

RESEARCH ARTICLE

Jumping up the sanitation ladder in rural Cambodia: The role of remittances and peer-to-peer pressure in adopting high-quality latrines

Valentina Zuin ^{1*}, Vandy Moug ², Rachel Juay³, Jessica Tribbe ⁴

1 United World College South Asia (UWCSEA), Singapore, Singapore, **2** iDE Innovation Lab, Phnom Penh, Cambodia, **3** Marsh McLennan Advantage Insights, Singapore, Singapore, **4** The Aquaya Institute, Larkspur, California, United States of America

* valezuin@gmail.com



OPEN ACCESS

Citation: Zuin V, Moug V, Juay R, Tribbe J (2024) Jumping up the sanitation ladder in rural Cambodia: The role of remittances and peer-to-peer pressure in adopting high-quality latrines. *PLOS Water* 3(5): e0000151. <https://doi.org/10.1371/journal.pwat.0000151>

Editor: Sara Marks, Eawag, SWITZERLAND

Received: February 11, 2022

Accepted: March 17, 2024

Published: May 29, 2024

Peer Review History: PLOS recognizes the benefits of transparency in the peer review process; therefore, we enable the publication of all of the content of peer review and author responses alongside final, published articles. The editorial history of this article is available here: <https://doi.org/10.1371/journal.pwat.0000151>

Copyright: © 2024 Zuin et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: Available data can be found at this link: <https://datadryad.org/stash/dataset/doi:10.5061/dryad.02v6wwqbf>.

Funding: The data used for this research was collected with funding from the United States

Abstract

Over the last 50 years, a combination of factors has driven sanitation improvements in rural areas of low-income and emerging economies in Asia. While open defecation remains an important challenge in many countries, Cambodia has rapidly increased rural sanitation coverage in the last 20 years. Using data collected via 92 interviews and seven focus group discussions, this qualitative study analysed the macro-level, community, and individual factors that motivated rural households to invest in high-quality latrines in seven villages in Cambodia that achieved and sustained open defecation free status with at least 85% latrine coverage. Local demand for adoption of high quality latrine was stimulated by a number of factors which include: a) NGO-led interventions that included behaviour change communication, sanitation marketing, and community-led total sanitation, all magnified by the strong support of local leaders at the village and commune levels; b) an increased proportion of rural households engaging in factory work, with access to raising wages, higher disposable incomes, and remittances; and c) subsidies and microcredit. Furthermore, migrants not only transferred financial resources to their home villages, but also transferred a set of ideas, norms, expectations, information, and behaviors back to their communities that reflect the migrants' new ways of life, and economic possibilities. We provide evidence that new habits among factory workers, and ownership and display of new technologies and consumer commodities as symbols of modern success and social status facilitated high-quality latrine adoption. Peer-to-peer pressure at the village level, and among adult children commuting to factories or visiting their rural hometown ensured widespread adoption.

1. Introduction

Between 2000 and 2017 the world population practising open defecation halved from 1.3 billion to 673 million [1]. Much of this progress occurred in rural areas and in Asia, with the gap in rural coverage decreasing from 43 to 26 percent between 2000 and 2017 [1].

Agency for International Development's (USAID) Water, Sanitation and Hygiene Partnerships and Learning for Sustainability (WASHpals) project under Task Order number AID/OAA-TO-16-00016 of the Water and Development Indefinite Delivery Indefinite Quantity Contract, contract number AID/OAA-I-14-00068, awarded to the Aquaya Institute. Jessica Tribble is a full time staff of the Aquaya Institute, and worked on research design, data collection, data analysis, and preparation of the manuscript, and the overall research on rural sanitation funded by WashPals for which the USAID contract was awarded. Valentina Zuin was a consultant of the Aquaya Institute during research design and data collection. Analysis and preparation of the manuscript was done as part of her responsibilities as a faculty at Yale-NUS College. Rachel Juay was a student research assistant to support data analysis and manuscript preparation, and her work was funded by the Yale-NUS College summer research grant. Vandy Moung was a full time staff of iDE Cambodia, the research partner that Aquaya chose to conduct field work in Cambodia. Vandy performed qualitative data connection in the study villages: he was both the interviewer as well as the focus group facilitator. Vandy also interacted with Jessica and Valentina on a weekly basis in all stages of data collection. The funders had no role in the study design of this specific part of the project that focuses on migration and sanitation, or the qualitative data analysis performed, but they provided inputs to research design and data collection of the larger research project on rural sanitation that was funded by them, which was published independently. The authors alone are responsible for the views expressed in this publication and they do not necessarily represent the decisions or policies of USAID.

Competing interests: The authors have declared that no competing interests exist.

While rural Cambodia is home to the largest proportion of individuals practicing open defecation in Southeast Asia, the country has made exemplary progress towards improving toilet use: open defecation (OD), while still a major challenge, reduced from 94% in 2000 to 41% in 2017 [1]. Further, in contrast to other low income countries with similar or even higher GDP such as Ghana and Kenya [2], where rural households predominantly invest in dry pits, a large proportion of rural Cambodians transitioned to owning a pour flush toilet, effectively jumping up the sanitation ladder and going beyond what the Joint Monitoring Program for Water Supply and Sanitation considers “basic service.” Indeed, of the 55% of rural household in Cambodia who have access to sanitation, the majority (52%) use a pour flush latrine with a septic tank [3].

Over the last 50 years, a combination of macro-level, community, and individual factors have driven sanitation improvements in rural areas of the developing world and emerging economies in Asia. Historical accounts of macro-level factors that explain improvements in Bangladesh, Vietnam, India, Thailand, Korea, Malaysia, and Singapore include: 1) economic growth, and poverty reduction in rural areas, though economic growth did not always occur before sanitation coverage started to increase [4–6, 8] the establishment of sanitation as a political priority at both the national and local level pursued as part of a wider narrative around notions of wellbeing, modernity and nation-building [4–8]; 3) the integration of sanitation with other infrastructure improvements such as housing and water, or as part of hygiene/cleanliness campaigns [5, 6]; and 4) the use of laws, regulation or authoritarian punitive measures to enforce improved sanitation [5, 6, 8]. Further these historical accounts point to specific efforts to ensure 5) a clear division of responsibilities among actors involved in the improvement of sanitation [7, 8]; and 6) monitoring of progress to increase accountability and change of course if needed [6, 8]. Finally, sanitation improvements in many of these countries relied on both 7) the involvement of the private sector in different capacities [6]; and 8) direct or indirect (via housing with adequate sanitation facilities) subsidies to the poor [5–7].

In the specific case of the developing world, factors that played a role in the reduction of OD also include a range of programmes developed with the support of international donors, to both raise demand for but also increase supply of sanitation [6, 7, 9, 10]. On the demand side, approaches included Behaviour Change Communication (BCC) that uses both mass media—such as TV—and interpersonal channels to interact with communities and achieve defined behavioural objectives. The approach is based on demonstrated theories and models [11], as well as context-specific formative research and behaviour analysis, which, in the specific case of sanitation, allows a better understanding of the motivations to invest in sanitation, and barriers faced [11]. Often using some of the same theories of change of BCC, Community-Led Total Sanitation (CLTS) is, since its initial success in Bangladesh in 1999, one of the most widely deployed of these behavioural interventions to increase demand of sanitation in rural settings [12]. Rather than directly delivering hardware or prescribing designs that may not be locally sensitive, CLTS relies on behaviour change and community self-enforcement, and tapping into emotional triggers such as disgust and shame to end open defecation and prompt the construction of latrines, often with locally available materials and skills [13].

Especially in Asia, governments and NGOs have often accompanied demand-creation with sanitation marketing programs to increase availability and affordability of supply options via the (often small) private sector. While not always effective in Sub-Saharan Africa, sanitation marketing programs run by international NGOs such as iDE and WaterShed have been quite successful in Asia, and in Cambodia in particular [14, 15]. Their sanitation marketing programs often combine product and service design, with a process to gain stakeholders' input on product prototypes, directly influencing the final design of the sanitation product or service. Independent sales agents are trained to speak with households about their sanitation needs,

and local entrepreneurs are identified and trained to meet the demand for a range of sanitation products, as well as manage their business in a sustainable way [16, 17].

Rural sanitation improvements are also driven by a number of factors at the household and community level that go beyond perceived desire to improve health and depend on a range of other factors such as comfort, convenience, privacy, and status [18–24]. Importantly, toilet uptake is closely intertwined with lifestyle attitudes and aspirations: a toilet is an essential part of a “modern home” [25], “a means to be civilized” [19, 26], a symbol of “being modern” [27], and an investment to acquire social status [28].

Such change of attitudes and aspirations is often documented as a consequence of social networks and social pressures, which often play an important role in latrine adoption and use. Individuals are more likely to own latrines if their social contacts do, because they want to imitate others, and because they exchange knowledge and ideas and adopt the healthy behaviors of one another [10, 26, 29–31].

