
Effects of an awareness raising campaign on intention and behavioural determinants for handwashing

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Abstract

This article assesses the effectiveness of The Great WASH Yatra handwashing awareness raising campaign in India on changing visitors' intention to wash hands with soap after using the toilet and the underlying behavioural determinants. Interviews based on the RANAS (Risk, Attitudes, Norms, Abilities, Self-regulation) model of behaviour change were conducted with 687 visitors before and after their visit to the campaign. Data showed that a campaign visit had little effect on the intention to wash hands with soap, even when comparing visitors who had actively participated in handwashing games with those who had not. After a campaign visit, knowledge about the benefits of washing hands had increased by almost half a standard deviation. A multiple linear regression analysis revealed that when considering all behavioural determinants change scores simultaneously, they were able to explain 57% of the variance in the intention change score. These findings suggest that substantively changing behaviour requires more than improving knowledge and emphasizing the importance of washing hands. Identifying the crucial behavioural determinants for handwashing may be an important first step in planning effective large-scale promotion programmes.

low-income and middle-income countries [1]. India ranks among the five countries with the highest estimated child mortality worldwide, with about 200 000 deaths per year [2]. A recent systematic review of handwashing practices and their effect on diarrheal diseases suggests that interventions promoting handwashing with soap lead to a 40% reduction in the risk of diarrhoea [3]. Despite its potential, handwashing with soap is seldom practiced in low-income countries [4]. A review of studies using structured observations to measure handwashing from 11 countries found that only 17% of child caregivers washed their hands with soap after using the toilet [5]. Likewise, Freeman *et al.* [3] estimated that 19% of people worldwide wash hands with soap after contact with faeces. For India, the researchers indicate a mean frequency of 15%. Considering India's low handwashing rates and the country's high disease burden, handwashing promotion efforts in India are especially needed.

To raise the profile of handwashing with soap in India, WASH United developed a concept for a travelling handwashing campaign called *The Great WASH Yatra* (TGWY). TGWY engaged visitors in a fun and playful way using the positive power of cricket, fun, games and Bollywood celebrities to promote life-saving handwashing behaviour in rural parts of northern India. The goal of the developers of TGWY was to create a unique Indian environment to embed messages on water, sanitation, and hygiene that would appeal to a predominantly rural audience and be immersive and genuinely fun. Most activities were based on traditional Indian board, outdoor, or

Introduction

Diarrhoea and pneumonia are still the leading causes of mortality among children under 5 years of age in

knowledge games. The importance of washing hands was reinforced at each activity and messages were disseminated on-site through a movie, posters, flyers, and on-stage activities. Supplementary material gives a detailed overview of the games and activities that were evaluated by this study.

Several studies have shown that raising awareness of the importance of washing hands leads to an improvement in proper handwashing [6–8]. However, other studies have also suggested that health education alone may be ineffective in changing behaviour [9–11]. It is important to study the factors that determine behaviour in order to better understand health behaviour and how and if behaviour change has been achieved. To identify the psychological mechanisms tackled by TGWY, the methodological approach of the present evaluation study was based on Mosler's RANAS (Risk, Attitudes, Norms, Abilities, Self-regulation) model of behaviour change [12]. The model was explicitly designed for the water and sanitation sector in developing countries. As suggested by Michie *et al.* [13] and Lippke and Ziegelmann [14], the RANAS model combines a set of causal determinants of health behaviour that have been specified by different well-known theories of behaviour change. The various theories from which the RANAS model has been derived include the health belief model [15], the theory of planned behaviour [16], the protection motivation theory [17], the social cognitive theory [18], and the health action process approach [19]. The objective of the RANAS model is to define the causal determinants of health behaviour on the basis of quantitative data. The model classifies the factors influencing behaviour formation into five blocks: risk, attitudinal, normative, ability, and self-regulation factors. Table I provides an overview and description of the behavioural determinants of the RANAS model used in this study. Given that the respondents' actual handwashing behaviour could not be measured on-site, the intention to wash hands with soap after using the toilet was used instead of actual behaviour measures.

