LaBobo Usage Study: Assessment of handwashing practices and user satisfaction among consumer households in Ho Chi Minh City, Vietnam.

1. Introduction

Handwashing with soap has been shown to reduce the incidence of diarrhea in addition to other infectious diseases, such as pneumonia and impetigo (Curtis & Cairncross, 2003; Jefferson et al., 2011; Luby et al., 2005).

However, according to the World Health Organization, in 2012 only 13% of the population in Vietnam practiced handwashing after potential contact with excreta, contributing to 2,031 diarrhea-related deaths attributable to inadequate hand hygiene in Vietnam in 2012 alone (WHO, 2012).

Established in 2013, HappyTap pioneered an innovative solution to the need for portable handwashing devices in Southeast Asia. The HappyTap team designed the LaBobo to function as both a hand-cleaning device and a solution to encourage the formation of healthy habits.

The purpose of this study was to characterize the use of LaBobo and the handwashing practices of respondents in households that had already purchased the device. Specifically, we sought to achieve the following research aims:

1. Determine the extent to which safe handwashing technique was associated with device used (i.e. LaBobo vs. other handwashing device)
2. Determine the extent to which handwashing at critical times was associated with the device used (i.e. LaBobo vs. other handwashing device)
3. Observe the functionality of LaBobo devices in consumer households and determine the extent to which functionality was associated with time since purchase
4. Describe the maintenance practices that consumer households use to upkeep the LaBobo and identify who within the household is most often responsible for LaBobo maintenance
5. Characterize LaBobo usage among various members of the household
6. Assess consumer household satisfaction with the LaBobo

2. Methodology

2.1. Recruitment

Survey respondents were identified and recruited from consumer records from HappyTap Vietnam. The largest proportion of customers were from the Bình Tân district of Ho Chi Minh City, with the majority of remaining customers living in the districts surrounding the centrally located Bình Tân district. Enumerators directly contacted individuals and organized interviews via telephone at least 24 hours prior to the time of the survey. Enumerators were also instructed to ask respondents whether they knew of anyone who owned a LaBobo and might be willing to participate in the survey. This form of snowball sampling allowed us to fortify our initial sample with additional consumer households. Respondents were given vouchers as compensation for their time.

2.2. Data Collection

Enumerators administered the surveys in pairs (i.e. one interviewer and one note-taker). The team of local, Vietnamese-speaking enumerators was trained on the use of mWater, an online data management platform. Whenever possible, enumerators utilized smart phones or tablets to collect data electronically via mWater. A number of surveys were also conducted using paper-based surveys. Data was uploaded to mWater's cloud-based storage system as soon as the user entered the data, irrespective of whether this data was entered concurrently as respondents were interviewed using the

mWater data collection tool, or entered into mWater from paper-based records. The surveys took between 20 and 30 minutes to conduct. Data collection took place between September the October, 2019.

The quantitative household survey consisted of seven main sections. Section 1 was designed to gather demographic information about the respondent and his/her household. Section 2 was completed via observation; the interviewer asked the respondent to demonstrate how he/she usually washes his/her hands. Section 3 was completed via observation; the interviewer asked the respondent if there was a child aged 10 years old or younger at home and if he/she could demonstrate how he/she usually washes his/her hands. In Section 2 and 3, the interviewer recorded observations concerning the device/equipment used for handwashing and the respondent's or child's handwashing technique (i.e. compliance with World Health Organization and Centers for Disease Control and Prevention recommendations, (WHO, 2009; CDC, 2019). Section 4 was completed via observation; the interviewer recorded observations of the LaBobo itself (e.g., damage, functionality, water quality). Section 5 was a household roster to identify all household members and classify each as never, ever, or daily users of the LaBobo. In section 6, the interviewer asked the respondent about cleaning and maintenance of the LaBobo as well as handwashing at critical times with the LaBobo and other handwashing devices. Finally, Section 7 asked both multiple choice and open-ended question about the respondent's and his/her family's satisfaction with the LaBobo.

Household Survey Contents:

- Demographics
- Handwashing Demonstration - Respondent
- Handwashing Demonstration - Child
- LaBobo Observation
- Household Roster
- LaBobo Use & Maintenance
- LaBobo Satisfaction

2.3. Data Analysis

Chi-squared tests were used to determine whether there were statistically significant differences in the frequency of outcomes of interest (i.e., observation of safe handwashing technique, self-report of ever using the LaBobo, self-report of daily use of the LaBobo, LaBobo functionality) by group (e.g., demonstration with LaBobo vs. with other handwashing device; adults v. children) or category of explanatory variable (e.g., time since purchase) (McHugh, 2013).

