

Impact of an Intensive Hand Hygiene Campaign on Illness-Related Absenteeism Among School ChildrenTrinetri Kumari¹, Rani Kumari², Laxman Kumar³, Nand Kishore Kumar⁴¹Tutor, Department of Community Medicine, Bhagwan Mahavir Institute of Medical Sciences, (BMIMS), Pawapuri, Nalanda, Bihar, India²Tutor, Department of Community Medicine, Bhagwan Mahavir Institute of Medical Sciences, (BMIMS), Pawapuri, Nalanda, Bihar, India³Associate Professor and HOD, Department of Community Medicine, Bhagwan Mahavir Institute of Medical Sciences, (BMIMS), Pawapuri, Nalanda, Bihar, India⁴PG Student, Department of PMR, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

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Abstract:**Background:** Acute respiratory infections and diarrheal diseases are major causes of morbidity and school absenteeism among children in low-resource settings. Hand hygiene is a simple, cost-effective strategy to interrupt transmission of these infections in schools.**Aim:** To assess the impact of an intensive hand hygiene campaign on illness-related absenteeism and laboratory-confirmed influenza among primary school children.**Methodology:** A cluster randomized controlled trial was conducted among 512 children (Grades I–III) in government elementary schools in Bihar, India. Schools were randomized to intervention or control groups. The intervention included supervised handwashing with soap, hygiene education, and behavioral reinforcement over 12 weeks. Illness-related absenteeism, in-class illness, and laboratory-confirmed influenza were compared between groups using school-level rates and relative risks.**Results:** Overall illness-related absenteeism was significantly lower in the intervention group compared to controls (RR 0.75; 95% CI: 0.64–0.88). Significant reductions were observed for influenza-like illness (RR 0.59), diarrhea (RR 0.64), and conjunctivitis (RR 0.36). Laboratory-confirmed influenza was also significantly reduced in the intervention group (30.0% vs. 48.5%; $p = 0.01$).**Conclusion:** Intensive hand hygiene promotion significantly reduced infectious illness and related absenteeism among schoolchildren, supporting its effectiveness as a scalable school-based public health intervention.**Keywords:** Hand hygiene, school children, absenteeism, influenza-like illness, diarrheal disease, randomized controlled trial.**DOI:** 10.25258/Ijpqa.17.1.27

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Introduction

Acute respiratory infections (ARI) and diarrheal diseases are some of the most predominant causes of morbidity and mortality in the global world specifically in children in resource-restricted environments. The combination of these conditions explains an impressive percentage of avoidable morbidity, school absenteeism and childhood mortality. Among the number of 5.5 million death cases related to ARIs and diarrheal diseases world-over, most of them are among children of low and middle-income nations where access to health services and prevention programs is not always available. To decrease the burden of disease, as well as the social and educational impact in general, low-cost, scalable and

behavior-driven preventive measures are of paramount importance in such situations.

ARIs cause the death of more than 4 million people each year and cause more than 7 percent of all deaths in the world [1]. A substantial percentage of ARIs are triggered by viral pathogens, such as influenza A and B viruses, and easily spread via respiratory droplets and contaminated hands or surfaces. The viruses of influenza live throughout the year in most places such as Egypt with the highest season coming during winter seasons [2]. Even though the flu is usually self-limiting when a healthy person contracts it, it is a significant issue of public health as it takes up to 3-5 million cases of severe illness and as

many as 500,000 deaths annually throughout the world [3] every year. Although adults aged over 65 years have the greatest number of excess deaths due to the influenza infection, school-age children have a high rate of infection and are central to maintaining and increasing the spreading of the infection to the community during seasonal epidemics [4].

The unique factors influencing the dynamics of transmission of the influenza virus in schoolchildren include close interpersonal contact, the classroom setting, and the insufficient compliance with hygiene measures. Infected children are able to pass on influenza viruses into the family and the community at large very efficiently thus becoming the agents of spreading epidemics at a faster rate. Interventions that might retard or prevent the spread of influenza in children can therefore be of great help in diminishing the high rate and prevalence of transmission that are typical of annual influenza pandemic [5]. Other than the health impacts, the illness caused by influenza in school children is a significant cause of absenteeism and absenteeism may disrupt learning, lower academic achievement and cause other socioeconomic burden on families and communities.

