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## **Accessibility and Sustainability of PMUY in India: A Comparative Study of Haryana, Uttar Pradesh, Rajasthan and Bihar**

**Indra Jakhar**

*Associate Professor, Dept. in Economics, Govt. National College, Sirsa, Haryana, India*

**Suman Kharb**

*Asst. Prof., Dept. of Economics, Govt. College Sultanpur, Gurugram, Haryana, India*

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### **Abstract**

Access to clean cooking energy is very important component to achieve sustainable development goal-6 due to its impact on public health, gender equality, environmental protection and poverty reduction. Although India has achieved tremendous progress in growth and economic development, still large proportion of rural households in India rely on traditional sources of cooking energy such as crop residues, firewood, and animal dungs. In order to reduce these challenges, the government of India introduced the Pradhan Mantri Ujjwala Yojana (PMUY) in 2016 containing the objectives of distributing subsidized Liquefied Petroleum Gas (LPG) connections to the women who belongs to economically poor households. The present study examines the accessibility and the sustainability of LPG consumption after implementing PMUY through the comparative analysis of Bihar, Haryana, Rajasthan and Uttar Pradesh. To examine the extent of long-term transition towards clean fuel through PMUY facilities, this study utilized secondary data of LPG connections, infrastructure for LPG distribution, cylinder refill adoption rate and cooking fuel uses in households. The finding shows the significant expansion of LPG connections, and distribution facilities in all four districts of India under PMUY. It was found that PMUY coverage and use of clean cooking was found substantial in Uttar Pradesh and Bihar under this scheme, although there is still gap to achieve sustained and exclusive LPG connections uses.

**Keywords:** Clean Fuel, LPG Accessibility, Sustainability, PMUY.

### **Introduction:**

Access to clean cooking fuel is recognized as an important component of sustainable development because of its implication for environmental protection, public health, poverty reduction and gender inequality. Although India has witnessed a substantial growth in economic development still a large percentage of household in rural India has to depend unclean biomass fuel such as crop residues, firewood and animal dung for cooking purpose. The use of traditional fuel in chulhas generates indoor air pollution, contributing to eye diseases, respiratory illnesses and other adverse diseases, particularly among children and women (Dabadge et al., 2018; Angoori & Kumar, 2023; Jaiswal & Meshram, 2019). The

dependence on traditional fuels accelerate to environmental degradation and responsible for considerable time burden on households for fuel collection in rural areas.

Addressing these challenges, the Government of India launched the Pradhan Mantri Ujjwala Yojana (PMUY) in 2016 for providing subsidized Liquefied Petroleum Gas (LPG) connections to the women who belongs to economically weaker households. The scheme aims to improve the accessibility and affordability of clean cooking fuel with the introduction of this important clean cooking fuel intervention. Studies showed that there is significantly expansion in LPG household connection after the implementation of PMUY along with strengthening the distribution network across the country (Aggarwal et al., 2018; Dabadge et al., 2018; Ranjan & Singh, 2020). As a result, access to clean cooking fuel has improved significantly, mainly among rural and economically backward households. The benefits of PMUY are not only limited to energy access although many studies have found positive socio-economic result associated with clean cooking fuel adoption. Sharma, Yadav, and Raj (2020) resulted that PMUY has significant effect to women's empowerment by enhancing decision-making power, awareness, behavioural changes and financial independence among women of rural Rajasthan. Similarly, Mall and Rani (2020) found that convenience of using LPG, reduced cooking time and improved well-being in Bihar household are the result of beneficiary satisfaction after implementation of PMUY. These findings suggest that the LPG interventions have its significant developmental benefits beyond the expansion of clean cooking fuel among households.

However, the increasing expansion of LPG connections could not address the important questions regarding the continuous transition of clean cooking energy. Existing studies resulted that access to LPG does not necessarily ensure its regular use. Ranjan and Singh (2020) examined that although PMUY succeed in expansion of LPG accessibility, still a large portion of beneficiary households continued to rely on unclean fuels because of their low-cost or free availability. As a result, the number of inactive LPG connections has increased and there is limited growth in LPG consumption. Similar results are presented by Gupta, Vyas, and Spears (2019) that fuel stacking practices are widespread and common in rural India, where households use traditional fuels alongside clean fuel despite owning LPG connections. These studies indicate that the challenge of clean energy transition extends beyond accessibility and emphasized to examine the affordability and continuous consumption of LPG.