To examine handwashing at critical times, we compared frequencies of reported handwashing using the LaBobo and using devices other than the LaBobo among children and adults in the sample. To assess satisfaction, we calculated frequencies for multiple choice satisfaction questions and conducted a light content analysis to capture common responses provided for the open-ended satisfaction questions. We conducted all descriptive analyses and inference testing in IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, N.Y., USA).

3. Results

3.1. Demographic Characteristics of Consumer Households

In total, 107 interviews were conducted, of which 88 (82%) were completed in their entirety. The majority of dropouts were due to respondents' pressing domestic duties, such as collecting children from work. The majority of consumer homes in our sample were townhouses (79%) and were headed by someone with a university degree (56%) (Table1). About half (49%) of the households surveyed were female headed. The average age of respondents was 27 years.

Table 1: Household and respondent characteristics (n=107)

	Aggregate (N = 107)	Male (N = 7)	Female (N = 100)
Respondent Characteristics			
Age of respondent – average (range)	27 (19 – 70)	33 (19 - 68)	27 (20 - 70)
Highest education level attained by respondent *			
No formal education	1 (1%)	0 (0%)	1 (1%)
Primary	2 (2%)	0 (0%)	2 (2%)
Secondary	5 (5%)	0 (0%)	5 (5%)
University	97 (93%)	6 (100%)	91 (92%)
Respondent occupation †			
Homemaker	10 (23%)	1 (14%)	10 (26%)
Mobile merchant (i.e. street vendor)	5 (11%)	0 (0%)	5 (13%)
Office worker (public or private sector)	16 (36%)	2 (29%)	14 (37%)
Business-owner (home-based)	3 (7%)	2 (29%)	1 (3%)
Business-owner (outside of home)	1 (2%)	0 (0%)	1 (3%)
Teacher	5 (11%)	1 (14%)	4 (11%)
Healthcare worker	1 (2%)	0 (0%)	1 (3%)
Student	2 (5%)	1 (14%)	1 (3%)
Hairdresser	1 (2%)	0 (0%)	1 (3%)
Primary caretaker is respondent			
No	73 (68%)	4 (57%)	69 (69%)
Yes	34 (32%)	3 (43%)	31 (31%)
Household Characteristics			
Head of household gender			
Male	43 (40%)	6 (86%)	37 (37%)
Female	52 (49%)	0 (0%)	52 (52%)
Both	12 (11%)	1 (14%)	11 (11%)
Highest education level attained by head of household‡			
"I am the head of household"	6 (13%)	2 (33%)	4 (9%)
Primary	2 (4%)	0 (0%)	2 (5%)
Secondary	14 (29%)	2 (33%)	12 (27%)
University	28 (56%)	2 (33%)	26 (59%)
Occupation of the head of household §			
Homemaker	8 (12%)	0 (0%)	8 (13%)
Agricultural	2 (3%)	0 (0%)	2 (3%)
Mobile merchant (i.e. street vendor)	13 (19%)	0 (0%)	13 (21%)
Office worker (public or private sector)	18 (26%)	1 (14%)	17 (27%)
Business-owner (home-based)	7 (10%)	3 (43%)	4 (6%)
Teacher	5 (7%)	0 (0%)	5 (8%)
Healthcare worker	3 (4%)	0 (0%)	3 (5%)
Taxi driver	9 (13%)	2 (29%)	7 (11%)
Hairdresser	2 (3%)	0 (0)%	2 (3%)
Real estate	1 (1%)	0 (0%)	1 (2%)
I am the head of the household	1 (1%)	1 (14%)	0 (0%)
Type of dwelling			
Apartment	22 (21%)	0 (0%)	22 (22%)
Townhouse	85 (79%)	7 (100%)	78 (78%)

* For "Highest education level attained by respondent", 2 respondents declined to answer; 1 man and 1 woman

† For "Respondent occupation ", 63 respondents declined to answer; 1 man and 62 women

‡ For "Highest education level attained by head of household", 57 respondents declined to answer; 1 man and 56 women

§ For "Occupation of the head of household", 38 respondents declined to answer; 38 women

3.2. Handwashing technique

Handwashing was considered safe if and only if demonstrations met all of the following criteria:

1. respondent washed their hands with soap,
2. completed all the WHO-recommended steps for safe handwashing:
   - "wet both hands with water
   - apply soap to cover all hand surfaces
   - rub hands palm to palm
   - right palm over left dorsum with interlaced fingers and vice versa
   - palm to palm with fingers interlaced
   - backs of fingers to opposing palms with fingers interlocked
   - dry[ing] hands thoroughly" (WHO, 2009)
3. the handwashing event lasted for at least 20 seconds (as recommended by the CDC) (CDC, 2019)
4. completely dried their hands after the handwashing event.