Another important driver of changes in practices and aspirations in rural areas documented by migration scholars, but often not considered by the sanitation literature, is domestic and international migration. Migrants not only transfer financial resources to their home villages, but also transfer a set of ideas, norms, expectations, information, and behaviors to their sending communities, or what Levitt has named “social remittances” [32–34], which reflect the migrants’ new ways of life and economic possibilities.

Fig 1 presents a visual summary of the macro-level, community, and individual factors underlying the reduction of open defecation and the increase in latrine coverage that are discussed in this section. The initial version of Fig 1 was collaboratively created by Caroline Delaire and the authors (VZ and JT), alongside other members of the USAID-funded Water, Sanitation, and Hygiene Partnerships and Learning for Sustainability (WASHpals) Research Team, as part of the desk review conducted at the project’s inception to categorize the multi-faceted factors influencing latrine adoption across different scales.

Study respondents reported that many of the macro as well as community and individual factors in Fig 1 underlie the reduction of open defecation and the increase in coverage of high-quality latrines in rural Cambodia today. Specifically, this qualitative study contributes to the peer reviewed literature exploring the multi-scalar—macro-level, community, and individual—factors influencing sanitation adoption highlighted in red in Fig 1. This combination of factors were either: a) mentioned by our research participants across all study villages (e.g. economic growth); b) not analyzed by the authors elsewhere [35] (see S1 in [35] for a list of factors that participants mentioned during fieldwork but were not analyzed by Tribbe et al., such as adult children influence and support, remittances, lack of willingness to use dry pits); c) are usually less studied in the sanitation literature, such as financial and social remittances, as well as the role of aspirations to modernity. Our goal is not to rank these factors in order of importance, but rather discuss qualitatively their relevance in the particular context of the villages in this study. The main contribution of this study is to put in conversation two usually disconnected scholarships, migration and sanitation adoption, to explain migrants and villagers’ choices and investments, and reflect on the role of remittances, which is typically understudied, in sanitation adoption.

Section 2 describes the methods used in the study and section 3 the main characteristics of the study villages and the evolution of latrine coverage during the time of the study. Section 4 discusses the rationale behind the widespread adoption of high-quality latrines rather than lower quality options, with a focus on a number of macro-level, community, and individual factors which include, among others, programs to increase the demand and supply of latrines, economic growth, factory employment, financial remittances, and social remittances and the role of aspirations. Section 5 concludes with the implications of these findings for future sanitation programs.

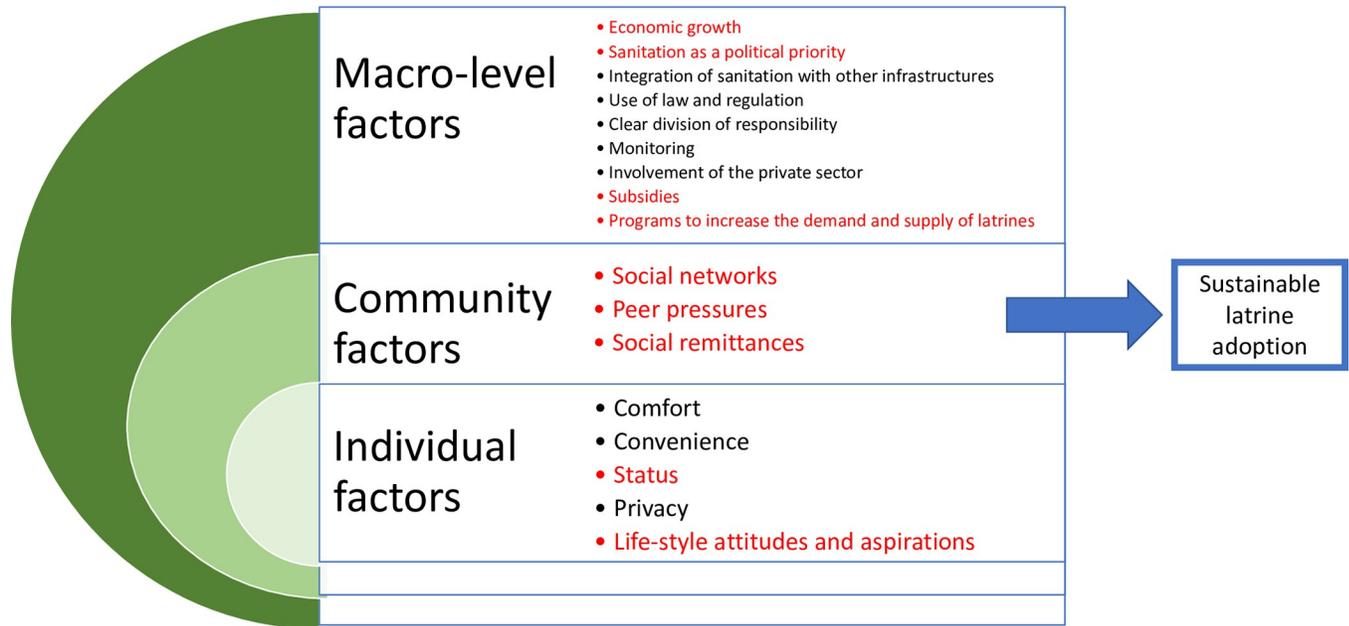


Fig 1. Macro-level factors, community factors, and individual factors related to sustainable latrine adoption. In red, factors that are the focus of this paper, in black other factors discussed in the paper that are presented in the literature. Source: A different version of this diagram and these three categories of factors were presented by Aquaya in an internal meeting led by Caroline Deloire with the project founder in 2018 before WASHPALs started. The types of factors highlighted in each category reflect the literature we reviewed in this paper and the authors' own ideas.

<https://doi.org/10.1371/journal.pwat.0000151.g001>

2. Methods

Setting and population

We performed qualitative data collection between November 2018 and February 2019 in 13 rural villages in the provinces of Kampong Speu and Kampong Cham in Cambodia, located two to three hours by road from Phnom Penh, the political and economic center of Cambodia. These villages were the focus of the study because they had been targeted by the Cambodia Rural Sanitation and Hygiene Improvement Programme (CRSHIP), implemented by the Ministry of Rural Development and Plan International Cambodia between 2012 and 2016. This programme aimed to increase access to improved sanitation facilities and promote proper hygiene practices among rural communities through CLTS and other approaches (e.g., sanitation marketing; WASH in school, sanitation, and hygiene; and behavior change communication campaigns) [36]. The village selection process is described elsewhere [35].

This paper focuses on seven of these 13 villages, which were found to have more than 85% latrine coverage at the time of our visit, according to the village chief report. In other words, these villages were able to achieve and sustain Open Defecation Free (ODF) status as defined by the Cambodian government, which establishes the threshold of 85% latrine coverage as sufficient to achieve ODF. These seven villages belong to a total of four communes, three in the Kampong Cham Province (Angkor Ban, Khchau, Samraong) in the districts of Kang Meas and Prey Chror, and one commune in the Kampong Speu Province (Khtong Krang) in the district of Samraong Tong (Table 1). Three different implementing partners worked in these seven villages, and the villages had an average size of 140 households.

Data collection. Data collection was performed by a Khmer- and English-speaking local researcher (VM), who conducted transect walks, interviews and focus group discussions until saturation, spending three to five days in each community. We conducted a total of 92

Table 1. Location of villages, implementing partners, poverty, and number of households.

Village	Commune	District	Province	Implementing partner	Number of household (2012 data)	Poverty rate, Commune level	Number of households and leaders interviewed (excluding members of Focus Group Discussions)
1	Angkor Ban	Kang Meas	Kampong Cham	IP1	157	19.7%	13 (9 females and 4 males)
2	Khchau	Kang Meas	Kampong Cham	IP1	183	19.9%	14 (8 females and 6 males)
3	Angkor Ban	Kang Meas	Kampong Cham	IP1	157	19.7%	14 (11 females and 5 males)
4	Samraong	Prey Chhor	Kampong Cham	IP2	154	17.8%	12 (6 females and 6 males)
5	Samraong	Prey Chhor	Kampong Cham	IP2	112	17.8%	12 (6 females and 6 males)
6	Khtong Krang	Samraong Tong	Kampong Speu	IP3	115	22.4%	13 (9 females and 4 males)
7	Khtong Krang	Samraong Tong	Kampong Speu	IP3	130	22.4%	12 (6 females and 6 males)

Source: The number of households per village in 2012 was provided by CHRSHIP.

Poverty Data was obtained by Open Development Cambodia [37]. Poverty data for village 6 and 7 are at the district level, rather than commune level.

<https://doi.org/10.1371/journal.pwat.0000151.t001>

interviews (55 female and 37 male participants), and seven focus group discussions (one per village, with both male and female participants). Interviewees at the village level included villagers as well as eight village leaders. Further we interviewed two implementing organizations responsible for triggering activities, two commune officials, and two provincial officials involved in CLTS implementation. Lastly, we analysed data and reports from implementing agencies, donors and commune and village officials to triangulate information on implementation processes, triggering dates, ODF status, and community size.