The aim of the present evaluation study was to find out in what way the activities of TGWY had an influence on the behavioural determinants specified

by the RANAS model and thus on the visitors' intention to wash hands with soap. The following research questions were addressed: (i) Did the intention to wash hands with soap and the behavioural determinants change from before to directly after the visit to TGWY? (ii) What are the differences in the intention to wash hands with soap and in the behavioural determinants between visitors who had actively participated in campaign activities on handwashing and those who had not? (iii) Which changes in which behavioural determinants led to changes in the intention to wash hands with soap?

Materials and methods

The Great WASH Yatra campaign

TGWY was a traveling campaign engaging visitors in the issues of sanitation and hygiene in a playful and carnival-style atmosphere on a 7000 m² area. The campaign was jointly managed by WASH United gGmbH and Quicksand, a Delhi based multi-disciplinary innovation consultancy. TGWY had two key goals: promoting life-saving handwashing behaviour and toilet usage. A set of interactive educational games and activities were developed, inspired by cricket, Bollywood song and dance, parlour games and popular Indian TV formats. Song, dance, theatre, art, and games themed and aligned around a unique narrative involving hygiene heroes and spreading the message of clean water and sanitation for all. The game zone comprised nearly 20 games that were housed in custom-designed stalls, arcade-like settings or outdoors. Each game was designed to communicate one or more of the core messages: the necessity of using toilets and the necessity of washing hands with soap. The core message of about half of the activities was to discourage open defecation and promote the usage of toilets. Because the focus of the present evaluation study was solely on the promotion of handwashing behaviour, only games and activities targeted at increasing handwashing rates were included in the analyses. Handwashing games and activities were such as the *Clean Hands Challenge*, where germ targets

Table I. Description of the behavioural determinants and example items

Behavioural determinants	Description	Example items
Risk factors		
Perceived vulnerability	Perceived risk of contracting diarrhoea	How high do you feel is the risk that you get diarrhoea?
Perceived severity	Perceived seriousness of the consequences of diarrhoea	Imagine you contracted diarrhoea, how severe would be the impact on your life in general?
Health knowledge	Knowledge about the causes and symptoms of diarrhoea	Can you tell me what causes diarrhoea?
Attitude factors		
<i>Instrumental beliefs</i>		
Costs	Beliefs about the costs of always washing hands with soap	Do you think that washing hands with soap and water is expensive?
Effort	Beliefs about the efforts needed to execute the behaviour	Do you think that washing hands with soap and water takes a lot of effort?
Response	Belief that the behaviour will lead to the desired outcome	How certain are you that washing hands with soap and water after using the toilet prevents you and your family from getting diarrhoea?
Attraction	Feelings of attractiveness when using soap to wash hands	Do you feel more attractive when you wash your hands with soap and water?
<i>Affective beliefs</i>		
Liking	Feelings of liking associated with washing hands with soap	How much do you like or dislike washing hands with soap and water?
Dirtiness	Feelings of dirtiness when not washing hands with soap	Do you feel dirty if you don't wash your hands with soap and water after using the toilet?
Norm factors		
Injunctive norm	Perceptions of other peoples' opinions about washing hands with soap	People who are important to you, do they rather think you should or you should not wash your hands with soap and water after using the toilet?
Ability factors		
Action self-efficacy	Confidence in the abilities to successfully perform the behaviour	Do you think you are able to always wash hands with soap and water after using the toilet?
Maintenance self-efficacy	Confidence in the abilities to successfully maintaining the behaviour	How confident are you that you can wash hands with soap and water even if urgent tasks arise which interfere with handwashing?
Recovery self-efficacy	Confidence in the abilities to successfully return to the behaviour	Imagine you have stopped washing hands with soap and water for several days, for example because there was no water for handwashing. How confident are you to start washing hands again?
Self-regulation factors		
Action control	Specification of when, where and how to wash hands with soap	How strongly do you try to wash hands with soap and water?
Commitment	Strength of identification with the behaviour	Do you feel committed to wash hands with soap and water after using the toilet?

are marked out on a large hand shaped cut-out and act as targets which players have to successfully hit with a wet soapy sponge, or the *Soap Lab* where participants dip their hands into coloured

chalk and then wash hands once with water only and once with soap and water in order to see for themselves the importance of soap for removing all of the chalk.