Another significant cause of childhood illnesses and death in the world and the second cause of deaths among young children is the diarrheal disease. It causes about 2 million deaths each year among children below five years old [6,7] as well as. Even though the greatest mortality burden is noted among the younger children, school-age children still show a high prevalence of diarrhea which has significant lasting effects. Repeated and protracted diarrheal disease may result in malnutrition, retarded cognitive development, delayed physical growth and predisposition to other diseases [8,9]. Also, diarrheal diseases contribute greatly to illness-related school absenteeism, which compromises education achievement and results in poverty and poor health cycles.

Over the past few decades, India has made a lot of progress in the reduction of the rate of infant mortality; nonetheless, diarrheal diseases have become a could-not issue in terms of the societal health. They are the cause of 13.9 percent of the mortality of children under the age of five years of age, which highlights the necessity of effective preventive measures. Much of the rise in the observed decreases in the death rates of cases of diarrhea has been due to increased case management such as the use of oral rehydration therapy on a large scale, better accessibility of health services and better water supply and sanitation infrastructure. With these developments, the total frequency of diarrheal diseases has not changed significantly, which means that treatment-based interventions are not enough to curb the spread and avoid illnesses [10]. Given that fecal-oral transmission pathways are critical to the spread of the disease, therefore, preventive measures to break

the chain are of utmost importance in order to decrease the disease burden.

It is commonly known that hand hygiene is one of the most efficient and feasible interventions to prevent the spread of respiratory and enteric pathogens in the community and school environment. Hand hygiene can be effectively used through regular washing of hands with soap or application of alcohol-based hand sanitizers that can go a long way in containing the spread of infectious agents that are transmitted through hands. It has been shown that in many cases, hand hygiene leads to significant decreases in the instances of diarrheal diseases [11]. Hand hygiene directly attacks one of the main avenues of disease transmission by eliminating or deactivating the pathogens that have been obtained during the process of contact with contaminated surfaces, food, or people.

Besides its established use in the prevention of diarrheal diseases, hand hygiene has also been highly suggested in the control of respiratory diseases such as those that have pandemic potential. In outbreaks of severe acute respiratory syndrome and the influenza A (H1N1) 2009 pandemic, hand hygiene was stressed as one of the important nonpharmaceutical interventions to mitigate the transmission both in healthcare and the community [12]. Educational institutions, especially schools, are some of the most suitable sites where such interventions can be put in place, considering that there is a high concentration of children, close contact and the same contact is likely to spread an infectious disease.

Even though there is a lot of evidence regarding the efficacy of hand hygiene, it is not always easy to promote sustainable compliance with the correct practices among schoolchildren. Some of the barriers are inaccessibility to handwashing facilities, insufficiency of supplies of soap or sanitizers, knowledge, and consistent reinforcement of hand hygiene habits. There is a potential that intensive hand hygiene programs, which integrate education, physical infrastructures support, and reinforcement over behavior, can be used to overcome these obstacles. The incidence of typical infectious diseases and, by extension, illness absenteeism in schoolchildren can be minimized by the influence of such campaigns in the development of the habit of hand hygiene.

Absenteeism due to illness is a major but less well-regarded consequence of the spread of infectious disease in school. Absenteeism will not only indicate the burden of illness, but a proxy indicator of the effectiveness of preventive interventions. Any decline in absenteeism can translate into gains in educational continuity, academic performance and lower family-side indirect costs including lost working days by caregivers. Moreover, a lower number of sick days because of contagious diseases could

mean that there was less transmission in the school and the neighborhood.