Sampling strategy. Participants at the village level were identified purposely with the help of key informants to ensure variation along the following variables: time of latrine adoption (early versus late adopters), socio-economic characteristics of the family (poor as classified by the Cambodian government or community members, vulnerable, and relatively well-off households), type and quality of latrine (dry latrine, simple pit latrine, high-quality pit latrine), latrine ownership (individual latrine owners, versus households sharing with others). Interviews and focus group discussions were semi-structured, and provided significant freedom to our local researcher (VM) to address questions that arose during data collection and during our weekly meetings. Indeed, migration related issues (including remittances) were not the planned focus of our data collection which at least instead covered a range of topics including the history of sanitation activities in the community, role of community leaders, drivers for latrine construction, follow-up activities by leaders and external actors, strategies for supporting poor and vulnerable households, post-ODF activities, and latrine satisfaction, maintenance and repair. Findings from interviews were triangulated regularly. Data collection in each village continued until saturation was reached as determined by the authors.

Data management and analysis. Once data collection was completed in each village, VM prepared a village report, and this report was discussed at length with the other authors to discuss emerging themes, new puzzles to uncover, and next steps [38]. In total, 78 hours of material were recorded, translated, and transcribed. Translation and transcription occurred while data collection was ongoing so that VZ, RJ and JT could follow data collection closely and familiarize themselves with the data. Using a pre-defined list of 24 codes defined by the authors on the base of the literature and of the discussion of the village memos (See S1 in Tribbe et al.

[35] and Fig 1), as well as inductive codes generated while performing line-by-line coding during data analysis, RJ, JT, and VZ coded and analysed both interview transcripts and village memos using NVIVO 12 Pro. Thematic analysis of all relevant codes was performed to build our argument and present participants' voices. The findings presented in this manuscript were shared with the interviewers by one or more respondents. Quotes are a distilled way a presenting the opinion or thoughts of a participant to provide a vivid idea of what this person or a group of respondents might mean.

Ethics. Our study protocol was determined to be exempt from full review by the Western Institutional Review Board (under 45 CFR §46.101(b)(2) of the Federal Common Rule in the U.S.) and Cambodia's National Ethics Committee for Health Research. Before entering each of the villages, we obtained consent from the commune and the village level authorities. Researchers obtained informed verbal consent from all interview and focus group participants prior to beginning each interview and, separately, consent for audio-recording. Two interviews were not audio-recorded, and in the case of these two interviewees, we took notes during the interview.

Limitations. Our data collection had three main limitations. First, many NGO interventions occurred in the study villages during the period of interest (2012–2018). As a result, both local leaders and households found it hard to recall the sequence of these interventions and their specific characteristics. As such, it is possible that some activities that were reported as part of CLTS may have been performed in the context of other sanitation projects, or were singular events that occurred before or after CLTS. That said, households typically remembered the CRSHIP implementing partners well, even when they could not remember specific activities they conducted. Second, we did not explicitly target adult children in our interviews: adult children who commute to factories left for work very early, returned home in late the evenings, and had very limited availability on their only rest day. Similarly, we were not able to talk to migrant children no longer residing in villages. Further, information about current latrine coverage and type of latrine used was collected from village or commune chiefs and were only partially verified by the research team. Lastly, our study does not focus on child sanitation, even though we know that at least in the villages in this study, open defecation among children was often practiced.

3. Results

Increased latrine coverage in study villages

According to CRSHIP's baseline data collected in 2012, pre-CLTS latrine coverage in the study villages was 29% on average and ranged from 0% to 57% (Fig 2). Only 14 households had a dry pit in the study villages; all other latrines were pour flush, or "villa" latrines as they are called in the local context. Specifically, a villa latrine is a pour flush latrine with a superstructure made of brick walls, tiled on the inside, a proper roof with ventilation, and a door that can be shut for privacy (Fig 3). Often, there is space to shower or bathe in a villa latrine. The cost for villa latrines ranged between 500 and 700 USD in our study villages. By contrast, dry pits—which consisted of a clay jar dug into the earth, a very basic superstructure made with local materials, and a roof (in some cases)—were much cheaper, and cost between 30 and 50 USD.

Investment in high-quality latrines occurred despite widespread poverty: on average, 15% of households, or 23 households (median = 20), were classified as poor in each village according to the village chiefs' report of the number of ID Poor households in their villages (Table 1). The Cambodian Government implements a standardized procedure for identifying poor households nationwide, and classifies these households as "ID Poor". Commune poverty levels in the study villages—which is the percentage of households who are ID Poor in the commune

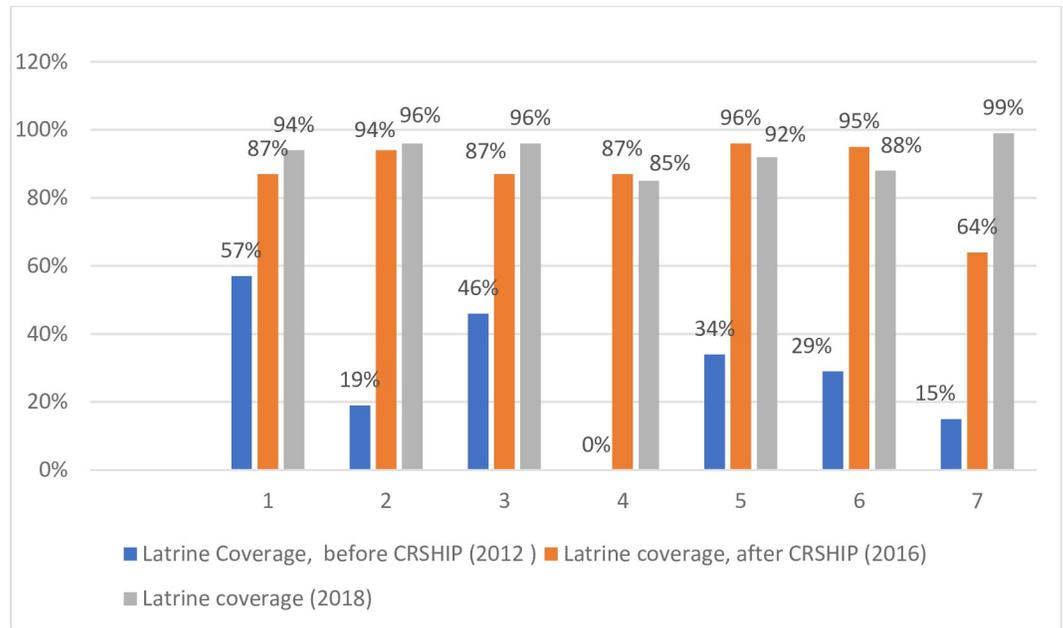


Fig 2. Evolution of latrine coverage by study village: 2012, 2016 and 2018. Source: CRSHIP for 2012 and 2016 data. 2018 data were collected with local authorities at the village level.

<https://doi.org/10.1371/journal.pwat.0000151.g002>

—averaged at 20%, which is slightly over the average poverty rate at the commune level in Cambodia at 19% [37, retrieved on 15/6/2020].

As with most CLTS programmes, the CRSHIP programme started with a CLTS triggering event—which in the study villages occurred between 2012 and early 2016 (S1 Table)—led by one of the three CRSHIP implementing partners (IP1, IP2 and IP3) and was then followed with meetings or visits by the same implementing partners, and local leaders, such as Village Chiefs and Deputy Chiefs, or Commune Officials. The study villages were certified to be ODF between December 2013 and early 2018 (S1 Table). On average it took villages 20 months to become ODF, with a significant range between villages that took only a year and villages that took up to 42 months (S1 Table).

By the end of CRSHIP in 2016, latrine coverage in the study villages had increased by 67.5% on average, and ranged between 34% and 100% (Fig 2); all villages were considered to be open defecation free according to the definition of the Cambodian government. That said, anecdotal evidence collected during our interviews and field visits suggest that some open defecation was still present in all study villages, especially among people who shared a latrine and among children under five.

Sanitation investments in the study villages were not only sustained, but also saw an increase once the program was over: latrine coverage in the study villages reported by the village leaders at the time of data collection (November 2018– February 2019) ranged between 85% (village 4) and 99% (village 7), with an average of 93% (median = 94%), which is higher than the average coverage of 87.5% across all villages achieved at the end of CRSHIP in 2016 (Fig 2 and S1 Table). The difference between the end of the program and the time of our visit (about 2 years later) is particularly startling in some villages: for example in village 7, coverage increased from 64% to 99% between 2016 and 2018, after CRSHIP ended. Importantly, this increase is recorded in all the study villages, and occurred despite a slight increase in the number of households in all villages.

Macro-level factors: Overlapping NGO interventions to increase the demand and supply of latrines and subsidies

The sustained increase of latrine coverage between 2012 and 2018 might not be too surprising given that from 2008 onwards, study villages were targeted by a number of interventions beyond CLTS, which included behaviour change communication, latrine provision via sanitation marketing, and subsidies, all of which contributed to the increase in sanitation coverage [39, 40]. Behaviour Change Communication (BCC) activities often focused on providing knowledge on the price of low-cost latrine options, highlighting the shame and loss associated with not having a toilet, especially for families with daughters, and stressed the inconvenience of having to defecate in the open, especially when hosting guests or during celebrations [41].