Chi-squared tests were used to determine whether respondents' safe handwashing was significantly associated with their use of the LaBobo during the demonstration or their use of their LaBobo the day before the interview took place (as a proxy indicator of frequent LaBobo usage).

Figure 1: Safe handwashing practice among adults and children, by handwashing device used to demonstrate handwashing

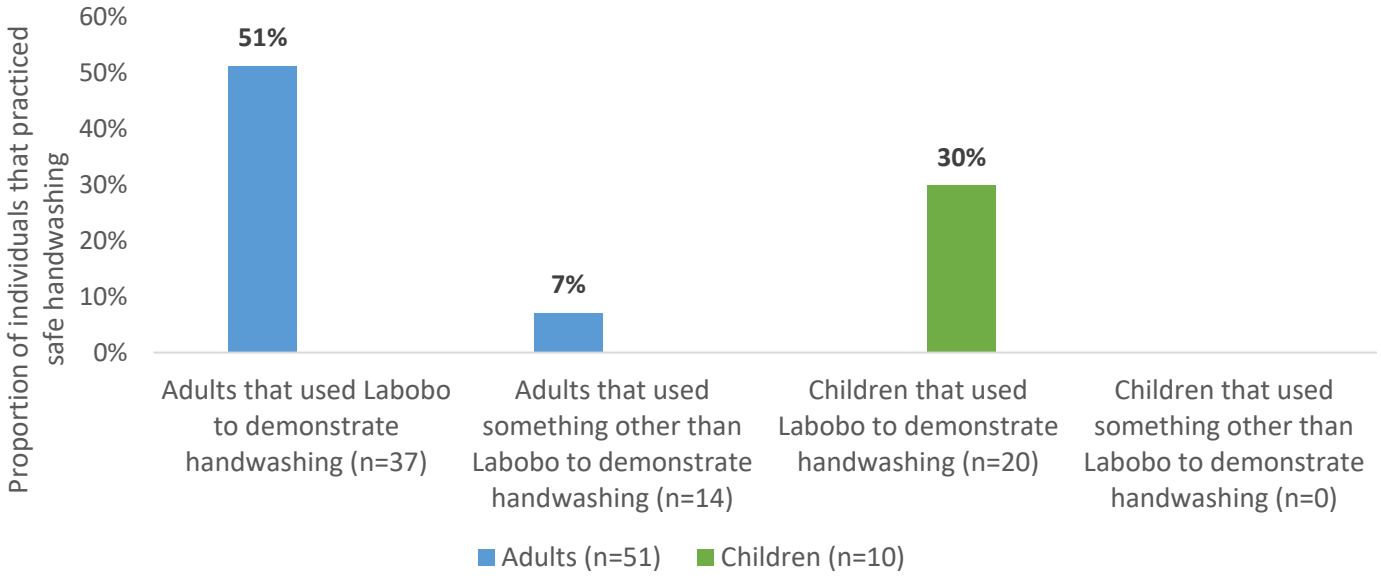
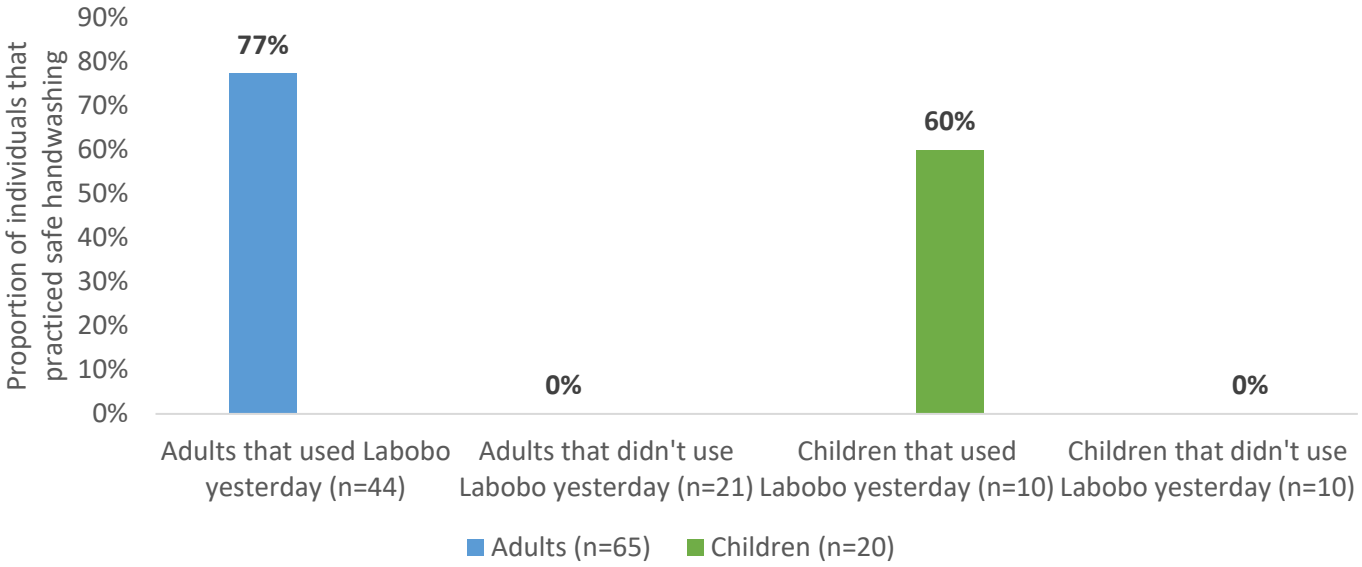


