Systematic review

What impact does the provision of separate toilets for girls at schools have on their primary and secondary school enrolment, attendance and completion?

A systematic review of the evidence

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July 2011

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Leading education and social research
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The EPPI-Centre reference number for this report is 1911.

This report should be cited as: Birdthistle I, Dickson K, Freeman M, Javidi L (2011) What impact does the provision of separate toilets for girls at schools have on their primary and secondary school enrolment, attendance and completion?: A systematic review of the evidence. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.
ISBN: 978-1-907345-17-3

Contents

List of abbreviations

3ie	International Initiative for Impact Evaluation
ADOLEC	Literature on adolescent health (LILACS database)
AIDS	Acquired immunodeficiency syndrome
CDC	Centres for Disease Control and Prevention (USA)
CYP	Children and young people
DFID	Department for International Development (UK)
EFA	Education for All (UNESCO)
ERIC	Education Resources Information Center (database; USA)
FGD	Focus group discussion
FRESH	Focus Resources on Effective School Health
GNI	Gross national income
HIV	Human immunodeficiency virus
HMIC	Health Management Information Consortium (database, UK)
IBSS	International Bibliography of Social Sciences (database)
IRC	International Reference Centre (IRC International Water and Sanitation Centre; the Netherlands)
KAP	Knowledge, attitudes and practices (study)
LILACS	Latin American and Caribbean Literature on Health Sciences (databases)
LSHTM	London School of Hygiene and Tropical Medicine (UK)
MARCH	Maternal, Reproductive and Child Health (LSTHM centre)
MDG	Millennium Development Goal
MEDCARIB	Caribbean health sciences database
MeSH	Medical Subject Headings (National Library of Medicine, USA)
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
PAHO	Pan American Health Organization
RCT	Randomised controlled trial
REPIDISCA	Pan American Information Network on Environmental Health (database)
SHARE	Sanitation and Hygiene Applied Research for Equity (LSHTM centre)
SSHE	School Sanitation and Hygiene Education (UNICEF)
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
WASH	Water, sanitation and health (intervention)
WHO	World Health Organization
WHOLIS	World Health Organization's library database
WSP	Water and sanitation programme

Executive Summary

The education of girls is recognised as an investment with many valuable returns, including the health and economic prosperity of women, their families and nations (Herz and Sperling 2004). Despite recent progress in increasing girls' enrolment, statistics from 157 countries indicate that only one country out of three had reached gender parity in both primary and secondary education in 2008 (UNESCO 2010). UNESCO (United Nations Educational, Scientific and Cultural Organization) estimates that almost half of the 157 countries are unlikely to meet the Millennium Development Goal (MDG) target to eliminate gender disparity in primary and secondary education no later than 2015 (MDG Goal 3, Target 4). Thus there is much interest in identifying the most effective ways of increasing girls' enrolment and completion.

Poor school sanitation facilities have been cited as a factor that can impede girls' access to their education. For example, UNICEF (United Nations Children's Fund) and the International Water and Sanitation Centre argue specifically that 'Education for girls can be supported and fostered by something as basic as a girls-only toilet' (UNICEF 2005). Consequently, a growing number of organisations are calling for increased investment in gender-sensitive 'water, sanitation and health' (WASH) interventions in schools, through such initiatives as Raising Clean Hands for WASH in Schools (Raising Clean Hands 2010).

To help verify whether WASH conditions contribute to girls' educational outcomes, a systematic literature review was conducted to determine what impact the provision of separate toilets for girls has on their primary and secondary school enrolment, attendance and completion.

The review question

The figure below illustrates the framework guiding the review, designed to help answer the review questions:

***Q1a**. Is there evidence of an impact of providing separate-sex toilets on the enrolment, attendance and/or completion of girls' education in primary or secondary schools?* and

***Q1b**. Is there evidence of associations between separate toilets and girls' educational outcomes?*

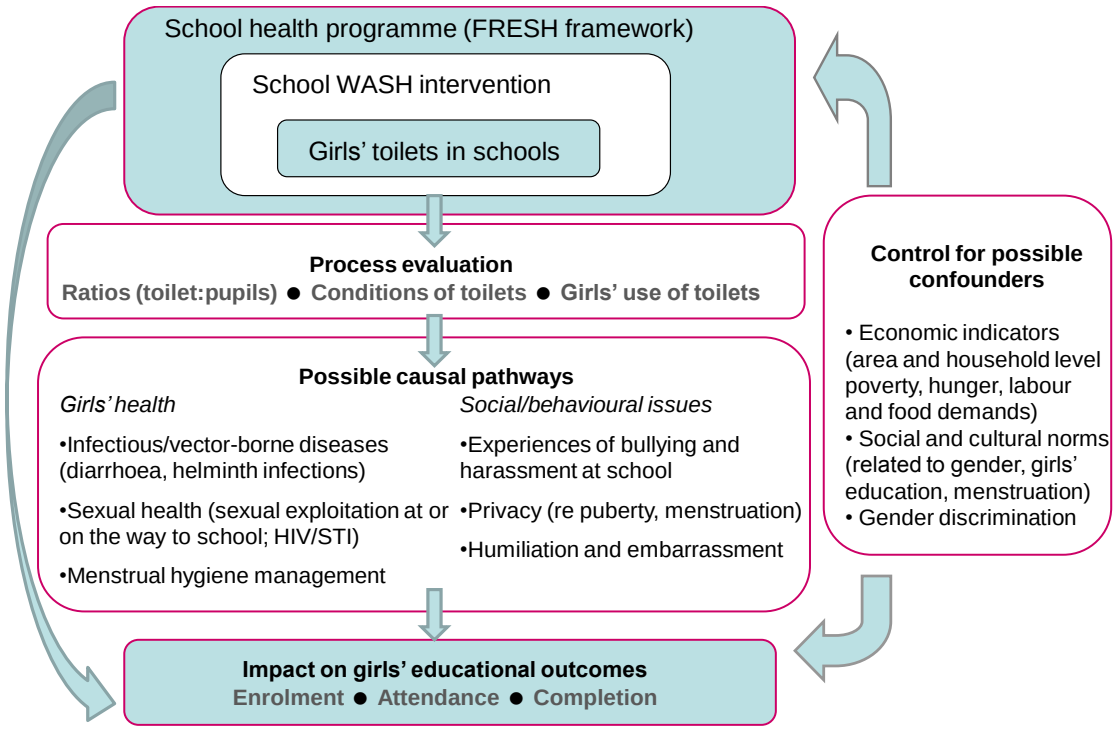
To allow for the possibility that we might find an absence or scarcity of evidence to answer Qs 1a and 1b, we also searched for and identified ('mapped') research in two related areas. First, to explore possible *causal pathways* by which single-sex latrines may impact on educational outcomes, we searched for studies that address the following question:

***Q2**. What is the impact of separate toilets on girls' health?*

Given that health issues are known to impact on school attendance and completion (Hunt 2008), establishing an impact of separate-sex toilets on girls' health could build indirect evidence of an impact of separate toilets on girls' educational outcomes. In addition, to allow for the possibility that we might not find sufficient research on the provision of separate toilets (in Qs 1–2), we enumerated the literature on a wider range of school-based WASH interventions, to answer this question:

Q3. Is there evidence that any school-based WASH interventions have an impact on girls' educational outcomes?