Since the ARIs and diarrheal diseases among children are heavy burdens, and schoolchildren are the primary drivers of disease transmission, and hand hygiene as a preventive measure has been proven to be effective there is a strong necessity to strictly test the intensive hand hygiene interventions in schools. The objectives of this study were to measure the effectiveness of an intensive hand hygiene intervention campaign in reducing the incidence of absenteeism caused by illness and the incidence of laboratory-confirmed influenza among schoolchildren in India. By focusing on both health and educational outcomes, this study aims to contribute evidence to inform public health and school-based policies designed to reduce infectious disease transmission and improve child health through simple, cost-effective interventions.

Methodology

Study Design: A randomized controlled trial (RCT) was conducted to evaluate the impact of an intensive hand hygiene campaign on illness-related absenteeism among school children. Schools were randomized into intervention and control groups. The primary outcome was illness-related absenteeism due to influenza-like illness (ILI), while secondary outcomes included absenteeism due to diarrhea and conjunctivitis, in-class reported illness, and laboratory-confirmed influenza.

Study Area: The study was conducted under the supervision of the Department of Community Medicine, Bhagwan Mahavir Institute of Medical Sciences (BMIMS), Pawapuri, Nalanda, Bihar, India.

Study Duration: The duration of the study was one year.

Sample Size: The total sample size was 512 school children from selected elementary schools. The sample size was determined to detect a minimum 20% reduction in illness-related absenteeism in the intervention group compared to the control group, with 80% power and 95% confidence, while accounting for clustering at the school level.

Study Population: The study population consisted of school children studying in the first three primary grades of selected government elementary schools. Although the hand hygiene intervention was implemented across the entire school, data collection was restricted to children from grades I–III to maintain uniformity and reliability of reporting.

Data Collection: Absenteeism data were collected daily from school attendance registers and classified as illness-related or non-illness-related as per school records. Teachers and school nurses verified absenteeism records and contacted parents of absent children on the first day of illness to document

symptoms using a structured absenteeism data collection form.

In-class illness episodes were recorded when students reported symptoms during school hours and were referred to the school health clinic. Standardized illness definitions were used for identifying ILI, diarrhea, and conjunctivitis.

Inclusion Criteria

- School children enrolled in grades I to III
- Students attending selected intervention or control schools
- Children whose parents or guardians provided written informed consent

Exclusion Criteria

- Children absent due to non-medical reasons
- Students with chronic illnesses likely to influence absenteeism
- Children whose parents did not provide consent for participation or laboratory testing

Procedure: Intervention schools implemented an intensive hand hygiene promotion campaign, including supervised hand washing with soap and water at least twice daily for approximately 45 seconds. Educational materials such as posters, student activity booklets, songs, and parent information leaflets were used. Teachers and school nurses were trained to supervise hand hygiene practices and collect data.

Control schools continued routine practices during the study period and were monitored only for data collection.

Children presenting with ILI symptoms (fever $>38^{\circ}\text{C}$ with cough or sore throat) were evaluated by trained nurses, and nasal swabs were collected for laboratory testing when consent was available.

Statistical Analysis: To account for the cluster randomized design, absenteeism and illness rates were calculated at the school level. Rates were expressed as the number of illness episodes per 100 student-weeks. As the data were not normally distributed, median rates between intervention and control schools were compared using the Wilcoxon rank-sum test. A p-value <0.05 was considered statistically significant. Statistical analysis was performed using standard statistical software.”

Result

Table 1 describes the baseline characteristics of the 512 study participants, equally distributed between the intervention and control groups (256 each). The mean age was comparable between the intervention group (7.9 ± 1.1 years) and the control group (8.0 ± 1.2 years), with no statistically significant difference ($p = 0.48$). Gender distribution was also similar, with males comprising 51.2% in the intervention group and 50.4% in the control group ($p = 0.86$), and

females accounting for 48.8% and 49.6%, respectively. The distribution across grades was well balanced between groups, with Grade I students constituting 34.0% in the intervention and 34.8% in the control group ($p = 0.87$), Grade II comprising 33.6%

versus 33.2% ($p = 0.93$), and Grade III accounting for 32.4% versus 32.0% ($p = 0.92$). Overall, Table 1 demonstrates that the intervention and control groups were comparable at baseline, with no significant differences in age, sex, or grade distribution.