Figure 2: Safe handwashing practice among adults and children, by reported LaBobo usage the day prior



There were a total of 65 adults who agreed to take part in a handwashing demonstration, of which 34 (52%) demonstrated safe handwashing. Adults who used the LaBobo during the demonstration were significantly more likely to practice *safe* handwashing than adults who used any other handwashing device [$\chi^2(1,51)=8.328$, $p=0.004$] (Figure 1). Adults who reported using the LaBobo the day before the survey were also significantly more likely to practice *safe* handwashing than adults who reported no use of the LaBobo in the day prior [$\chi^2(1,46)=5.924$, $p=0.015$] (Figure 2).

Of the 20 children who took part in a handwashing demonstration, 6 (30%) demonstrated safe handwashing. There were no children that demonstrated handwashing with a device other than LaBobo. As a result, there could be no comparison of safe handwashing between children that used or did not use LaBobo to demonstrate handwashing (Figure 1). Children who reported using the LaBobo the day before the survey were significantly more likely to practice *safe* handwashing than children who reported no use of the LaBobo in the day prior [$\chi^2(1,20=8.571$, $p=0.003$] (Figure 2).

3.3. Handwashing at critical times

Respondents were asked about their handwashing practices and the practices of their children the day before the interview. Interviewers prompted respondents to provide a list of all of the times at which they washed their hands the day before the interview. Interviewers did not provide any answer choices so as to reduce social desirability bias. According to the Centers for Disease Control and Prevention, critical times for handwashing to have consequential health gains include before and after preparing food; before eating; before and after treating a cut or wound; after defecating; after handling child feces; after blowing their nose, coughing, or sneezing; after touching an animal, animal feed, or animal waste; after handling pet food or pet treats; after touching garbage or something unclean (CDC, 2019).

3.3.1. Handwashing at critical times with LaBobo

The majority of adults reported washing their hands using the LaBobo after defecating (88%) and after touching garbage/ something unclean (76%) (Table 2). Around half of the respondents reported washing their hands with the LaBobo, in the day prior to the survey, before preparing food (49%) and before eating (50%). Very few of the respondents reported washing their hands using the LaBobo after handling child feces (5%). No respondents stated that they washed their hands with the LaBobo before/after treating a cut or wound, after touching an animal, or after handling pet food. This may have been due to the respondent not having a pet or encountering an injury that required treatment in the day prior to the survey.

Respondents were asked about the handwashing practices of children 10 years or younger in the household using the LaBobo. There was a total of 18 respondents that answered questions about children under 10. The majority of respondents reported that children under 10 washed their hands using the LaBobo, in the day prior to the survey, after

touching garbage/something unclean (61%) and after defecating (61%). Half reported that children under 10 had washed their hands using the LaBobo before eating food (50%). No adults reported that their children had washed their hands before or after preparing food. However, it is possible that this finding is more reflective of the fact that children are unlikely to be engaged in these activities at all rather than that they are particularly unlikely to wash their hands using the LaBobo at these times.

