

Hand Washing Among School Children in Bogotá, Colombia

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Remarkable improvements have been made in the past century in the fight against communicable diseases, yet a significant amount of mortality and morbidity worldwide can still be attributed to these conditions.¹ Respiratory infections and diarrheal diseases—the 2 leading causes of disease burden globally—are responsible for half of all child deaths each year.¹ The burden of communicable disease remains predominantly acute in developing regions of the world,² and children remain particularly vulnerable.³

Recent estimates in Colombia indicate that acute respiratory and intestinal infections are the main cause of mortality among children aged 1 to 4 years, the second leading cause of death among girls aged 5 to 14 years, and the third leading cause of infant mortality.⁴ According to a recent national household survey in Colombia, 14.1% and 9.6% of children younger than 5 years had experienced diarrhea or an acute respiratory infection, respectively, in the 2 weeks before the survey.⁴

Despite much evidence supporting the effectiveness of measures such as vaccination,^{5,6} improvement in sanitary conditions,^{3,6} and basic hygiene practices^{3–7} in controlling communicable diseases, many developing nations have yet to achieve effective vaccination coverage⁶ and remain plagued with poor sanitary conditions. Basic personal hygiene behaviors, such as hand washing, are still not widely practiced.⁷

Diverse health behavior and social marketing theories have been applied in the design and implementation of behavioral change interventions that promote infection-control practices.^{8,9} The theory of reasoned action and planned behavior,^{10,11} for example, suggests that a person's behavior is determined by her or his intention to perform the behavior. Intention, in turn, is a function of the person's attitudes toward the behavior, beliefs concerning benefits or harms of adopting or not adopting the behavior, subjective norms and normative beliefs, and perceived control over the opportunities, resources, and skills necessary to perform the behavior.^{9,10} More recently, ecological approaches have been incorporated into behavioral theories to

Objectives. We assessed hand-washing behaviors and intentions among school children in Bogotá, Colombia, to help identify and overcome barriers to proper hygiene practices.

Methods. Data on hand-washing behavior and intentions and individual and contextual factors were collected from 2042 sixth- through eighth-grade students in 25 schools in Bogotá via anonymous questionnaires. A member of the school administration or teaching staff completed a questionnaire about the school environment. Site inspections of bathroom facilities were conducted.

Results. Only 33.6% of the sample reported always or very often washing hands with soap and clean water before eating and after using the toilet. About 7% of students reported regular access to soap and clean water at school. A high level of perceived control was the strongest predictor of positive hand-washing intentions (adjusted odds ratio [AOR]=6.0; 95% confidence interval [CI]=4.8, 7.5). Students with proper hand-washing behavior were less likely to report previous-month gastrointestinal symptoms (OR=0.8; 95% CI=0.6, 0.9) or previous-year school absenteeism (OR=0.7; 95% CI=0.6, 0.9).

Conclusions. Scarcity of adequate facilities in most schools in Bogotá prevents children from adopting proper hygienic behavior and thwarts health promotion efforts. The current renovation program of public schools in Bogotá provides a unique opportunity to meet the challenges of providing a supportive environment for adoption of healthy behaviors. (*Am J Public Health.* 2008;99:94–101. doi:10.2105/AJPH.2007.129759)

disentangle independent effects of individual and contextual factors on health behavior.¹² The underlying premise of such models is a bidirectional relation between environmental modifications and behavioral change.^{12,13}

Bearing in mind that school children have been consistently implicated in the spread of communicable diseases¹⁴ and that the school has been recognized as a vital setting for health promotion, we assessed the prevalence and individual and contextual determinants of proper hand-washing behavior and positive hand-washing intentions among school children in Bogotá, Colombia.

METHODS

Study Design and Population

We collected cross-sectional data on hand-washing practices, knowledge, intentions, and attitudes; the school environment (e.g., availability of clean water, soap, and bathroom facilities); school absenteeism; and other individual and school contextual factors from 2042

students in sixth through eighth grade in 11 private and 14 public schools in Bogotá. These grades were chosen because reading proficiency at this age enables respondents to complete the questionnaire within the time available.