Affordability remains one of the most critical barriers to regular use of LPG. Studies showed that the high cost of LPG cylinder refills is a regular constraint for poor households. Giri and Aadil (2018) showed that refill expenses, family size, household income, food habits, and delivery to remote areas constraints affects LPG consumption pattern among PMUY users. Similar conclusions were reached by Jaiswal and Meshram (2019), Swain and Mishra (2019), and Mall and Rani (2020) who reported that easy and free access to traditional fuels and lack of refill affordability remained main obstacles to the regular adoption of LPG. These findings suggest that although connection subsidies have improved initial accessibility to LPG cylinder but regular use of LPG depends mainly on the ability of affording regular refills by households.

Infrastructural and behavioural factors have their effect on the sustainability of LPG consumption. Dabadge et al. (2018) concluded that there is huge the mismatch between the growing number of LPG consumers and the expansion of distributor facilities. It may affect

service delivery and refill accessibility to the users. Aggarwal et al. (2018) similarly highlighted the importance of adequate distribution facilities to accelerate large-scale penetration of LPG use. Angoori and Kumar (2023) found that although people are well aware about the harmful effect of traditional fuel on health and environment yet they prefer to use unclean fuel due to refill cost of LPG cylinder. It shows that awareness alone is not sufficient to guarantee sustained consumption and infrastructural and economic factors continue play a decisive role.

The existing literature highlighted the critical distinction between accessibility to LPG cylinder its affordability, and sustainability. Accessibility means the access to LPG connections and distribution network facilities, affordability means households have the ability to purchase refills on continuous basis, and sustainability refers to the exclusive and continued use of LPG cylinder for primary cooking fuel. Previous studies have analysed all three dimensions of accessibility, affordability and sustainability separately and did not analysis the interrelationship between these aspects within a state-level comparative framework. In particular, only few evidence exists which shows the relationship between the rapid expansion of PMUY connections, adequate distributor network, refill adoption, and regular clean fuel consumption across different states with their socio-economic features.

Against this backdrop, the present study analysed the accessibility, affordability, and sustainability of LPG consumption under PMUY through a comparative analysis of Bihar, Haryana, Rajasthan and Uttar Pradesh. The study utilizes secondary data on PMUY connections, LPG distribution network, adoption rate of refill, and use of clean cooking fuel to examine the extent to which PMUY has penetrated a long-term transition towards clean cooking energy. These states have different socio-economic and distribution infrastructural facilities, varying from relatively developed LPG markets (Haryana) to states, where householders have lower initial modern/clean fuel adoption and major dependence on unclean/traditional fuels (Bihar). By connecting the indicators of accessibility, affordability, and sustainability, the study tries to provide a complete evolution of the achievements and bottlenecks of PMUY and positively contribute to government policy discussions for strengthening India's cooking energy transition from traditional to clean energy.

### **Research Gap:**

Although given previous research has examined the role of PMUY's in achieving LPG access and found the challenges to continue adoption of LPG, still very few studies examined the interrelation between accessibility, affordability and sustainability of LPG for cooking activities. Existing studies rarely connect the indicators such as LPG connections, distribution facilities network, refill adoption rates, and consumption of clean fuel in a comparative way across different state-level framework. Consequently, there is lack of evidence to examine whether accelerating LPG accessibility through PMUY has converted into sustained modern/clean and cost- effective cooking fuel uses. This study tries to fill this gap with a comparative analysis of Bihar, Haryana, Rajasthan and Uttar Pradesh.

Multiple factors have influenced the transition from unclean cooking fuels to clean cooking energy. It is important to relate the LPG accessibility, its affordability, and sustainability. While PMUY has substantially improved access to LPG connections, the long-term success of the programme depends on the adequacy of distribution infrastructure network and the financial ability of households to afford regular refills. The present study

*Accessibility and Sustainability of PMUY in India: A Comparative Study of...* Indra Jakhar & Suman Kharb tries to conceptualize the interconnection between the PMUY intervention, accessibility of LPG, affordability of refill, and sustainable adoption of clean fuel.

### **Objectives:**

1. To examine the expansion of LPG connects under PMUY in selected Indian states.
2. To analyse the adequacy of LPG distribution network for accelerating LPG coverage.
3. To assess the affordability of LPG consumption through refill adoption behaviour among PMUY beneficiaries.
4. To examine the interconnection of the accessibility, affordability, and sustainability of LPG use across Bihar, Haryana, Rajasthan and Uttar Pradesh.
5. To identify policy implications for strengthening the long-term effectiveness of PMUY.

