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Barriers to and facilitators of uptake and sustained use of LPG through the PMUY in tribal communities of Pune district

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ABSTRACT

The Pradhan Mantri Ujjwala Yojana (PMUY), launched in India in 2016, is the world's largest program to provide cleaner cooking fuel to poor households. The PMUY may yield large health benefits because of increased LPG use, and more importantly, reduced chulha use, and thus may significantly reduce household air pollution exposures. This research, conducted in a tribal, difficult-to-reach area of Pune District, leveraged PMUY to study the uptake, adoption, usage, and health benefits of LPG. This work highlighted barriers to and facilitators of adoption and sustained LPG usage. Our findings have program implications and need to be addressed to ensure that poor households continue to use LPG as their primary cooking fuel.

Our study indicates that most households expressed a desire to own an LPG gas stove but are not aware about the methods to avail the scheme and rely on the local governments to obtain the LPG. The perceived benefits of using LPG differ among people, depending on their own experiences. The most common perceived benefits include ease of use and less time spent on cooking. However, most people are unaware of the severe health effects of HAP, which, if known, might influence their decision to own and use LPG for cooking. The challenges in availing the scheme include varying registration amount, lesser awareness of the document requirements and multiple trips to the distributors' office to fulfil the documentary requirements. Further, the sustained use is hampered by the non-subsidized refills and unavailability of transport facilities for the refill replacement. Further, the beneficiaries are unaware that the subsidy goes towards the repayment of the loan and more clarity is expected from the distributor when availing the scheme.

In conclusion, the population in tribal regions is willing to use the LPG regularly if the refill costs are subsidized. Further increasing logistical and financial support to rural distributors will help in better uptake.

Introduction

The Pradhan Mantri Ujjwala Yojana (PMUY), launched by the Government of India in 2016, is the world's most extensive program to provide cleaner cooking fuel to underprivileged households (*National Portal of India*, n.d.). This scheme provides financial assistance as a loan to a woman above 18 years of age who is registered below the poverty line for the purchase of the LPG connection and stove, amounting to INR 1600. This amount is later deducted in installation from the subsidy amount of the refill cylinder (*National Portal of India*, n.d.). PMUY is expected to yield enormous health benefits because increased LPG use and, more importantly, reduced chulha use may significantly reduce household air pollution (HAP) levels (Sidhu et al., 2017). Although PMUY has largely been successful in providing LPG connections to households that have never used one, challenges remain in providing LPG connections to the most under-resourced communities, such as tribal communities (Mani et al., 2020). Besides, sustainable usage of LPG by the PMUY beneficiaries is one of the biggest challenges for the success of the PMUY (Kar et al., 2019).

Despite a large uptake (Gould et al., 2020), the continued use of LPG by the PMUY beneficiaries is not highly reported (Kar et al., 2019; Mani et al., 2020). Factors contributing to lower-than-ideal LPG usage include attitudes, beliefs, accessibility issues and affordability that affect LPG purchase and usage. These issues need to be understood to address lesser usage. Further, these barriers have program implications that need to be addressed to ensure that underprivileged households can obtain LPG connections and continue to use LPG as cooking fuel. Our qualitative study

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attempted to understand some of these factors and how these affect the health of LPG users in rural tribal areas. Here, we present the qualitative study methods, results and implications for policymakers.

Methods

Our study focused on assessing the barriers to & facilitators of uptake of LPG and tried to understand the sustained use of LPG. We used two approaches that could return useful insights into the drivers of adoption and sustainable use of LPG. These approaches focused on consumer or LPG user community perspective and that of the LPG provider (distributor).

Qualitative research methods were primarily used to conduct the study. Qualitative research is commonly used to describe a social phenomenon which primarily answers "Why?", "How?" and "What way?" of any research questions. In doing so, qualitative research attempts to understand the nature of human experiences. In this study, we intended to establish priorities and understand barriers and facilitators of uptake, use and implementation of PMUY in tribal regions.

The study tools, consisting of the focus group discussion (FGD) and interview guides, were prepared based on the study objectives, including uptake and sustained usage of LPG. The Institutional Ethics committee of the KEM Hospital Research Centre approved the study protocol and related tools. Only participants from whom we received informed consent participated in the study.