A pilot study and focus group sessions were conducted to assess the suitability of the questionnaire with regard to duration, language appropriateness, and question comprehensibility. Comprehensiveness of the constructs studied was appraised in the focus groups.

We generated a multistage cluster sample that reflects the socioeconomic characteristics of children registered in the Bogotá school system. Stratification was based on type of school (private vs public) and on the Bogotá Secretary of Education ranking of the school's socioeconomic strata (SES). Nearly all sampled students (95.1%) and schools (89.2%) participated. Passive consent was obtained from students and parents (i.e., students who declined to participate in the study or parents who refused their child's participation in the study were requested to reply with a written statement to that effect).

Data Collection

We explained the study aims, then distributed a standardized self-completed anonymous questionnaire to participating students. Hand-washing behavior was assessed based on 4 criteria related to hand-washing technique: use of soap, use of clean water, hand washing before eating, and hand washing after using the toilet. Each criterion was scored on a 5-point Likert scale¹⁵ ranging from “always” to “never.” Students who reported “always” or “very often” for all 4 criteria were classified in the “proper hand washing” category.

In accordance with constructs of the theory of reasoned action and planned behavior,^{10,11} hand-washing intentions were classified as positive or negative on the basis of responses to 2 questions about hand-washing intentions (1) before eating and (2) after toilet use (e.g., “How likely is it that you will wash your hands the next time you use the toilet?”). Each question was scored on a 5-point scale (1=very unlikely, 5=very likely). Students who answered “likely” or “very likely” to both questions were classified as having positive intentions. We asked 4 questions related to knowledge of infectious disease transmission and health outcomes associated with hand washing (e.g., “Does covering your mouth while coughing help prevent the spread of infections?”). Correct answers to all 4 questions indicated a high degree of knowledge, 3 correct answers indicated medium knowledge, and fewer than 3 indicated low knowledge.

We asked respondents about the degree of difficulty associated with washing their hands with soap and water before eating and after using the toilet. Those who answered “easy” or “very easy” to both questions were classified as having a high degree of perceived control over hand washing; all others were classified as having a low degree of perceived control. Three questions were asked about attitudes toward hand washing before meals and after toilet use (regardless of the student’s own behavior) and the utility of washing hands with soap when dirty (e.g., “Does it bother you when people do not wash their hands after toilet use?”). Each question was scored on a 5-point scale, and the cumulative scale was recoded as negative (3–6), neutral (7–11), and positive (12–15) attitudes. Finally, we measured subjective hand-washing norms with 2 questions about the student’s willingness to comply with expectations of parents, classmates, and teachers regarding hand

washing before eating and after using the toilet; questions were scored on a 5-point scale, and the sum recoded as negative (2–5), neutral (6–7), and positive (8–10).

We collected information about age (10–13 vs >13 years), gender, parental education (0–4, 5–10, or >10 years of schooling), family SES (low, medium, or high, on the basis of the formal coding of neighborhoods for municipal tax and billing purposes), sources of knowledge about hand washing and hygienic practices (parents, school, or mass media), and performance of regular teeth brushing and fingernail cleaning. We also asked students about the presence of gastrointestinal or upper respiratory disease symptoms during the month before the questionnaire was answered and school absenteeism during the past academic year because of these diseases. Barriers to hand washing were categorized as contextual (including lack of clean water) or individual (e.g., forgetfulness or laziness). The ratio of students per toilet unit (i.e., toilet and sink) was calculated based on the number of students registered in the school and the number of functioning and accessible toilet units. Further details of the interview schedule are available from the authors.

A member of the school administration or teaching staff completed a questionnaire about the school environment. C.L.-Q. conducted on-site observations of bathroom facilities. We conducted field work between March 2006 and April 2007.