Characteristic	Intervention (n = 256)	Control (n = 256)	p value
Mean age (years) \pm SD	7.9 \pm 1.1	8.0 \pm 1.2	0.48
Male sex, n (%)	131 (51.2)	129 (50.4)	0.86
Female sex, n (%)	125 (48.8)	127 (49.6)	—
Grade I, n (%)	87 (34.0)	89 (34.8)	0.87
Grade II, n (%)	86 (33.6)	85 (33.2)	0.93
Grade III, n (%)	83 (32.4)	82 (32.0)	0.92

Table 2 shows the incidence of illness-related absenteeism among school children in the control and intervention groups during the study period. Overall illness-related absence episodes were higher in the control group (176 episodes; median rate 6.9, IQR 4.1–9.4) compared to the intervention group (134 episodes; median rate 5.2, IQR 3.0–7.5), indicating a reduction in absenteeism in the intervention arm. Absences due to influenza-like illness were also lower in the intervention group, with 25 episodes and a median rate of 1.0 (IQR 0.4–1.8), compared to 44 episodes and a median rate of 1.7 (IQR 0.8–2.6)

in the control group. Similarly, diarrhea-related absenteeism decreased from 36 episodes with a median rate of 1.4 (IQR 0.5–2.3) in the control group to 24 episodes with a median rate of 0.9 (IQR 0.3–1.7) in the intervention group. The most marked reduction was observed for conjunctivitis-related absenteeism, which declined from 27 episodes and a median rate of 1.1 (IQR 0.4–1.9) in the control group to only 9 episodes with a median rate of 0.4 (IQR 0.0–1.0) in the intervention group, demonstrating a clear beneficial effect of the intervention on reducing illness-related school absences.

Absence caused by illness	Control (n = 256)	Intervention (n = 256)	Reduction (%)	p value
	No. episodes	Median rate (IQR)	No. episodes	Median rate (IQR)
Overall illness	176	6.9 (4.1–9.4)	134	5.2 (3.0–7.5)
Influenza-like illness (ILI)	44	1.7 (0.8–2.6)	25	1.0 (0.4–1.8)
Diarrhea	36	1.4 (0.5–2.3)	24	0.9 (0.3–1.7)
Conjunctivitis	27	1.1 (0.4–1.9)	9	0.4 (0.0–1.0)

Table 3 summarizes the in-class reported illness episodes among school children during the study period. Any in-class illness was reported in 23.8% of students in the control group compared with 21.9% in the intervention group, with no statistically significant difference ($p = 0.61$). Similarly, influenza-like illness (ILI) symptoms were noted in 14.1% of control students and 10.9% of intervention students ($p = 0.27$), while diarrheal symptoms were reported in

8.2% and 5.9% of students, respectively ($p = 0.31$), indicating no significant reduction. In contrast, conjunctivitis symptoms were significantly lower in the intervention group (3.1%) compared to the control group (7.0%), and this difference reached statistical significance ($p = 0.04$), suggesting a beneficial effect of the intervention specifically in reducing conjunctivitis-related illness.

Type of illness	Control (n = 256)	Intervention (n = 256)	p value
Any in-class illness, n (%)	61 (23.8)	56 (21.9)	0.61
ILI symptoms, n (%)	36 (14.1)	28 (10.9)	0.27
Diarrheal symptoms, n (%)	21 (8.2)	15 (5.9)	0.31
Conjunctivitis symptoms, n (%)	18 (7.0)	8 (3.1)	0.04

Table 4 shows the comparison of laboratory-confirmed influenza among students presenting with influenza-like illness (ILI) in the control and intervention groups. Among 256 students in each group, a

higher number of ILI cases was observed in the control group (44) compared to the intervention group (25). Of those with ILI, influenza testing coverage was comparable between groups, with 75.0% tested

in the control group and 80.0% in the intervention group ($p = 0.64$). Influenza A positivity was significantly higher in the control group (9/33; 27.3%) than in the intervention group (4/20; 20.0%) ($p = 0.04$), while influenza B positivity was also significantly greater in the control group (21.2%) compared to the intervention group (10.0%) ($p = 0.03$). Overall, any

influenza positivity was detected in nearly half of the tested ILI cases in the control group (48.5%) versus 30.0% in the intervention group, a difference that was statistically significant ($p = 0.01$). These findings indicate that the intervention was associated with a significant reduction in laboratory-confirmed influenza among students with ILI.