The study was conducted in tribal areas of Junnar block in Pune district, where we have performed extensive research on methods to enhance the usage of LPG (Harrell et al., 2020; Pillarisetti et al., 2019). To initiate the inquiry process, we identified households that had received an LPG connection through PMUY, with different usage patterns, ranging from no LPG use to nearly 100% use. We randomly identified 228 households to determine the usage pattern in the area based on the list of PMUY eligible households provided by the local LPG distributor. A screening questionnaire was administered to the PMUY beneficiary in these households, which was a woman older than 18 years, and information was obtained on the availability of LPG or chulha and the frequency of use of LPG and chulha on a day to day basis. This screening led to the categorization of the 228 households into four groups: i.) Above 70% usage: All three meals on LPG, ii.) Between 70% to 30% usage: Any two meals on LPG, iii.) Below 30% usage: Only one meal on LPG, and iv.) No LPG: No meal on LPG.

We randomly selected 20 households from each group and administered a semi-structured questionnaire that enquired about their understanding of the PMUY scheme, household purchasing behaviours, solid and liquid fuel use, and other predictors of adoption and sustained LPG usage. We further conducted one focused group discussion in each group and purposively selected one participant in each for an in-depth interview for a detailed understanding of the barriers to and facilitators in uptake and sustained PMUY usage. The FGDs were conducted at a neutral and mutually convenient location to all the participants and the interviews were conducted at the participants' households. Flowchart 1 describes the process for participant selection.

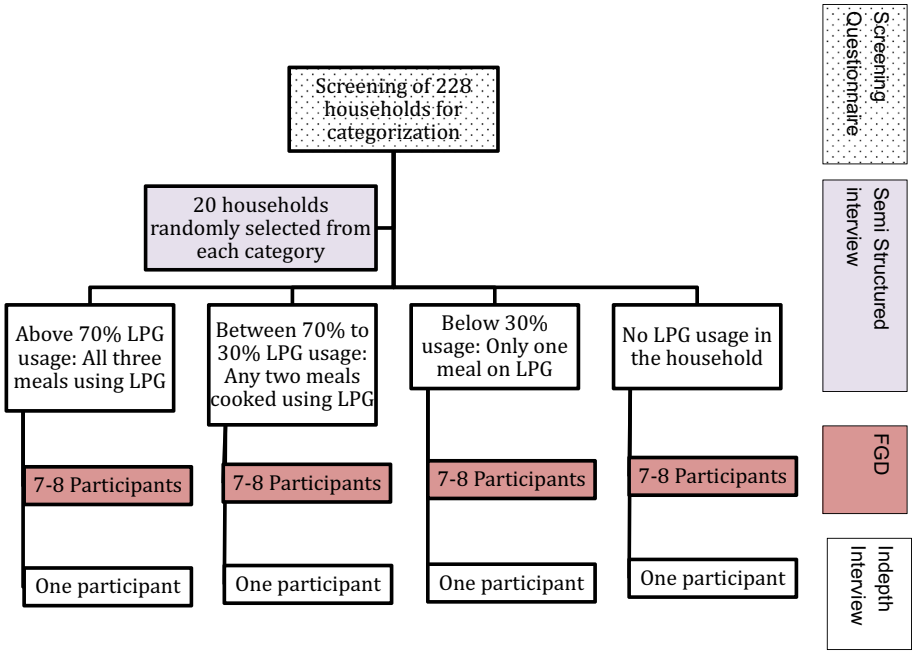
The second approach was to understand the LPG providers' perspective. It included understanding topographical characteristics, population characteristics, and development-related parameters like the road network; previous uptake of LPG either through direct interaction or through government programs; and other challenges in service provision in the implementation of PMUY.

We conducted in-depth interviews with LPG distributors of Hindustan Petroleum Corporation Limited (HPCL), which is the primary distributor in the study area, to understand distributors` perspective on the benefits of the PMUY, specific challenges and barriers faced by distributors in implementing PMUY, and suggestions on improving the implementation of PMUY. The interviews and FGDs were transcribed in Marathi (local language) and translated to English. Later it was imported into the MaxQda software for coding. We used the inductive approach of qualitative analysis. The purpose was to summarise raw data into a brief, summary format and establishing clear links between the evaluation or research objectives and the summary findings derived from the raw data. The transcripts were coded after reading them; codes were grouped into categories. Patterns about reasons for preference of LPG over biomass, the process of availing LPG, advantages, and experiences and more were pooled under categories.