Statistical Analysis

First-order statistics were calculated to characterize the sample and ascertain the prevalence and determinants of proper hand-washing behavior and positive hand-washing intentions. Associations between outcome variables and individual and contextual factors were examined in logistic regression models and are expressed as unadjusted odds ratios (ORs) and adjusted odds ratios (AORs), and their corresponding 95% confidence intervals (CIs) were obtained from logistic regression models. We performed the analyses with SPSS version 14.0 (SPSS Inc, Chicago, IL).

Because of severe response pattern inconsistencies, 99 questionnaires were excluded, which left 1943 questionnaires for analysis.

RESULTS

The average age of participants was 13.4 years (SD=1.2); 53.7% of the sample were males, 49.1% studied in private schools, and 56.4% were from the lowest SES (Table 1). One third (33.6%) of the sample (n=645) practiced proper hand-washing behavior according to the criteria defined in the “Methods” section (i.e., washing hands “always” or “very often” with soap and clean water before eating and after using the toilet). Only 3% of students, however, met the stricter Centers for Disease Control and Prevention definition, which includes always washing hands for at least 20 seconds upon entering one’s home and after nose blowing, coughing, and other critical episodes of germ contamination.¹⁶

Age, gender, SES, type of school, mother’s education, and father’s education were not associated with hand-washing behavior. Children who reported proper hand-washing behavior were more likely to report regular teeth brushing (OR=4.5; 95% CI=3.6, 5.7) and fingernail cleaning (OR=1.7; 95% CI=1.4, 2.2).

The most often cited sources of information about hygiene and hand washing were parents (88.5%), followed by school (66.7%), then the media (56.8%). Students informed by their parents were twice as likely to practice proper hand-washing behavior as were students who did not mention parents as a source of information (OR=2.1; 95% CI=1.5, 3.0).

The 3 most frequently given reasons for not washing hands were forgetfulness (78.2%), laziness (43.5%), and lack of time (21.7%). Other reasons cited were lack of clean water (18.9%) or soap (16.7%), bathroom facilities that were dirty (16.5%) or unsafe (5.2%), and lack of interest (6.3%).

Impact of Proper Hand Washing

As seen in Table 1, participants who reported proper hand-washing behaviors were less likely to report gastrointestinal symptoms in the previous month (OR=0.8; 95% CI=0.6, 0.9) or absenteeism because of respiratory or gastrointestinal disease in the previous year (OR=0.7; 95% CI=0.6, 0.9). Hand-washing behavior was not associated with previous-month respiratory symptoms (OR=0.9; 95% CI=0.8, 1.1).

TABLE 1—Sociodemographic Characteristics, Hygiene Practices, Health-Related Characteristics, and Sources of Hygiene Knowledge Among School Children (N=1943): Bogotá, Colombia, March 2006–April 2007