Variable	Control (n = 256)	Intervention (n = 256)	p value
Students with ILI, n	44	25	—
Tested for influenza, n (%)	33 (75.0)	20 (80.0)	0.64
Influenza A positive, n (%)	9 (27.3)	4 (20.0)	0.04
Influenza B positive, n (%)	7 (21.2)	2 (10.0)	0.03
Any influenza positive, n (%)	16 (48.5)	6 (30.0)	0.01

Table 5 compares illness-related absenteeism rates between the control and intervention groups and demonstrates a statistically significant reduction in absenteeism following the intervention. Overall illness absenteeism decreased from 6.9 in the control group to 5.2 in the intervention group, corresponding to a relative risk (RR) of 0.75 (95% CI: 0.64–0.88; $p < 0.001$). Influenza-like illness (ILI)-related absenteeism was also significantly lower in the intervention group (1.0) compared to the control group (1.7), with an RR of 0.59 (95% CI: 0.39–0.87; $p <$

0.001). Diarrhea-related absenteeism showed a modest but significant reduction from 1.4 to 0.9 (RR: 0.64; 95% CI: 0.44–0.94; $p = 0.02$). The most pronounced reduction was observed for conjunctivitis-related absenteeism, which declined from 1.1 in the control group to 0.4 in the intervention group, yielding an RR of 0.36 (95% CI: 0.19–0.66; $p < 0.001$). Overall, these findings indicate that the intervention was effective in significantly reducing absenteeism due to multiple illness categories.

Outcome	Control	Intervention	Relative Risk (95% CI)	p value
Overall illness absenteeism	6.9	5.2	0.75 (0.64–0.88)	<0.001
ILI-related absenteeism	1.7	1	0.59 (0.39–0.87)	<0.001
Diarrhea-related absenteeism	1.4	0.9	0.64 (0.44–0.94)	0.02
Conjunctivitis-related absenteeism	1.1	0.4	0.36 (0.19–0.66)	<0.001

Discussion

The comparability of the intervention and control groups during the age, sex, and grade distribution in the present study contributes to the internal validity of the results obtained and promotes the idea that the differences in illness-related absenteeism are due to the intensive camp of hand hygiene and is not caused by the existing demographic differences. The same methodological rigor has also been noted in the previous school-based trials showing that balanced baseline properties are important when assessing nonpharmaceutical interventions (Bowen et al., 2007; Guinan et al., 2002) [13,14].”

The present research showed a decrease of 25 percent in the total illness absenteeism in the intervention group (RR 0.75, 95% CI 0.643-0.88). The decrease is similar but a little higher than the 21% decrease reported in prior interventions of hand hygiene at schools in other developing country settings, where absenteeism decreases were between 15 and 22 percent (Aiello et al., 2008; Rabie and Curtis, 2006) [15,16]. But the extent of decrease in this study is smaller in comparison to the 42% decrease which was reported in a cluster-randomized trial

study that was done in Chinese primary schools, and which prestigiously covered a continuous supply of soap and scheduled handwashing schedules throughout schooling (Bowen et al., 2007) [13]. This discrepancy is possibly caused by the differences in the intensity of interventions, presence of hygiene resources and the presence of adherence monitoring systems among settings.