Table 2: Handwashing at critical times the day prior to survey, by device used and household member group (adults vs. children)

	Handwashing at critical times with LaBobo				Handwashing at critical times with devices other than the LaBobo			
Critical handwashing times	Adults (n=74)		Children (n=18)		Adults (n=77)		Children (n=10)	
Before preparing food	36	49%	0	0%	22	29%	0	0%
After preparing food	29	39%	0	0%	13	17%	0	0%
Before eating food	37	50%	9	50%	18	23%	3	30%
Before and after treating a cut or wound	0	0%	0	0%	0	0%	0	0%
After defecating	65	88%	11	61%	29	38%	4	40%
After cleaning child's feces	4	5%	1	6%	3	4%	0	0%
After blowing their nose, coughing, or sneezing	0	0%	0	0%	0	0%	0	0%
After touching an animal, animal feed, or animal waste	0	0%	0	0%	0	0%	0	0%
After handling pet food or pet treats	0	0%	0	0%	0	0%	0	0%
After touching garbage/something unclean	56	76%	11	61%	40	52%	4	40%

3.3.2. Handwashing at critical times with other handwashing devices

Respondents were also asked 'Yesterday, after what occasions did you wash your hands using something other than the LaBobo?' The majority of adults reported doing so after touching something unclean/garbage (52%). Fewer adults reported handwashing with something other than the LaBobo after defecating (38%), before preparing food (29%), before eating (23%), and after preparing food (17%). Only 4% of adult respondents reported washing hands with something other than the LaBobo after handling child feces. Overall, adults washed their hands at critical times more frequently when using the LaBobo than when using something other than the LaBobo.

The adult respondents noted a similar pattern for children; about two-fifths of respondents' children washed their hands with something other than LaBobo, in the day prior to the survey, after defecating (40%) and after touching garbage/something unclean (40%). Only 30% did so before eating. None of the children reportedly washed their hands using something other than the LaBobo before or after preparing food, nor after cleaning another child's feces. As with handwashing with the LaBobo, this may be more due to children not engaging in these activities, rather than their tendency to wash their hands at these critical times. Overall, children washed their hands at critical times more frequently when using the LaBobo than when using something other than the LaBobo.

Neither children nor adults identified washing their hands after contact with animals or after treating an injury, which may be due to not having encountered either scenario the day prior to the interview.

Critical handwashing times (CDC, 2019):

1. Before preparing food
2. After preparing food
3. Before eating
4. Before and after treating a cut or wound
5. After defecating
6. After handling child feces
7. After blowing their nose, coughing, or sneezing
8. After touching an animal, animal feed, or animal waste
9. After handling pet food or pet treats
10. After touching garbage/something unclean

3.4. LaBobo functionality

LaBobo units were defined as fully functional if and only if they met all of the following criteria:

- "working perfectly"[1],
- not having any damage (whether cosmetic or functional),
- and containing clear water free of particulate matter.

A total of 95 LaBobo units were observed by enumerators, of which the majority (88%) were full functional. Some units were not observed due to the interviews being cut short by respondents (n=12), usually due to the respondents needing to return to work or domestic duties.

Functionality was not significantly associated with time since purchase [$\chi^2(1,89)=1.847$, $p=0.605$]. A total of 24 respondents did not know the age of their LaBobo and were therefore excluded from this test. Both functional and non-functional units were purchased one to two months prior to the time of the survey, on average, and 87% of respondents had purchased their LaBobo within the past two months.

3.5. LaBobo maintenance

Respondents were asked who in the household was usually responsible for refilling and cleaning the LaBobo in the 7 days prior to the survey. The family member responsible for maintaining the LaBobo was predominantly the mother, with 67% and 64% of respondents identifying that it was 'usually' the mother who refilled or cleaned the LaBobo within the 7 days prior to the interview, respectively (Table 3). The majority of respondents reported that the device was refilled or cleaned (43% and 42% respectively) once every three days in the 7 days prior to the interview. Only one-third of respondents reported that the device was refilled or cleaned more than once a day in the 7 days prior to the interview (27% and 17% respectively).

When mothers were responsible for refilling the LaBobo, the device was usually refilled once in the last 7 days. Similarly, when fathers were responsible for refilling the LaBobo, the device was usually refilled once in the last 7 days. The LaBobo was usually cleaned one time in the last 7 days when mothers were responsible for cleaning and once every three days when fathers were responsible for cleaning. Thus, it appears that the LaBobo is refilled and cleaned at similar frequencies, regardless of whether the mother or father in the family is responsible. However, mothers were disproportionately responsible for these tasks.