### **Research Methodology:**

The study uses a descriptive and comparative research methodology to examine the accessibility and sustainability of clean cooking fuel adoption under the Pradhan Mantri Ujjwala Yojana (PMUY) in selected Indian states. Four states of India (Haryana, Uttar Pradesh, Rajasthan, and Bihar) were purposively selected to capture LPG penetration levels, regional variations in socio-economic conditions, distribution infrastructure, and dependence on unclean cooking fuels. Haryana represents a relatively advanced state with higher modern fuel coverage and strong LPG infrastructure; Bihar, Rajasthan and Uttar Pradesh give important information into the implementation of PMUY in states characterized by varying levels of energy poverty and large rural populations.

The study is based entirely on secondary data relating to PMUY connections and LPG distributors from Indian Petroleum Natural Gas Statistics (IPNG) published by the Ministry of Petroleum and Natural Gas. Insights of cooking fuel uses was collected from the National Family Health Survey (NFHS-4, 2015-16 and NFHS-5, 2019-21). Data on refill behaviour of LPG consumption among PMUY beneficiaries were compiled from Petroleum Planning and Analysis Cell (PPAC) reports, parliamentary questions and replies available through the Rajya Sabha Questions Archive and the Lok Sabha Questions Archive, the PMUY dashboard, and the Open Government Data Platform of India. The study covers the period from 2016-17 to 2024-25, enabling an assessment of both the expansion phase and the sustainability phase of PMUY implementation.

The study focuses on two dimensions accessibility and sustainability. Accessibility is assessed through indicators such as the number of PMUY connections, growth in LPG distributors, and the ratio of LPG connections per distributor. Sustainability is evaluated through refill adoption behaviour and changes in household use of clean cooking fuels.

To evaluate the growth performance of PMUY, annual growth rates and Compound Annual Growth Rates (CAGR) have been computed for both LPG connections and LPG distributors. Infrastructure adequacy has been assessed through the Connections per Distributor Ratio and the sustainability of LPG usage has been examined through refill adoption rates among PMUY beneficiaries. Comparative state-level analysis represents inter-state differences in accessibility, infrastructure burden, refill behaviour, and sustainability of LPG usage.

## Results:

- 1. Growth and Expansion of PMUY:** The data on number of connections released was taken in cumulative form year wise to examine the growth and expansion under PMUY in the selected four states. The year wise data across the selected states is presented in table 1.1 below and the compound annual growth rate is also calculated for each state over the time period.

**Table1.1:**  
**No.of PMUY Connections from 2016-17 to 2024-25**

| Year        | Haryana (Lakhs) | Uttar Pradesh (Lakhs) | Rajasthan (Lakhs) | Bihar (Lakhs) |
|-------------|-----------------|-----------------------|-------------------|---------------|
| 2016-17     | 2.79            | 55.31                 | 17.23             | 24.77         |
| 2017-18     | 3.57            | 64.86                 | 26.26             | 49.13         |
| 2018-19     | 6.80            | 129.63                | 56.96             | 78.95         |
| 2019-20     | 7.31            | 147.56                | 63.69             | 85.38         |
| 2020-21     | 7.27            | 147.33                | 63.6              | 85.24         |
| 2021-22     | 7.39            | 167.18                | 66.2              | 100.95        |
| 2022-23     | 7.67            | 175.03                | 69.27             | 107.33        |
| 2023-24     | 11.13           | 185.92                | 73.77             | 116.2         |
| 2024-25     | 11.15           | 185.94                | 73.81             | 116.29        |
| <b>CAGR</b> | <b>18.93%</b>   | <b>16.37%</b>         | <b>19.94%</b>     | <b>21.33%</b> |

Source: compiled from MOPNG - IPNG statistics annual reports

In the table above we see that in the state of Haryana the number of PMUY connections have increased from 2.79 lakhs in 2016-17 to 11.15 lakhs in 2024-25 with a compound annual growth rate of 18.93 percent and the major surge in connections under PMUY in Haryana took place in 2018-19 with 91 percent increase in 2018-19 as compared to 2017-18. In Uttar Pradesh the number of PMUY connections have increased from 55.31 lakhs in 2016-17 to 185.94 lakhs in 2024-25 with a compound annual growth rate of 16.37 percent and similarly in Bihar and Rajasthan the number of PMUY connections have increased from 24.77 lakhs in 2016-17 to 116.29 lakhs in 2024-25 and 17.23 lakhs in 2016-17 to 73.81 lakhs in 2014-25 respectively with a compound annual growth rate of 21.33 percent in Bihar and 19.94 percent in Rajasthan. In all the states there has been sharp increase in PMUY LPG connections during 2018-19. The increase was primarily driven by expansion of scheme targets, relaxation in

