

## Examining the psychosocial drivers of handwashing behaviour among school children

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### ABSTRACT

**Aim:** Handwashing with soap remains the single most cost-effective strategy for reducing the spread of infectious diseases. From our scoping search, no study was identified which examined the predictors of children's handwashing behaviour within the context of the Health Belief Model (HBM) and Theory of Planned Behaviour (TPB) combined. This paper contributes to bridging this gap in literature. We sought to examine variables emanating from the HBM and TPB which could potentially predict handwashing behaviour; determine whether behavioural intention will potentially predict behaviour; and identify school children's motivation for proper handwashing behaviour.

**Subject and Methods:** Data were collected from 717 school children recruited from four basic schools. A structured questionnaire was used for data collection. Data were analysed using multi-variable linear regression models.

**Results:** Participants' knowledge of hand hygiene failed to predict behavioural intention and handwashing behaviour. As regards participants' perception of severity, there was an association with behavioural intention in a crude model, but this was not so in an adjusted model. Also, perception of severity was not associated with handwashing behaviour. Attitude to handwashing ( $\beta = 0.120$ , 95% CI [0.00, 0.24]  $p = 0.046$ ), possession of handwashing skills ( $\beta = 0.037$ , 95% CI [0.01, 0.07]  $p = 0.008$ ), and subjective norms ( $\beta = 0.263$ , 95% CI [0.20, 0.33]  $p < 0.001$ ) were among the psychosocial variables that showed potential for predicting both behavioural intention and behaviour. The TPB's intention-behaviour relationship was corroborated by our results. Among others, motivation for adherence to proper handwashing behaviour included the desire to make hands smell better.


**Conclusion:** Interventions targeting the handwashing behaviour of school children should consider strategies that move beyond mere knowledge improvement, but rather target attitude and skill enhancement strategies implemented in partnership with 'significant others' such as teachers, and adult peers.

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## Introduction

Infectious diseases continue to pose a threat to public health, especially among children, the aged and immunocompromised (Khabbaz et al., 2015). The experience of COVID-19 has taught the world that the outbreak of an infectious disease, depending on the infectivity, pathogenicity and virulence of the agent, can have dire consequences on the socio-political and economic life of the entire world (Kar et al., 2023). Many countries in the global south are faced with a double burden of disease, for which Ghana is no exception. Ghana has not been spared in terms of outbreaks of infectious diseases, from common ones such as cholera to more novel ones such as COVID-19.

Water, sanitation and hygiene (WASH) remain crucial in any comprehensive effort to combat the spread of infectious diseases among human population. In the developing world, many infectious diseases are transmitted through the fecal-oral route (Stürchler, 2023), and therefore a strategy that succeeds in interfering with this route often leads to achieving substantial health outcomes. Though morbidity and mortality due to infectious diseases are not respecter of age, there is common knowledge that children, the aged and immunocompromised tend to be high at-risk population groups. Some available studies suggest that about 90% of diarrhoeal diseases occur among children (UNICEF-Ghana, 2015). One possible explanation of this situation is the fact that the school environment creates a heightened person-to-person contact with its obvious implications on the spread of pathogens. In light of this, school-based WASH interventions undoubtedly require increased attention (Adams et al., 2009).

Handwashing with soap (HWWS) remains the single most cost-effective strategy for reducing the infectious disease burden (Curtis et al., 2011) and has been described as the 'do it yourself vaccine' due to its simple nature (Global Handwashing Partnership, 2018). HWWS demonstrates usefulness in the prevention of common conditions such as diarrhoea as well as complex ones such as Severe Acute Respiratory Syndrome (SARS) and COVID-19. HWWS is effective when done under running water, and at key moments. Some available systematic reviews and meta-analyses report that, HWWS reduced the episodes and risk of diarrhoea by 30–40% (Freeman et al., 2014; Ejemot-Nwadiaro et al., 2015).

The Theory of planned Behaviour (TPB) and Health Belief Model (HBM) are notable behaviour change models which have been used to explain varied health behaviours. The TPB posits that the closest determinant of behaviour is 'intention', which is predicted by attitudes, subjective norms and behavioural control (Ajzen, 1988). The HBM underscores the importance of beliefs in health decision-making. Some elements of this model include perceived susceptibility, perceived severity, perceived benefits and barriers, among others (Strecher et al., 1997). Within the context of this study, 'perceived susceptibility' refers to an individual's perception of his/her vulnerability to the negative consequences of poor handwashing behaviour. 'Perceived severity' refers to the perception of the individual as regards the seriousness of the negative consequences of poor handwashing behaviour. On the other hand, 'perceived benefits' refer to the perception of the individual as regards the benefits to be derived from adhering to safe handwashing behaviour, while perceived barriers are the costs (including social costs) to be incurred as a result of adhering to a safe handwashing behaviour, from the perspective of the individual. The integration of the TPB and HBM tends to offer a synergistic potential in