Figure 1.1 Guiding framework for the review



Methods of the review

While the review questions moved from narrow (impact) to broad (mapping), the review methodology was 'broad', in order to identify studies that could answer *any* of the research questions. Using a two-stage review, we first sought studies that investigated school-based WASH interventions and reported girls' education and/or health outcomes. In the second stage, we assessed whether studies contained evidence that could: (i) be synthesised to answer Q1a or Q1b; (ii) provide a conceptual map of mediating factors by which separate toilets may impact on educational outcomes (Q2); or (iii) enumerate all the school WASH studies identified under Q3.

To search for published research through electronic databases, key search terms were determined by the review question and the following inclusion criteria:

(i) Intervention: must examine the impact of a WASH intervention delivered in an educational setting, i.e. primary and secondary schools (both public and private) where girls aged 4–18 are in attendance (either single- or mixed-sex schools). To answer Qs 1a, 1b and 2, the intervention must be specifically the provision of separate toilets for girls in schools. To answer Q3, studies of any WASH intervention delivered in the context of a school could be included (given the subsequent criteria were met).

(ii) Geographical location: must be conducted in a lower- or middle-income country.

(iii) Outcomes: must collect and report outcome data for girls aged between 4 and 18 years old, specifically: (i) educational outcomes (i.e. enrolment, attendance and/or completion); or (ii) health outcomes (including a wide range of health outcomes, such as infectious diseases, reproductive health outcomes and psycho-social experiences of bullying and harassment); or (iii) girls' views, experiences or opinions of WASH facilities.

(iv) Study design: must be empirical research.

(v) Date: any.

(vi) Language: any.

To identify studies missed through 11 database searches, handsearching included: checking bibliographies of recent and relevant papers; disseminating an electronic 'Request for relevant research'; and searching relevant websites.

Inclusion and exclusion criteria were applied successively to abstracts and full reports, and EPPI-Reviewer software was used for screening, coding and analysing, using a single web location to house the documents and monitor progress of the review. Scientific advisors and potential users of the review – including representatives of UNICEF, Save the Children, Care International, WaterAid and DFID (UK Department for International Development) – were engaged in all aspects of the review, from its design to the search for studies and interpretation of findings.

Results

Of 5,082 studies identified through databases or handsearching, and screened on title and abstract, 406 were screened on full-text and 73 coded to gauge whether they answered any of the key questions. We did not identify any studies that assessed the impact of separate-sex toilets on either educational (Qs 1a–1b) or health (Q2) outcomes. We conclude that existing studies cannot answer the key review questions for the following reasons:

(i) All schools in the study had separate-sex toilets, thereby precluding a comparison with other arrangements, such as shared toilets or no toilets.

(ii) All schools in the study had shared toilets.

(iii) The outcomes were not disaggregated by sex (this was confirmed by author contact in the case of 10 studies which described separate-sex toilets and educational or health outcomes, but did not report outcomes separately for girls).

(iv) Separate-sex toilets were included as part of a comprehensive package of WASH interventions, and the study was not designed to disentangle the effects of single components.

Q3 asked whether *any* school WASH programmes impacted on girls' educational outcomes (whether the intervention included separate toilets or not). Twelve evaluations of comprehensive school-based WASH interventions were identified, of which four assessed girls' educational outcomes and reported a beneficial effect. These studies were not critically appraised, as the protocol was to map rather than review studies under Q3.

Conclusions and recommendation

The primary aim of this systematic review was to identify and synthesise evidence of the impact of separate toilets for girls on their enrolment and attendance in

schools. With an absence of identified studies in this area, we did not find evidence either for or against the impact of separate toilets for girls on their educational outcomes (equipoise). There may be several reasons for the absence of research in this area.

- The lack of sex-disaggregated data may stem from a lack of gender awareness in the field of hygiene and sanitation.
- There may be inadequate research capacity, particularly for designing and implementing rigorous evaluations that can measure the effects of different components of comprehensive interventions.
- Collaboration between governments, NGOs (non-governmental organisations) and researchers with evaluation expertise could help generate empirical evidence and build research capacity, but such collaborations are rare.
- 'Practitioner wisdom', or field experience, may have already convinced many in the sector that providing separate toilets for girls is the right thing to do, from a human rights' perspective and because it facilitates girls' educational experience.

While the question of separate toilets was considered to be important, the review team agreed it may be helpful to first understand more basic questions like:

- Are there *enough* toilets in schools? For example, what is the provision and does it ensure adequate access for both girls and boys? And,
- Are the conditions of toilets *good enough*? Specifically: is the quality of school toilets good enough to ensure they are used by girls and boys?

While gender separation may be a necessary component of acceptability to girls, it is unlikely to be sufficient if toilets are not secure, clean, functional or private. And toilets can only benefit girls' education if girls are using them.

To address these gaps in understanding, the review team made the following recommendations for future research:

- Conduct a 'review of reviews' to understand better the causes of poor educational attainment, absenteeism and drop-out for girls, at different ages and stages of development (including evidence that school sanitation acts as a 'push out' factor).
- Increase surveillance or auditing of school facilities, to understand better the existing provision and conditions of school toilets.
- Map government policies related to toilet provision (e.g. ratios of latrines to pupils) and conditions (including whether and how toilets should be separated for girls and boys), and comparing regulations with reality (documented through audit data).
- Build strong monitoring and evaluation plans – including the collection of attendance data – into programmes to improve WASH conditions and menstrual management in schools, ideally from the design stage.

Since the provision of separate-sex toilets is probably necessary but not sufficient to impact on girls' educational outcomes, the review team felt that the most useful question to answer was Q3 of this review: *Is there evidence that any school-based WASH interventions have an impact on girls' educational outcomes?* As a result of its findings, the team encourage at least two new well-designed, cluster-randomised trials to generate sound evidence from different contexts, where

cultural and environmental factors differ (e.g. religion and access to water, respectively). Such studies could investigate whether and how a comprehensive school sanitation and hygiene intervention impacts on both educational outcomes and health outcomes, and would ideally incorporate:

- Process evaluation, to assess changes in toilet provision (ratios) and conditions (whether they are adequate and acceptable), and behaviour change (including the use of toilets by girls and boys); and
- Qualitative research to help explain the mechanism and context of the findings.

1. Background

1.1 Aims and rationale for current review

The education of girls is increasingly recognised as an investment with many valuable returns, including the health and economic prosperity of women, their families and nations (Herz and Sperling 2004). Despite recent progress in increasing girls' enrolment, statistics from 157 countries indicate that only one country out of three had reached gender parity in both primary and secondary education in 2008 (UNESCO 2010). UNESCO (United Nations Educational, Scientific and Cultural Organization) estimates that almost half of the 157 countries are unlikely to meet the Millennium Development Goal (MDG) target 'to eliminate gender disparity in primary and secondary education no later than 2015' (MDG Goal 3, Target 4). Thus there is much interest in identifying the most effective ways of increasing girls' enrolment and completion.