Accessibility and Sustainability of PMUY in India: A Comparative Study of... Indra Jakhar & Suman Kharb

beneficiary identification procedures, widening of eligibility categories, aggressive implementation before the 2019 general elections, and rapid expansion of LPG distribution infrastructure-

“The CAG audit report  
(Chapter\_3\_Distribution\_of\_LPG\_connections\_under\_PMUY\_Report No. 14 of 2019)”.

To access a clearer picture of growth in the number of connections under PMUY the growth rate has been depicted in the table 1.2 below.

**Table 1.2:**  
**Growth rate in no. of PMUY connection**

| Year    | Haryana | Uttar Pradesh | Bihar | Rajasthan |
|---------|---------|---------------|-------|-----------|
| 2016-17 | -       | -             | -     | -         |
| 2017-18 | 28.11   | 17.27         | 98.35 | 52.41     |
| 2018-19 | 90.54   | 99.86         | 60.69 | 116.92    |
| 2019-20 | 7.42    | 13.83         | 8.15  | 11.82     |
| 2020-21 | -0.57   | -0.16         | -0.17 | -0.14     |
| 2021-22 | 1.68    | 13.48         | 18.43 | 4.10      |
| 2022-23 | 3.84    | 4.69          | 6.33  | 4.63      |
| 2023-24 | 45.05   | 6.22          | 8.26  | 6.50      |
| 2024-25 | 0.18    | 0.01          | 0.08  | 0.05      |

Source: self-computed from data compiled from MOPNG-IPNG statistics annual reports. In all the selected states there has been maximum growth rate in number of connections in 2018-19 except Bihar. In Bihar there has been decrease in growth rate of connections in 2018-19 as already the base numbers of connections were high. As of September 2018, Bihar was ranked among the top three states in India in terms of providing new LPG connections under “PMUY (Council on Energy, Environment and Water Study-Access to Clean Cooking Energy and Electricity Survey of States 2018)”. Except Bihar the other states show the same pattern i.e. major surge in number of connections in 2018-19 and decline in number of connections thereafter due to saturation of eligible households and data adjustment and duplicate connections were removed. The percentage growth rate is negative in 2020-21 for all the above states due to pandemic related implementation slow down. In 2023-24 again there is increase in growth rate of connections due to implementation of “Ujjwala 2.0”. Further Government approved the release of additional 75 lakhs connections in September 2023 and oil and marketing companies have completed the release of above said connections by July 2024- Digital Sansad

“GOVERNMENT OF INDIA RAJYA SABHA UNSTARRED QUESTION  
NO.- 131”.

Further to examine the trend of growth in connections year wise and the rate of the growth in number of connections have been calculated year wise of all the four states in graph 1.1 and also depicted in graph 1.2 respectively. (Appendix).

**2. LPG Distribution Infrastructure Analysis:** The expansion of LPG distribution infrastructure during the implementation period of the PMUY scheme is analysed with the help of data on LPG distributors of the selected states during the study period. The data reveals that all four states experienced an overall increase in the number of LPG distributors;

though the rate of growth differed significantly across states. The table 2.1 shows the number of LPG distributors in four states – Haryana, Uttar Pradesh, Rajasthan, and Bihar – from 2016-17 to 2024-25 along with their Compound Annual Growth Rate (CAGR). Uttar Pradesh had the highest absolute number of LPG distributors throughout the period. The number increased from 3,395 distributors in 2016-17 to 4,145 in 2024-25. As compared to Haryana the number of connections allotted under PMUY as discussed above are more in Uttar Pradesh, Rajasthan and Bihar so distributors are also more due to their wide geographical area and large population size of these states. The annual growth rate in LPG distributors have shown a major surge in 2018-19 in all states which is due to the reason of major surge in connections as explained above. The growth rate of LPG distributors in all the four states are calculated in table 2.1.1 and graph 2.1 (Appendix).