an effort to achieve a health behaviour change. The theories have been used to explain several phenomena including vaccine uptake (Fan et al., 2021; Rajeh et al., 2023). Though some studies have investigated the predictors of handwashing behaviour in varied settings, from our scoping search, no study was identified which has examined the psychosocial predictors of children's handwashing behaviour within the context of the TPB and HBM combined. This paper makes such a contribution to the body of knowledge. Precisely, we have sought to quantitatively examine the psychosocial variables emanating from the aforementioned models/theories which could potentially explain handwashing behavioural outcomes (*i.e.* Behavioural intention and behaviour). We have also sought to determine whether behavioural intention will potentially predict behaviour and proffer possible conditions necessary for such an association to occur. Finally, we sought to determine school children's motivation for adherence to proper handwashing behaviour.

## Methods

### *Approach and design*

We employed an analytical cross-sectional design and assessed the outcome variable retrospectively. A quantitative approach was adopted since it was deemed most appropriate within the context of the research objectives. The approach and design were deemed most efficient for a study seeking to determine the psychosocial correlates of reported handwashing behaviour at a single point in time.

### *Study population*

The study population comprised junior high school children in four selected schools within Ejisu and Juaben Municipalities of Ghana. These schools were selected based on a set of inclusion criteria developed as part of a bigger study (Appiah-Brempong et al., 2019). There was a total of 717 school children involved in the study. All school children in the four selected schools who were present on the day of the survey had the opportunity to participate in the study.

### *Description of data collection procedures and tools*

Handwashing behaviour was assessed using a structured questionnaire adapted from Pang et al. (2015), Ram (2010) and Eshetu (2013). The questionnaire makes use of dichotomous questions as well as questions on a 5-point Likert scale. Example of possible responses on items ranged from 1 (disagree strongly) to 5 (agree strongly). Sub-variables were examined for internal reliability using the Cronbach alpha test set at  $\alpha \geq 0.7$ . The questionnaire was organized into sections – Section A assessed participants' socio-demographic profile; Section B assessed the handwashing behaviour of participants after using the toilet and before meals. Sections C, D, E, F and G assessed a wide range of psychosocial variables which primarily emanate from the TPB as well as the HBM. Psychosocial variables assessed included were self-efficacy, knowledge, attitude, perceived susceptibility, and perceived severity. The questionnaire was researcher administered. Data

were collected with the assistance of trained teaching and research assistants based at the Kwame Nkrumah University of Science and Technology. The minimum educational qualification of a research assistant was a university degree.

### **Data entry, cleaning and storage**

Data were entered into *SPSS v. 22* (SPSS Inc., Chicago IL) and exported to *Stata v. 14.0* (Stata Corp., College Station, Texas). Entry errors were verified using *Stata's codebook* command. Identified mismatches were corrected manually. *Stata v. 14.0* addressed missing values automatically by eliminating its effect on outputs of statistical tests. Data cleaning was completed within three calendar months. All assent and consent forms were kept safely in a location different from that used for keeping the questionnaires. Data entered were stored on a personal computer specifically designated for the research and backed up on two different external hard drives kept at two different locations. Access rights to these devices were given to only core members of the research team. The goal of this protocol was to ensure adherence to the ethical principle of confidentiality or privacy as was assured by participants of the research.

### **Data analysis**

Data were analysed using descriptive and inferential statistical tests. Descriptive analysis involved the generation of frequencies, percentages and measures of central tendencies. The aforementioned were employed for the analysis of socio-demographic data of study participants (age, sex, religion, parents' education, and occupation of household head). On the other hand, inferential statistical tests were employed to determine the possible associations between psychosocial variables and the intermediate variable (behavioural intention) and response variables (Practice of HWWS before meals and after toilet use). Subsequently, we explored for possible association between behavioural intention and practice of HWWS. Specifically, linear regression models were employed to determine all such associations, and statistical significance level was set at  $p < 0.05$ . We employed multiple linear regression models to explore these associations. Normality of data was checked using the Q-Q plot. Owing to the fact that data were collected from participants who were located within clusters of schools, it was necessary to adjust for data clustering as part of the analysis process; this was done using robust standard errors. All data analyses were aided by *Stata version 14.0* (Stata Corp., College Station, Texas).