Results

Characteristics of the participants

The study participants (PMUY eligible households) either had farming as their primary occupation or worked as daily wages earners. Of the



Flowchart 1. The LPG user participant selection process.

Table 1
Distribution of households as per the proportion of LPG and chulha use.

Name of group	No. of households
Above 70% usage: All three meals on LPG	137
Between 70% to 30% usage: Any two meals on LPG	39
Below 30% usage: Only one meal on LPG	23
No LPG: No meal on LPG	29

houses approached, 90% of households owned a chulha and used both LPG and chulha alternatively with varying proportions of use. The categorization of the proportion of households is described in Table 1. As described previously, we randomly selected 20 respondents from each of these four categories for further enquiries.

Results of qualitative enquiries

Reasons for preference of LPG over biomass for cooking

The time needed and physical work involved in cutting and gathering firewood and biomass for cooking was reported as a major reason for preferring LPG. It was seen that typically, one trip for collecting biomass fuel requires a complete day, depriving women of the ability to complete other household work or earn daily wages. The respondents also reported that they face stricter actions by forest authorities if found collecting wood, given the rules for forest preservation. Some respondents preferred to purchase firewood from the market to ensure sufficient stock at home. The rainy season is challenging, as the given geographic terrain receives heavy rainfall throughout the season, and the households have to stock wood before the monsoon arrives. Due to such challenges in collecting and storing biomass, respondents felt that shifting to LPG would be physically less taxing and allow more time for other activities.

"*For many years, in fact, decades together, collected wood for fuel since morning to afternoon because of which lost income from daily wages work*"

[A 70 plus respondent]

The respondents have shared some untoward experiences and accidents that took place during the collection of woods. A woman's eye got hurt, and she was admitted to a hospital for two days for treatment. Some reported encounters with poisonous snakes and scorpions. A few reported minor injuries while carrying the bundles of wood from the forest.

'*I was admitted for a month in a hospital for days for a snake bite. I was cutting wood for fuel and was tying them in a bundle when I stepped on a big snake by mistake and it bit me.*'

[A 30-year woman]

Respondents also gave some other reasons as to why chulha usage is not perceived favourably by them. *Chulha* usage requires a longer time for cooking. Smoke, scarcity of fuel, struggle to provide hospitality to guests at odd hours were some additional reasons for the discomfort caused by chulha. In the old days, when the chulha was the only option for cooking, people experienced many disadvantages, including scarcity of wood fuel, extensive time in searching and collecting the fuel, long hours of cooking a meal for joint families, inadequacy during festivities and guest visits at home, limitation of cooking a single food item at a time only, the consistent smoky atmosphere in the house, health effects of burning of eyes, adverse effect on eyesight and cold and cough. Given this background, LPG was found to be advantageous for easy cooking.

'*We paid INR 100, filled the application with the required documents and received an LPG because of the current national government. We thought of buying LPG because we didn't have it and secondly to protect us from the harmful effects of the smoke of Chulha.*'

[A 35-year-old respondent]

Sources of information about PMUY

When we enquired about the sources of information which the participants used for availing PMUY scheme, it was found that more than 50% of the participants were informed about the scheme by word of mouth, i.e. through friends and relatives, while about 20% were not aware of the scheme, until they approached the distributor for a regular LPG connection. Television advertisements were the source of information for 12% of the participants, while the LPG distributor, Accredited Social Health Activists (ASHA) and Gram Panchayats informed nearly 6% of the participants.

The qualitative enquiry provided more insights into the source of information. Some respondents were informed about the scheme during a visit to the town place closer to their village or when they enquired the reasons for queues at the LPG distributor's office. Some reported that fellow villagers or people who were members of self-help groups shared information with them. In some remotely located villages, the Gram Panchayat staff shared the information with the villagers or an employee of the Panchayat office informed households that their names were on the list for PMUY eligibility. One of the respondents reported that her mother-in-law counselled each woman from the village to enroll in PMUY.