**Table-2.1:**  
**LPG Distributors State wise**

| <b>Year</b> | <b>Haryana</b> | <b>Uttar Pradesh</b> | <b>Rajasthan</b> | <b>Bihar</b> |
|-------------|----------------|----------------------|------------------|--------------|
| 2016-17     | 540            | 3,395                | 1,099            | 1,109        |
| 2017-18     | 479            | 2,959                | 1,063            | 1,076        |
| 2018-19     | 614            | 4,052                | 1,333            | 1,799        |
| 2019-20     | 621            | 4,110                | 1,372            | 1,938        |
| 2020-21     | 623            | 4,126                | 1,385            | 1,993        |
| 2021-22     | 625            | 4,134                | 1,387            | 2,009        |
| 2022-23     | 624            | 4,142                | 1,387            | 2,024        |
| 2023-24     | 626            | 4,142                | 1,384            | 2,033        |
| 2024-25     | 627            | 4,145                | 1,385            | 2,037        |
| <b>CAGR</b> | <b>0.018</b>   | <b>0.025</b>         | <b>0.029</b>     | <b>0.078</b> |

Source: self-computed from data compiled from MOPNG-IPNG statistics annual reports.

The other factor taken to access the infrastructure layout and efficiency in distribution is the connection per distributor calculated by dividing number of the connections issued in particular year by the number of LPG distributor in that particular year. The connection per distribution ratio is calculated in similar manner for all the years and for all the four states. It is shown in the table 2.2 where we observe that in 2016-17 the pressure on LPG distributors is low as the numbers of connections released were also low in all states and it was the initiation phase of Ujjwala yojana. In 2017-18 and 2018-19 there has been rise in the connection per distributor ratio of all states except Bihar. In Bihar the base value was already high in 2016-17 as compared to other states. After 2018-19 there has been consistent increase in the ratio except the Covid period of 2020-21. Again the major increase in connection per distributor ratio is in 2023-24 which is due to initiation of “Ujjwala 2.0”. But overall the ratio of connection per distributor presents a dismal picture as evident from the given table that the distributors are over burden in Bihar, Rajasthan and Uttar Pradesh due to high ratio which raises the concern on ease of availability, delivery and refilling of the cylinders. So, the infrastructural conditions have not improved in the same pace as the numbers of connections are allotted under PMUY.

**Table 2.2:**  
**Connection per distributor of the states from 2016-17 to 2024-25**

| Year    | Haryana | Uttar Pradesh | Rajasthan | Bihar  |
|---------|---------|---------------|-----------|--------|
| 2016-17 | 516.2   | 1629.2        | 1567.5    | 2233.5 |
| 2017-18 | 745.5   | 2192.0        | 2470.0    | 4566.1 |
| 2018-19 | 1108.2  | 3199.2        | 4272.7    | 4388.4 |
| 2019-20 | 1177.0  | 3590.4        | 4641.8    | 4405.5 |
| 2020-21 | 1166.5  | 3570.8        | 4591.7    | 4276.8 |
| 2021-22 | 1182.4  | 4044.1        | 4773.1    | 5024.7 |
| 2022-23 | 1229.7  | 4225.8        | 4994.3    | 5303.0 |
| 2023-24 | 1777.9  | 4488.8        | 5330.3    | 5715.6 |
| 2024-25 | 1778.3  | 4485.9        | 5329.2    | 5708.9 |

Source: self-computed from data compiled from MOPNG-IPNG statistics annual reports.

**3. Clean Cooking fuel Adoption Analysis:** For analyzing the clean cooking fuel adoption the study uses the data of NFHS as proxy variable. The study aimed to use the factsheet of NFHS-4, NFHS-5 and NFHS-6 to know how overtime the use of clean cooking fuel has increased. But in the recently released data of NFHS-6 (2023-24) the data on clean cooking fuel is not available which limits the analysis to NFHS-4 and NFHS-5. The comparison of clean cooking fuel usage between NFHS-4 (2015-16) and NFHS-5 (2019- 21) provides important evidence regarding the effectiveness of PMUY in improving access to modern cooking energy across the selected states. It shows that four states experienced an increase in the proportion of households using clean cooking fuels after the implementation of PMUY, although the magnitude of improvement varied considerably. Table 3.1 represents that Bihar achieved outstanding achievement in clean cooking fuel adoption.