### **Ethical considerations**

Ethical considerations for this study were deemed extremely important in that the study targeted children. In consonance with best practice, we obtained both 'assent' and 'consent' prior to the conduct of the study. Thus, prior to the survey, all participating school children had given a written assent with corresponding consent from their parents or guardians. All assent and consent forms were kept safely in a location different from that used for keeping the questionnaires. The authors officially applied for ethical clearance from the Committee on Human Research, Publication and Ethics (CHRPE) – an institutional review board based at the Kwame Nkrumah University of

Science and Technology, Ghana. Subsequently, the study was cleared unconditionally by the ethics board with ethical clearance reference number: *CHRPE/AP/402/16*.

## Results

### *Socio-demographic characteristics*

The mean age of study participants was 14 years ( $SD = 1.37$ ). Majority of participants were females (51.3%), and Christianity was the main religion (90.8%) professed. The dominant educational level of a participant's father was the tertiary (35.7%), whereas the dominant educational level of a participant's mother was the secondary (32.5%). There was a response rate of 100%. Further details of participants' characteristics are presented in [Table 1](#).

### *Psychosocial predictors of handwashing behaviour*

Psychosocial predictors of behavioural intention were identified to be perceived susceptibility ( $\beta = 0.101$ , 95% CI [0.04, 0.16]  $p = 0.001$ ), subjective norms ( $\beta = 0.263$ , 95% CI [0.20, 0.33]  $p < 0.001$ ) and attitudes to HWWS ( $\beta = 0.120$ , 95% CI [0.00, 0.24]  $p = 0.046$ ). With regard to HWWS after toilet use, the possible predictors were handwashing skill ( $\beta = 0.037$ , 95% CI [0.01, 0.07]  $p = 0.008$ ) and subjective norms ( $\beta = 0.055$ , 95% CI [0.01, 0.10]  $p = 0.011$ ). Additionally, attitudes to HWWS ( $\beta = 0.098$ , 95% CI [0.04, 0.16]  $p = 0.001$ ), handwashing skill ( $\beta = 0.050$ , 95% CI [0.01, 0.09]  $p = 0.007$ ) and subjective norms ( $\beta = 0.110$ , 95% CI [0.05, 0.17]  $p < 0.001$ ) were identified as predictors of HWWS-before meals. Details are presented in [Table 2](#).

**Table 1.** Characteristics of participants [ $n = 717$ ].

Variables	Frequencies	Percentage (%)
Sex		
Male	349	48.7
Female	368	51.3
Religion		
Christianity	651	90.8
Islam	57	8.0
Traditional	8	1.1
Others	1	0.1
Father's Educational Level		
Tertiary	256	35.7
Secondary	238	33.1
Basic/Middle	127	17.7
Primary	27	3.8
No formal education	69	9.6
Mother's Educational Level		
Tertiary	159	22.1
Secondary	233	32.5
Basic/Middle	185	25.8
Primary	52	7.2
No formal education	88	12.2
Occupation of Household Head		
Civil/Public service	196	27.3
Farming	214	29.9
Clergy	32	4.5
Self-employed	267	37.2
Unemployed	8	1.1

**Table 2.** Psychosocial predictors of intention and HWWS ( $p < 0.05^*$ ).

Variables	Behavioural intention			Reported HWWS-after toilet use			Reported HWWS-before meals		
	Beta Coef (β)	Crude		Beta Coef (β)	Crude		Beta Coef (β)	Crude	
		p-value	Adjusted p-value		p-value	p-value		p-value	
Knowledge	0.001	0.991	–	–0.03	0.038	0.202 <sup>f</sup>	–0.035	0.306	–
Attitude	0.125	0.001	0.046 <sup>a</sup>	0.033	0.154	–	0.098	0.001	0.001 <sup>i</sup>
P. susceptibility	0.101	0.001	0.001 <sup>b</sup>	0.030	0.065	–	0.013	0.001	0.595 <sup>j</sup>
P. severity	0.011	0.001	0.822 <sup>c</sup>	0.051	0.284	–	0.068	0.116	–
Skill	0.026	0.001	0.084 <sup>d</sup>	0.041	0.001	0.008 <sup>g</sup>	0.050	0.001	0.007 <sup>k</sup>
Subjective norms	0.263	0.001	0.001 <sup>e</sup>	0.053	0.004	0.011 <sup>h</sup>	0.110	0.001	0.001 <sup>l</sup>

\*All  $p$ -values were adjusted for clustering using the robust standard errors.

a,b,c,d,e – Adjusted for all psychosocial variables with crude  $p < 0.05$  when tested against behavioural intention.

f,g,h – Adjusted for age, and all psychosocial variables with crude  $p < 0.05$  when tested against HWWS-after toilet use.

i,j,k,l – Adjusted for age, and all psychosocial variables with crude  $p < 0.05$  when tested against HWWS-before meals.