We could identify at least ten international and local NGOs and foundations that had been active in sanitation activities beyond the three CRSHIP implementing partners (international NGOs such as SNV, East Meets West, World Vision, WaterShed, and local NGOs and Microfinance Institutions (MFIs) such as Malaysian Youth, Prasak, Oreda, Sao Sary Foundation, LOLC, and other development NGOs that villagers could not name). This level of NGOs and MFIs engagement is not unusual in the context of Cambodia, where there are many NGOs active in the sanitation sector, and providing 100% of rural population access to improved sanitation by 2025 was a political goal defined by the Ministry of Rural Development in their 2011–2025 National Strategy for Rural Water Supply and Sanitation [40]. Additionally, study villages likely received frequent visits from organizations as a result of their accessibility to the capital, Phnom Penh.

Sanitation marketing programs played a particularly important role in four villages (1, 2, 4, 5), though their role in the study villages appeared limited compared to rural Cambodia in general, where sanitation marketing programs led by IDE and Watershed are known to have had a transformational impact in increasing sanitation coverage in many districts of the country [14–17]. In a typical sanitation marketing event in our study villages, the commune leader or the village chief would organize a meeting to introduce different latrine options, including low cost dry pits latrines, and their costs. In the same meeting, the private supplier of these technologies would be introduced to villagers, and supplies would be offered them for purchase. Villagers recall that these events resulted in many people buying latrines on the spot, because it was sold at “*a good price*.” They also mentioned that the price included the delivery at the house, suggesting that this specific trait of the service was attractive to them. The extent to which they were given “education” regarding sanitation and the price of the latrine was not consistent across the 4 villages.

Sanitation marketing typically does not have pro-poor objectives, and coupling CLTS with subsidies is not considered best practice [41]. Yet, many subsidies were offered in these villages to enable households—including the poor—to invest in high-quality latrines. Table 2 shows that the percentage of households who benefited from subsidies in our study villages ranged widely from 2% to 54% (Table 2), with villages in Kampung Speu receiving much higher subsidies (42%) on average than those in Kampung Cham (6%) (S2 Table). With respect to timing, interviews suggest that most of these subsidies were not offered during or around sanitation marketing events in this village, but before or after CLTS triggering (S2 Table). Subsidies in the study villages came from two main sources, commune budgets and NGOs, and were not always targeted to poor households exclusively. Typically, the subsidy included materials such as a pan and rings, and in some cases part of the superstructure (bricks and cement); although in at least one village, ID poor households received a rebate after they completed construction and in some cases, NGOs provided households with a full latrine.

In line with the growing body of evidence that community leaders play important roles in ODF achievement and sustainability [42–45], this study also found that village and commune



Fig 3. Two different villa latrines. Photo credit: Vandy Moung.

<https://doi.org/10.1371/journal.pwat.0000151.g003>

chiefs in the study villages were instrumental to ODF achievement and sustainability. A specific discussion of the role of commune and village leaders, as well as strategies used by them to increase coverage in the study villages, is detailed in [35].

Widespread adoption of villa latrines rather than lower quality options

As shown in Table 2, pour flush latrines accounted for 100% of coverage in 3 villages in November 2018; in 2 of these 3 villages, no dry pits existed even at the end of CRSHIP, suggesting that no households invested in dry pits to begin with. In village 7, there were 11 dry pits at the end of CRSHIP in 2016, yet in November 2018 there were zero, suggesting that all these households switched to a pour flush latrine. Village 4 was an outlier in our dataset, in that it had 28 dry pits at the end of CRSHIP, and still had 12 at the time of our visit, a much higher number and percentage than the other villages.

4. Discussion: Understanding villa latrine adoption

In order to understand the adoption of villa latrines, we discuss a number of factors mentioned by study respondents and presented in red in Fig 1. We start with macro-levels factors such as the economic growth and the increase factory employment that touched many Cambodian rural households, and the role played by financial and social remittances. Further, we discuss community factors such as the role of social networks and peer pressure in latrine adoption, as well as

Table 2. Latrine types and subsidies in study villages at the end of 2018 (time of our data collection).

Village #	Latrine coverage	Total number of latrines	Number of dry pits	Number of pour flush	Number of latrines shared	Sharing % of total	Subsidies as % of total households in a village
1	94%	147	0	147	10	6%	17%
2	96%	177	2	175	0	0%	2%
3	96%	150	0	150	15	10%	4%
4	85%	139	12	127	43	27%	4%
5	92%	114	1	113	5	4%	5%
6	88%	121	1	120	10	7%	31%
7	99%	138	0	138	0	0%	52%

Source: Village leaders report.

<https://doi.org/10.1371/journal.pwat.0000151.t002>

individual factors such as convenience, habits and status. In order to frame this section, we present villagers' perceptions of villa latrine and dry pits, given its relevance to situate villagers' behaviours. While we do not have data that allows us to look at how population in the study villages changed over time, discussions with Cambodian researchers of our extended team suggested that the growth of the population coupled with the transformation of rural areas into urbanized areas, has significantly altered the built environment, resulting in the encroachment upon forest and green spaces.

Perception of villa latrines and dry pits

A strong preference for investing in villa latrines is consistent with the cultural preference for anal cleaning with water in Cambodia, and the positive attributes all respondents used to describe these latrines: “nice,” “fancy,” “big,” the one “with marbles,” “convenient” and “spacious,” since “one can easily take a bath in it.” According to interviewees, villa latrines can also be cleaned and have no smell. And it is “forever” because of the bricks. But villa latrines in our study villages are more than just objects that improve quality of life. As discussed later in this section, and expressed by many respondents, owning a villa latrine is a means of meeting the aspiration to be perceived to be “modern,” and to have “what others have.”

In contrast, many interviewees described dry pits as “smelly,” “disgusting,” and “with tons of worms.” They are also difficult to use consistently, because they are “unusable when it rains,” and when it is windy because “when the wind blows, it smells so bad.” Interviewees associate dry pits with “the old,” “the past,” and consider them uncomfortable because “it is not possible to use them with water” and “one needs to sit on the wood to poop.” Some households went as far as considering dry pits worse than open defecation, and there was very little willingness to adopting a dry pit until households had the option to purchase a villa latrine: “Why don’t I dig a dry pit? That is disgusting! Pooping inside the big jar. I won’t do that. I am willing to use a shovel to dig, shovel is more convenient. We dig and tightly cover and step on it not to make it smelly. I can’t poop in the dry pit.” Households with dry pits were also considered as poor and pitied by their neighbours.

Sharing pour flush latrines was not common: it occurred for only 8% (mean and median) of the latrines (12 latrines on average, median of 10), though this percentage ranged from 0% in village 1 and 8, to 27% (43 shared latrines) in village 3. In village 3, sharing was found to be an option only among family members or relatives, and perceived as a temporary arrangement for households living in the same compound, which typically comprises either relatives from separate households who live next to each other, or newly married couples who live on the same plot in an independent or separate house. For those who did share, this was not a permanent solution. Further, even among relatives who shared, occasional use was considered more acceptable than daily use: “I go there once in a while. I go to the forest, I don’t want to disturb them” and “if relatives need to use it so often, they should get one by themselves.” Furthermore, sharing was more acceptable among a mother and her children (especially daughter(s)), or among siblings (especially sisters), whereas sharing with mothers-in-law, sisters-in-law, or other members of the family was less acceptable. This suggests that even among households who share latrines, some members are likely to continue open defecating. This is consistent with findings of others in Cambodia [46].

As a result of both this strong preference for “villa” latrines and the resistance to dry pits, households in the study villages often either shared or openly defecated until they were able to find their own financial resources or until they received help from external organizations including NGOs, charities, or commune funds.

“I built later than others, and I just built the nice one.” Interviewer: “Why didn’t you build something simpler?” Respondent: “No, I would bear [continuing to open defecate while saving money] and build the nice one.”

Note that this is not because villagers were not offered the possibility to invest in low quality latrines: NGOs and local leaders explained that they prioritized coverage increase over investments in high-quality latrines, especially for late adopters, given the political imperative to achieve Open Defecation Free status, for which there was no requirement at the time of implementation for latrines to be pour flush. They further explained that NGOs provided a number of low-cost options, given the limited financial possibilities of the household living in these villages, but interviews suggest that even the provision of materials such as a pan and rings were insufficient to convince households to construct simple dry pits; instead the materials were often left unused. Multiple households confirmed this, and a number of them elaborated on their willingness to wait in various ways despite the entreaties from local leaders:

“They [local leaders] also said that if I couldn’t afford to build the brick latrine, I could build the ash one [the dry pit] but I didn’t build it. I didn’t want to build it. I waited till I had money”

“They [local leaders] asked when we could build the latrine, they asked if I could build a temporary one. I said I won’t build a temporary one. I will build a complete [latrine] soon.”

