Vol 5 | Issue 2 | April - June | 2025

ORIGINAL ARTICLE

COST SAVINGS FOR THE PUBLIC THROUGH INTEGRATED ESSENTIAL LABORATORY SERVICES (IELS): A CROSS-SECTIONAL STUDY, NAMAKKAL, INDIA, 2025

Poonkodi K [(1)], Sathishkumar P [(2)]

(1) Directorate of Public Health and Preventive Medicine

INTRODUCTION

Globally, the World Health Organization (WHO) has emphasized the critical role of diagnostics in achieving Universal Health Coverage (UHC), highlighting that nearly 47% of the global population has little or no access to essential diagnostics.[1] The Lancet Commission on Diagnostics (2021) further underscored the "diagnostics gap" as a major barrier to equitable healthcare delivery, especially in low- and middle-income countries, where inadequate access leads to delayed diagnoses, poor treatment outcomes, and higher financial burden on patients. Bridging this gap through public sector diagnostic coverage is considered central to advancing global health equity.[2] In India, The 70:70 paradox limits access to healthcare in India: people incur 70% of their healthcare expenses out of their pockets, of which 70% of the amount goes only toward medications, leaving them in debt and impoverished. Some of India's main health obstacles are high out-of-pocket expenses (OOPE), inadequate or ambiguous quality of medical care, restricted access, and lack of proper medical care availability.[3] Recognizing this, the Government of India introduced the Free Diagnostic Services Initiative (FDSI) under the National Health Mission in 2015, aiming to provide an assured menu of essential tests at all levels of care. This aligns with the National Essential Diagnostics List (NEDL) 2019, which was the first of its kind globally, placing India at the forefront of institutionalizing essential diagnostics within UHC frameworks.[4] The Government of Tamil Nadu launched the Essential Diagnostics Services System (EDSS) in 2019 under the Free Diagnostic Services Initiative (FDSI) to enhance access to quality laboratory services. In 2022, this programme was redesignated as Integrated Essential Laboratory Services (IELS), focusing on strengthening laboratories by providing essential equipment, reagents, and a Laboratory Information Management System (LIMS) interlinking primary, secondary, and tertiary care facilities. Under this initiative, health facilities are mandated to provide an assured menu of tests either in-house or through a hub-and-spoke model.

Financial barriers to diagnostics contribute significantly to out-of-pocket expenditure (OOPE) in India, with poorer populations often disproportionately affected.[5] Broader health financing challenges also emphasize the need for sustainable public diagnostic coverage to mitigate inequities.[6]

Tamil Nadu has been one of the leading states in operationalizing free diagnostic services, with IELS serving as a model for integrating laboratory networks through digital platforms and cluster-based management. In Namakkal district, 64 PHCs, 8 GHs, 1 GMCH, and 1 DPHL are interconnected through 30 IELS clusters. This study estimated the Out of Pocket Expenditure(OOPE) saved by calculating the equivalent private-sector costs of diagnostic tests performed between January–June 2025, assuming zero direct cost to patients under IELS.

METHODS

A descriptive cross-sectional study was undertaken using data retrieved from the IELS software for the period January to June 2025. During this six-month interval, a total of 31,469 diagnostic samples were processed across 73 distinct tests performed at different levels of healthcare delivery, ranging from primary to tertiary care facilities. To maintain analytical rigor and restrict the scope to patient-related diagnostics, environmental samples including operation theatre (OT) swabs, OT sterility assessments, labour ward surveillance swabs, and water samples were excluded. Following this exclusion, the dataset comprised 29,478 patient-derived samples representing 69 clinical diagnostic tests, which served as the basis for further analysis. Descriptive statistics were employed to summarize

Please Scan this QR Code to
View this Article Online
Article ID: 2025:05:02:03
Corresponding Author: Sathishkumar P
e-mail : dr.sathishkumarp@gmail.com

the distribution of tests by type and level of healthcare facility. The number of samples included for each of the 69 clinical diagnostic tests was tabulated.

To estimate the potential out-of-pocket expenditure (OOPE) savings attributable to the IELS initiative, a comparative cost analysis was performed. Data on the prevailing cost of diagnostic tests in the private sector were collected from five laboratories within Namakkal district, of which two held accreditation from the National Accreditation Board for Testing and Calibration Laboratories (NABL), thereby ensuring quality and reliability of reported costs. The mean unit cost of each test was calculated by averaging values across these laboratories. The OOPE savings were subsequently derived by comparing the estimated private-sector expenditure for the same volume and type of diagnostic services with the zero-cost model under IELS, where patients incur no financial burden for accessing diagnostic services.