	Total, No. (%)	Proper Hand-Washing Behavior ^a		OR (95% CI)
		No (n=1272), No. (%)	Yes (N=645), No. (%)	
Sociodemographics				
Aged 10–13 years	1145 (59.0)	753 (59.3)	376 (58.4)	1.0 (0.9, 1.3)
Boys	1043 (53.7)	703 (55.3)	331 (51.3)	1.1 (0.9, 1.3)
Private school	815 (41.9)	533 (41.9)	277 (42.9)	1.1 (0.9, 1.4)
Socioeconomic strata				
Low (Ref)	1094 (56.4)	691 (54.5)	388 (60.2)	1.0
Medium	605 (31.2)	410 (32.3)	184 (28.6)	0.8 (0.6, 1.0)
High	240 (12.4)	168 (13.2)	72 (11.2)	0.8 (0.6, 1.0)
Mother's education, y				
0–4 (Ref)	243 (12.7)	158 (12.7)	81 (12.7)	1.0
5–10	871 (45.7)	583 (46.8)	283 (44.5)	0.9 (0.7, 1.3)
>10	793 (41.6)	589 (40.6)	147 (41.5)	1.1 (0.8, 1.4)
Father's education, y				
0–4 (Ref)	297 (16.2)	201 (16.7)	86 (14.2)	1.0
5–10	791 (43.2)	517 (43.0)	265 (43.9)	1.2 (0.9, 1.6)
>10	742 (40.5)	506 (40.6)	272 (42.8)	1.2 (0.9, 1.8)
Hygiene practices				
Proper hand washing	645 (33.6)			
Hand washing after toilet use ^b	1592 (82.5)			
Hand washing with soap after toilet use ^b	1077 (57.4)			
Hand washing before eating ^b	908 (46.9)			
Hand washing with soap before meals ^b	676 (36.1)			
Regular teeth brushing	1164 (60.0)	625 (49.1)	523 (81.3)	4.5 (3.6, 5.7)
Fingernail cleaning	1293 (67.6)	801 (64.0)	480 (75.6)	1.7 (1.4, 2.2)
Health outcomes				
Gastrointestinal symptoms	520 (26.9)	361 (28.5)	151 (23.5)	0.8 (0.6, 0.9)
Respiratory symptoms	1171 (60.8)	777 (61.6)	381 (59.5)	0.9 (0.8, 1.1)
Illness-related absenteeism	640 (33.2)	445 (35.3)	185 (28.8)	0.7 (0.6, 0.9)
Sources of hygiene knowledge				
Parents	1715 (88.5)	1096 (86.4)	599 (93.0)	2.1 (1.5, 3.0)
School	1292 (66.7)	854 (67.4)	422 (65.5)	0.9 (0.8, 1.1)
Mass media	1141 (58.9)	745 (58.8)	377 (58.5)	1.0 (0.8, 1.2)
Other characteristics				
Cares for a younger child	587 (43.0)	402 (44.4)	181 (40.9)	0.9 (0.7, 1.1)
Prepares food at home	801 (58.6)	529 (58.4)	259 (58.3)	1.0 (0.8, 1.3)

Note. OR=odds ratio; CI=confidence interval.

^aUse of soap, clean water, and hand washing before eating and after using the toilet.

^bAlways or very often.

Individual Predictors of Positive Intentions Toward Hand Washing

Consistent with the behavioral theory underpinning our study, a high level of perceived

control over hand-washing behavior was strongly associated (AOR=6.0; 95% CI=4.8, 7.5) with positive intentions toward proper hand washing (Table 2). Also

associated with positive intentions were positive hand-washing attitudes (AOR=2.1; 95% CI=1.5, 2.8), and neutral (AOR=1.4; 95% CI=1.1, 1.8) and positive (AOR=1.4; 95% CI=1.1, 1.8) hand-washing subjective norms.

Students of medium SES were less likely than were those of low SES to express positive hand-washing intentions (AOR=0.6; 95% CI=0.5, 0.8), whereas no differences were observed between students in the highest and students in the lowest SES strata. Compared with those students whose mothers completed 0–4 years of education, students whose mothers completed 5 to 10 years of schooling were 1.6 times more likely to indicate positive hand-washing intentions (AOR=1.6; 95% CI=1.1, 2.2), and those whose mothers were more highly educated (>10 years) were twice as likely to indicate positive intentions (AOR=2.0; 95% CI=1.4, 2.8). Age, gender, type of school, father's education, and level of knowledge regarding hygiene practices were not associated with hand-washing intentions (Table 2).

Contextual Predictors of Proper Hand Washing

About 7% (7.3%, n=136) of the students reported that their school had clean water and soap available and accessible on a regular basis. Availability and accessibility to water and soap were more commonly reported by students from private schools (10.8%) than by those from public schools (4.7%; OR=2.3; 95% CI=1.6, 3.2) and by students in the highest SES (27.7%) than by those in the medium (4.2%) and low SES (4.5%; for high vs others, OR=8.4; 95% CI=5.7, 12.1). Having adequate bathroom facilities at school was positively associated with washing hands “very often” and “always” before eating and after using the toilet (OR=2.7; 95% CI=1.9, 3.9). Fewer than 10% (8.1%, n=156) of students reported regular availability of toilet paper at school.