Table 3: Frequency of cleaning and refilling the LaBobo in the past week, by who was responsible for the task

Household member	% of households (N = 82)	Most common frequency (in the last 7 days)
In the last 7 days, who usually refilled the LaBobo		
Mother	67%	One time
Father	23%	One time
Grandmother	4%	Once every two days
Grandfather	0%	-
Children under 10	0%	-
Children over 10	1%	One time
*In the last 7 days, who usually cleaned the LaBobo**		
Mother	64%	One time
Father	32%	Once every 3 days
Grandmother	3%	One time
Grandfather	1%	Once a day
Children under 10	0%	-
Children over 10	0%	-

*There was data missing for one household for "In the last 7 days, who usually cleaned the LaBobo"

[1] "Working perfectly" was the perceived practical functionality, as determined by interviewer observations.

3.6. LaBobo use

3.6.1. Characterizing LaBobo use among various household members

Respondents were asked to report, on behalf of their fellow household members, who in the household had used the LaBobo the day before the interview. The majority (63%) of the respondents reported that mothers in the household had used the LaBobo yesterday; 41% reported that fathers had used the LaBobo yesterday; and 97% reported that children had used the LaBobo yesterday (Table 4).

For each household member group/profile (i.e., mother, father, grandparents, children), who had used the LaBobo the day prior, the respondent provided the number of times people in that group had used the LaBobo in that day. On average, respondents reported that mothers and fathers in the household had used the LaBobo about 5 times in the day before the interview and that children had used the LaBobo 8 times.

Table 4: Household members' reported usage of LaBobo the day prior to interview (n=80)

Household member	% of respondents who reported that each group had used the LaBobo yesterday (y/n)	Average number of times used yesterday (among those who used yesterday)
Mother (n=80)	63%	4.8
Father (n=80)	41%	4.9
Grandparents (n=80)	8%	3.8
Children (n=23*)	97%	8.0

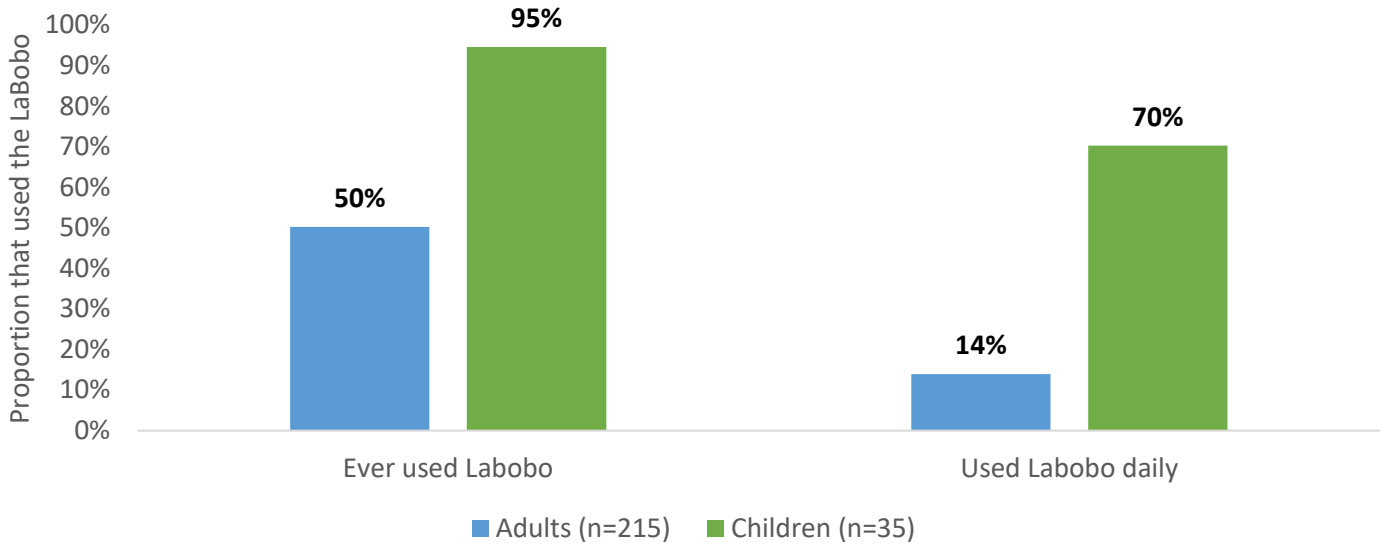
*32 households were identified as having one or more child among the sample, with data missing from 9 households regarding LaBobo use the day prior

3.6.2. Use (ever and daily) among adults and children in the household

Respondents were also asked to provide a full roster of all adults and children in their household. The respondent then reported whether each individual household member had ever used the LaBobo and whether each person was a daily user of the device.