Macro-level factors: Economic growth and factory employment

The widespread adoption of villa latrines must be understood within the context of Cambodia’s economic growth: wage employment, the minimum wage, disposable income, and average consumption all increased steadily and significantly in Cambodia in the years in which latrine coverage has improved in the study villages. Wage employment as a share of total employment increased from 25 percent in 2007 to 49 percent by 2015 in the country [47], and disposable income has doubled in rural areas between 2013 and 2017 [47].

The garment and footwear sector—which is the most important sector in Cambodia’s exports, accounting 74 per cent of the country’s total merchandise exports for 2018 [48]—has grown nine-fold in less than 20 years—from roughly US\$ 1 billion in 2000 to more than US\$ 9 billion in 2018 [48]—spearheading Cambodia’s economic growth. This is particularly the case of rural areas, given that the garment and footwear sector mostly employ young female workers from rural areas [49]. As the garment and footwear sector grew in importance, the sector’s minimum wage as defined by the government also increased consistently, rising from US\$ 80 per month in 2013, to US\$ 153 per month from 1 January 2017 [50, 51]; average monthly earnings in the garment sector are higher compared to other private sectors [52].

Macro-level factor: Financial remittances

Another important factor in shaping economic growth in the context of rural Cambodia is the inflow of remittances from both external (or international) [53] and internal migrants. The number of internal and external migrants increased importantly since the beginning of 2000 in part as a result of employment opportunities in factories in Cambodia and the region. In 2013, about one-fourth of the population of Cambodia (4.1 million people) were internal migrants [54], and external migrants increased 160% between 2000 and 2015, amounting to 1.19 million or 7.6% of Cambodia’s total population in 2015 [55]. Remittances from both internal and external migrants play an important role in increasing family disposable income, especially in rural areas. In 2010, average remittances from external and internal migrants amounted to 20.1% and 3.9% of median disposable household income respectively [56]. Such disposable income is used to make investments in healthcare, education, durable and non-durable items [57], ultimately stimulating economic growth at the local and national level.

In line with what has been found by others [58, 59], in the study villages, adult children who commute to factories on a daily basis regularly contribute to their households' expenses, and so do adult children who live outside Cambodia (external migrants), in Phnom Penh or in the factory's housing (internal migrants). Scholars of Cambodian migration hypothesize three specific reasons why adult children regularly send remittances. First, children support their parents because they have what some authors call "a debt of gratitude" towards them [60]. Such debt has become increasingly monetized [60], and children are expected to send home as much as they can [61, 62], especially when migrants live at home or leave their children behind for others to care for [59]. Second, not complying with the remittance duties entails heavy personal consequences such as being branded as lazy or selfish by siblings or other members of the family [58]. Third, remittances play a role in the long-term acquisition and elevation of the migrant's household status within the village [58, 63]. Status is important not only for the families of adult children but also for the adult children themselves: migration in Cambodia, as in other countries [64], is often circular in nature, whereby Cambodian migrants regularly return to their villages to visit and to support their family during the harvesting season [58, 65, 66].

We found that remittances—in a few cases coupled with micro-credit—helped the large majority of interviewed villagers to invest in durable goods, such as home improvements, and particularly high-quality latrines, in ways that would not have been possible otherwise, in line with what found by others [67]. When asked about why some households have latrines and other don't, villagers were quick to explain that *"those who can afford mostly have children working in Japan or garment factory. They can afford to build."* For example, in village 1, adult children started working in factories in 2015, and most *"sent money to build"* a latrine. In village 2, adult children started working in the garment factories in 2017, and then *"they had money."* Multiple villagers reported that they *"get more from remittances than from rice,"* and that those who have a lot of children working in factories have more money than those who have fewer children or children that are still too young to work. The parent of a single child explained: *"Why didn't I have enough money [to buy a latrine]? I have only one child, who else would earn money?"*

The role of microcredit in latrine adoption was limited in the study villages, with the exception of households who benefited from specific microcredit for sanitation programs (only available in village 4 and 7) or households who had access to remittances. This is despite the relevance of microcredit in rural Cambodia: micro-finance institutions (MFIs) supply 52% of rural formal credits in Cambodia and microcredit for sanitation has been piloted in different provinces and districts of Cambodia [68–70]. In our villages, however, most households obtaining micro-credit did so to repay another loan, purchase consumer goods, like a motor-cycle, or enhance their housing.

The majority of those who took up microcredit with MFIs in the study villages did so because of the stability provided by the remittances from their adult children who had migrated, in line with what microcredit scholars previously found in Cambodia [71 cited in 72]. Indeed, many reported that loans were only possible when children work in factories:

"I didn't have anyone working in the factories so I don't dare. I was afraid that I didn't have money to repay."

"At that time, their children were small and didn't work in the factories yet. So, they didn't dare to borrow money. After I built it for 3 or 4 years, those children grew up and worked in the factories and their parents dared to borrow to build it and repaid the lender."

This is consistent with the fact that many households in our study villages were highly indebted and reported fearing being indebted to MFIs. The consequences of indebtedness to

MFIs have become severe in Cambodia: documented consequences include land dispossession for loan repayment [73], reduced household expenditures [74], education interruptions, and the need for young adult children to migrate to factories, in Phnom Penh or internationally, to support their families in repaying debts [67, 72, 75, 76].

Macro-level factor: Social remittances

Migrants not only transfer financial resources to their home villages, but also transfer what Levitt has termed “social remittances” [32–34]—a set of ideas, norms, expectations, information, and behaviors that reflect the migrants’ new ways of life, and economic possibilities back to their communities.

While decisions to invest in a latrine in the study village were not always made by or with an adult child, a number of villagers report to have consulted their migrant children before purchasing a latrine or to have been advised by them to invest in a specific type of latrine, namely a villa latrine. This suggests that the demand for latrine improvement was not solely internal to the village and is consistent with the findings of migration scholars that migrants’ influence over household decisions is closely related to the size of their financial contribution [72]. Furthermore, as many adult children, especially women, leave their own children to be cared for by their parents while they work, they are very much interested in the living conditions of their parental home [72].

Individual factors: Habit, convenience and status

There are a number of ways in which adult children affected the demand for villa latrines in the study villages. First, adult children who commute daily to and from their villages to go work in the city or in factories developed a new habit of using higher quality latrines, and demanded one at home as well. For example, a commune chief (village 6) explained that adult children “*have the habit at the factories, they have the [villa] latrine, so when they can afford, they tell their parents to build it.*”

Convenience was particularly salient for adult children who still lived at home and went to work at a nearby factory every day: “*They leave home in the morning and they return back home by taxi in the evening. It is hard for them when they don’t have the latrine. There is no place to poop and take a bath so they push their parents.*” But even for adult children who did not live at home, convenience played a role since they regularly visited for important holidays, religious ceremonies and during the harvest, and this often stimulated a latrine purchase: “[My] children said it is hard.” And they added that their children said “*Let’s build a latrine. I will give you the money. When I come, it is convenient. When we have guests, it is also convenient.*”

Finally, as also established by migration scholars [77], adult children wanted to emulate their peers who occupy a certain social status. In this context, the acquisition of a villa latrine was not simply about improving sanitation, it was also about performing new kinds of “consumption practices” [32, 66] and the aspiration to be “modern.” Being modern in rural Cambodia is linked to enhanced capacity for consumption, the acquisition of material items, and the performance of advanced social status [61, 78]: what is acquired serves as a signal that a household has been in close contacts with places and objects that are perceived as modern and cosmopolitan [19, 29, 79].

Community factors: The role of peer pressure and social norms in enabling widespread adoption

While adult children play a fundamental role in creating demand for high-quality latrines, aspirations to modernity at the village level combined with peer pressures resulted in new social norms that enabled widespread adoption.

Observing neighbours and peers, having “interactions with them” [80, pg. 9], and being part of an active social life [80, pg. 9] are fundamental in forming people’s aspirations [80–82]. Specifically, proximate peer pressure is a known driver for technology adoption [26, 83], and has been identified as a central in the adoption of rural sanitation technologies in a number of studies [19, 26, 84], and has often been leveraged in CLTS programming.

In our study villages, peers not only influenced each other’s decision to invest in sanitation, but also influenced the choice of a villa latrine over other sanitation technologies, as found by others [83]. Indeed, villagers explained that at first, they wanted to build a dry pit, but when they saw others building nice latrines, they wanted a similar design:

“We saw each other and we followed. Before we have never seen such a good toilet.”

“After everyone got it, we just followed them and got one as well.”

“I just followed others. Some built it. We saw that it is convenient, and just wanted it to build it as well”

Local authorities took advantage of peer pressure to trigger household investments in sanitation, both during household visits and during CLTS meeting. Indeed, where local leaders actively encouraged community members to invest in sanitation, latrine coverage was higher [35]. A village leader (in village 7) reported that he convinced households to invest in a latrine by asking: “Don’t you look around? Everyone builds it. How come you can’t build a latrine?” The leader of village one similarly reported that after hearing from villagers “you don’t have to tell me” since “I know where to bury poop”, he responded “now [all] the neighbors already got one, except you.” Local leaders also arranged meetings to introduce households without latrine to those with latrines, allowing them to hear directly from latrine owning households about their experience.