Only 3 schools (12%) had an available and accessible toilet unit for every 25 children, as mandated by national guidelines.¹⁷ On average, there was 1 toilet unit for each 62 students. This ratio was higher for public schools than for private schools: 85 versus 29 students per toilet, respectively.

TABLE 2—Multivariate Logistic Regression Analysis of Factors Associated With Positive Intentions Toward Proper Hand Washing Among School Children: Bogotá, Colombia, March 2006–April 2007

	Hand-Washing Intentions		OR (95% CI)	AOR ^a (95% CI)
	Negative (n=724), No. (%)	Positive (n=1219), No. (%)		
Aged 10–13 years	441 (61.1)	704 (57.9)	1.1 (0.9, 1.4)	
Boys	393 (54.4)	648 (53.2)	0.9 (0.8, 1.1)	
Private school	298 (41.3)	516 (42.3)	1.0 (0.9, 1.3)	
Socioeconomic strata				
Low (Ref)	362 (50.2)	731 (60.1)	1.00	1.00
Medium	252 (35.0)	354 (29.1)	0.7 (0.6, 0.8)	0.6 (0.5, 0.8)
High	107 (14.8)	131 (10.8)	0.6 (0.5, 0.8)	0.7 (0.5, 1.1)
Mother's education, y				
0–4 (Ref)	106 (14.8)	137 (11.5)	1.00	1.00
5–10	305 (42.7)	566 (47.5)	1.4 (1.0, 1.9)	1.6 (1.1, 2.2)
> 10	304 (42.5)	489 (41.0)	1.2 (0.9, 1.7)	2.0 (1.4, 2.8)
Father's education, y				
0–4 (Ref)	122 (17.6)	175 (15.4)	1.00	
5–10	294 (42.5)	497 (43.8)	1.2 (0.9, 1.5)	
> 10	279 (40.1)	463 (40.8)	1.2 (0.9, 1.5)	
Level of knowledge ^b				
Low (Ref)	109 (16.1)	151 (13.0)	1.00	1.00
Medium	240 (35.6)	408 (35.0)	1.2 (0.9, 1.6)	1.1 (0.8, 1.5)
High	326 (48.3)	607 (52.1)	1.3 (1.0, 1.8)	1.1 (0.8, 1.5)
High level of perceived control ^c	283 (39.2)	954 (78.3)	5.6 (4.6, 6.8)	6.0 (4.8, 7.5)
Attitudes toward proper hand washing ^d				
Negative (Ref)	155 (21.9)	158 (13.2)	1.00	1.00
Neutral	265 (37.5)	350 (29.1)	1.3 (1.0, 1.7)	1.1 (0.8, 1.5)
Positive	287 (40.6)	693 (57.7)	2.4 (1.8, 3.1)	2.1 (1.5, 2.8)
Subjective norms of hand washing ^e				
Negative (Ref)	335 (46.7)	453 (37.8)	1.00	1.00
Neutral	237 (33.0)	414 (34.5)	1.3 (1.0, 1.6)	1.4 (1.1, 1.8)
Positive	146 (20.3)	333 (27.8)	1.7 (1.3, 2.1)	1.4 (1.1, 1.8)

Note. OR=odds ratio; CI=confidence interval; AOR=adjusted odds ratio.

^aAdjusted for socioeconomic strata, mother's education, level of hygiene knowledge, attitudes toward hand washing, perceived level of control, and subjective social norms about hand washing.

^bLevel of knowledge was assessed on the basis of the number of correct responses to 4 questions. High (4), medium (3), and low (1–2).

^cPerceived level of control was assessed with 2 questions. Respondents who answered “easy” or “very easy” to both questions were classified as having a high degree (1); all others were classified as having a low degree (0).