RESULTS

Between January and June 2025, 29,478 samples covering 69 diagnostic tests were processed under the Integrated Essential Laboratory Services (IELS) in Namakkal district. The estimated private sector equivalent cost was ₹285.3 lakhs, representing the out-of-pocket CBC Count (7,464 tests; ₹31.5 lakhs), Thyroid Hormone Analysis (5,768; ₹56.1 lakhs), and HbA1c (3,686; ₹15.7 lakhs). High-cost molecular diagnostics such as TRUENAT (3,377; ₹91.2 lakh) and CBNAAT (1,155; ₹36.7 lakh) accounted for a substantial share of savings. Additional notable tests included Liver Function Tests (₹12.5 lakh), Renal Function Tests (₹3.2 lakh), and Lipid Profile (₹6.0 lakh). These findings underscore the significant financial protection provided by IELS through free access to essential diagnostics.

Table 1: Top five lab investigations sent through IELS

S.No	Test name	Number of samples
1	Complete Blood Count(CBC)	7464
2	Thyroid Hormone Analysis (T3, T4, TSH)	5768
3	Glycosylated haemoglobin (HbA1C)	3686
4	TRUENAT	3377
5	LFT (Liver Function Test)	1475

Figure 1 shows the utilization pattern by type of investigation. The Complete Blood Count (CBC) was the most frequently performed test (7,464 samples), followed by Thyroid Function Tests (5,768) and HbA1c (3,686), reflecting the high demand for routine and chronic disease-related diagnostics. In contrast, the number of molecular diagnostics such as TRUENAT (3,377) and CBNAAT (1,155) was comparatively lower; however, these tests had the highest average unit cost (>₹2,500–₹3,000), contributing disproportionately to the estimated private sector equivalent expenditure. Together, TRUENAT and CBNAAT accounted for nearly half of the total financial savings. Moderately priced tests such as Liver Function Tests (1,442; ₹12.5 lakh), Renal Function Tests (1,654; ₹3.2 lakh), and Lipid Profiles (1,689; ₹6.0 lakh) showed consistent utilization, aligning with the rising burden of non-communicable diseases. Infectious disease diagnostics including IgM ELISA (dengue) and NS1 ELISA (dengue) were less frequently requested.

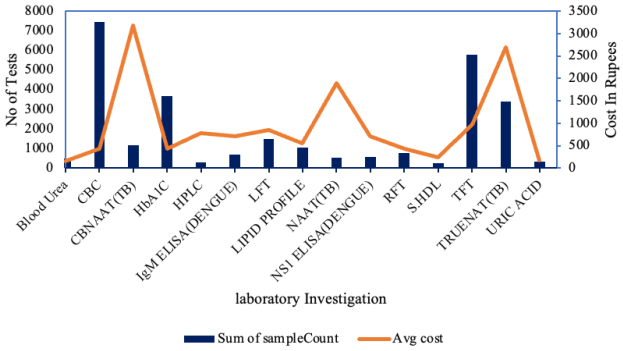

Figure 1: Test Utilization and Average Private-Sector Costs under IELS, Namakkal

DISCUSSION

This study demonstrates that the IELS programme in Namakkal significantly reduced out-of-pocket expenditure (OOPE), saving an estimated ₹285 lakhs over a six-month period. By providing an assured package of essential diagnostics free of cost, the programme directly addressed one of the major contributors to medical impoverishment in India. A key limitation of this analysis is the assumption that, in the absence of IELS, all patients would have sought private-sector diagnostic services. In reality, some patients may have accessed public secondary or tertiary facilities where selected tests are available, while others may have foregone necessary investigations altogether due to financial constraints. Consequently, the savings reported here may represent an upper-bound estimate. Nevertheless, the findings are consistent with previous evidence from India, which highlights the disproportionate diagnostic burden borne by vulnerable and low-income populations.[7,8] High OOPE on diagnostics not only delays care-seeking but also increases the risk of health expenditure, particularly for households managing chronic diseases such as diabetes, thyroid disorders, and tuberculosis.[9] Global studies similarly show that diagnostic access is a critical determinant of universal health coverage (UHC), with the Lancet Commission on Diagnostics estimating that nearly 50% of the world's population lacks access to basic tests.[10]