Requirements for availing PMUY

The respondents were aware and informed about the scheme's requirements, which included a photocopy each of Aadhaar card, Ration Card, and one photo for enrollment in the scheme. A few shared that residential proof and a copy of the bank passbook are also required. An application form was filled which was submitted with a fee of Rs. 100 and necessary documents. The LPG cylinder was received after 3–4 weeks, followed by stove within a week.

The scheme demands that the family build a kitchen platform for the installation of the LPG stove. Usually, a typical tribal house lacks kitchen platforms because chulhas are placed on the ground. A few said that they do not have a kitchen platform but have availed the scheme and have kept the LPG stove on a table for a temporary purpose. They plan to build a platform during the renovation of the house. People from the agency supported and cooperated while submission of the documents.

Challenges in availing the scheme

Most of the respondents faced challenges in availing the scheme as their names were not listed in the eligibility list. Despite applying multiple times by paying INR 100, many respondents were not updated about their eligibility, and they had to contact the distributor multiple times. Some respondents thought that the scheme was biased towards more influential people in the village. There was a difference in payments done by respondents at the time of application wherein some paid INR 100 whereas some paid INR 700 or INR 1100. However, the major cost difference to avail the scheme worried few respondents. Another indirect challenge includes no kerosene supply to households owning LPG. Kerosene is used for lighting and, in some homes, in a kerosene stove. The respondents were unhappy about not having enough information about the no-kerosene rule when they were informed about the PMUY.

Contrastingly, the distributor informed that almost 90–95% of the population is covered through the PMUY; and there are no additional targets because all of those who are eligible as per the defined criteria can avail the scheme. The distributors had to increase their number of vehicles to reach remote locations and supply LPG. Moreover, other preparations for implementing the scheme included an increased number of staff and infrastructure with the purchasing of computers.

Systems were expanded to reach the maximum population. The sale of LPG s increases during festivals and is low during the rainy season.

Advantages of LPG

Respondents expressed their happiness after receiving LPG through the scheme. Ease in cooking, time-saving, managing large quantities of cooking, smokeless homes, no blackening of walls and ceiling and no burning of eyes were listed as advantages of LPG. They added that the stove could be cleaned regularly without any hassle, and the platform used for placing the stove makes it more secure for children as they can't reach the height of the platform.

Some respondents are happy that they need to worry less about kids playing around when LPG is in use as against the chulha. Women also reported having more free time which they could utilize for earning daily wages, doing household chores, or having more leisure time. LPG allows them to improve their finances. The money earned would be helpful to fulfil family responsibilities. They reported a reduction in physical stress and improved skin complexion due to reduced trips to forests.

"*Now a lot of time is saved since we started using LPG, women are happy*"
[A 45-year-old women]

When asked about the first experience of using LPG, most replied that they felt ecstatic and on the top of the world. A few shared since they had used the LPG earlier somewhere else usually at their maternal household, they found it easy to ignite and use. But they agreed that if there is no information about the use then it could be frightening for the first time. Others reiterated that they initiated to use it immediately and were confident to cook food on it. LPG brought happiness and content in their lives, as it was registered on their (the women's) names. A few revealed that they were very apprehensive for the first time and thought that the ignition could lead to the cylinder blast. Nevertheless, later, they experienced the ease of ignition and use.

"*Once I forgot to switch off the LPG when something was on it for cooking. I had gone outside and forgot to switch off. But unfortunately, nothing untoward happened as it was LPG; if it would have been Chulha there would be a great loss. The flames are bigger and stronger than LPG.*"
[A 70-year-old respondent]

Financial implications of LPG use

Many respondents were happy to pay the small registration amount for availing the LPG connection. However, they know about the loan on the scheme, the subsidy on the refill, and the refund in the bank accounts. The majority of respondents voiced that the cost of the refill is high, not affordable to them. They pay INR 700 for the refill and an additional INR 50 for the vehicle rent that delivers the LPG to a common point in the villages. On many occasions, they wouldn't have money to refill the cylinder, and unwillingly they have to use *chulha* till they could gather money for a refill. Some shared that a non-regular and inadequate income was a limitation in getting an LPG refill. They often prioritize spending money to refill the LPG cylinders during big festivals and on special occasions. Some said that the refill booking process, which is necessary, is sometimes difficult for them.