^dAttitudes toward proper hand washing were assessed on the basis of 3 questions. Each question was scored on a 5-point scale, and the cumulative scale was recoded as negative (3–6), neutral (7–11), and positive (12–15).

^ePerceived social norms of hand washing were measured with two questions. Each question was scored on a 5-point scale and recoded as negative (2–5), neutral (6–7), and positive (8–10).

DISCUSSION

Although 150 years have passed since Semmelweis demonstrated the effectiveness of hand washing in preventing nosocomial infections,^{18,19} low compliance with hand-washing

initiatives is still noted among health care professionals^{20,21} and school children alike.^{22,23}

In our study, only 3% of the students surveyed in Bogotá met the Centers for Disease Control and Prevention recommendation for effective prevention of disease transmission

through hand washing.¹⁶ Using the more lenient criteria of washing hands “always” or “very often” with soap and clean water before eating and after using the toilet, one third (33.6%) of students were classified as practicing proper hand-washing behavior.

Nearly two thirds (62.8%) of students reported positive intentions toward proper hand washing. As mentioned, intentions to perform a behavior are determined by perceived control, personal attitudes, and subjective norms.^{10,11} All 3 of these constructs, but not knowledge about hand washing, were found to be significant predictors of hand-washing intentions in this study. A high level of control over the behavior was the strongest predictor (AOR=6.0). Perceived control reflects a person's beliefs regarding internal and external factors that may facilitate or impede performance of the behavior.¹¹

For hand washing, external factors include, for example, availability and accessibility of clean and secure hand-washing facilities and ample time. An individual's abilities and aptitude to perform the behavior given appropriate conditions may be important internal factors. Indeed, in this sample of youth, forgetfulness, along with laziness and lack of time, was the most commonly cited reason for not washing hands. When asked about actions that could be taken to improve their hand-washing behavior and increase their control over performing the behavior, students suggested placement of reminders (cues and motivators) in bathrooms and school cafeterias, permanent, visible soap dispensers, and access to hand-washing facilities in and near school cafeterias.

Attitudes, which reflect the degree to which performance of a behavior is positively or negatively valued by an individual,¹⁰ were also found to be important in predicting hand-washing intentions. Respondents who expressed positive attitudes toward proper hand washing were twice as likely to report positive intentions as were those with negative attitudes. Attitudes are shaped by salient beliefs, perception of the expected outcomes, and subjective value of the expected outcomes.¹⁰ Therefore, to reinforce positive attitudes toward hand washing, negative beliefs related to hand hygiene (e.g., the common misperception that diarrhea and respiratory diseases are innocuous and inevitable conditions) need to be modified.^{24,25}

Neutral and positive subjective norms of hand washing were weakly, but significantly, associated with positive intentions (AOR=1.4; 95% CI=1.1, 1.8). These subjective norms are influenced by the total set of normative beliefs concerning the expectations of parents, classmates, and teachers regarding hand-washing behavior and the student's motivation to comply with these expectations. Subjective norms may be an important construct in the development and adoption of a culture of hygiene and self-care within school settings.^{26,27} The literature on hand washing among health care providers indicates that perceived social norms are an important predictor of hand washing and are associated with professional recognition.²¹ A culture of hygiene may also be further promoted by creating hygiene clubs and providing incentives to students who exhibit proper hygiene practices, as suggested by the students themselves.

Proper hygienic habits such as hand washing have been shown to reduce diarrhea morbidity and life-threatening diarrhea by 42% to 48%,²⁸ the prevalence of upper respiratory infections by 24%,²⁹ and the prevalence of dermatological infections by 23% to 43%.³⁰ Youngsters who washed their hands regularly (4 times a day) suffered 24% fewer sick days because of respiratory illness and 51% fewer sick days because of gastrointestinal diseases.³¹ Participants in our study who reported proper hand-washing behaviors were significantly less likely to report gastrointestinal symptoms in the previous month (OR=0.8). School absenteeism in the previous year because of gastrointestinal or respiratory conditions was 20% less common among students who reported proper hand washing (OR=0.7).