Respondents explained that peer pressure was not always “indirect.” It also occurred directly through informal conversations (“chit chatting”) or “blaming” by neighbors attempting to persuade them to invest in a latrine, as described by Tribbe et al. [35] in Cambodia, and by other authors elsewhere [85].

Peer pressures seemed particularly strong during major life events such as wedding ceremonies or funerals, or when guests were invited to visit, which often happened when migrant children returned home with their friends, or when households hosted members of their family living in other parts of Cambodia or internationally. One respondent explained that if their adult children “bring their friends to come and visit during the holidays, we will be ashamed as we don’t have the latrine.” And others added: “Guests coming is difficult if we don’t have a latrine. We need a latrine these days;” [Guests] would ask us “if we have a latrine.” Another respondent explained that she invested in a latrine when her son got married, for the guests who were invited to the ceremony.

While peer pressure—whether generated by actions of neighbours or local leaders—resulted in new social norms that stimulated high-quality latrine investments, it also had the negative consequence of generating shame and fear among households that did not have such latrines, corroborating past findings of CLTS and sanitation research in other contexts [86–90]. This is especially concerning since households that did not manage to invest in a latrine in these villages were typically poorer or more vulnerable in other ways—again, in line with what occurs in other contexts [87, 89]. Some villagers explained that they feared of not being perceived “as clean as others” and other villagers explained that since “everyone has this one [villa latrine], if we don’t build this one, we will feel ashamed.” Another one explained that the neighbours said “No matter poor or rich, you should have the latrine so that it’s convenient [. . .].”

5. Conclusions

Over the last 50 years, a combination of macro-level, community, and individual factors has driven sanitation improvements in rural areas of the developing world and emerging economies in Asia (Fig 1). While open defecation remains an important challenge in many countries especially in Southern Asia and Sub-Saharan Africa, Cambodia has rapidly increased rural sanitation coverage in the last 20 years. We examined a specific subset of macro-level, community, and individual factors, as identified by our study respondents, that motivated rural households to invest in high-quality latrines in seven villages located in proximity to urban centers and factories in the two Cambodian provinces of Kampong Champ and Kampong Speu. These villages achieved and sustained open defecation free status with at least 85% latrine coverage at the time of our visit.

Local demand for latrine adoption was stimulated by macro-level factors, which include rapid urbanization of rural areas, NGOs interventions, economic growth, and access to finance mostly via remittances and subsidies. Interventions included behaviour change communication, sanitation marketing, and community-led total sanitation, all magnified by the strong support of local leaders at the village and commune levels. Wage employment, the minimum wage, disposable income, and average consumption have all increased steadily and significantly in Cambodia in the years in which latrine coverage has improved in the study villages.

Furthermore, community and individual factors also motivated high-quality latrine adoption in the study villages: migrants not only transferred financial resources to their home villages, but also transferred a set of ideas, norms, expectations, information, and behaviors back to their communities that reflect the migrant's new ways of life and economic possibilities. While economic remittances are known to play an increasingly important role in the local development of many countries, and in 2019, amounted to more than foreign development investments and overseas development assistance combined in low to middle income countries [91], social remittances are often overlooked especially when they involve internal migrants. We provide evidence that new habits among factory workers, the precise conception of what a modern toilet should be, and ownership and display of new technologies and consumer commodities as symbols of modern success and social status facilitated high-quality latrine adoption. Peer pressure at the village level and among adult children commuting to factories or visiting their rural hometown ensured widespread adoption.

These findings suggest that remittances from migration and salaried work can be used to the advantage of the sanitation sector, not just because of the financial resources they generate that can be then used for sanitation, but because of the aspirations to modernity generated by exposure to cities and work in factories. In general, these findings provide evidence that improving sanitation at workplaces—which is just starting to gain traction in the sector—could lead to important spillover effects at the household and community levels, especially in the context where there are no significant barriers or costs to improve sanitation facilities and in communities located in proximity to factories. Initiatives such as WASH4Work [92] focus on the benefits of improved water and sanitation facilities for workers and employers; future research could further investigate the impact of such programs on both the workers' households, and their villages of origin.

We found that aspirations toward modernity were central to understanding why a large number of households chose to invest in a high-quality latrine. Such findings are in line with recent development economics literature focused on the relevance of internal rather than external constraints to poverty reduction. Specifically, these authors argue that internal constraints, such as lack of hope and limited aspirations, rather than external constraints, such as low access to credit or limited education and health, must be the focus of poverty reduction

initiatives [81, 85, 93–96]. Further, Appadurai [80] argues that the poor's capacity to aspire could be a natural ally for policy makers to be able to reduce poverty.

The sanitation sector, and specifically CLTS supporters, should reflect on the implications of promoting simple latrines, such as those typically promoted in rural areas of developing countries, rather than promoting more aspirational models. Understanding how aspirations can be “activated” [17], at least for the type of villages like the ones in this study, located near urban areas and factories, is also crucial. Indeed, methods for classifying rural communities—such as the SanPlan web tool, currently under development by USAID—which uses publicly available data on population and accessibility to classify communities according to their level of remoteness [conversations with Jessica Tribbe, 2021]—could guide sanitation implementers to develop more tailored programming for villages with access to urban centers and factories.

Finally, in line with many authors, we find that peer pressure was central to sanitation adoption [24, 27–29]. Peer pressure was indirectly activated by observing peer behaviour, but also directly activated by village leaders during meetings or household visits and by disapproving neighbours living in proximity of households without a latrine. Studies have shown that social relationships, in general, matter for health and health-related outcomes [97], and as such they should be better investigated and incorporated in program design. While we document the positive aspects of this mechanism, important negative aspects were associated with peer pressure, as documented by other authors [87–89] and such cannot be underestimated or ignored, especially as they mostly affect the poor.

Supporting information

S1 Checklist. Inclusivity in global research.

(DOCX)

S1 Table. Characteristics of the study villages.

(DOCX)

S2 Table. Subsidies in the study villages.

(DOCX)

Acknowledgments

The data used for this research was collected with funding from the United States Agency for International Development's (USAID) Water, Sanitation and Hygiene Partnerships and Learning for Sustainability project under Task Order number AID-OAA-TO-16-00016 of the Water and Development Indefinite Delivery Indefinite Quantity Contract, contract number AID-OAA-I-14-00068. The authors alone are responsible for the views expressed in this publication and they do not necessarily represent the decisions or policies of USAID.

We want to express our gratitude to the iDE team, our fantastic research partners in Cambodia, and to the households and village leaders hospitality and collaboration during data collection. We also want to thank Ranjiv Khush, Rachel Peletz, Jane Margaret Jacobs, and Anju Paul for their help at various stages of manuscript preparation. We are also grateful to our reviewers, whose insightful, kind, and constructive comments allowed us to improve the manuscript substantially.

Author Contributions

Conceptualization: Valentina Zuin, Jessica Tribbe.

Data curation: Jessica Tribbe.

Formal analysis: Valentina Zuin, Rachel Juay, Jessica Tribbe.

Investigation: Valentina Zuin, Vandy Moug.

Methodology: Valentina Zuin, Jessica Tribbe.

Project administration: Jessica Tribbe.

Resources: Jessica Tribbe.

Supervision: Valentina Zuin, Jessica Tribbe.

Writing – original draft: Valentina Zuin.

Writing – review & editing: Vandy Moug, Rachel Juay, Jessica Tribbe.