The results from Namakkal also illustrate the dual role of IELS in meeting both high-volume, low-cost needs (e.g., CBC, HbA1c, thyroid function tests) and high-cost, lower-frequency molecular diagnostics (e.g., TRUENAT and CBNAAT). The inclusion of advanced molecular tests under a free public diagnostic framework is particularly significant in the Indian context, where tuberculosis remains a major public health challenge and molecular testing is critical for early detection and drug-resistance monitoring.[11] By absorbing these costs, IELS not only provides financial protection but also strengthens disease control efforts.

Before the implementation of Integrated Essential Laboratory Services (IELS), biological specimens such as sputum and serum for infections including dengue, scrub typhus, leptospirosis and typhoid were routinely collected at peripheral facilities but often had to be transported to higher centres without any formal support for field staff. With the roll-out of IELS, a structured incentive system was introduced—₹6 per kilometre for transport of samples and ₹100 per day as a daily allowance. This financial support has encouraged health-care workers to undertake sample transportation work that was previously difficult to sustain due to lack of incentives. The improved motivation and logistical support may partly explain the higher number of samples reaching laboratories in the post-IELS period, contributing to the observed savings in out-of-pocket expenditure for patients.

Moreover, the integration of laboratory information through the Laboratory Information Management System (LIMS) enhances surveillance, ensures accountability, and supports rational utilization of resources across primary, secondary, and tertiary levels of care. This aligns with WHO's Essential Diagnostics List (EDL) and India's commitment under the National Health Policy 2017 to expand access to diagnostics as part of comprehensive primary healthcare.[12,13]

REFERENCES

1. World Health Organization. The essential diagnostics list: improving access to in vitro diagnostics to support universal health coverage and advance global health security. Geneva: WHO; 2021. Available from: https://www.who.int/publications/i/item/9789240028174

2. Fleming KA, Horton S, Wilson ML, Atun R, DeStigter K, Flanigan J, et al. The Lancet Commission on diagnostics: transforming access to diagnostics. Lancet. 2021;398(10315):1997–2050. doi:10.1016/S0140-6736(21)00673-5

3. Out-of-Pocket Healthcare Expenditure: A Scopus-Based Systematic Review. Afr J Biol Sci. 2024 Aug;6(14):2613-29. doi:10.33472/AFJBS.6.14.2024.2613-2629.

4. Ministry of Health and Family Welfare. National Essential Diagnostics List (NEDL) 2019. New Delhi: Government of India; 2019. Available from: https://nhm.gov.in/New_Updates_2018/NEDL.pdf

5. Dash A, Mohanty SK. Do poor people in the poorer states pay more for healthcare in India? BMC Public Health. 2019;19(1):1020. doi:10.1186/s12889-019-7342-8

6. Gupta I, Chowdhury S. Financing for health coverage in India: issues and concerns. IEG Working Paper No. 346. October 2016. Accessed April 26, 2022. Available from: https://ssrn.com/abstract=2858718

7. Prinja S, Bahuguna P, Pinto AD, Sharma A, Bharaj G, Kumar V, et al. The cost of universal health care in India: a model based estimate. PLoS One. 2012;7(1):e30362.

8. Selvaraj S, Karan A. Why publicly-financed health insurance schemes are ineffective in providing financial risk protection. Econ Polit Wkly. 2012;47(11):60–8.

9. Bhojani U, Thriveni BS, Devadasan R, Munegowda CM, Devadasan N, Kolsteren P, et al. Out-of-pocket healthcare payments on chronic conditions impoverish urban poor in Bangalore, India. BMC Public Health. 2012;12:990.

10. Fleming KA, Horton S, Wilson ML, Atun R, DeStigter K, Flanigan J, et al. The Lancet Commission on diagnostics: transforming access to diagnostics. Lancet. 2021;398(10315):1997–2050.

11. Central TB Division. India TB Report 2024. Ministry of Health and Family Welfare, Government of India. New Delhi: MoHFW; 2024.

12. World Health Organization. First WHO Model List of Essential In Vitro Diagnostics. Geneva: WHO; 2018.

13. Ministry of Health and Family Welfare. National Health Policy 2017. Government of India. New Delhi: MoHFW; 2017.