Students who reported regular availability of soap and clean water were almost 3 times more likely to consistently wash their hands before eating and after using the toilet. Regrettably, fewer than 7% of the sample reported regular access and availability to these resources at school. Personal observation revealed that soap and clean towels were virtually unavailable in any of the schools except in staff bathrooms and preschool classrooms. None of the school directors or staff who participated in the survey reported regular availability of soap and towels for students. Cost and vandalism were cited as the main reasons for this situation. There were

also no reports of schoolwide programs to promote hand washing.

These findings concur with those of the School Sanitation and Hygiene Education study in which schools in several developing countries consistently reported lack of soap for hand washing.²³ Provision of soap has been shown to be effective in promoting hygiene habits and preventing and controlling the spread of communicable diseases.^{32,33} Hand washing with a generous amount of clean water is effective at reducing the presence of some viruses,³⁴ but the use of soap (or alternative rubbing agents) is vital to remove contamination from bacteria, parasites, and fungi.^{35–37} Alcohol-based hand sanitizers may be considered as an alternative to soap,³⁸ but the risk of poisoning and intoxication^{39,40} and the high cost must be weighed carefully.

According to Colombian regulation NTC (Colombian technical norm) 4595 (1999),¹⁷ all schools must have a minimum of 1 operating sink and toilet or urinal for every 25 children. This regulation makes no reference, however, to the availability of supplies such as toilet paper and soap or to hand-washing facilities in school cafeterias or lunchrooms. Few (12%) of the schools surveyed complied with these standards. In some schools, accessibility to clean water or toilets was limited because bathrooms were locked to prevent vandalism or because the toilets or sinks did not work properly. Local press recently reported a claim by the Bogotá health authorities that 76% of school toilets were in severely deteriorated condition and linked this to several outbreaks of hepatitis A among school children in the city.⁴¹ Many schools were constructed more than 30 years ago under different building codes and were designed for fewer students. On a more optimistic note, as part of the Development Plan of the Educational Sector, more than half of all public schools in Bogotá are modifying their physical structure to meet national regulations.⁴² Hopefully, in the near future all schools will undergo this modernization process. An ecological approach, specifically the implementation of structural changes in the city environment (e.g., establishment of bicycling paths), has positively affected the behavior of the residents of Bogotá.⁴³ Based on this experience, we expect that the provision of a supportive and protective school environment will help school children develop a sense of attachment that will bring

them to respect their surroundings and improve their behaviors.

The discrepancy between the rate of proper hand washing (33%) and the low proportion who reported adequate school hand-washing facilities (7%) may suggest that school children reduce the number of contamination events during school hours because of the unavailability of toilet paper, soap, and clean water and unsafe or dirty bathrooms. These children may exhibit proper hand-washing behavior at home or other places where these resources are available. Studies in the United Kingdom and Sweden indicate that 72% and 28% of school children, respectively, avoid defecating at school.^{44,45}

Strengths and Limitations

This study extends the current level of knowledge about hygiene practices among school-attending adolescents in Bogotá, Colombia, and provides an epidemiological basis for policy development for school communities. The results should be viewed with the usual necessary degree of caution associated with self-reported behaviors, especially those perceived to be nonnormative.⁴⁶ We anticipate that any bias in the reporting is toward over-reporting of “proper” behaviors. A study in the United States revealed that although nearly 95% of individuals reported hand washing after toilet use, only 66% of these persons were observed to actually do so.⁴⁷ Similarly, a survey in Colombia indicated that nearly 50% of mothers claimed to wash their hands with soap after contact with feces, but observations showed that only 17% did so.⁴⁸ As with all school-based research, the findings may not generalize to the 10% of Bogotá children who do not attend school.⁴²