In a recent review of international literature on drop-out and retention, a wide range of factors have been shown to contribute to girls' absenteeism or drop-out, including those described as either 'school supply-side' or 'school demand-side' factors (Hunt 2008).

Supply-side or 'push' factors are conditions in schools that can *push girls out of school* (Hunt 2008) such as:

- Distance to the school;
- Harassment, bullying, discrimination or punishment at school;
- Sexual harassment or other dangers at or on the way to school;
- Expectations of doing chores at school (e.g. water collection).

Demand-side or 'pull' factors stem from conditions outside school– in household, community and social contexts– that *pull girls out of school* (Birdthistle et al. 2009, Glynn et al. 2010, Hunt 2008) and can include:

- Ill health;
- Onset of puberty, marking the beginning of adulthood and adult roles;
- Early menarche;
- Early sexual debut;
- Pregnancy or expulsion for pregnancy;
- Marriage or expectations of marrying;
- Death of a parent, particularly in contexts of high HIV/AIDS incidence (human immunodeficiency virus/acquired immunodeficiency syndrome);
- Domestic duties, chores, childcare;
- Expectations/pressures to work for income;
- Lack of social and economic opportunities for girls;
- Inability to pay school fees;
- Inability to pay for uniform, books, etc.;
- Family preference for spending school fees/expenses on male children;
- Hunger.

Poor school sanitation facilities have been cited as a factor that can *push* children, particularly girls, out of school. While we are not aware of studies providing quantitative evidence of this (based on background research for this review), qualitative research indicates that some girls may be discouraged from attending a school without adequate toilet facilities (WaterAid 2009), and the claim has been supported by water and sanitation practitioners and organisations. For example, Lidonde writes in *Waterlines,* 'Poor sanitation in schools limits school attendance... School drop-out and low literacy rates, especially among the girl children, can be largely attributed to poor sanitation' (Lidonde 2004). Arguing more specifically that the lack of access to separate and decent toilets is impeding girls' access to their education, UNICEF (United Nations Children's Fund) and the International Water and Sanitation Centre have commented that 'Education for girls can be supported and fostered by something as basic as a girls-only toilet' (UNICEF 2005). Consequently, a growing number of organisations are calling for increased investment in gender-sensitive 'water, sanitation and health' (WASH) interventions in schools, through such initiatives as Raising Clean Hands for WASH in Schools (Raising Clean Hands 2010).

To help verify whether WASH conditions contribute to girls' educational outcomes, a systematic literature review was conducted to determine what impact the provision of separate toilets for girls has on their primary and secondary school enrolment, attendance and completion.

1.2 Definitional and conceptual issues

This section outlines and defines the key issues addressed in this review. We aimed for explicit and precise definitions to make clear the scope and limits of the review. This also allowed us to develop a coherent search strategy, which can be replicated in the future.

1.2.1 School-based water, sanitation and hygiene interventions

There are a wide range of school-based interventions that fall under the umbrella of WASH interventions, including clean water for drinking and washing, hygiene education and safe waste disposal. For this review, we aimed to identify school-based interventions delivered within the context of a toilet (i.e. the physical space for excreta disposal), particularly the provision of separate toilets for girls.

1.2.2 Educational settings

We searched for interventions implemented in educational settings, including primary and secondary schools (both public and private, and either single- or mixed-sex schools), where girls aged 4–18 are in attendance.

1.2.3 Lower- and middle-income countries

This review focused on lower- and middle-income countries as defined by the World Bank (http://data.worldbank.org/about/country-classifications). The main criteria for classifying countries are based on gross national income (GNI) per capita. A full list of countries that meet the World Bank criteria, according to 2009 GNI per capita, was compiled and used to screen studies for inclusion.

1.2.4 Educational and health outcomes

The review sought to identify studies that reported both educational and health outcomes. The key educational outcomes included:

- *Enrolment*: The number of individuals registered in both primary and secondary schools.
- *Attendance*: The number of students present at a school during the time it is in session.
- *Completion*: The number of individuals who complete primary or secondary school.

A wide range of health outcomes were considered, including infectious/vector-borne diseases (e.g. diarrhoea, helminth infections, respiratory infections); sexual health (e.g. sexual exploitation at school); and reproductive health including menstrual management and hygiene. Psycho-social experiences of bullying, harassment, privacy and embarrassment were also considered.

1.3 Review question approach

1.3.1 Review synthesis questions

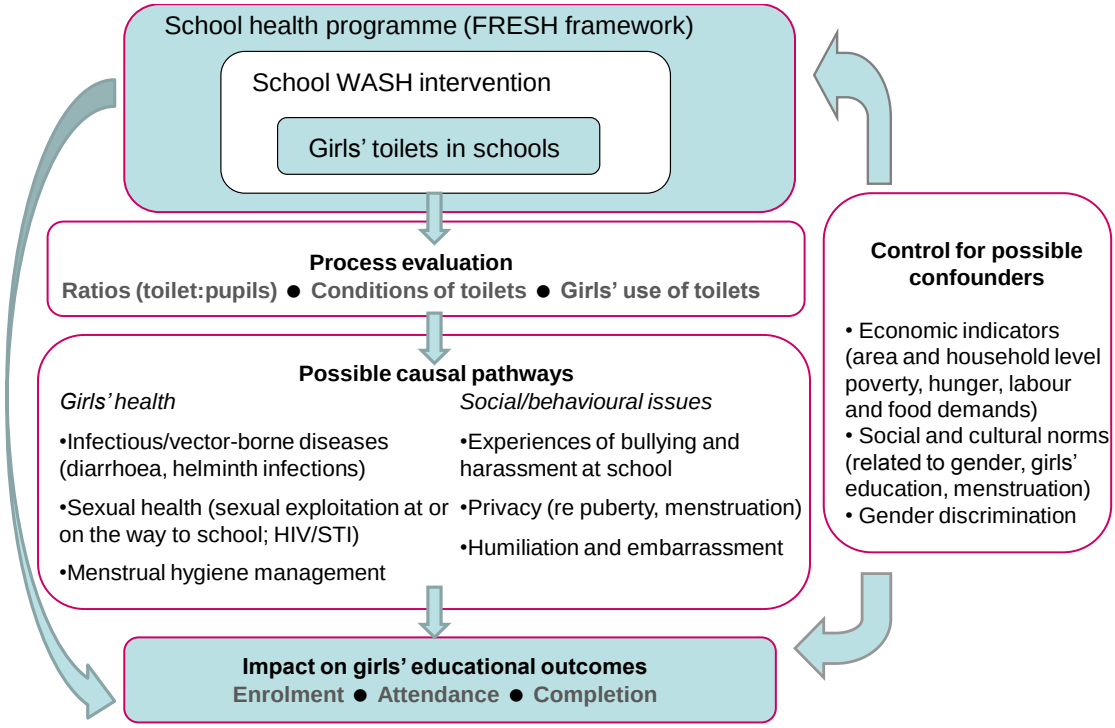
Figure 1.1 illustrates the framework we used to guide the review, based on our initial understanding of the literature in this and related areas. It informed how we searched for and described studies which could answer the following potential review questions:

***Q1a**. Is there any evidence of an* impact *of providing single-sex toilets on the enrolment, attendance and/or completion of girls' education in primary or secondary schools?*

***Q1b**. Is there evidence of* associations *between separate toilets and girls' educational outcomes?*

Answering these questions was the primary aim of the review. We sought research in which separate toilets are the intervention of interest, or identified as part of a broader water and sanitation intervention. We first aimed to identify evidence of causality between the provision of separate toilets and girls' educational outcomes; that is, where impact could be attributed to the separate provision of toilets. We also sought to report associations between separate toilets and girls' educational outcomes (e.g. where changes in educational outcomes cannot be attributed to the provision of separate toilets alone, since alternative explanations cannot be ruled out). In as much detail as possible, we aimed to assess the quantity and quality of research addressing Qs 1a and 1b to determine what evidence exists and what further evidence is needed.

