure (Ghosh et al., 2026; Solanki et al., 2025), or the absence of financial protection from insurance (Dror et al., 2016). There is no study that runs against this general association, and it is tensions related to mechanism and magnitude rather than to the direction of the association that are in question.

The review is significantly poorer on three questions that are implicit in the guiding question. First, the marginal cost resulting from delays or self-medication, as opposed to the cost of treatment in general, can only be precisely quantified by Rathi et al. 2020) for the case of presumptive MDR-TB; similar quantification is missing for cancer, cardiac disease and general morbidity. Second, indirect economic cost – productivity and income loss – is barely addressed, with only one study represented (Bang et al., 2021), and although it was explicitly mentioned in the guiding question, it was not adequately covered. Third, no study directly monetizes mortality risk; the closest proxy is that of Rathi et al. (2020) and Chandra et al. (2021) for delay duration for a disease with well-established mortality consequences.

There are two tensions that need to be recognized, not solved. First, the absence of an income gradient in self-medication from Kanougiya et al. (2026) contrasts with the premise of income differences in the Malik et al. (2022) model (most likely a difference in analytical scale, five villages sample and a population-level model, but not tested in the literature). Second, the literature on diagnostic delay presents the mechanism of diagnostic delay differently by disease; the literature on tuberculosis delay is more of a health system structure explanation (private first contact with health care, fragmentation), while the cancer-delay literature is more of a sociocultural barriers explanation (stigma, awareness). These do not necessarily need to be mutually exclusive; however, there is no study that combines both in a given disease classification.

This review not only integrates the findings of the individual studies, but the review also suggests one conceptual model that can be integrated into one causal chain of the four themes above, which cannot be attained by a single individual primary research. The model (Figure 2) assumes that structural access barriers (distance, transport cost, facility shortage, and informal-sector employment) lead to two behavioral pathways described in this review: self-medication or delayed formal care seeking, with the evidence suggesting that these pathways are not mutually exclusive, but rather

often coexist (Murmu et al., 2025). Both pathways lead to diagnostic delay, primarily as a result of the private-sector-first approach that was set in place in Section 3.2. The direct and indirect economic costs of delay are most starkly reflected in the escalating catastrophic health cost described in Section 3.3 and reported by Rathi et al. (2020) and Bang et al. (2021) in their productivity-loss study.

The added value of this model is its last step: catastrophic expenditure is likely to increase structural access barriers that started the cycle, because when a household is in debt, they are less able to pay for transport, travel, or future care, thereby closing a poverty-reinforcing circle. This feedback link is presented here as a hypothesis that could be tested in future studies, but is not directly reported by any individual study in the evidence base; it is listed here because it follows from all the evidence provided by the 28 studies combined. The job of the review was not just to report on what is already known if it were formulated that way. It was charged to come up with a testable structure of evidence that, by study by study, would only light up one part of the pathway.