### The intention-behaviour relationship

To determine whether or not behavioural intention will potentially predict handwashing behaviour, the pairs ‘intention after toilet use’ and ‘practice of HWWS after toilet use’ were examined. Similarly, ‘intention before meals’ and ‘practice of HWWS before meals’ were also examined. With respect to the first pair, the model adjusted for the variables age, handwashing skill and subjective norms. With regard to the second pair, the model adjusted for age, attitude, skill and subjective norms.

Results of the adjusted model showed a statistically significant relationship between intention (to wash hands with soap after toilet use) and practice of HWWS after toilet use ( $\beta = 0.247$  95% CI 0.08 0.41  $p = 0.003$ ). Similarly, an adjusted model showed a statistically significant relationship between intention (to wash hands before meals) and practice of HWWS before meals ( $\beta = 0.346$ , 95% CI [0.19, 0.50]  $p < 0.001$ ).

### Reasons for adherence to HWWS

The survey identified reasons for adherence to the practice of HWWS to include removal of pathogens from hands, removal of dirt from hands, desire to gain respect from peers, desire to make hands smell good, a quest to make hands look attractive, and an act to stimulate appetite for food. The dominant motive underlying adherence to HWWS was identified to be the removal of pathogens from hands (34%). The second most frequent motivation was the removal of dirt from the hands (30%). Moreover, 22% of the responses were linked to the desire to make hands smell good. [Figure 1](#) is a column chart comparing the varied motives for adherence to HWWS.

## Discussion

### Predictors of reported handwashing behaviour

Attitude to HWWS predicted behavioural intention as well as the practice of HWWS before meals. Perceived susceptibility was identified as a possible predictor of intention. Subjective norms predicted both intention and practice of HWWS at the two key

moments. In addition, handwashing skill was identified as a predictor of the practice of HWWS at both key moments.

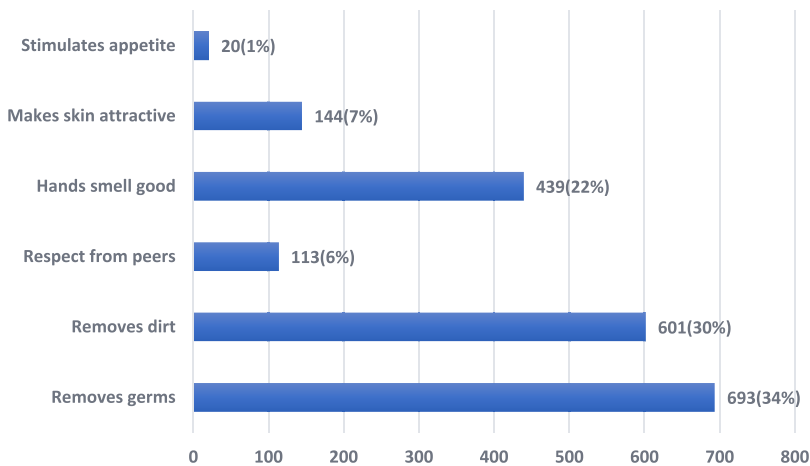
From the above, the role of attitude, and subjective norms in predicting both intention and practice can be seen to be crucial. These findings are consistent with the TPB which stipulates that attitude to a behaviour is a predictor of behavioural intention (Ajzen, 1988). In a study by Lopez-Quintero et al., 2009, respondents who demonstrated positive attitudes to proper handwashing were twice more likely to demonstrate positive intentions to practice proper handwashing as compared to participants who reported negative attitudes.

The crucial role of subjective norms implies the need for interventionists to involve *significant others* especially school teachers with respect to the design and implementation of hand hygiene promotion interventions that seek to target school children (Gbolu et al., 2023; Tidwell et al., 2020). In view of this, it becomes imperative for school health promotion practitioners to give attention to the handwashing behaviour of school teachers, recognizing the significant influence of teachers on the handwashing behaviour of school children, as evidenced by this study. In a recently published study conducted in the Bono East region of Ghana, school teacher's handwashing behaviour was determined by their knowledge, attitudes, and perceived severity (Gbolu et al., 2023).