The difference in proportions of adults and children that had ever used the LaBobo was statistically significant [$\chi^2(1,252) =25.311$, $p<0.001$]. Out of the 215 adults identified within the households surveyed, about half (n=108, 50%) had ever used the LaBobo (Figure 3). Of the 35 children identified within households surveyed, an overwhelming majority (n=33, 95%) had ever used the LaBobo. Additionally, the difference in proportion of adults and children that used the LaBobo daily was statistically significant [$\chi^2(1,252) =57.926$, $p<0.001$]. The majority of children identified in household rosters were daily users (70%), as contrasted with adults, who were predominantly not daily users (86%).

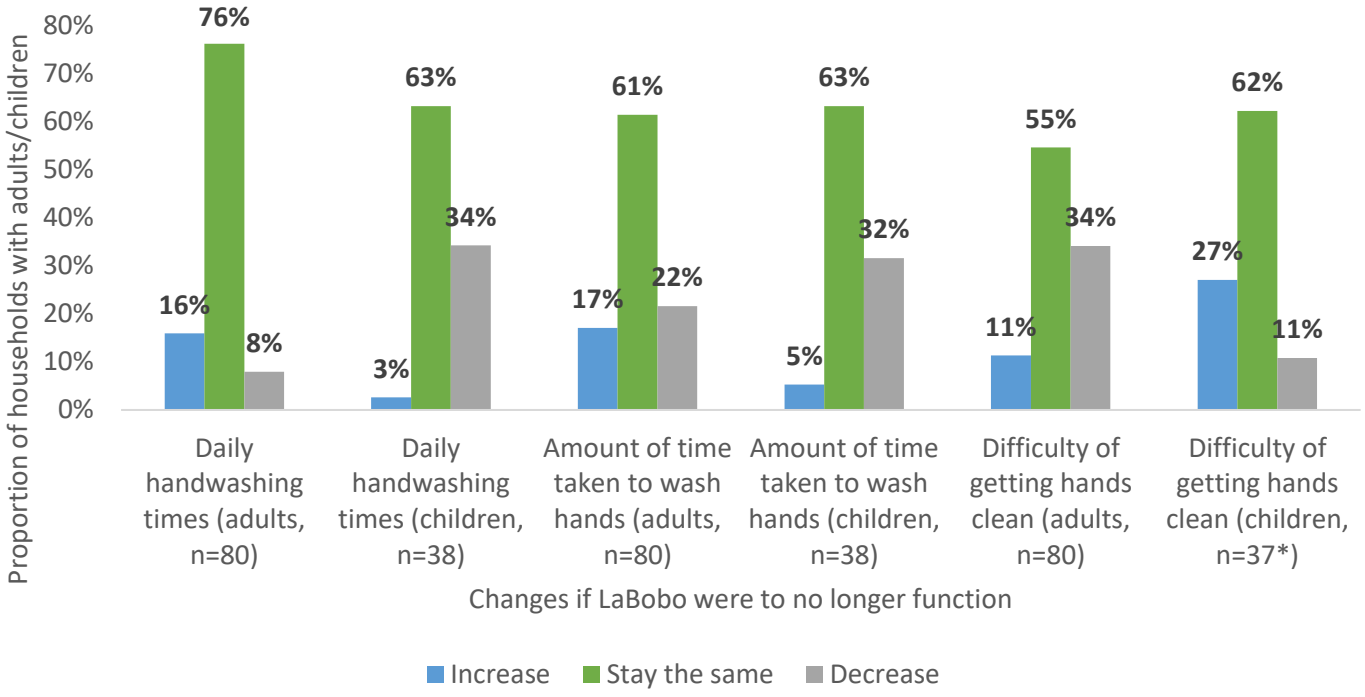
Figure 3: Proportion of adults and children who reported using the LaBobo



3.7. LaBobo satisfaction

In order to assess the household's satisfaction with the LaBobo and curb social desirability bias, we asked respondents if any aspects of their handwashing behavior or the handwashing behavior of other household members would change as a result of their LaBobo no longer working. The majority of respondents stated that for both the adults and the children, there would be no change in the number of times they washed their hands, amount of time taken to wash their hands, and difficulty of getting their hands clean (Figure 4). About one third of respondents in households with children felt that the number of times their children would wash their hands would decrease (34%) and that the difficulty of getting their hands clean would increase (27%).

Figure 4: Respondents' perception of change due to LaBobo ceasing to function



*There were data missing for one household with children.