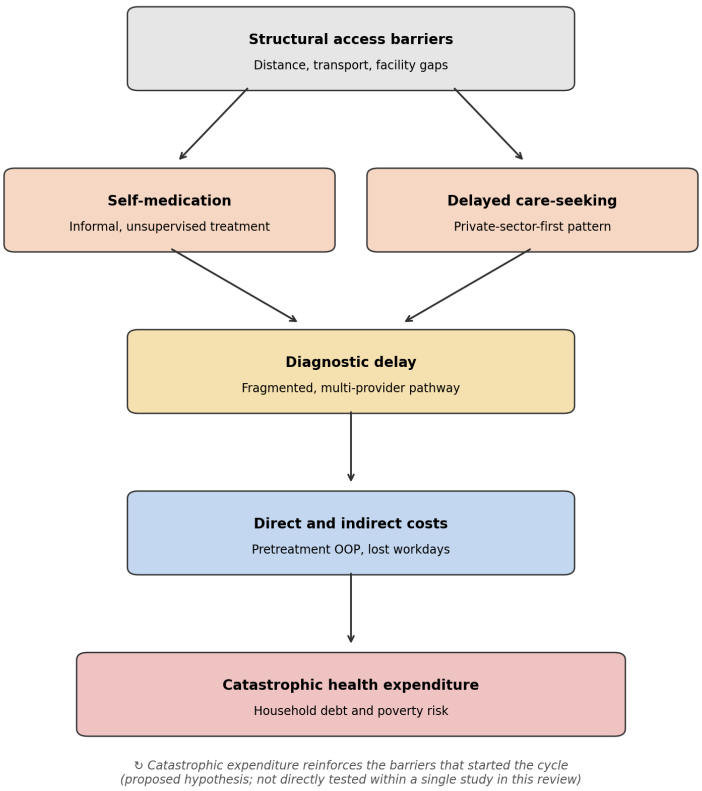

Figure 2. Proposed conceptual model: the delay-cost pathway, synthesizing Themes 1 to 4 into a single causal chain. The final feedback link is a hypothesis proposed by this review, not a directly tested finding.

This synthesis is subject to a number of restrictions. Firstly, only English-language peer-reviewed literature was included, and non-English regional studies or grey literature were not included. Secondly, this synthesis does not follow a pre-registered protocol, was not systematic, and was not conducted using a formalized critical-appraisal tool (although a formal critical-appraisal tool was used to inform the synthesis, and the confidence markers in Section 3 approximate what evidence strength would look like). Third, because of heterogeneity of outcome measures and designs, no quantitative pooling of effect sizes or cost figures was attempted, and the synthesis was thematic and qualitative in nature by design.

CONCLUSION

The aim of this review was to find out from the peer-reviewed literature the direct and indirect economic costs to rural and semi-urban populations of delayed care-seeking and self-medication in India. The 28 studies, covering the topics of self-medication, diagnostic delay, catastrophic expenditure, and data from national survey studies, collectively provide clear and consistent evidence for the general premise: there are real household economic consequences of these behaviors, and Rathi et al.'s (2020) finding that the OOP costs for presumptive MDR TB patients in pretreatment exceed median annual household income stands out as the most eye-catching direct evidence in the review. Meanwhile, the literature is sparse on the specifics the guiding question asks about: the separation of the marginal cost of delay from the overall treatment cost, the measurement of indirect productivity loss, and the monetization of the cost associated with mortality are each considered in only a handful of studies, if any. This pattern would appear to be the strongest possible reason to continue with primary research, and places Ghosh et al. (2026) and Murmu et al. (2025) – the two studies most closely to measuring this chain directly, in a single rural Indian sample, in an unmistakable spotlight for future research. Study designs that explicitly match the timing of care-seeking with OOP measures that quantify household financial outcomes would be useful in future research; designs that build on the single studies' foundation to date are also needed to further the productivity-loss and mortality-cost literature and take into account the measurement caveat that OOP measures from standard recall approaches underestimate the true financial burden, as this review has sought to characterize.

Rather than resolving these tensions with one more isolated field study, this review's central contribution is to make the shape of that fragmentation visible and to propose the unified delay-cost pathway model above as the structure future primary research should now test directly.

REFERENCES

Ahmad, N., & Aggarwal, K. (2017). Health shock, catastrophic expenditure and its consequences on welfare of the household engaged in informal sector. *Journal of Public Health, 25*, 611-624. https://doi.org/10.1007/s10389-017-0829-9

Bang, A. A., Bhojraj, S., Deshmukh, M., & Bang, A. (2021). Economic burden of pain in back and extremities in the adult population: A community-based estimate in rural Gadchiroli, India. *Journal of Global Health Reports, 5*, e2021019.