**Table 3.1**  
**Clean Cooking Fuel Adoption by households**

| State         | NFHS-4 (2015-16) % | NFHS-5 (2019-21) % | Absolute Increase % | Relative Growth % | PMUY Expansion | Clean Fuel Growth |
|---------------|--------------------|--------------------|---------------------|-------------------|----------------|-------------------|
| Bihar         | 17.8               | 37.8               | 20                  | 112.4             | Very high      | Very high         |
| Uttar Pradesh | 32.7               | 49.5               | 16.8                | 51.4              | Very high      | Strong            |
| Haryana       | 52.2               | 59.5               | 7.3                 | 14.0              | Moderate       | Smaller increase  |
| Rajasthan     | 31.8               | 41.4               | 9.6                 | 30.2              | Moderate       | Moderate          |

Source: State wise factsheet NFHS-5

From the table we observe that in Bihar there has been 20 percent increase in clean cooking fuel adoption in NFHS-5 as compared to NFHS-4. During the NFHS-5 even though the period of covid-19 is also included when the economy was not in a normal state and was facing issues like supply disruptions even then also PMUY implementation is quite effective. In Uttar Pradesh also the rate of increase in clean cooking fuel in NFHS-5 as compared to NFHS-4 is 16.8 percent which is low than Bihar but still quite high. Haryana and Rajasthan had not shown such double-digit rate of increase in clean cooking fuel as shown by Bihar and Uttar Pradesh but still there has been increase in clean cooking fuel of adoption of 7.3 percent and 9.6 percent respectively in NFHS-5 as compared to NFHS-4. The relative growth percentage of clean cooking fuel is high for Bihar and Uttar Pradesh and moderate for Rajasthan and Haryana as we see in above table for NFHS-5.

Another indicator we have taken for the sustainability of usage of clean fuel under PMUY is the “refill adoption rate” which is calculated as number of refills (not more than 3) by beneficiaries in a state in a year divided by number of connections released in that state in particular year multiplied by 100. The analysis is limited subject to the availability of data on number of refills state wise and year wise. In this paper we have taken data on beneficiaries who have taken refills not more than 3 (due to data availability) from 2016-17 to 2021-22 and for 2023-24. For the period 2022-23 and 2024-25 the data was not available for all the four selected states. The data is shown in table 3.2.

**Table 3.2:**  
**Refill Adoption rate State wise**

| Time Period | Bihar | Uttar Pradesh | Rajasthan | Haryana |
|-------------|-------|---------------|-----------|---------|
| 2016-17     | 83.39 | 81.38         | 82.85     | 65.14   |
| 2017-18     | 69.52 | 64.77         | 71.99     | 40.13   |
| 2018-19     | 83.97 | 84.94         | 89.50     | 74.03   |
| 2019-20     | 63.75 | 63.08         | 68.28     | 37.20   |
| 2020-21     | 40.11 | 35.09         | 41.33     | 18.53   |
| 2021-22     | 59.05 | 52.69         | 50.12     | 31.43   |
| 2022-23     | N. A  | N. A          | N. A      | N. A    |
| 2023-24     | 55.76 | 66.76         | 64.98     | 69.21   |
| 2024-25     | N. A  | N. A          | N. A      | N. A    |

Source: Self compute from data extracted from IPNG reports and open Government data platform India, <https://www.data.gov.in>

The table reflects that the refill adoption rate was quite high in 2016-17 for Bihar, Rajasthan and Uttar Pradesh of 83.39 percent, 82.85 percent and 81.38 respectively and moderate in Haryana of 65.14 percent. There is decline in the refill adoption rate in 2017-18 due to high price as reflected in several reports - “Down to Earth” 03 Aug 2022-The biggest reason for not refilling LPG cylinders is said to be its high price. The prices of LPG were skyrocketing even as there has been a sharp reduction in the subsidy given for it. Investigated by Down to Earth -03 Aug 2018 the implementation of PMUY in mid-2017, it was found that the majority of the people were not refilling the cylinder. In 2018-19 there is major surge in the refill adoption rate. The increase was primarily driven by expansion of scheme targets,

*Accessibility and Sustainability of PMUY in India: A Comparative Study of...* Indra Jakhar & Suman Kharb  
relaxation in beneficiary identification procedures, widening of eligibility categories, aggressive implementation before the 2019 general elections, -

“The CAG audit report

(Chapter\_3\_Distribution\_of\_LPG\_connections\_under\_PMUY\_Report No. 14 of 2019)”.