Survey procedures and study areas

Data were collected over a 5-week period, from October 14 through 19 November 2012, within five stations of TGWY by means of structured interviews using a standardized, pre-coded and pre-tested questionnaire administered in paper-and-pencil. The same visitors were interviewed before and after their visit to TGWY. Selection criteria were that respondents were at least 16 years of age, that they intended to visit TGWY immediately after the first interview (pre-interview), and that they were committed to giving a second interview (post-interview) after their visit. Each interview lasted between 10 and 15 min. Interviewers were instructed to recruit participants from both genders equally if possible. Each respondent who participated in both the pre- and the post-interview received three bars of soap as an incentive. Seven interviewers with a Master's degree in social sciences or humanities were recruited and received training in the objectives and methodology of the survey, in the theoretical background of the questionnaire and in the procedures and interpersonal communication in the field. The interviewers familiarized themselves with the questionnaire by reviewing the purpose for each item and by conducting role-plays and mock interviews on how to administer the questionnaire and record responses. The study was conducted in strict compliance with the ethical principles of the American Psychological Association (APA) and the Declaration of Helsinki. The study protocol was approved by the ethical review committee of the Faculty of Arts of the University of Zurich and by the Indian Ministry of Drinking Water and Sanitation.

Participants

A total of 1005 visitors were invited to participate in the study. One hundred and seventy-six visitors did not want to be interviewed for the pre-interview and 142 of the visitors who had participated in the pre-interview did not want to be interviewed again for the post-interview, resulting in 687 matching pre- and post-interviews. The sample consisted of 59.4% male and 40.6% female respondents. The age of the respondents ranged between 16 and 84 years, with a median age of

32.8 years (SD = 12.4). Twenty-two per cent of the interviewees had never attended school, 3.5% had completed 1–4 years of schooling, 19.3% had completed 5–8 years, 29.7% had completed 10–12 years and 25.6% had completed a secondary school degree or higher. The majority were Hindus (88.2%), followed by Muslims (11.6%). Seventy-seven per cent of the respondents were married and 22.7% were single. On average, visitors spent 41 min at TGWY event. The time spent at the event did not differ between participants and non-participants and did not affect the changes in the behavioural determinants or in their intention to wash hands.

Measures

The questionnaire was developed from previous instruments used in studies on handwashing practices and water consumption in developing countries [20–22]. All English items were translated into Hindi and retranslated to ensure the meaning of the questions was accurate. The pre-visit questionnaire included structured items addressing the intention to wash hands with soap, the behavioural determinants of the RANAS model, and socio-demographic characteristics. Example items for the behavioural determinants are displayed in Table I. Five-point unipolar items (from 1 to 5) were used to measure the behavioural determinants (e.g. 1 = 'not at all' and 5 = 'very much'). Two items (the affective belief liking and the injunctive norm) were originally assessed on a 9-point scale with bipolar verbal descriptors at each end of the scale (e.g. 1 = 'dislike it very much' and 9 = 'like it very much'). It was decided to reduce the 9-point scale to a 5-point scale by combining the descriptions of former scores of 1 through 5, because <5% of respondents had used this half of the scale. If multiple items were used to measure a behavioural determinant, the items were averaged to build scales. A single question was used to quantify the intention to wash hands with soap ('How strongly do you intend to always wash hands with soap and water after using the toilet?'). Response options were rated on 5-point scales, with one representing 'not at all strongly' and five representing 'very strongly'. During the

administration of the post-questionnaire, items on the intention to wash hands with soap and on the behavioural determinants were administered a second time. In addition, visitors were asked in which handwashing game or activity they had actively participated in.