Figure 1.1 Guiding framework for the review



To allow for the possibility that we might find an absence or scarcity of evidence to answer Qs 1a–1b, we searched for and identified research in two related areas. First, to explore possible *causal pathways* by which single-sex latrines may impact on educational outcomes, we searched for studies that address the following question:

***Q2**. What is the impact of separate toilets on girls' health?*

Research has shown that school WASH conditions are related to health issues such as vector-borne diseases including diarrhoea and soil-transmitted helminths (Migele et al. 2007), and incidents of harassment and humiliation in school toilets (Abrahams et al. 2006, Leach et al. 2003). Given that health issues are also known to impact on school attendance and completion (Hunt 2008), establishing an impact of separate-sex toilets on girls' health could build indirect evidence of an impact of separate toilets on girls' educational outcomes. To be able to describe studies that address Q2, we focused on whether the provision of *separate* toilets (rather than *any* toilets*)* are related to girls' health issues.

Finally, to allow for the possibility that we might not find sufficient research on the provision of separate toilets (in Qs1–2), we enumerated the literature on a wider range of school-based WASH interventions, to answer this question:

***Q3**. Is there evidence that any school-based WASH interventions have an impact on girls' educational outcomes?*

We proposed to note the number and type of studies assessing the impact of any school WASH programmes on educational outcomes disaggregated by sex, and among sub-populations of girls (e.g. by socio-economic status). This could include

whether the provision of *any* toilets (separate or not) impact on girls' educational outcomes.

To explore possible confounders of the relationship between separate toilets and educational outcomes, we had also proposed to identify studies that could answer:

Of factors known to influence girls' educational outcomes (e.g. poverty and gender norms and expectations), which are important determinants of whether schools provide separate toilets for girls?

As an example, socio-economic conditions may explain educational improvements since a school with more resources may be more likely to provide separate-sex toilets (as in Ekpo et al.'s comparison of government and private schools in Nigeria, 2008) and also more likely to achieve better educational outcomes. Similarly, a good headteacher may be the reason some schools provide separate toilets and also perform well. Socio-economic factors would thus be the underlying explanation for why girls-only toilets are correlated with girls' educational outcomes (rather than the toilets themselves). Similarly, issues like gender discrimination may explain why some schools do not cater to girls' needs (e.g. by providing separate toilets) or show improvements in enrolling and retaining girls, particularly if girls are burdened with WASH duties like water collection and cleaning of toilets. Following peer-review of the protocol, it was decided that this question (of confounders) was beyond the scope of the review, and consequently the search was *not* designed to answer this question. It would be noted, however, whether studies able to answer Qs 1–2 considered potential confounders in their analyses.

1.3.2 Type of review approach

Although the review questions moved from narrow (impact) to broad (scoping) the review methodology applied was 'broad' in order to search and identify studies that could answer *any* of the research questions (Qs 1-3). Specifically, we conducted a two-stage review process:

Stage one: Search for studies which investigate school-based water, sanitation and hygiene interventions and which report girls' education and/or health outcomes and decide if they meet the review inclusion criteria (see Section 2.2.1).

Stage two: Decide whether we have evidence/data that can:

(i) Be synthesised to answer Q1a or Q1b; or

(ii) Provide a conceptual description of mediating factors by which separate toilets may impact on educational outcomes (Q2); or

(iii) Build a 'map' of all the school WASH studies identified (which include separate toilets, Q3).

2. Methods used in the review

2.1 User involvement

2.1.1 Approach and rationale

We aimed to engage potential users in all aspects of the review, from the design and process of the review to the dissemination and application of findings. Collaborators represented UNICEF, Save the Children, Care International and WaterAid, and informed the progress of the review at four key points:

(i) *Protocol*: Users had the opportunity to assess the scope of the review including the conceptual framework, search strategy and draft inclusion and exclusion criteria. A draft protocol was sent to the project advisors and discussed by all members and advisors of the research team via teleconference.

(ii) *Searching*: We announced the review with an electronic 'Request for relevant research' sent to staff at UNICEF, Save the Children, DFID, Plan, Care, WaterAid, Emory University's Center for Global Safe Water, the London School of Hygiene and Tropical Medicine (LSHTM) MARCH (Maternal, Reproductive and Child Health) and SHARE (Sanitation and Hygiene Applied Research for Equity) centres, and encouraged all to circulate the request. (See Appendix 2.3 for the letter issued).

(iii) *Draft report*: We organised a workshop in February 2011 to: share preliminary findings of the review, and invite feedback from the project advisors; identify changes and additions needed to submit a complete draft of the report for peer review; and discuss implications of the review for research and practice, e.g. how the review findings can serve as a catalyst for better research and evaluation. Participants discussed: adequacy of the evidence base to support the prioritising of and to inform decisions about investments in separate toilets for girls; the limitations of existing research; how better research and systematic monitoring can fill existing gaps; how to increase interest and investments in high-quality research in this area, including building capacity to undertake rigorous impact studies; and opportunities for integration of girl-friendly WASH interventions with other school health initiatives (e.g. life skills-based education, and health-promoting policies and health services, as outlined by the FRESH[1] framework).

(iv) *Dissemination*: The final report will be disseminated in printed and electronic form via the SHARE and MARCH websites and user networks nurtured throughout the project. We will work with the DFID programme and stakeholders to develop ways of disseminating the results to a range of audiences. We also plan to submit the review for publication as a Campbell Systematic Review.

[1] The FRESH Start initiative, launched at the World Education Forum in Senegal, 2000, is an inter-agency partnership to Focus Resources on Effective School Health, through comprehensive school health programmes. www.freshschools.org/

2.2 Identifying and describing studies

2.2.1 Defining relevant studies: inclusion and exclusion criteria

To be *included* in the scope, research must meet the following criteria:

(i) Intervention: examine the impact of a WASH intervention (that includes separate toilets) delivered in an educational setting, e.g. a public, independent or private school.

(ii) Geographical location: be conducted in a lower- or middle-income country

(iii) Outcomes: collect and report outcome data on the impact of separate toilets for girls aged between 4 and 18 years old, specifically: *either* educational outcomes *or* health outcomes *or* girls' views, experience or opinions of separate-sex toilets.