References

1. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP). Progress on Household Drinking Water, Sanitation and Hygiene 2000–2017. 2019.
2. Macrotrends. <https://www.macrotrends.net/countries/KHM/cambodia/gdp-per-capita>. Retrieved on 28/4/2023.
3. Joint Monitoring Program. Progress on Household Drinking Water, Sanitation, and Hygiene 2000–2020: Five Years into the SDGs. 2021. <https://washdata.org/reports?reports%5B0%5D=report-type%3Aglobal%20updates>
4. Hang HT, Tranh NC. Selling Sanitation in Vietnam. 2002.
5. Tortajada C, Joshi Y, Biswas A. Water and urban development. In: The Singapore water story: sustainable development in an urban city state. 2013. p. 30–57.
6. Graham JP. Successful Sanitation Projects in Thailand, Malaysia, and Singapore. In: Water and Sanitation-Related Diseases and the Environment: Challenges, Interventions, and Preventive Measures. 2011. p. 251–6.
7. Northover H, Ryu SK, Brewer T. Achieving total sanitation and hygiene coverage within a generation—lessons from East Asia [Internet]. 2015. Available from: <http://www.wateraid.org/np/what-we-do/our-approach/publications/view-publication?id=4ea98b1d-e89d-40be-acbe-0d280699f40f>
8. Korea Water and Wastewater Works Association (KWWA). Transformation of the Water Sector (1960–2012). 2012.
9. Hanchett S. Sanitation in Bangladesh: Revolution, Evolution, and New Challenges. 2016.
10. Curtis V. Explaining the outcomes of the ‘Clean India’ campaign: institutional behaviour and sanitation transformation in India. *BMJ Glob Heal*. 2019; 4:1–11. <https://doi.org/10.1136/bmjgh-2019-001892> PMID: 31646010
11. Abraham C, Michie S. A Taxonomy of Behavior Change Techniques Used in Interventions. *Heal Psychol*. 2008; 27(3):379–87. <https://doi.org/10.1037/0278-6133.27.3.379> PMID: 18624603
12. Zuin V, Delaire C, Peletz R, Cock-Esteb A, Khush R, Albert J. Policy Diffusion in the Rural Sanitation Sector: Lessons from Community-Led Total Sanitation (CLTS). *World Dev* [Internet]. 2019; 124:104643. Available from: <https://doi.org/10.1016/j.worlddev.2019.104643>
13. Venkataramanan V, Crocker J, Karon A, Bartram J. Community-Led Total Sanitation: A Mixed-Methods Systematic Review of Evidence and Its Quality. *Environmental Health Perspectives*. 2018; 106(2). <https://doi.org/10.1289/EHP1965> PMID: 29398655
14. iDE. WASH Markets <https://washmarkets.ideglobal.org/country-learning/market-based-sanitation-reduces-diarrheal-disease-in-rural-cambodia>. 2019. Retrieved on 29/4/2023.
15. Shah R, Fogelberg K, Lockwood H. Agenda for Change Systems Strengthening Research WaterSHED Case Study. 2021. <https://watershedasia.org/wp-content/uploads/A4C-WaterSHED-case-study-FINAL.pdf>
16. IDE. iDE’s Approach to Sanitation Marketing. 2003.
17. Jenkins MW, McLennan L, Revell G, Salinger A. Strengthening the sanitation market system: WaterSHED’s Hands-Off experience. 2019.
18. Jenkins MW, Scott B. Behavioral indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana. *Soc Sci Med* [Internet]. 2007 Jun [cited 2012 Nov

- 24]; 64(12):2427–42. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17442472> <https://doi.org/10.1016/j.socscimed.2007.03.010> PMID: 17442472
19. Jenkins MW, Curtis V. Achieving the 'good life': Why some people want latrines in rural Benin. *Soc Sci Med*. 2005; 61:2446–59. <https://doi.org/10.1016/j.socscimed.2005.04.036> PMID: 15949883
 20. Peal A, Evans B, Van der Voorden C. Hygiene and Sanitation Software. An Overview of Approaches [Internet]. Water Supply and Sanitation Collaborative Council (WSSCC). 2010. 157 p. Available from: http://link.springer.com/chapter/10.1007/978-1-4757-5793-4_6
 21. Devine J. Introducing SaniFOAM: a framework to analyze sanitation behaviors to design effective sanitation programs. Learn to scale up Work Pap Washington, DC . . . [Internet]. 2009;(October). Available from: <http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Introducing+SaniFOAM+:+A+Framework+to+Analyze+Sanitation+Behaviors+to+Design+Effective+Sanitation+Programs#0>
 22. Garn J V., Sclar GD, Freeman MC, Penakalapati G, Alexander KT, Brooks P, et al. The impact of sanitation interventions on latrine coverage and latrine use: A systematic review and meta-analysis. *Int J Hyg Environ Health* [Internet]. 2017; 220(2):329–40. Available from: <https://doi.org/10.1016/j.ijheh.2016.10.001> PMID: 27825597
 23. Jenkins MW, Sugden S. Rethinking Sanitation: Lessons and Innovation for Sustainability and Success in the New Millennium. 2006.
 24. Jenkins MW, Cumming O, Cairncross S. Pit latrine emptying behavior and demand for sanitation services in Dar Es Salaam, Tanzania. *Int J Environ Res Public Health*. 2015; 12(3):2588–611. <https://doi.org/10.3390/ijerph120302588> PMID: 25734790
 25. Leong C. Narratives of sanitation: Motivating toilet use in India. *Geoforum*. 2020; 111(March):24–38.
 26. O'Reilly K, Louiss' E. The toilet tripod: Understanding successful sanitation in rural India. *Health Place* [Internet]. 2014 Sep; 29:43–51. Available from: <http://linkinghub.elsevier.com/retrieve/pii/S1353829214000768> <https://doi.org/10.1016/j.healthplace.2014.05.007> PMID: 24954614
 27. Bardosh K. "Achieving Total Sanitation" in Rural African Geographies: Poverty, Participation and Pit Latrines in Eastern Zambia. *Geoforum* [Internet]. 2015; 66:53–63. Available from: <http://dx.doi.org/10.1016/j.geoforum.2015.09.004>
 28. Kov P, Nguyen NK, Chan V. Expanding Reach into Sanitation Market through Behavior Change Communications. Lessons from Rural Cambodia. 2015.
 29. Shakya HB, Christakis NA, Fowler JH. Social network predictors of latrine ownership. *Soc Sci Med*. 2015; 125:129–38. <https://doi.org/10.1016/j.socscimed.2014.03.009> PMID: 24726688
 30. Dickinson K, Pattanayak S. Open sky latrines: Do social interactions influence decisions to use toilets? 2009;1–24. Available from: <http://www.aae.wisc.edu/events/papers/devecon/2008/dickinson.09.25.pdf>
 31. Dickin S, Bisung E, Savadogo K. Sanitation and the commons: The role of collective action in sanitation use. *Geoforum* [Internet]. 2017; 86(September):118–26. Available from: <http://linkinghub.elsevier.com/retrieve/pii/S0016718517302683>
 32. Levitt P, Lamba-Nieves D. Social remittances revisited. *J Ethn Migr Stud*. 2011; 37(1):1–22.
 33. Levitt P. Social remittances: Migration driven local-level forms of cultural diffusion. *Int Migr Rev*. 1998; 32(4):926–48. PMID: 12294302
 34. Levitt P. *The Transnational Villagers*. University of California Press; 2001.
 35. Zuin, V, Moug V, Juay R, Tribbe J. Jumping up the sanitation ladder in rural Cambodia: the role of remittances and peer-to peer pressure in adopting high quality latrines. Dryad Digital Repository. <https://doi.org/10.5061/dryad.02v6wwqbf>
 36. Tribbe J, Zuin V, Delaire C, Khush RS, Peletz R. How Do Rural Communities Sustain Sanitation Gains? Qualitative Comparative Analyses of Community-Led Approaches in Cambodia and Ghana. *Sustainability*. 2021; 13(5440).
 37. Global Fund. Progress Report 2013. 2014. <https://www.wsscc.org/sites/default/files/uploads/2016/04/Sanitation-for-a-Better-Cambodia-The-Cambodia-Rural-Sanitation-and-Hygiene-Improvement-Program-CR-SHIP-2014.pdf>. Retrieved on 28/4/2023
 38. Ministry of Planning Government of Cambodia. Cambodian population and poverty rate 2015 [Internet]. Open Development Cambodia. 2015. p. <https://data.opendatacambodia.net/en/dataset>. Available from: <https://data.opendatacambodia.net/en/dataset/cambodian-population-and-poverty-rate-2015>
 39. Kov P. Synthesis Report on Technical Assistance P132201: Cambodia Sanitation Marketing [Internet]. Phnom Penh; 2015. Available from: <http://documents.worldbank.org/curated/en/228141468179331853/pdf/96183-WP-P132201-PUBLIC-Box391443B-ACS.pdf>
 40. Ministry of Rural Development. National Strategy for Rural Water Supply, Sanitation, and Hygiene 2011–2025—Summary. 2012.