Data analysis

We used Paired Student's *t*-tests to compare pre- and post-visit scores in intention and the behavioural determinants. Two-way repeated measures analyses of variance were used to determine if there were any significant differences from pre- to post-visit in the behavioural determinants and in the intention to wash hands with soap among handwashing games participants and non-participants. Change scores for all behavioural determinants and for the intention to wash hands with soap were calculated to reflect differences from pre- to post-visit. A forced-entry multiple linear regression analysis using change scores was carried out to explore the relationship between changes in the behavioural determinants and changes in the intention for washing hands with soap. When appropriate, the threshold for statistical significance was corrected for multiple comparisons using Bonferroni's method (alpha of 0.05 divided by the number of comparisons). All analyses were performed using IBM SPSS Statistics (version 21.0 for Windows. Armonk, NY: IBM Corp.).

Results

Overall impact of TGWY on the intention to wash hands and on the behavioural determinants

Means and standard deviations for pre- and post-visit measures of the behavioural determinants and the intention to wash hands with soap are presented in Table II. After applying Bonferroni's correction for multiple comparisons (*P* significant only if $< 0.003 = 0.05/15$), significant differences between pre- and post-visit scores were observed for all behavioural determinants except for maintenance self-efficacy ($P = 0.255$). According to Cohen's [23] criteria for effect sizes, affective beliefs liking

($d = 0.22$) and dirtiness ($d = 0.31$), the injunctive norm ($d = 0.32$), and action self-efficacy ($d = 0.20$) showed small effect sizes ($d = 0.20$). The risk factor health knowledge ($d = 0.47$) and the instrumental belief response ($d = 0.38$) were close to a medium effect size ($d = 0.50$). The other differences were found to be less than Cohen's (1988) convention for a small effect size ($d = 0.20$). Only perceived vulnerability and the instrumental belief attraction showed a significant decrease in scores from pre- to post-visit.

Differences between handwashing games participants and non-participants

Out of the 687 interviewed visitors, 366 respondents (53.3%) indicated having actively participated in at least one handwashing game or activity. Separate two-way repeated measures analyses of variance were used to determine differences from pre- to post-visit in the intention to wash hands with soap between handwashing games participants and non-participants. Note that the instrumental belief effort was excluded because 671 (98.0%) respondents reported handwashing as being no effort at all. Table III provides pre- and post-visit means and standard deviations for handwashing games participants and non-participants as well as results of the analyses of variance. Significant interaction effects were present for three of the behavioural determinants: the instrumental belief attraction, action self-efficacy and action control. The interaction effects indicated that when comparing pre- and post-visit scores, handwashing games participants demonstrated a higher decrease in how attractive they feel after washing hands with soap and less improvement in their perceived self-efficacy to perform the behaviour and in their determination to execute and control the behaviour than non-participants. Effect sizes for the instrumental belief attraction and for action control were negligible ($\eta^2 < 0.01$). For self-efficacy, the interaction between handwashing games participants and pre- and post-visit time of interview accounted for 1.8% of the total score variability. After applying Bonferroni's correction for multiple comparisons, only the interaction effect

Table II. Differences in the behavioural determinants and in the intention to wash hands with soap between pre- and post-visit