(iv) Study design: be empirical research.

(v) Date: any.

(vi) Language: any.

Therefore, research was *excluded* for any of the following reasons (and the first reason for exclusion was recorded for every study screened):

(i) Did not examine the impact of a school-based WASH intervention.

(ii) Was not conducted in a lower- or middle-income country.

(iii) Did not collect and report the impact of separate toilets on the following outcomes for girls aged 4–18: *either* educational outcomes *or* health outcomes *or* girls' views, experience or opinions of separate-sex toilets.

(iv) Was 'non-empirical' research, i.e. descriptive, a methodological paper, an editorial, commentary or book review, a policy document, a resource or textbook, a bibliography, a theoretical paper, or a position paper.

We were inclusive in the types of study designs and conceptualised 'impact' to be broader than the 'effect' of an intervention. For example, the types of evidence synthesised could include girls' perceptions of the impact of separate toilets on their educational outcomes. Different investigative approaches offer different strengths as well as shortcomings, and triangulating various types of evidence can maximise what we learn.

2.2.2 Identification of potential studies: search strategy

Key search terms were determined by the review question and the inclusion and exclusion criteria, and were tested against papers already identified through handsearching.

The search strategy involved developing strings of terms to denote two key aspects of the review, namely:

- Relevant interventions – e.g. sanitation, hygiene, toilets, girl-friendly;
- Population/setting – e.g. schools, pupils, girls;

Appendix 2.1 includes a more complete list of generic terms from which search strings were developed.

The strings included 'free text' terms (i.e. the database searches for an instance of a term in the title and abstract of a record) and descriptor terms (i.e. codes

applied by individual databases to characterise studies, also referred to as MeSH headings, thesaurus terms or keywords).

- *Published research*: searches were undertaken of the following bibliographic databases: PubMed, ERIC, Social Sciences Citation Index (SSCI), Global Health, LILACS, WHOLIS, PAHO, REPIDISCA, MEDCARIB, ADOLEC, and IBSS.

The search strings applied, and the number of hits for each database, are summarised in Appendix 2.2.

- *Reviews*: identification of reviews as a source of further research studies included searching the following databases: Cochrane, Campbell, 3ie.
- *Handsearching*: we checked the bibliographies of recent and relevant papers found in the electronic searches, for studies missed through the above database searches. Also, to help identify research reports (not necessarily published in academic journals), grey literature and research that has not yet been published, we issued a 'Request for relevant research' through the respective networks of all project partners. We encouraged recipients to forward the request to colleagues and networks, to reach the largest audience possible. A copy of the 'Request' is included in Appendix 2.3. A dedicated email account was created to receive responses (wash.review@lshtm.ac.uk).

Finally, the following *websites* were searched for relevant research: OECD, DFID, World Bank, Water Aid, IRC International Water and Sanitation Centre, WHO, CDC, Health Management Information Consortium (HMIC) database, WASH Research News (http://washresearch.wordpress.com), WASH in Schools (www.schools.watsan.net), freshschools.org, and schoolsandhealth.org.

2.2.3 Screening studies: applying inclusion and exclusion criteria

Inclusion and exclusion criteria were applied successively to (i) titles and abstracts and (ii) full reports. Full reports were obtained for those studies that appeared to meet the criteria or where we had insufficient information to decide. These studies were re-screened in two stages.

(i) Studies that did not meet the inclusion criteria were excluded outright.

(ii) Studies that partially met the criteria (e.g. investigated a WASH-based intervention) were screened to identify if they could answer the key review questions (Qs 1–3).

A selection of studies were excluded but retained while investigating if further information could be obtained to answer the in-depth review question and/or shed light on why the in-depth review questions could not be answered.

For 10 studies which included toilet provision and educational or health outcomes, but either:

- Did not specify if the toilets were separate for girls, and/or
- Did not report the outcomes separately for girls,

we contacted the authors to request sex-specific data to assist in the screening process. One example of this 'Request for additional data' is provided in Appendix 2.4.

Additional studies were also excluded but retained for background information and discussion. EPPI-Reviewer software was used for screening, coding and analysing,

using a single web location to house the documents and monitor progress of the review.

2.2.4 Full-text coding and discussion

A coding tool was developed, prior to screening, to identify the following key elements of each potential included study for the in-depth review:

- Description of the intervention, e.g. separate toilets, girl-friendly toilets, handwashing after using toilets;
- Comparison groups in the study analysis, e.g. separate vs shared toilets; separate vs no toilets; 'girl-friendly' toilets with menstrual supplies vs separate toilets without supplies;
- Population characteristics/setting, e.g. age, primary school, secondary school;
- Study design, e.g. randomised controlled trial, in-depth interviews;
- Outcomes measured, e.g. educational enrolment, attendance, completion;
- Geographical location, e.g. which low, lower middle, or middle income countries studies were conducted in.

A copy of the coding tool is included in Appendix 2.5. The tool was used to assist in identifying if studies could answer the review question (see section above) and provided additional contextual detail for the results and subsequent discussion provided in Chapter 3.

2.2.5 Identifying and describing studies: quality assurance process

At all steps of the screening (on title and abstract, full-text, and then coding), a sample of studies (about 10%) were screened by two researchers. This was to ensure consistency in application of the inclusion and exclusion criteria. Where the screening decisions did not match, the Principal Investigator made the final allocation. The remaining studies were screened independently by single reviewers, but uncertainties and reasons for discrepancies were regularly discussed by the review team, to continually improve consistency.

3. Results

3.1 Studies included from searching and screening

Figure 3.1 illustrates the process of filtering, from searching to scoping and finally to synthesis.

A total of 5,741 citations were identified through systematic searches of 11 electronic databases. The largest yield of the citations identified came from health index databases, e.g. Global Health (N=2,385), followed by PubMed (N=850). The number of citations identified in each database is documented in Appendix 2.2.

Of the 5,741 citations identified, 722 were duplicates and excluded when citations were uploaded onto the EPPI-Reviewer database. A further 63 papers were identified through handsearching (including author contact), leaving a total of 5,082 citations to screen.

Titles and abstracts were screened using the exclusion criteria, described in Section 2.2.1. The majority of papers excluded at this stage (N=4,243) did not meet the first inclusion criterion, as they did not relate to the intervention of interest (i.e. they did not investigate the impact of school-based WASH intervention). The second most common exclusion criterion was based on geographical location, with 289 studies excluded because they were conducted in high-income countries.