During the period 2019-20 to 2020-21 there has been decline in the refill adoption rate of all the states, though the rate of decline may vary among the states. But the period of 2020-21 experienced major decline in refill adoption rate is due to Covid -2020, which itself contradicts the data provided by NFHS-5 factsheet of clean cooking fuel analysis. As NFHS -5(2019-21) period is abnormal year and data also show supply constraints and low refill adoption rate still the NFHS -5 report shows a percentage increase in clean cooking fuel growth of double digit in some states as shown in table 3.1. In the period 2021-22 and 2023-24 again there is increase in refill adoption rate as compared to the previous year which may be attributed to completion of targets of phase I of PMUY and to initiation of “Ujjwala 2.0.

### **Conclusion:**

The present paper makes an attempt to evaluate the Pradhan Mantri Ujjwala Yojna (PMUY) across the critical dimensions of accessibility, distributional infrastructure analysis and long-term sustainability. The findings of the paper suggest that PMUY has shown unprecedented growth and expansion in form of number of connections given under PMUY in four selected states from 2016-17 to 2024-25 and shown phenomenal spikes in connections occurred in 2018-19 and 2023-24. The expansion of LPG distributional infrastructure during the implementation period of the PMUY reveals that all four states experienced an overall increase in the number of LPG distributors; though the rate of growth differed significantly across states. Another factor taken to access the infrastructure layout and efficiency in distribution is the connection per distributor. The overall the ratio of connection per distributor presents a dismal picture that the distributors who are overburdened in Bihar, Rajasthan and Uttar Pradesh which raises the concern on ease of availability, delivery and refilling of the cylinders. So, the infrastructural conditions have not improved in the same pace as the numbers of connections are allotted under PMUY.

For analysing the clean cooking fuel adoption, the study uses the data of NFHS factsheet. The comparison of clean cooking fuel usage between NFHS-4 (2015-16) and NFHS-5 (2019-21) provides important evidence regarding the effectiveness of PMUY in improving access to modern cooking energy across the selected states. It shows that four states experienced an increase in the proportion of households using clean cooking fuels after the implementation of PMUY, although the magnitude of improvement varied considerably. Another indicator we have taken for the sustainability of usage of clean fuel under PMUY is the “refill adoption rate”. There is decline in the refill adoption rate in 2017-18, the biggest reason for not refilling LPG cylinders is said to be its high price. The prices of LPG were skyrocketing even as there has been a sharp reduction in the subsidy given for it. During the period 2019-20 to 2020-21 there has been decline in the refill adoption rate of all the states, though the rate of decline may vary among the states. But the period of 2020-21 experienced major declines in refill adoption rate. While the clean cooking fuel usage improved in NFHS round, but low refill rates reveal a stark gap between having a connection and sustained clean fuel usage. The PMUY successfully eliminated the high entry barrier of free initial connection and capital cost but the recurring cost of refills remains primary hurdle for long term sustainability. The

*Accessibility and Sustainability of PMUY in India: A Comparative Study of...* Indra Jakhar & Suman Kharb  
 gap between NFHS data and refills data reveals that the beneficiaries are practicing fuel stacking undermining the health and environmental goals of the scheme.

### **Policy Implications:**

The findings of the paper imply that the metric of success for PMUY must be from connections distributed to annual average refill rates per household. There is need to tract regular usage than initial enrolment. As there are large number of people who are using three or less refills which reflects recurring cost as main barrier and leads to fuel stacking. The current model of flat subsidy of “Ujjwala 2.0” needs to be more dynamic. The subsidies should be indexed to inflation and it should be increased in when frequency of refill increases to incentivize habit formation. There is need to strengthen deep rural infrastructure to reduce the transport cost passed on by distributors to rural consumers. Also mentioned by CAG that encouraging the sustained usage of LPG remains a big challenge as the annual average refill consumption of PMUY consumers has declined. The annual average refill consumption of 1.93 crore PMUY consumers (who have completed more than one year as on March 31, 2018) was only 3.66 refills as worked out by audit. Dec 11, 2019-India Today. So, in order to fulfil the objectives of PMUY the policy needs to be more dynamic in terms of infrastructural set up to ensure doorstep delivery and monitoring the annual average refill rates.