Basa, S., & Venkatesh, S. (2016). Patient and healthcare system delays in the start of pulmonary tuberculosis treatment among tribal patients registered under DOTS, Odisha. *Journal of Clinical and Diagnostic Research, 10*(9), LC21–LC24. https://doi.org/10.7860/JCDR/2016/20136.8567

Beza, L., Leslie, S. L., Alemayehu, B., & Gary, R. (2021). Acute coronary syndrome treatment delay in low to middle-income countries: A systematic review. *International Journal of Cardiology: Heart & Vasculature, 35*, 100823. https://doi.org/10.1016/j.ijcha.2021.100823

Chandra, A., Kumar, R., Kant, S., & Krishnan, A. (2021). Diagnostic pathways and delays in initiation of treatment among newly diagnosed tuberculosis patients in Ballabgarh, India. *American Journal of Tropical Medicine and Hygiene, 104*(4), 1321–1325. https://doi.org/10.4269/ajtmh.20-1297

Dror, D. M., Chakraborty, A., Majumdar, A., Panda, P., & Koren, R. (2016). Impact of community-based health insurance in rural India on self-medication & financial protection of the insured. *Indian Journal of Medical Research, 143*(6), 809–820. https://doi.org/10.4103/0971-5916.192075

George, S. (2023). Being sick to a cancer patient: Pathways of delay in help seeking and diagnosis of cancer in India. *Journal of Social and Economic Development, 25*(1), 52–69. https://doi.org/10.1007/s40847-022-00221-0

Ghosal, J., Dutta, A., Kshatri, J. S., Das, A., Kanungo, S., Singh, A., Kerketta, S., Ghosal, S., Kaur, H., Bal, M., Ranjit, M., Satpathy, S. K., & Pati, S. (2023). Development, validation & pilot testing of a questionnaire to assess healthcare seeking behaviour, healthcare service utilization & out-of-pocket expenditure of Particularly Vulnerable Tribal Groups of Odisha, India. *Indian Journal of Medical Research, 157*(5), 412–420. https://doi.org/10.4103/ijmr.ijmr_3570_21

Ghosh, S., Ghosh, S., & Samanta, A. (2026). Household out-of-pocket health expenditure, catastrophic health expenditure, and its determinants: A cross-sectional study in a rural block of North 24 Parganas, West Bengal. *Journal of Family Medicine and Primary Care, 15*(1), 363–370. https://doi.org/10.4103/jfmpc.jfmpc_475_25

Goswami, S., Gupta, S. S., Gangane, N., Vyas, V., & Royburman, A. (2022). Financial impact of oral cancer treatment on the households in rural India. *Indian Journal of Cancer.* Advance online publication.

G S, V. S., Padukudru Anand, M., Sumana, M. N., Ramachandra, N. B., Chikkahonnaiah, P., Shankaregowda, R., M N, J., Eshwarappa, C. S., Maheshwarappa, Y. D., & B S, J. (2026). Patient and health system related factors affecting diagnostic and treatment delays in tuberculosis: A

cross-sectional study in Mysuru, South India. *PLOS ONE, 21*(2), e0342998. https://doi.org/10.1371/journal.pone.0342998

Kanougiya, S., Bhaskarpandi, S., Surendhar, A., Dharani, R., Swetha, R., Dhanush, M., Oviya, V., & Vishali, B. (2026). Self-medication among older adults in rural India: Structural gaps in primary care and pain management. *BMC Health Services Research, 26*(1), 333. https://doi.org/10.1186/s12913-026-14114-z

Kulal, S., H K, J., Shivapura Anandakumar, A., H R, R., & G, P. (2025). The sociocultural determinants of cervical cancer outcomes in India: A critical review of diagnostic delays and treatment disparities. *Cureus, 17*(7), e88967. https://doi.org/10.7759/cureus.88967

Kumar, S., Hazra, S., Dutta, A., Londhe, D., & Kaushik, R. (2026). Ayush systems in India: Understanding the awareness, utilization, and out-of-pocket expenditure (OOPE): Insights from the 79th round of National Sample Survey (NSS) 2022–23. *Journal of Ayurveda and Integrative Medicine, 17*(4), 101361. https://doi.org/10.1016/j.jaim.2026.101361

Kuthari, R., Damor, R., & Shringarpure, K. (2025). Mixed methods study of care pathway and delay in obtaining health services by breast cancer patients in India. *Asian Pacific Journal of Cancer Prevention, 26*(6), 2097–2107. https://doi.org/10.31557/APJCP.2025.26.6.2097

Malik, B., Farooqui, H. H., & Bhattacharyya, S. (2022). Disparity in socio-economic status explains the pattern of self-medication of antibiotics in India: Understanding from game-theoretic perspective. *Royal Society Open Science, 9*(2), 211872. https://doi.org/10.1098/rsos.211872