"*The cost of Rs. 800 is too high.*"

"*This time paid less, only Rs. 700 -otherwise paid Rs. 750, 800 and 900 for the refill till now*"
[A 70 plus respondent]

They voiced the need to have an extra LPG cylinder because it becomes challenging to manage cooking on chulha till they get a refill, however, they faced financial challenges to procure the second cylinder.

Low response to the scheme

There are different factors responsible for the low response, including high cost, lack of transport, and non-subsidy. The distributor agreed that people do not have complete information about the scheme. The community assumes that they benefit from the scheme by paying just Rs.100, but do not understand that the LPG is not free, it is a loan and the subsidy amount goes to the government to repay the loan. This has caused the population to pay higher refill costs – at non subsidized rates – which in turn has reduced consumption of LPG. Distributor agreed about the low response to the scheme. He opined that beneficiaries ask lots of questions about the subsidy to the distributor. When people started understanding about the loan and its repayment through the amount of subsidy, they turned their back towards the scheme. The calculated cost of LPG turns out to be expensive to the people availing the scheme. To avoid the expenses of refilling, people use it as an alternate source to chulha.

Hurdles for the lower consumption rate

The refill rate is found to be extremely low. After providing 480 new connections, the refills request does not cross 300 per year. People accessing the schemes are from a lower socio-economic class. The refill amount becomes expensive to them. They usually refill during special occasions such as during festivals and marriage ceremonies. The LPG company introduced small LPG cylinders of 5 kg capacity to reduce the transportation cost and effort. However, the price of this 5 kg cylinder was higher per kg gas, so the scheme didn't get to generate additional consumption. Another hurdle is that the PMUY connection is non-transferable.

Mixed use of chulha and LPG

All the women reported using LPG supplemented by *chulha* to save LPG such that it could be used for an extended duration. A participant said when used in combination with chulha, LPG runs for at least three months as against a month if LPG is used exclusively. Respondents typically used *chulha* to heat water and cook chapatis and bhakaris (Indian bread) that consume much fuel. Some revealed that for the routine purpose, they use LPG but shift to *chulha* during festivities and special occasions that require elaborate cooking and traditional delicacies. The usage of LPG depends on the number of family members, and larger joint families used chulha more often than smaller nuclear families.

Another reason for *chulha* use in the rainy season as it helps to keep the house warm and clothes dry. However, they added that LPG has reduced the use of wood fuel, thus saving trees. The PMUY scheme has benefited families by partially solving the issue of scarcity of wood fuel.

Distributors views on logistic and financial challenges in promoting the scheme

Dealers do not get the commission for the delivery of LPG in remote areas. This is the biggest drawback of the scheme affecting the motivation of the agencies to serve remotely located residents. Such connections are not affordable to the company. For consumers, once the loan is repaid, the subsidy is credited to the bank account after ten days, and if the account is not maintained with sufficient balance, it is on hold till the account turns active. The distributor also added that the poor people who already face challenges to collect a large sum of money for the refill find it cumbersome to not receive the subsidy immediately after the payment.

The geographical areas served by the LPG distributors we spoke with can be categorized based on characteristics likely to influence the uptake and sustainable LPG usage. While providers are expected to deliver cylinders timely at the doorstep of all households, this is sometimes challenging or, reported to be impossible due to resource constraints.

Characteristics of areas may help explain issues of effective and timely distribution of LPG cylinders by service providers.

In summary, the providers implemented the scheme by deploying increased staff and infrastructure, including the computers, vehicles, and cylinder storage and office space. However, the distributor experiences a rise in sales only during specific periods, including the festival and rainy season. The distributor identifies hurdles of lower consumption as a higher one-time cost, the problems with back accounts for receiving a subsidy, and the non-transferability of the connections.

Table 2 explains the summary of findings from all the above mentioned these.

Conclusion

PMUY has been a widely advertised scheme of the Government of India. Despite advertisement, more than 50% eligible population was informed about the scheme by word of mouth. Hence, the source of information for publicizing such schemes could be through local government like the gram panchayat offices. The local stakeholders could be engaged in providing information to the population for more widespread information. The primary users especially women in the family associate use of LPG with wellbeing (Malakar & Day, 2020) and these strategies can be deployed for publicizing the scheme and sustained usage.