Behavioural determinants	Pre-visit		Post-visit		<i>t</i>	<i>P</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Risk factors							
Perceived vulnerability	2.62	1.38	2.32	1.25	-4.53	0.000	-0.17
Perceived severity	3.34	1.40	3.57	1.11	3.54	0.000	0.14
Health knowledge	2.03	0.92	2.54	1.11	12.23	0.000	0.47
Attitude factors							
<i>Instrumental beliefs</i>							
Costs	4.30	1.20	4.47	0.94	4.14	0.000	0.16
Effort	4.97	0.25	4.92	0.41	2.91	0.004	-0.11
Response	3.95	0.96	4.32	0.58	9.80	0.000	0.38
Attraction	3.69	1.00	3.47	1.01	-4.06	0.000	-0.16
<i>Affective beliefs</i>							
Liking	4.11	0.88	4.32	0.72	5.64	0.000	0.22
Dirtiness	4.08	1.02	4.41	0.74	7.92	0.000	0.31
Norm factors							
Injunctive norm	4.21	1.11	4.56	0.72	8.26	0.000	0.32
Ability factors							
Action self-efficacy	4.29	0.73	4.44	0.46	5.33	0.000	0.20
Maintenance self-efficacy	3.88	0.94	3.93	0.64	1.14	0.255	0.04
Recovery self-efficacy	3.91	0.93	4.00	0.60	2.78	0.006	0.11
Self-regulation factors							
Action control	3.81	1.04	3.93	0.70	3.02	0.003	0.12
Commitment	4.08	0.88	4.15	0.55	2.13	0.034	0.08
Intention	3.98	0.92	4.09	0.62	3.04	0.002	0.12

Note. *N* = 687. All variables ranged from 1 to 5.

action self-efficacy remained significant (*P* significant only if $< 0.003 = 0.05/15$).

Changes in the behavioural determinants explaining changes in the intention to wash hands with soap

Descriptive statistics of the change scores of the intention to wash hands with soap and the behavioural determinants are shown in Table IV. Overall, mean differences from pre- to post-visit were low. Health knowledge showed the highest increase from before to after the visit ($M = 0.51$; $SD = 1.09$). A multiple linear regression analysis using change scores was performed with the intention to wash hands with soap as the outcome variable and the behavioural determinants as the predictor variables (see Table IV). The analysis was found to be statistically significant $F(14, 615) = 60.682$, $P < 0.001$,

indicating that the change scores of the behavioural determinants were good predictors of the intention to wash hands with soap change score. The linear combination of the behavioural determinants, as indexed by the adjusted R^2 statistic, accounted for 57% of the variance in the change score of the intention to wash hands with soap. The Durbin Watson value was close to 2 (1.90), indicating that the data met the assumption of uncorrelated residuals. None of the predictors had a variance inflation factor higher than 4.65, and most were under 2.00. We found that the change scores of five behavioural determinants contributed significantly to explaining the increase in the intention to wash hands with soap from pre- to post-visit (see Table IV). Change scores in the instrumental belief response, injunctive norm, action self-efficacy, and commitment had significant positive regression weights,

Table III. Means (*M*) and standard deviations (*SD*) of pre-visit, post-visit and change scores of the behavioural determinants and the intention to wash hands with soap by active participants and passive spectators