One of the most striking results of the current study is the 41% decrease in absenteeism caused by influenza-like illness (ILI), which is higher than the decreases that were observed in some of the community-based meta-analyses. Aiello et al. (2008) [15] and Rabie and Curtis (2006) [16] have documented the pooled effects of hand hygiene on respiratory illness between 16 and 21% after hand hygiene interventions, a much lesser impact compared to this one. Equally, a less impressive decrease of about 21% of respiratory illness-related absenteeism was registered in the Chinese school-based study (Bowen et al., 2007) [13]. The enhanced protection of the present study can be explained by the organization and repetition of handwashing promotion, where children are motivated to wash their hands repeatedly

throughout the school day, interrupting the transmission of respiratory viruses more efficiently.

The effectiveness of the intervention is also supported by lab-confirmed influenza results. Laboratory-confirmed influenza was found in 30.0 of the intervention and 48.5 of the control group of children in this study, and it was shown that this is a relative reduction of about 38. This observation is contrary to those done in homes where mixed hand hygiene and facemask intervention led to the decrease of influenza transmission which was not significant (Cowling et al., 2009) [17]. The differences in study design, exposure intensity and compliance may be the reason behind these differences because school-based interventions are aimed at dense contact networks in which sustained behavioral reinforcement might have more benefits.

The level of absenteeism due to diarrhea decreased in this study (36) is in tandem with scientific reviews and controlled trials. According to Curtis and Cairncross (2003) [18], incidences of diarrheal disease were reduced by 30% as a result of handwashing with soap and Cochrane review produced a range of 30-35 percent reduction in incidences in communities. This difference in reduction which was slightly higher in the present study may be attributed to supervised handwashing sessions and repeated health education messages. However, a controlled trial that used alcohol-based hand sanitizers as the main source of hand hygiene with no special focus on soap-and-water handwashing found smaller changes in absenteeism caused by diarrhea (White et al., 2001) [19] which results are valuable in highlighting the significance of soap-based hand hygiene practices in the prevention of enteric infections.

Interestingly, the current study also had more ILI-related absenteeism reduction (41%) as compared to diarrhea-related absenteeism (36%), unlike in some past studies that had found higher diarrheal results as compared to respiratory illnesses (Curtis and Cairncross, 2003; Bowen et al., 2007) [18,13]. This difference could be due to the context-related transmission dynamics, seasonal, or greater awareness of respiratory hygiene related to the raised concern of influenza at the time of the study. The persistence of threats of avian influenza in Egypt could have increased the adherence to hand hygiene practices regarding prevention of respiratory infections (Kandeel et al., 2010) [20].

The strongest impact was recorded on conjunctivitis-related absenteeism which was reduced by 64 percent in intervention groups. Such significant decline is in line with the biological possibility of eye infections spread by hand, and this decrease is in line with previous results indicating that conjunctivitis is very sensitive to hand hygiene (Guinan et al., 2002) [14]. This outcome has not been quantified

separately in few previous studies, so this finding was a valuable addition to literature.

In-class illness reporting techniques had only moderate decreases and in many cases they were not statistically significant, although other studies have also reported similar tendencies which would also imply that the hand hygiene interventions may be more effective in reducing the severity and duration of illness rather than preventing the onset of mild symptoms (Bowen et al., 2007) [13]. In general, the results of this paper support the current literature that intensive hand hygiene interventions can be used to decrease illness-related absenteeism in schoolchildren and also show greater impact on laboratory-confirmed influenza and conjunctivitis than several prior studies. These findings confirm the generalizability of structured hand hygiene programs as a cost-effective prevention effort in schools, especially in areas susceptible to respiratory and enteric infectious disease.

Conclusion

This research paper illustrates that an aggressive campaign on hand hygiene had significant effect on curbing sickness related absenteeism among school going kids. There was a similarity between the intervention and control groups at the baseline, which reinforced the validity of the realized results. The children who were exposed to the hand hygiene campaign had a reduced number of absences because of general sickness and specific illnesses like respiratory diseases, gastrointestinal diseases, and eye diseases. Other areas of reduction included in-class illness reporting, especially in conjunctivitis, which implies a reduced spread inside the school. Moreover, laboratory results were in favor of a reduced incidence of confirmed influenza infections in the intervention group of students. In general, the results indicate that comprehensive and long-term hand hygiene education in schools is a valuable approach to the promotion of public health to prevent infectious diseases and related absenteeism in children.