The population, in general, is willing to procure and own an LPG connection given the benefits of ease and convenience of use of LPG, lesser smoke and time saved compared to biomass usage. The challenges in the collection and storage of biomass also make the population prefer LPG over biomass. However, the population faces financial constraints for sustained usage of LPG. Lack of information about the loan which PMUY provides for obtaining a connection makes the refills expensive compared to the subsidized refills in regular connection. This results in the misconception about the costs of refills and making it unaffordable for use. More clarity in the payment of subsidies is needed at the population level. This could be one possible reasons for lesser LPG use in PMUY beneficiaries when compared to general customers as described by Gould et al. (2020).

Continued use by the provision of a second cylinder is preferred by the population; however, the purchase of a second cylinder is a barrier reported. This has resulted in mixed fuel usage and stacking by a larger proportion of the population. The number of new connections with the LPG distributors has increased exponentially due to the scheme's implementation; however, the refill rate has only marginally increased due to low usage of LPG. The distributors did not financially benefit by implementing the scheme and hence suggested higher incentives for the distribution of cylinders in remote areas.

PMUY provides LPG access to poor households; there are additional 'out of pocket' expenses to beneficiaries, including purchasing the gas stove and expenses towards building a platform for placing the stove above the cylinder level. Poorer households find it difficult to pay these costs, thereby delaying the acceptance of PMUY connection. The second challenge in difficult-terrain areas lies in the fact that LPG distribution networks are not so robust and wide as in urban areas; thus, many households find it difficult to travel to the offices of LPG distributors and get a cylinder. Although distributors are supposed to arrange the transport, the scanty requirements in such geographically difficult areas make the distributor lose the profits and might run a risk of suffering losses. The third challenge is the absence of required documentation

Table 2
Summary of findings.

Themes	Summary points
Biomass usage for cooking	• It is a regular and time-consuming activity • Dry wood is preferred • Buying wood is a possible but expensive option • **The use of biomass for cooking keeps the house warm during the rainy season and dries clothes (the study area is known for heavy and continuous rains during the monsoon)**
Challenges while collecting wood fuel	• Accidents • Snake bites • Seasonality • Current regulations from forest authorities have made it challenging to access wood
Disadvantages of Chulha	• Scarcity of wood fuel • Time in searching and collection of the fuel • **Long hours of cooking meals** • Longer time for ignition hence cannot be used for smaller meals or tea
Source of information about PMUY	• **Word of mouth** • Village meetings
Implementation of the scheme	• Filled in the form with registration fees a multiple time but did not receive the scheme due to variety of reasons including, incomplete documents and joint bank accounts • Did not receive any communication after filling registration cost • **The clarity in the requirements for availing the scheme is lacking** • The amount paid at the time of registration varied • The requirement of building a kitchen platform to avail the scheme is cumbersome in already small houses • **Participants not aware of the "loan" on the scheme and assume that the connection and the first refill is free**
LPG use through the scheme	• Ease in cooking • Time-saving and time utilization • Less risk of accidents due to open fire • **Prefer saving of the LPG than convenience for special occasions, urgent needs and serving unexpected guests at odd hours when the chulha is turned off**
Challenges in utilizing the scheme	• **Unaffordable refill cost** • The subsidy is not deposited in the PMUY connection as participants are not aware of the "loan" on the scheme and assumes that the connection and the first refill is free. Thus the consumption is less as the cost of the refill is unaffordable. • After the loan amount is recovered, the subsidy is deposited in a bank account (the consumers need money in hand or request to reduce the refill cost) • The kerosene supply for households with PMUY is discontinued. Kerosene is used in lamps when the electricity supply is disconnected and to ignite the chulha. The study participants were unaware of the rules relating to kerosene supply when availing the scheme
Expectations from the government	• An additional LPG cylinder • **Subsidy on the refill**

Important findings marked in **bold**.

needed to obtain LPG connecting in PMUY, with many households unable to produce Aadhaar cards and bank account in the name of the eligible woman in the household.

As the study was done in socially marginalized tribal communities, sustained usage of LPG is affected by many factors including proximity to forests, educational and economic status of the family (Khanwilkar et al., 2021). These factors may be common characters to the PMUY beneficiaries given the eligibility criteria and hence the recommendations from this study can be extrapolated for all PMUY beneficiary.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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