41. Kar K, Pasteur K. Subsidy or self-respect? Community led total sanitation. An update on recent developments. *IDS Work Pap.* 2005; 257(November):1–62.
42. Mukherjee N.; Robiarto A.; Saputra E.; Wartono D. Achieving and Sustaining Open Defecation Free Communities: Learning from East Java. 2012.
43. Robinson A. Final Evaluation: Pan African CLTS Program 2010–2015. 2016.
44. Tribbe J, Zuin V, Delaire C, Khush R, Peletz R. How do rural communities sustain latrine coverage and use? Qualitative comparative analyses in Cambodia and Ghana. *Sustainability.* 2021; 13(5440):1–23.
45. USAID. An Examination of CLTS's Contributions toward Universal Sanitation [Internet]. 2018. Available from: <https://www.tetrattech.com/pdf/download?url=http://localhost%252fen%252fdocs%252fpd17%252d005%252dan%252dexamination%252dof%252dctss%252dcontributions%252dtoward%252duniversal%252dsanitation%252epdf>
46. WaterAid/Causal Design. Assessing the Influence of Social Context on Sanitation Uptake: Final Report. 2017.
47. National Institute of Statistics. Cambodia socio-economic survey 2017. *Minist Plan.* 2018; (November):106.
48. ILO. Cambodia Garment and Footwear Sector Bulletin. The Footwear Sector—New Opportunities for Cambodia? 2019.
49. Chhair S, Ung L. Economic history of industrialization in Cambodia. 2016.
50. ILO. What explains strong export and weak employment figures in the Cambodian garment sector? *Cambodian Garment Footwear Sect Bull Issue* [Internet]. 2017;(6):1–12. Available from: https://www.ilo.org/asia/publications/WCMS_555290/lang-en/index.htm
51. ILO. Cambodian Garment and Footwear Sector Bulletin. 2018.
52. Shrestha M. The Impact of Minimum Wage Hikes on Employment and Wages in Cambodia. *J Dev Econ.* 2019; 139(May):203–16.
53. Tangtipongkul K, Khiev V. The Effect of Remittance on Economic Growth in Cambodia. *J Popul Soc Stud.* 2019; 27(3):232–46.
54. UNESCO, UNDP I and U-H. Overview of Internal Migration in Cambodia [Internet]. 2017. Available from: <https://bangkok.unesco.org/sites/default/files/assets/article/SocialandHumanSciences/publications/Policy-brief-internal-migration-indonesia.pdf#:~:text=MigrationinIndonesiatendstobe,ruralareasasurbanduetodevelopment%28ibid.%29>
55. OECD/Cambodia Development Resource Institute. Interrelations between Public Policies, Migration and Development in Cambodia. 2017.
56. Asian Development Bank ILO. Cambodia addressing the skills gap: Employment diagnostic study [Internet]. 2015. 111 p. Available from: https://www.ilo.org/wcmsp5/groups/public/—asia/—ro-bangkok/documents/publication/wcms_425375.pdf
57. International Organization for Migration (IOM). Analyzing the Impact of Remittances from Cambodian Migrant Workers in Thailand on Local Communities in Cambodia. 2010.
58. Parsons L, Lawreniuk S, Pilgrim J. Wheels within Wheels: Poverty, Power and Patronage in the Cambodian Migration System. *J Dev Stud* [Internet]. 2014; 50(10):1362–79. Available from: <http://dx.doi.org/10.1080/00220388.2014.940915>
59. Zimmer Z, Van Natta M. Migration and left-behind parents and children of migrants in Cambodia: a look at household composition and the economic situation. *Asian Popul Stud.* 2018; 14(3):271–89.
60. Green WN, Estes J. Precarious Debt: Microfinance Subjects and Intergenerational Dependency in Cambodia. *Antipode.* 2019; 51(1):129–47.
61. Derks A. *Khmer Women on the Move: Exploring Work and Life in Urban Cambodia.* University of Hawai'i Press; 2008.
62. Bylander M. Contested mobilities: gendered migration pressures among Cambodian youth. *Gender, Place Cult.* 2015; 22(8):1124–40.
63. Lawreniuk S, Parsons L. Mother, grandmother, migrant: Elder translocality and the renegotiation of household roles in Cambodia. *Environ Plan A.* 2017; 49(7):1664–83.
64. De Haas H. Migration and development: A theoretical perspective. *Int Migr Rev.* 2010; 44(1):227–64. <https://doi.org/10.1111/j.1747-7379.2009.00804.x> PMID: 26900199
65. Parsons L. Mobile inequality: Remittances and social network centrality in Cambodian migrant livelihoods. *Migr Stud.* 2016; 4(2):154–81.
66. Mills MB. Contesting the margins of modernity: women, migration, and consumption in Thailand. *Am Ethnol.* 1997; 24(1):37–61.

67. Bylander M. Borrowing across borders: Migration and microcredit in Rural Cambodia. *Dev Change*. 2014; 45(2):284–307.
68. Dwan P, Bond M. Evaluation report: WaterSHED's Hands-Off Sanitation Marketing Program. 2016.
69. World Bank Water and Sanitation Program. Making toilets more affordable for the poor through microfinance. 2014.
70. IDinsight. Microfinance loans to increase sanitary latrine sales. 2013.
71. Bylander M, Hamilton ER. Loans and Leaving: Migration and the Expansion of Microcredit in Cambodia. *Popul Res Policy Rev*. 2015; 34(5):687–708.
72. Liv D. Study on the drivers of over-indebtedness of microfinance borrowers in Cambodia: An in-depth investigation of saturated areas. *Cambodia Inst Dev Study* [Internet]. 2013;(Final Report):1–83.
73. Green N, Bylander M. The Coercive Power of Debt: Microfinance and Land Dispossession in Cambodia. *Sociol Dev*. 2019;(August).
74. Seng K. Rethinking the Effects of Microcredit on Household Welfare in Cambodia. *J Dev Stud* [Internet]. 2018; 54(9):1496–512. Available from: <https://doi.org/10.1080/00220388.2017.1299139>
75. Ovesen J, Trankell IB. Symbiosis of Microcredit and Private Moneylending in Cambodia. *Asia Pacific J Anthropol* [Internet]. 2014; 15(2):178–96. Available from: <http://dx.doi.org/10.1080/14442213.2014.894116>
76. Ovesen J, Ojendal J, Jao Ovesen log-Britt Trankell When Every Household is an Island.Social Organization and Power Structures.
77. Grabowska I, Garapich MP, Jaźwińska E, Radziwinowiczówna A. Migrants as Agents of Change. *Migrants as Agents of Change*. 2017. 137–167 p.
78. Paling W., Mobility Modernity and Status. *The World In Phnom Penh and Phnom Penh in the World*. 2012.
79. Gardner K, Osella F. Migration, modernity and social transformation in South Asia: An overview. *Contrib to Indian Sociol*. 2003; 37(1–2):v–xxviii.
80. Appadurai A. The Capacity to Aspire: Culture and the Terms of Recognition. In: *Culture and Public Action*. 2004. p. 59–84.
81. Janzen SA, Magnan NP, Sharma S, Thompson WM. Aspirations failure and formation in rural Nepal. *J Econ Behav Organ*. 2017; 139(April):1–25.
82. Genicot G, Ray D. Aspirations and Inequality. *Econometrica*. 2017; 85(2):489–519.
83. Bailey M, Johnston D, Kuchler T, Stroebel J, Wong A. Peer effects in product adoption. 2019.
84. Shakya HB, Christakis NA, Fowler JH. Association between social network communities and health behavior: An observational sociocentric network study of latrine ownership in rural india. *Am J Public Health*. 2014; 104(5):930–7. <https://doi.org/10.2105/AJPH.2013.301811> PMID: 24625175
85. Pattanayak SK, Yang JC, Dickinson KL, Poulos C, Patil SR, Mallick RK, et al. Shame or subsidy revisited: Social mobilization for sanitation in Orissa, India. *Bull World Health Organ*. 2009; 87(8):580–7. <https://doi.org/10.2471/blt.08.057422> PMID: 19705007
86. Bateman M, Engel S. To shame or not to shame—that is the sanitation question. *Dev Policy Rev*. 2018; 36(2):155–73.
87. Engel S, Susilo A. Shaming and Sanitation in Indonesia: A Return to Colonial Public Health Practices? *Dev Change* [Internet]. 2014 Jan; 45(1):157–78. Available from: <http://doi.wiley.com/> <https://doi.org/10.1111/dech.12075>
88. Brewis A, Wutich A. Why we should never do it: Stigma as a behaviour change tool in global health. *BMJ Glob Heal*. 2019; 4(5):1–3.
89. Brewis A, Wutich A, du Bray M V., Maupin J, Schuster RC, Gervais MM. Community hygiene norm violators are consistently stigmatized: Evidence from four global sites and implications for sanitation interventions. *Soc Sci Med* [Internet]. 2019; 220(July 2018):12–21. Available from: <https://doi.org/10.1016/j.socscimed.2018.10.020>
90. Brewis A, Rosinger A, Wutich A, Adams E, Cronk L, Pearson A, et al. Water sharing, reciprocity, and need: A comparative study of interhousehold water transfers in sub-Saharan Africa. *Econ Anthropol*. 2019; 6:208–21.
91. Bank World. Migration and remittances—Recent Developments and Outlook. *Migration and Development Brief* 31. 2019.
92. WASH4Work. Mission, WASH4Work. Available at: <https://wash4work.org/mission/> (Accessed: 17 May 2024). WASH4Work initiative. 2020.
93. Lybbert TJ, Wydick B. Hope as Aspirations, Agency and Pathways: Poverty Dynamics and Microfinance in Oaxaca, Mexico. *NBER Working Paper Series*. 2016.

94. Lybbert TJ, Wydick B. Poverty, aspirations, and the economics of hope. *Econ Dev Cult Change*. 2018; 66(4):709–53.
95. Tanguy B, Dercon S, Orkin K, Taffesse AS. The Future in Mind: Aspirations and Forward-Looking Behaviour in Rural Ethiopia. 2014.
96. Macours K, Vakis R. Changing Households' Investments and Aspirations through Social Interactions: Evidence from a Randomized Transfer Program [Internet]. Vol. 5137, Impact Evaluation Series. 2020. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1517009#%23
97. Perkins JM, Subramanian S V., Christakis NA. Social networks and health: A systematic review of sociocentric network studies in low- and middle-income countries. *Soc Sci Med* [Internet]. 2015; 125:60–78. Available from: <https://doi.org/10.1016/j.socscimed.2014.08.019> PMID: 25442969