Murmu, C., Murmu, B. K., & Tudu, R. (2025). Health-seeking behaviour and determinants among tribal communities in a rural district of West Bengal. *Student's Journal of Health Research Africa, 6*(5), 12. https://doi.org/10.51168/sjhrafrica.v6i5.2038

Pandey, P., & Singh, S. K. (2017). Catastrophic health expenditure among geriatric population of Lucknow district, India. *Journal of Geriatric Mental Health, 4*(1), 42–47. https://doi.org/10.4103/jgmh.jgmh_40_16

Paulraj, D., Loganathan, V., Gola, A., & Kar, S. S. (2025). Household healthcare expenditure: A cross-sectional analysis of urban and rural Puducherry, South India. *Journal of Family Medicine and Primary Care, 14*(6), 2458–2483. https://doi.org/10.4103/jfmpc.jfmpc_1944_24

Prasad, B., Tripathy, J. P., Thekkur, P., & Muraleedharan, V. (2021). Insights from national survey on household expenditure for primary healthcare services availed through informal healthcare providers. *Journal of Family Medicine and Primary Care, 10*(5).

Pradhan, J., Dwivedi, R., Pati, S., & Rout, S. K. (2017). Does spending matters? Re-looking into various covariates associated with Out of Pocket Expenditure (OOPE) and catastrophic spending on accidental injury from NSSO 71st round data. *Health Economics Review, 7*(1), 48. https://doi.org/10.1186/s13561-017-0177-z

Prinja, S., Kumar, S., et al. (2022). What is the out-of-pocket expenditure on medicines in India? An empirical assessment using a novel methodology. *Health Policy and Planning*. Advance online publication.

Rathi, P., Shringarpure, K., Unnikrishnan, B., Chadha, V. K., Acharya, V., Nair, A., Sagili, K. D., & Shastri, S. (2020). Pretreatment out-of-pocket expenses for presumptive multidrug-resistant tuberculosis patients, India, 2016–2017. *Emerging Infectious Diseases, 26*(5), 989–992. https://doi.org/10.3201/eid2605.181992

Rathod, P., Sharma, S., Ukey, U., Sonpimpale, B., Ughade, S., Narlawar, U., Gaikwad, S., Nair, P., Masram, P., & Pandey, S. (2023). Prevalence, pattern, and reasons for self-medication: A community-based cross-sectional study from central India. *Cureus, 15*(1), e33917. https://doi.org/10.7759/cureus.33917

Reddy, B. V., Rajan, V., Aravindakshan, R., Vaikkakara, S., & Sharmila, V. (2025). Unmet need for completing the antenatal care continuum among pregnant women in rural India: A mixed-methods study. *Cureus, 17*(7).

Samal, J., Gs, P., & Singh, H. (2026). "Fragmented care pathway in a layered TB care system": A grounded theory approach to understand care pathways and delays in TB care in Odisha. *BMC Health Services Research, 26*(1), 1038. https://doi.org/10.1186/s12913-026-14797-4

Siva, N., Samantaray, K. K., Krishnapriya, K., Priya, B., Vasudevan, N. J., Tanaya, K., Das, S., & Sahoo, J. (2025). Health-seeking behavior and healthcare utilization among patients with non-communicable diseases in India: Insights from a systematic review. *BMC Health Services Research, 25*(1), 1548. https://doi.org/10.1186/s12913-025-13441-x

Solanki, A., Kumar, G. D., Varma, G. R., Babu, B. V., & Kusuma, Y. S. (2025). Morbidity, treatment-seeking behaviour, and out-of-pocket expenditures among the tribal geriatric population: A cross-sectional study from a South Indian district. *Cureus, 17*(1), e77546. https://doi.org/10.7759/cureus.77546

Viramgami, A., Upadhyay, K., & Balachandar, R. (2020). Catastrophic health expenditure and health facility access among rural informal sector families. *Clinical Epidemiology and Global Health.* Advance online publication. https://doi.org/10.1016/j.cegh.2020.05.005