Respondents were also asked open-ended questions about their level of satisfaction with the LaBobo. When asked how their daily routine would change without the LaBobo, respondents mostly said that there would be no change to their routine, though some mentioned it would be more difficult for their children to wash their hands. When asked how they felt about their hands when using the LaBobo, respondents commonly said they felt clean, and described the LaBobo as convenient and durable. One respondent stated "it is more convenient because it can be placed in the bedroom, which is suitable for the head of household because of [their] leg pain". LaBobo customers were asked if they would buy another LaBobo to replace theirs if it stopped working. Of the 88 respondents that answered, the majority (n=58, 66%) stated that they would. The majority (n=79, 90%) also said they would recommend the LaBobo to friends and relatives.

Overall satisfaction with the LaBobo was quite high, with 95% of customers that responded to the satisfaction questions (n=88) being satisfied (n=45, 51%) or very satisfied (n=39, 44%) with the LaBobo. Things customers liked about the LaBobo included its convenience, durability, ease of purchase, price, and aesthetic. Conversely, the things customers disliked the most included the small size of the drip tray (particularly in causing small spills), the design being mostly for children, and the lack of easy drainage. The most commonly recommended change customers would want to see in the LaBobo was adjusting the design to prevent spillover. Other suggestions included diversifying the design to also be more inclusive for adults.

4. Discussion

4.1. Safe handwashing

Individuals who used the LaBobo to demonstrate their usual handwashing technique were more likely to practice safe handwashing than those who used other handwashing devices. This held true for both adults and children. Additionally, both adults and children washed their hands at critical times more frequently when using the LaBobo than when using other handwashing devices. Among LaBobo consumer households in Ho Chi Minh City, Vietnam, use of the LaBobo for handwashing was associated with safer handwashing practices both in terms of handwashing technique and handwashing at critical times.

4.2. Functionality and maintenance

The vast majority of LaBobo units observed were fully functional (i.e. no cosmetic or functional damage, clean water free of particulate matter). Almost all respondents reported that their LaBobo had been refilled and cleaned in the week prior to the survey. Mothers were most often responsible for both refilling and cleaning the household LaBobo. While this finding aligns with expected gender roles in the Vietnamese context (ActionAid Vietnam, n.d.), it is important to consider how maintenance of the LaBobo may add to the burden of unpaid housework placed on women. According to recent research from ActionAid Vietnam, women at any age, ethnicity, rural or urban location undertake more unpaid work than men (ActionAid Vietnam, n.d.).

4.3. LaBobo use

In our characterization of LaBobo use among various members of the household, we expected to see the most frequent use among children. The majority of respondents with children in their household reported that their child had used the LaBobo the day before the interview, and that their child was a daily LaBobo user. Reported usage was higher than expected among adults in the household.

4.4. LaBobo Satisfaction

The vast majority of respondents reported being either satisfied or very satisfied with their LaBobo. Most respondents said that they would purchase another unit if their LaBobo were to stop working and stated that they would recommend the product to friends and family. However, most respondents felt that their own and their fellow household members' handwashing practices and daily routines would not change if their LaBobo stopped working. Despite this finding, the results suggest that, overall, consumer households value the LaBobo and are satisfied with their purchase.

4.5. Study strengths and limitations

We feel that the recruitment strategy we used was a strength of the study. We carefully piloted a variety of recruitment strategies and selected the most successful strategy for the full scale survey. However, by leveraging online sales records for recruitment, we limited our sample to households who had purchased the LaBobo since it became available online (i.e. no more than one year prior to the start of the survey). As a result, long-term effects of the LaBobo on handwashing practices were unable to be thoroughly studied.

While 107 households participated in the survey, our sample size for certain analyses was limited by missing data. A number of respondents refused to answer certain questions or opted out of completing the survey due to time constraints. Missing data may have affected the validity of some of the findings. Additionally, 29 of the 136 electronic responses to the survey appeared to be duplicate entries; we learned from discussions with the enumerator team that these duplicates likely represented instances in which electronic responses were started during the surveys by the interviewer and then completed later, using paper-based surveys filled out during the survey by the note-taker. Of these 58 total responses, we retained the 29 entries with attached photographs of the LaBobo, or i) the most recent submission date, *and* ii) the most survey fields completed. This limits our overall sample size to 107 households.

Another important strength of our study is the use of observation techniques. Enumerators conducted direct observation of handwashing techniques and LaBobo units. This direct observation methodology increases the validity of our findings around LaBobo functionality and safe handwashing techniques. While we did rely on self-report to capture handwashing at critical times, we carefully structured survey items to avoid social desirability bias. Specifically, respondents were prompted to provide a full list of all occasions at which they washed their hands in the day prior to the interview, rather than being asked to reply 'yes' or 'no' to each critical handwashing time. Due to time and resource constraints, it was not practical to conduct observation studies, which are considered the gold standard in handwashing studies (WHO, 2019).

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