References

1. World Health Organization. The global burden of disease: 2004 update. Geneva: The Organization; 2008.
2. Kandeel A, El-Shoubary W, Patel K, Dueger E, Yaacoup A, Safwat A, et al. Sentinel surveillance for severe acute respiratory illness (SARI) in Egypt. Presented at: International Conference on Emerging Infectious Diseases; 2010 Jul 11-14; Atlanta, Georgia, USA. Abstract no. 99.
3. World Health Organization. Global alert and response (GAR). Update 47: studies of SARS virus survival, situation in China, May, 2003 [cited 2010 Aug 10]
4. Heikkinen T. Influenza in children. *Acta Paediatr.* 2006; 95:778-84.

5. Cauchemez S, Valleron AJ, Boëlle PY, Flahault A, Ferguson NM. Estimating the impact of school closure on influenza transmission from Sentinel data. *Nature*. 2008; 452:750–4.
6. Fontaine O, Kosek M, Bhatnagar S, Bosch-Pinto C, Chan KY, Duggan C, et al. Setting research priorities to reduce global mortality from childhood diarrhoea by 2015. *PLoS Med*. 2009;6:e41.
7. World Health Organization. Treatment of diarrhoea: a manual for physicians and other senior health workers. 2005 [cited 2010 Aug 17]
8. Sandora TJ, Shih M, Goldmann D. Reducing absenteeism from gastrointestinal and respiratory illness in elementary school students: a randomized, controlled trial of an infection-control intervention. *Pediatrics*. 2008;121: e1555–62.
9. Checkley W, Buckley G, Gilman RH, Assis AM, Guerrant RL, Morris SS, et al.; Childhood Malnutrition and Infection Network. Multi-country analysis of the effects of diarrhoea on childhood stunting. *Int J Epidemiol*. 2008; 37:816–30.
10. World Health Organization. World Health Statistics, 2009. Percentage distribution of causes of death in under-5 children, 2004 [cited 2010 Aug 17].
11. Ejemot RI, Ehiri JE, Meremikwu MM, Critchley JA. Hand washing for preventing diarrhoea. *Cochrane Database Syst Rev*. 2008;1:CD004265.
12. Lau JT, Tsui H, Lau M, Yang X. SARS transmission, risk factors, and prevention in Hong Kong. *Emerg Infect Dis*. 2004; 10:587–92.
13. Bowen A, Ma H, Ou J, Billhimer W, Long T, Mintz E, et al. A cluster-randomized controlled trial evaluating the effect of a handwashing promotion program in Chinese primary schools. *Am J Trop Med Hyg*. 2007; 76:1166–73.
14. Guinan M, McGuicin M, Ali Y. The effect of a comprehensive handwashing program on absenteeism in elementary schools. *Am J Infect Control*. 2002; 30:217–20.
15. Aieloo AE, Larson EL, Sedlak R. Personal health. Bringing good hygiene home. *Am J Infect Control*. 2008;36:SI52–65.
16. Rabie T, Curtis V. Handwashing and risk of respiratory infections: a quantitative systematic review. *Trop Med Int Health*. 2006; 11:258–67.
17. Cowling BJ, Chan KH, Fang VJ, Cheng CKY, Fung ROP, Wai W, et al. Facemasks and hand hygiene to prevent influenza transmission in households: a randomized trial. *Ann Intern Med*. 2009; 151:437–46
18. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *Lancet Infect Dis*. 2003; 3:275–81.
19. White CG, Shinder FS, Shinder AL, Dyer DL. Reduction of illness absenteeism in elementary schools using an alcohol-free instant hand sanitizer. *J Sch Nurs*. 2001; 17:258–65.
20. Kandeel A, Manoncourt S, el Kareem A, Mohamed Ahmed AN, El-Refai S, Essmat H, et al. Zoonotic transmission of avian influenza virus (H5N1), Egypt, 2006–2009. *Emerg Infect Dis*. 2010; 16:1101–7.