Because many children attend school and school children have been repeatedly implicated in the spread of infectious diseases within schools, homes, and the broader community,^{49–53} school-based hygiene and health promotion strategies have been shown to be cost effective.^{49,50} School-aged children are receptive to learning and thus are more inclined than are adults to change their behaviors and adopt new, more-healthful habits and can therefore act as agents of health change in the context of their social environments.^{35,54} This is especially important because nearly 40% of students reported

caring for a younger sibling and 60% prepare food at home. Moreover, hygiene promotion affects the health of individuals and, in turn, reduces the burden of communicable diseases on the health care, social, and economic systems in terms of physician visits, medical treatment, hospitalization costs, and school and parental work absenteeism.^{52–59}

Conclusion and Recommendations

To ensure adoption of proper hand-washing behavior, numerous individual and contextual barriers and their interactions demand attention. At the individual level, it is important to determine the different cues that students need to help improve their behaviors and the information that can shape positive attitudes toward proper behavior. Hand-washing promotion can be incorporated into the school curriculum, and other stakeholders (e.g., soap manufacturers) can be invited to participate in these educational activities. The paramount contextual-level barrier facing this population, however, is the scarcity of adequate facilities for hand washing in most schools. This not only prevents children from adopting proper hygienic behavior but also thwarts school-based educational and health-promotion efforts. Indeed, many students expressed a lack of coherence between the messages provided by teachers regarding hygiene and the daily reality of their school environments.

The Centers for Disease Control and Prevention recommendations for effective hand washing may be overly ambitious or unrealistic in environments such as Bogotá schools because they emphasize the importance of hand washing during all episodes of germ contamination and the utilization of paper towels for hygienic hand drying.¹⁶ From a practical standpoint, hand-washing compliance among school children in Bogotá may be enhanced by focusing on higher risk contamination events—such as before eating or handling food, after contact with feces, or during the influenza season—and by adopting more-affordable hand-drying methods such as “spontaneous room air evaporation.”⁶⁰ Gradual introduction of stricter and more-comprehensive recommendations can be pursued once children have habituated basic hygienic practices and an adequate context for hand-washing hygiene has been established.⁶¹ Exploration of pathways leading from the performance of behavior to formation of habit

(automatic responses to specific cues⁶²) is warranted but is beyond the scope of this study.

Promotion of healthful behaviors requires the design of coherent and comprehensive school health policies,⁶³ supportive environments (e.g., provision of waste-disposal containers in bathrooms, improvement of occupational health and safety standards in schools),⁶⁴ and the involvement, encouragement, and redefinition of responsibilities of students, parents, teachers, school staff, health professionals, and private and public organizations.^{9,64–67} At the broader societal level, governments and other agencies responsible for the well-being of children need to be made aware that financial and technical support of simple and inexpensive interventions, such as hand washing with soap, may be effective in the achievement of the Education for All objectives,⁶⁸ Millennium Developmental Goals,⁶⁹ and the principles of Colombia's new Childhood Law (Law 1098 of 2006).⁷⁰

Recently implemented strategies, such as *Salud al Colegio* (Healthy Schools),⁷¹ have the potential to improve the standards of care by helping school children overcome hand-washing barriers. Furthermore, innovative marketing strategies, such as the “global public private partnership for hand washing with soap strategy,”⁹ have proven valuable in reducing the economic and technical barriers that frequently jeopardize the sustainability and effectiveness of health-promotion interventions.

Our findings highlight the need for more-intensive efforts to promote proper hand-washing behaviors to decrease the alarming morbidity and mortality associated with infectious diseases among school children and to lessen the economic burden of these conditions on the Colombian health care system. ■

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Contributors

C. Lopez-Quintero conceptualized the research questions, conducted the data analyses, and wrote the initial

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Human Participant Protection

The research protocol was approved by a university-based research committee in Colombia. Approval for analysis of the data was obtained from the Ethics Research Committee of the Hebrew University of Jerusalem.

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