Similarly, the crucial role of handwashing skill as a predictor of the practice of HWWS implies the need to prioritise the psychomotor (skill-enhancement) strategies in any hand hygiene educational intervention targeting school children. On the other hand, it gives an indication that cognitive (knowledge-based) approaches alone may not be effective to propel the adoption of proper handwashing behaviour.

### The intention-behaviour relationship

The result generated by this study has shown that the intention to wash hands with soap is associated with handwashing behaviour. This lends credence to the utility of the 'behavioural intention' (which emanates from the TPB) in predicting school children's handwashing behaviour. Thus, it can be emphasised that behavioural intention



**Figure 1.** A Column Chart showing motivation for proper handwashing behaviour.



remains an important determinant of school children's handwashing behaviour. Notwithstanding, it is worth mentioning that behavioural intention may not always predict behaviour. Some studies have linked this intention-behaviour gap to the role of other variables such as self-efficacy and motivation (Ahn et al., 2023; Bassett, 2015).

### ***Motivation for handwashing***

The dominant motivation for HWWS was reported to be the removal of pathogens from hands. This is an indication that the Germ Theory may still hold utility when designing hand hygiene educational interventions among school children. The Germ Theory, which was popularized between 1850 and 1920 posits that specific diseases are caused by specific microscopic organisms (Harvard University, 2018). The second major motivation for HWWS was identified to be the removal of dirt from hands. The removal of dirt and oils from the hands appears to be a key advantage of HWWS especially when compared with the use of a hand sanitizer, which many experts agree to its inability to remove dirt and debris from hands (Filion et al., 2011).

It would be useful for future studies to explore the utility of the Self-Determination Theory (SDT) in explaining school children's motivation to adopt and sustain proper handwashing behaviour. The SDT has evolved to encompass both intrinsic and extrinsic motivation. It suggests that all humans have three basic psychological needs – autonomy, competence, and relatedness; when these needs are supported adequately, people are likely to demonstrate a higher motivation towards adopting or persisting at the behaviour in consideration (Ryan & Deci, 2017).

### ***Reflection and implications for practice***

This study primarily examined the influence of psychosocial variables on behavioural intention and behaviour. Key explanatory variables examined included knowledge, attitude, perceived susceptibility, perceived severity, skill and subjective norms. With the exception of knowledge and skill which emanate from the Social Cognitive theory, all other psychosocial variables assessed emanate from the TPB and HBM. The strength of this study lies in the synergy derived from the combined use of the TPB and HBM in handwashing behaviour change. It can be observed from the results of this study that explanatory variables from a single theory or model did not demonstrate predictive potential for all the response variables considered by this study. Health behaviour change practitioners can therefore leverage on the complementarity of variables emanating from two or more theories/models in order to design comprehensive behaviour change strategies that achieve the desired health promotion outcomes. Thus, the combined effect of the constructs perceived susceptibility, skill, attitudes, and subjective norms could have increased likelihood of predicting school children's intention to wash hands with soap, and or proper handwashing behaviour.

### ***Potential limitations of study***

The results of this study may be limited to settings which have socio-economic and cultural characteristics similar to those of the geographical area of this study. Another



potential limitation relates to the use of self-reported data, which has the tendency to introduce some socially acceptable responses into the dataset. Also, there is the possibility of a recall bias since the outcome variable of the study was assessed retrospectively. In spite of the aforementioned potential limitations, the study offers useful lessons which can serve as a guide to practitioners and future researchers seeking to advance the practice of HWWS in schools.

## Conclusion

The study gives an indication that handwashing skill, attitudes, subjective norms and perceived susceptibility are key variables which could trigger the intention to wash hands with soap and or the practice of HWWS. With regard to the intention-behaviour relationship, the evidence generated by this study suggests that the intention to wash hands with soap does predict handwashing behaviour. From these reflections, it can be concluded that handwashing interventions targeting school children ought to prioritise children's handwashing skill enhancement, develop positive hand hygiene attitudes and enhance children's subjective norms by involving 'significant others' in the intervention design and delivery process. Also, it may be expedient to revisit the Germ Theory when developing the content of hand hygiene educational materials for school children.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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## Author's contribution

EA-B conceptualized the research ideas, developed the proposal and data tools. MA-B supported the data collection activities. EA-B and MA-B contributed to the data analysis, discussion of results and development of manuscript.

## Data availability

The datasets used and/or analysed are available from the corresponding author on reasonable request.

## Informed consent

A written assent and corresponding consent were sought from the primary participants and parents/guardians, respectively.

(a) Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and was approved by an Institutional Review Board/Ethics Committee. See details under Methods.

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