Behavioural determinants	Handwashing games participants			Non-participants			<i>df1</i>	<i>df2</i>	<i>F</i>	<i>P</i>	η^2
	Pre-visit <i>M</i> (<i>SD</i>)	Post-visit <i>M</i> (<i>SD</i>)	Change score <i>M</i> (<i>SD</i>)	Pre-visit <i>M</i> (<i>SD</i>)	Post-visit <i>M</i> (<i>SD</i>)	Change score <i>M</i> (<i>SD</i>)					
Risk factors											
Perceived vulnerability	2.55 (1.39)	2.22 (1.24)	-0.34 (1.69)	2.69 (1.36)	2.45 (1.26)	-0.24 (1.69)	1	675	0.52	0.473	0.001
Perceived severity	3.33 (1.41)	3.60 (1.15)	0.28 (1.67)	3.34 (1.38)	3.52 (1.07)	0.17 (1.74)	1	676	0.66	0.418	0.001
Health knowledge	2.14 (0.95)	2.66 (1.12)	0.52 (1.14)	1.92 (0.87)	2.41 (1.08)	0.50 (1.03)	1	679	0.05	0.831	0.000
Attitude factors											
<i>Instrumental beliefs</i>											
Costs	4.42 (1.09)	4.62 (0.75)	0.19 (0.96)	4.15 (1.30)	4.30 (1.10)	0.15 (1.22)	1	679	0.30	0.585	0.000
Response	4.01 (0.87)	4.33 (0.56)	0.32 (0.94)	3.86 (1.05)	4.30 (0.61)	0.43 (1.03)	1	672	2.15	0.143	0.003
Attraction	3.70 (0.95)	3.36 (1.03)	-0.34 (1.40)	3.67 (1.05)	3.59 (0.99)	-0.07 (1.34)	1	677	6.27	0.012	0.009
<i>Affective beliefs</i>											
Liking	4.20 (0.80)	4.40 (0.60)	0.20 (0.92)	4.00 (0.95)	4.23 (0.82)	0.23 (1.09)	1	679	0.18	0.669	0.000
Dirtiness	4.16 (0.88)	4.46 (0.73)	0.31 (1.05)	3.99 (1.13)	4.35 (0.76)	0.36 (1.14)	1	671	0.45	0.502	0.001
Norm factors											
Injunctive norm	4.30 (0.96)	4.60 (0.59)	0.31 (1.08)	4.09 (1.25)	4.50 (0.85)	0.41 (1.16)	1	665	1.27	0.259	0.002
Ability factors											
Action self-efficacy	4.42 (0.56)	4.46 (0.43)	0.05 (0.60)	4.16 (0.86)	4.40 (0.50)	0.25 (0.78)	1	678	13.31	0.000	0.018
Maintenance self-efficacy	3.98 (0.85)	3.98 (0.55)	0.00 (0.88)	3.78 (1.01)	3.86 (0.73)	0.09 (1.01)	1	679	1.71	0.192	0.003
Recovery self-efficacy	4.02 (0.84)	4.07 (0.48)	0.05 (0.83)	3.78 (1.00)	3.92 (0.71)	0.15 (0.96)	1	680	3.52	0.061	0.005
Self-regulation factors											
Action control	3.95 (0.94)	3.99 (0.63)	0.04 (1.04)	3.64 (1.13)	3.87 (0.76)	0.22 (1.14)	1	679	4.56	0.033	0.007
Commitment	4.17 (0.77)	4.23 (0.46)	0.06 (0.76)	3.98 (0.99)	4.05 (0.63)	0.07 (0.90)	1	679	0.02	0.878	0.000
Intention	4.08 (0.81)	4.16 (0.54)	0.09 (0.85)	3.87 (1.01)	4.00 (0.71)	0.12 (0.97)	1	675	0.23	0.628	0.000

Note. *N* = 687. All variables ranged from 1 to 5.

indicating visitors with a higher increase on these scales were expected to have a higher increase in their intention to wash hands with soap. The strongest predictor was commitment ($\beta = 0.51$, $t = 10.27$, $P < 0.001$). Perceived vulnerability had a significant negative weight, opposite in sign from its correlation with the intention change score. The negative beta weight indicated that, after accounting for the remaining behavioural determinants, those visitors with a higher increase in perceived vulnerability were expected to have less increase in their reported intention to wash hands with soap.

Discussion

Principal findings

This study investigated three research questions addressing the impact of a large-scale handwashing

awareness-raising campaign on the intention to wash hands with soap and on the behavioural determinants of the RANAS model underlying intention.

- (1) Overall impact of TGWY on the intention to wash hands and on the behavioural determinants

Results from the on-site visitor survey showed that there were small differences in the intention and in the behavioural determinants from before to after the visit of TGWY campaign. Generally speaking, a campaign visit had a medium effect on the visitors' knowledge about the benefits of washing hands and a small to medium effect on their certainty that washing hands with soap and water after using the toilet protects them and their family from diarrhoea. Even though an increase in health knowledge was observed, the marginal increase in the intention

Table IV. Descriptive statistics of the change scores and regression analysis summary for changes in the behavioural determinants explaining changes in the intention to wash hands with soap from pre- to post-visit