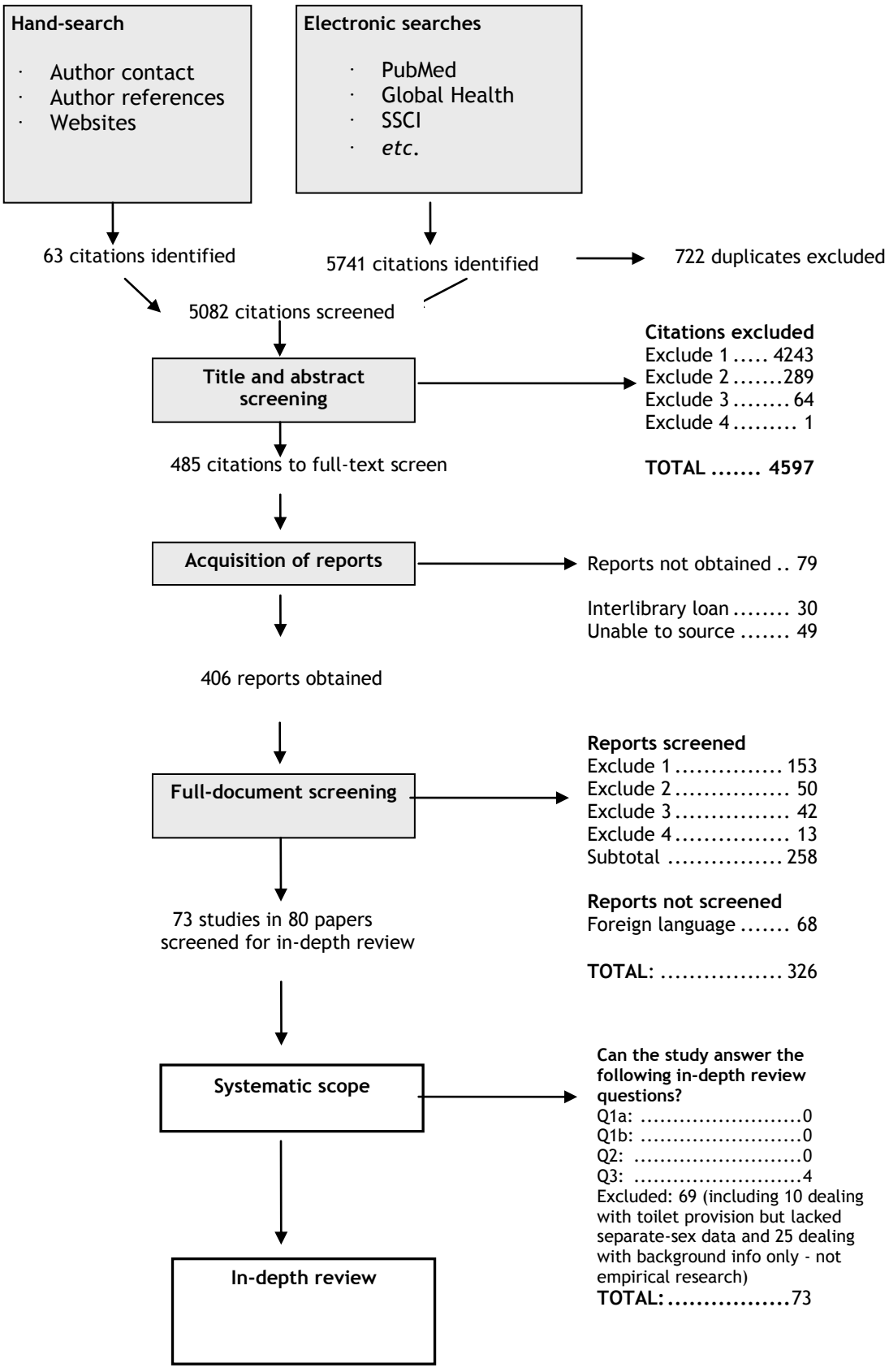
A total of 79 papers were unobtainable for full-text screening. There was difficulty sourcing 49 papers because of lack of citation details, particularly international governmental reports written in Spanish. The remaining 30 were sourced and requested through the interlibrary loan system but they were either not retrieved in time or there was a delay in obtaining the papers. Again this mainly applied to the non-English-language literature.

The decision to include non-English citations introduced a set of novel methodological issues for the team, such as using 'Google Translate' to screen on title and abstract, finding new portals to obtain references (e.g. www.scielo.br/) and needing additional time for the retrieval of international literature that is not readily available through electronic download. The cut-off date for considering studies for inclusion in the review was 11 January 2011.

In total, 406 papers went through to full-text screening. At this second, more detailed stage of screening, a further 258 papers were excluded, most often on the grounds that they did not meet the first criterion for inclusion (N=153) or that they were not conducted in a lower- or middle-income country (N=50), or the outcomes assessed were not relevant to this review (N=42). A further 68 studies in languages other than English were not screened and therefore excluded.

The full-text screening resulted in a total of 73 studies (reported in 80 papers) that were coded to see if they answered any of the key review questions. Details of those studies are provided in the following section.

Figure 3.1 Results of the search and scoping



3.2 Details of studies found from the search, according to research question

3.2.1 Question 1a: Is there any evidence of an impact of providing single-sex toilets on the enrolment, attendance and/or completion of girls' education in primary or secondary schools?

The primary aim of this systematic review was to identify and synthesise evidence of the impact of separate toilets for girls on their enrolment and attendance in schools. We did not identify any studies that were designed specifically to assess the impact of separate-sex toilets. And to date, no trial has been registered to assess the impact of separate-sex toilets (Cochrane Central Register of Controlled Trials and the Campbell Library), suggesting that no evaluations are currently underway.

From our systematic search, however, we did identify five studies in which separate toilets for girls were included as part of a broader WASH intervention. In each case, the study was supported by UNICEF and designed to evaluate local adaptations of UNICEF's School Sanitation and Hygiene Education (SSHE), an initiative combining 'hardware' (construction of water, handwashing and sanitation facilities) and 'software' (training, supervision, joint planning, parent mobilisation, life skills education, children's clubs, outreach activities) inputs. SSHE promotes a gender-sensitive approach including equal input and responsibilities of boys and girls, and gender-specific facilities including separate toilets for girls and boys.

The five SSHE evaluations, summarised in Table 3.1, show that while UNICEF's SSHE initiative includes separate toilets for girls, evaluations of SSHE to date have not been designed to assess, and are not capable of assessing, the specific impact of separate-sex toilets on girls' educational outcomes. Reasons for this limitation are discussed below, for each of the five studies.

(i) A study was conducted to evaluate the impact and sustainability of SSHE in Kerala in India in 2006, by comparing 150 schools that had completed the intervention four years before (in 2002) to 150 control schools that had not received the SSHE intervention (Mathew et al. 2009).

(ii) A pilot study assessed SSHE in six countries, by comparing schools before and two years after the intervention, and by comparing intervention schools with control schools in each country (UNICEF/IRC 2006). The number of intervention schools ranged from 10 in Colombia to 64 in Nepal; and the number of control schools ranged from three in Colombia to 19 in Zambia.

Both studies collected attendance data, and compared attendance between schools that had received the SSHE intervention and control schools (neither study randomly allocated intervention and control schools). Unfortunately, it is not possible from these two studies to assess the impact of separate-sex toilets on school attendance since neither study specified whether the control schools had separate toilets for girls. In both studies, some of the control schools had received interventions sponsored by other agencies/donors, which may have included separate-sex toilets. And in the Kerala study, separate toilets are described as the 'standard design', suggesting they would be present in the non-intervention schools. In either case, given the many components of the SSHE intervention, it would be difficult to disentangle the effect of separate toilets from other elements. The authors acknowledge they could not single out the impact of specific components.