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**Survey and energy-use datasets:**

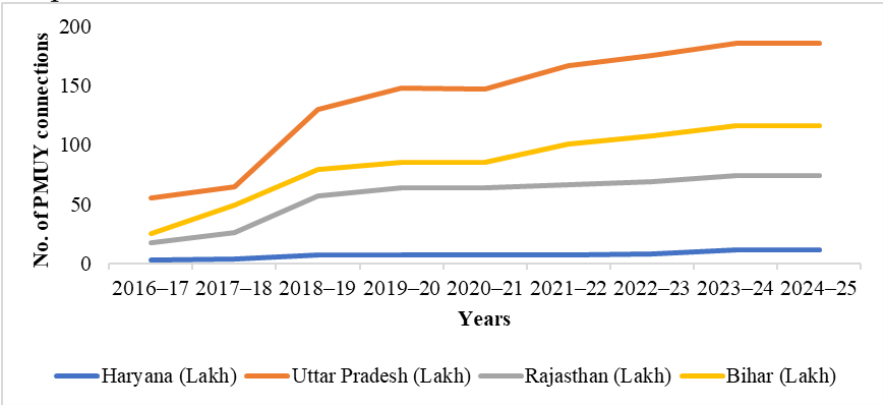
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1. Environmental Magazine -Down to Earth-03 Aug 2022
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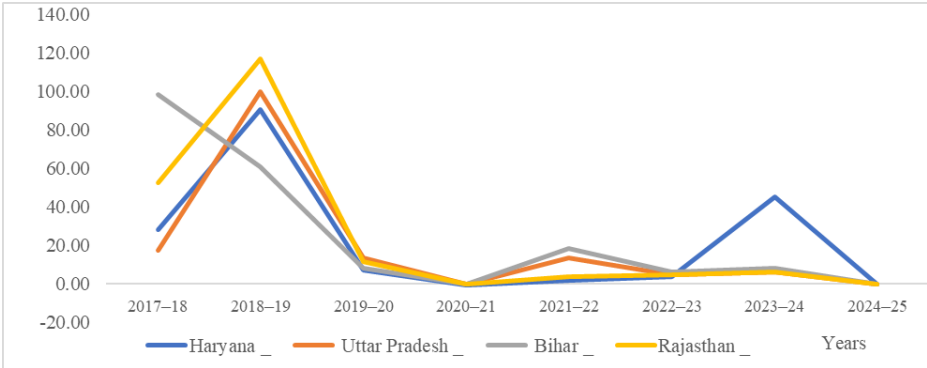
Appendix:

Graph 1.1-No. of PMUY connections from 2016-17 to 2024-25



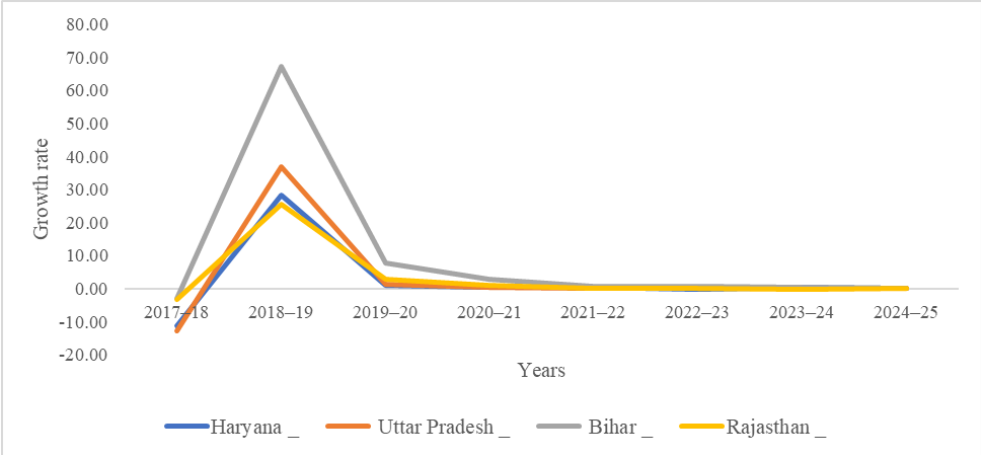
Source: self-computed from data compiled from MOPNG IPNG statistics annual reports

Graph 1.2: Growth Rate in No .of PMUY Connection



Source: self-computed from data compiled from MOPNG IPNG statistics annual reports

Graph 2.3: Growth rate in No. of LPG Distributors



Source: self-computed from data compiled from MOPNG IPNG statistics annual reports