Behavioural determinants	<i>M</i> (SD)	<i>B</i>	SE <i>B</i>	β	95% CI (<i>B</i>)		<i>P</i>
					LL	UL	
Risk factors							
Perceived vulnerability	-0.29 (1.69)	-0.05	0.02	-0.10	-0.08	-0.02	0.001
Perceived severity	0.23 (1.70)	-0.01	0.02	-0.01	-0.04	0.02	0.706
Health knowledge	0.51 (1.09)	0.02	0.02	0.02	-0.02	0.06	0.407
Attitude factors							
<i>Instrumental beliefs</i>							
Costs	0.17 (1.09)	0.01	0.02	0.01	-0.04	0.05	0.793
Response	0.37 (0.98)	0.10	0.03	0.11	0.04	0.15	0.001
Attraction	-0.22 (1.38)	0.03	0.02	0.05	-0.01	0.07	0.139
<i>Affective beliefs</i>							
Liking	0.22 (1.00)	-0.05	0.03	-0.06	-0.11	0.00	0.072
Dirtiness	0.33 (1.09)	-0.06	0.03	-0.07	-0.12	0.00	0.067
Norm factors							
Injunctive norm	0.36 (1.12)	0.10	0.03	0.13	0.05	0.16	0.000
Ability factors							
Action self-efficacy	0.14 (0.69)	0.12	0.04	0.09	0.04	0.20	0.005
Maintenance self-efficacy	0.04 (0.94)	0.04	0.05	0.05	-0.06	0.15	0.390
Recovery self-efficacy	0.10 (0.90)	0.08	0.06	0.08	-0.03	0.19	0.166
Self-regulation factors							
Action control	0.13 (1.09)	0.04	0.03	0.05	-0.01	0.10	0.107
Commitment	0.07 (0.83)	0.57	0.06	0.51	0.46	0.68	0.000
Intention	0.11 (0.91)						

Note. *N* = 989. Adjusted $R^2 = 0.57$. CI = Confidence interval.

confirms the notion that knowledge alone is not sufficient to motivate a change in behaviour [18, 24]. Past studies indeed suggest that traditional health education may be ineffective in changing hygiene behaviour [9, 10, 25] and that even an increase in hygiene awareness does not lead to changes in hand-washing practices [11].

- (2) Differences between handwashing games participants and non-participants

When comparing visitors who had actively participated in handwashing games with those who had not, there was no difference in the changes in the intention to wash hands. The most important finding was that handwashing games participants showed less increase in their confidence to always being able to wash hands with soap after using the toilet. This result appears counterintuitive at first glance, as past research has confirmed that self-efficacy is an

important determinant of health-protective behaviour [17, 26]. However, it makes sense when considering that respondents who were explicitly confronted with handwashing messages might have realized how difficult it would be to always wash hands at critical times. Occupation with handwashing topics seemed to impede an increase in the perceived confidence in executing the behaviour, a result to be tested in further research.

- (3) Changes in the behavioural determinants explaining changes in the intention to wash hands with soap

The last research question of this study concerned the extent to which the change scores of the behavioural determinants are important in explaining changes in the intention to wash hands with soap. The determinants were able to explain a substantial part of the variance in the intention change score.

Five determinants significantly predicted the changes in intention: the perception of how vulnerable one is to diarrhoea, the belief that washing hands with soap prevents from getting diarrhoea, the sentiment whether important people think handwashing is vital, the confidence in one's own abilities to perform the behaviour, and, most importantly, the personal importance of and commitment to washing hands with soap after using the toilet. Interestingly, a decrease on the vulnerability scale was associated with an increase in the intention to wash hands. One possible interpretation is reverse causality, meaning that visitors reporting a higher intention of washing hands with soap after using the toilet felt less vulnerable to diarrhoea at post-visit than those who did not report this increase in intention and thus did not feel less vulnerable. Correspondingly, there is evidence that caregivers perceiving more threat from not washing hands with soap were less likely to have a designated place for handwashing [27]. Personal commitment to always washing hands with soap after using the toilet was the strongest predictor for intention. Commitment to a behaviour can be described as the amount of internal pressure felt by a person to perform the behaviour [28]. An increase in intention thus depended on an increase in the intensity of commitment, i.e. the importance of handwashing to the respondent. Intention formation has indeed been stated to imply a commitment to perform a certain behaviour [29]. Moreover, commitment has been found to have a high impact potential in behaviour change interventions on safe water consumption [21, 22].