(iii) A third study to evaluate UNICEF's SSHE programme was conducted in the Dowa District of Malawi in 2007, by comparing three schools that had

implemented the programme (two years before) with three control schools (McPhedran et al. 2010). It was not possible from this evaluation to gauge the impact of separate toilets for girls, since all schools in the study – intervention and control – had separate-sex toilets.

(iv) A study was conducted in Bangladesh in 1993–94 to assess the impact of newly-constructed sanitation facilities in 228 rural primary schools in 16 thanas (UNICEF 1994). The schools were randomly selected from 1,089 primary schools that had been part of a Government of Bangladesh and UNICEF effort to construct safe water and sanitation facilities between 1992 and 1993. The sanitation facilities included separate toilets for girls (the 'software' component of SSHE had not yet been implemented). The sanitary facilities and conditions within each school were assessed retrospectively (1–2 years after construction) and girls' attendance was compared between March 1993 and March 1994. It is not possible from this evaluation to assess the specific impact of separate-sex toilets on girls' attendance, since baseline data on sanitary provision was not provided. Specifically, it is not reported whether or which schools had separate toilets for girls before the intervention.

(v) A study conducted in three districts of Kenya in 2006–07 compared 100 randomly selected schools that had received a UNICEF-supported intervention (including water facilities, toilets and handwashing facilities, teacher training and children's clubs) with 50 (neighbouring) control schools (Njuguna et al. 2009). In each intervention school, separate toilets had been constructed for girls (although in three schools, the girls' toilets were not functioning, and in three schools, the boys' toilets were not working). Days missed were counted from attendance records, and assessed according to frequency of handwashing, and cleanliness and use of toilets, but not by whether schools provided separate-sex toilets or not. (As with the above studies, it was not specified whether the control schools had separate-sex toilets.)

3.2.2 Question 1b: Is there evidence of associations between separate toilets and girls' educational outcomes?

We identified one study that assessed whether existing school conditions, including provision and conditions of toilets, were associated with educational outcomes (no intervention was provided, this was an observational study). In 1998, Mensch and Lloyd (1998) conducted an in-depth study of the school environment in a purposively selected sample of 36 primary schools in three districts of rural Kenya. Data was collected from 1,963 students in standards 7 and 8, and observations made of existing conditions, including the following aspects of girls' toilets: whether the girls' toilets were clean; if there was a barrier between girls' toilets; if toilets were secure from observation; if boys were observed hanging around girls' toilet; and girls' experiences of harassment at toilets. These and other factors were compared among schools categorised as 'high-performing' (N=12) and 'low-performing' (N=21), according to girls' scores on the national primary school leaving exam. It was not specified whether high- and low-performing schools had separate-sex toilets or not, and it appeared from the data that all schools provided separate toilets for girls. Without a comparison between girls' toilets and any other toilet arrangements, this study was unable to answer Q1b.

3.2.3 Question 2: What is the impact of separate toilets on girls' health?

We sought studies that investigated the specific impacts of separate-sex toilets on girls' health outcomes. We identified two potential studies but, upon review, determined they could not establish a link between health outcomes and separate-sex toilets (and thus could not answer Q2) for the following reasons.

(i) In 1978, Koopman and colleagues conducted the first epidemiological study to measure the importance of toilets in causing endemic diarrhoea (Koopman 1978). Data were captured from 8,329 male and female students in grades 1–5, in 14 municipal schools, in Cali, Colombia. Children's experiences of diarrhoea and vomiting were assessed according to schools' number of toilets, proportion of functional toilets, and hygienic toilets. However, it was not stated whether schools provided separate toilets for girls. Neither was the sex of the participants reported, precluding a separate analysis for girls.

(ii) The above-mentioned study conducted in Kerala, India, by Mathew and colleagues (Mathew et al. 2009) also compared health outcomes (self-reported colds and diarrhoea) between intervention and control schools. However, it was not possible to compare health outcomes by whether schools had separate-sex toilets, since it was not specified whether the control schools had separate toilets for girls.

Table 3.1 Studies that assessed WASH interventions (including separate toilets for girls) and impact on educational and/or health outcomes

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact of *separate toilets* on girls' educational and/or health outcomes
Evaluations of interventions that included separate toilets for girls						
Mathew et al. 2009	To investigate the impact and sustainability of school interventions for water, sanitation and hygiene education, and secondarily, examine the associations between school conditions and pupil practices.	Kerala State, Allapuzha, Pattanamthitta, and Kottayam districts, India; 2006–07. The intervention took place prior to 2003. 300 (75 in each intervention, 150 in control) upper primary government schools (from class 7) within 50 metres of a water supply facility.	Cross-sectional survey conducted four years after intervention completed (no baseline data). Two intervention districts with one post-intervention control district, chosen for similarities of geography, economics, and socially (not specified). School visits (unannounced) were conducted to observe facilities, and interview teachers and 569 groups of 7,835 children; 764 household visits.	District-wide intervention in two districts for one year prior to 2003. 150 schools in each intervention district implemented UNICEF-supported School Sanitation and Hygiene Education (SSHE) combining 'hardware' (construction of water, handwashing and sanitation facilities) and 'software' (training, supervision, joint planning, parent mobilisation, etc.) inputs, including a 'gender policy' ensuring separate toilet facilities for girls.	150 schools in one control district (not randomly allocated). Did not receive the SSHE intervention, but some received subsequent district-wide programmes.	Not reported. Attendance was compared between schools that had SSHE interventions vs those that did not, but not by whether schools had separate-sex toilets or not. (Almost all schools had separate-sex toilets?) *Health outcomes* Self-reported student health (colds and diarrhoea) compared between schools with SSHE interventions vs those without, but not by whether schools had separate-sex toilets.

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact of *separate toilets* on girls' educational and/or health outcomes
UNICEF/IRC 2006	To assess a pilot programme for school water, sanitation and hygiene education in six countries.	Burkina Faso, Colombia, Nepal, Nicaragua, Viet Nam, Zambia (data not reported for Nicaragua)	Participatory research to make pre- and post-comparisons in intervention schools (two years after implementation); and comparisons between intervention and control schools, based on surveys and focus group discussions with children, teachers, headteachers, parents and school council, and school observations.	Combination of 'hardware' (construction) and 'software' (training, supervision, life skills education, children's clubs, outreach activities), with gender-sensitive approach (equal input and responsibilities) and gender-specific facilities including separate toilets for girls and boys. No. of intervention schools: Burkina Faso: 26 Colombia: 10 Nepal: 64 Viet Nam: 40 Zambia: 31	No. control schools: Burkina Faso: 4 Colombia: 3 Nepal: 7 Viet Nam: 14 Zambia: 19	Not reported. It was not specified whether intervention and control schools had separate-sex toilets or not.
UNICEF 1994	To assess the impact of sanitation facilities on girls attendance	Bangladesh, 1993-94 228 randomly selected rural primary schools. Sample size calculated based on assumed latrine quality.	Retrospective survey of WASH conditions, with attendance compared before and after the intervention.	Provision of sanitation and safe water supply, gender-separate girls' latrines. ('Hardware' only, as per Phase 1– Construction. Phase 2 of the programme – hygiene education – had not yet been implemented.)	None.	Not reported. It was not stated whether schools had separate toilets for girls before the intervention. Baseline data on sanitary provision before the intervention were not provided.