Part of the approach of TGWY was to create an environment which associated the issue of sanitation and hygiene with positive emotions through songs, dance, drama, parlour games and film. Moreover, the Indian Minister of Drinking Water and Sanitation attended the press conference at several stops and popular cricket players and a Bollywood actress were brand ambassadors of the campaign. Since no meaningful differences were found between visitors who had played actively and those who had not, the results suggest that attending TGWY was effective in itself and that it did not

make a significant difference whether visitors actively engaged in activities or not.

Strengths and weaknesses of the study

To the best of our knowledge, this is the first study to evaluate a large-scale handwashing campaign by assessing its immediate effect on participants' intention to wash hands and the underlying behavioural determinants. A high response rate was achieved from addressed campaign visitors and follow-up rates were high. The strong resonance of TGWY had led to many more visitors than expected by the organizers and resulted in long queues at the different stalls. As a consequence, over half of the interviewed visitors had not actively participated in any kind of activity focusing on handwashing. Due to the limited number of respondents who had participated in a particular game, it was not possible to study the effect for each individual activity. However, no big differences were found between visitors who had participated in handwashing games and those who had not. Since only visitors that were over 16 years old were interviewed, and since most adults let children go first, the findings depict the overall effect of attending this event rather than the additional effect of dynamic involvement in activities. The relatively low immediate impact of the campaign on the intention to wash hands with soap after using the toilet is consistent with previous studies on handwashing promotion campaigns. Those campaigns that typically find handwashing programmes to reduce child diarrhoea require intensive and controlled interventions [3, 5].

The reliance on self-reported intention as an indicator predicting actual behaviour outcome is a potential limitation to the study. Due to the nature of the study, it was not possible to measure any changes in handwashing behaviour, let alone observe handwashing practices at home. The limitations in using intention measures instead of actual behaviour measures are acknowledged. However, even though intention does not necessarily mean behaviour uptake, behaviour change rarely occurs with a lack of intention [30, 31]. According to

different meta-analyses, behavioural intention is a valid proxy for behaviour, accounting for considerable proportions of the variance in actual behaviour (22–28%) across a wide number of domains [32, 33]. Intention still is the key psychological predictor of behaviour [32, 34] and a medium- to large-sized change in intention has been found to lead to a small- to medium-sized change in behaviour [35]. Jenner *et al.* [36] even have identified intention as a significant predictor to perform appropriate hand hygiene.

Practical implications

Hygiene promotions, including handwashing, are ranked as the most cost-effective interventions to prevent disease [37–39]. TGWY campaign seemed to have raised awareness on the importance of washing hands with soap and water after using the toilet. However, it is clearly not enough to tell people to wash their hands in order not to get sick to change such a complex behaviour as handwashing [40]. For example, a study undertaken in Uganda found that 84% of respondents recognized the importance of washing their hands after using the toilet, but only 14% were observed to do so [41]. Deep-rooted habitual practices such as handwashing can be difficult to change [42]. The marginal increase in the visitors' intention to wash hands in in the present study offers limited promise that this large-scale campaign might have a large impact in reducing childhood diarrhoea. First of all, the intervention was not tailored to the specific population as suggested in Mosler's RANAS approach [12], meaning that interventions should be matched to the key factors determining behaviour within a specific population. Successful interventions will have to address the relevant behavioural determinants for handwashing, including perceived and actual barriers that might hinder handwashing performance. Moreover, programmes including regular home visits or community events have been an important component of a number of apparently successful hygiene promotion programmes [43–46]. Further research should focus on closing the existing gaps in information needed

to design effective large-scale handwashing interventions that require less intensive monitoring and have a long-term impact.

Supplementary data

Supplementary data are available at *HER* online.

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Conflict of interest statement

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