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact of *separate toilets* on girls' educational and/or health outcomes
McPhedran et al.2007	To assess impact of school sanitation on girls' attendance.	Dowa District, Malawi. Six schools, not randomly allocated.	Cross-sectional comparison of intervention and control schools, two years after implementation (no baseline data). Sanitation survey, questionnaires, interviews and FGDs (focus group discussions). School registers.	Three schools, had received school sanitation intervention by UNICEF two years before.	Three comparison schools.	Not reported. Enrolment was compared between intervention and control schools, but all six schools (three intervention and three control) had separate-sex toilets.
Njuguna et al. 2009	To understand (i) what makes a programme effective, and (ii) what are the impacts of a WASH-in-schools programme.	100 schools in Nairobi, Mombasa and Kwale District, Kenya. >5000 children either observed or involved in classroom voting. Year: 2007.	Cross-sectional study Observation of handwashing (N=1,000 pupils), classroom voting (N=4,900 pupils), small group discussion (16 schools).	50 schools provided with 'software' (teacher training) and 'hardware' (construction of water, sanitation, and hygiene facilities) at schools from 2005 to 2007. Inputs provided by UNICEF.	50 schools that did not receive the UNICEF intervention (the non-intervention school nearest to each intervention school).	Not reported. Girls' daily absences were compared by schools, but it was not specified whether control schools had separate-sex toilets or not.

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact of *separate toilets* on girls' educational and/or health outcomes
Non-intervention studies (no intervention provided, existing conditions assessed)						
Mensch and Lloyd 1998	To provide an in-depth look at the school environment and the ways it potentially can help or hinder adolescents.	Rural Kenya (three districts). 36 primary schools (purposively selected to represent a wide range of environments), with data collected from 1,963 students in standards 7 and 8.	A situation analysis combining quantitative and qualitative methods, e.g. observations and inventories of school facilities and interviews with teachers and students	No intervention provided: observational study of existing conditions, including: - Water at school; - Girls' toilet clean; - Barrier between girls' toilets; - Toilets secure from observation; - Boys observed hanging around girls' toilets; - Girls' harassment at toilets.	'High-performing' (N=12) schools were compared to 'low-performing' schools (N=21), according to girls' scores on national primary school leaving exam.	Not reported. It was not specified whether high- and low-performing schools had separate-sex toilets or not.
Koopman 1978	The first epidemiologic study to measure the importance of toilets in causing endemic diarrhoea.	Cali, Colombia 8329 male and female students in grades 1–5, in 14 municipal schools. Year: 1977.	Cross-sectional symptom prevalence survey with students. School observations (unannounced visits).	None: observational study of existing conditions, including: - number of toilets; - % toilets functioning; - % toilets with faeces outside bowl; - number of water faucets.	None.	Not reported. No educational outcomes were reported. *Health outcomes* Not reported by sex. Sex of participants was not recorded in the survey. Using a combined hygienic status for males and females, unhygienic toilet conditions were associated with diarrhoea and vomiting, but not necessarily causal.

3.2.4 Why existing studies cannot answer the key review questions (Qs 1a, 1b and 2)

A selection of studies (N=10) described school-based toilet provision in relation to educational and/or health outcomes, but either:

- Did not specify if the toilets were separate for girls; and/or
- Did not report the outcomes separately for girls.

Before excluding studies on this basis, we contacted the authors to request sex-specific data. We thought it was possible they had collected but not reported separate-sex data in their publication. One example of this 'Request for additional data' is provided in Appendix 2.4.

Examples of the authors' responses are provided in Appendix 3.1. Based on our review of these studies, and follow-up with authors, we conclude that existing studies cannot answer the key review questions for the following reasons:

(i) All schools in the study had separate-sex toilets, thereby precluding a comparison with other arrangements, such as shared toilets or no toilets (e.g. Bowen et al. 2007, Njuguna et al. 2009)

(ii) All schools in the study had shared toilets (e.g. Koopman 1978)

(iii) The outcomes were not disaggregated by sex (e.g. Blanton et al. 2010, O'Reilly et al. 2007)

(iv) Separate-sex toilets are included as part of a comprehensive package of WASH interventions, and the study was not designed to disentangle the effects of single components (e.g. Mathew et al. 2009, UNICEF/IRC 2006). We did not identify evaluations in which the only intervention offered was separate toilets for girls, or where this was phased in before or after other interventions. Rather, separate toilets were one component within a 'bundle' of WASH interventions (including 'hardware' like the provision of safe water, soap and adequate lighting, as well as 'software' such as hygiene education and/or teacher training). Even 'girl-friendly latrines' – a concept growing in popularity among international organisations, governments and women's rights movements – should not only be separate from boys, but provide water, soap, supplies for menstrual management, and privacy from other girls as well as boys. Where this is being implemented, for example with UNICEF's support, the evaluations have not been able to distinguish the relative effects of single components.

3.2.5 Question 3: Is there evidence that any school-based WASH interventions have an impact on girls' educational outcomes?

To allow for the possibility that we might find an absence of evidence to answer Qs 1–2, we had also noted the quantity and type of studies assessing the impact of any school WASH programmes on girls' educational outcomes (whether the intervention included separate toilets or not). Although we provide details of the studies, such as methodological design, geographical location and examples of findings reported, in the sections that follow, it should be noted that the studies have not been subjected to formal critical appraisal (the intention was to describe rather than review these studies).

Appendix 3.2 summarises 12 evaluations of school-based WASH programmes, including interventions providing:

- Handwashing stations;

- Water treatment solutions;
- Teacher training to promote water treatment and hygiene to pupils;
- Hygiene education;
- 'Hardware' and 'software' inputs together.

The studies assess a range of outcomes, including:

- Improved knowledge/awareness of hygiene;
- Behaviour change (e.g. handwashing before eating; handwashing with soap after defecation);
- Diarrhoeal incidence
- Increases in household water treatment practices (e.g. from pupils sharing knowledge with family and community members);
- Educational outcomes including absenteeism and/or enrolment.

Most of the studies in Appendix 3.2 cannot demonstrate an impact on *girls'* educational outcomes. This is because either they did not measure educational data, or they did not disaggregate the data by sex. However, four studies assessed girls' educational outcomes and reported a beneficial effect. In the case of two studies – one showing an increase in girls' enrolment in Dowa District in Malawi (McPhedran et al. 2010) and the other in girls' attendance in Bangladesh (UNICEF 1994) – both assessed their interventions retrospectively (about two years after implementation), and without baseline data. Thus, they cannot rule out the influence of other concurrent or subsequent government schemes that were designed to increase enrolment (e.g. financial support to families of girls). That said, the interventions were well-received, with good uptake. A third study showed that girls were absent less when there was more handwashing ($p<0.043$) and very high toilet use (>90%; $p<0.048$). Finally, preliminary evidence from a cluster-randomised trial in Kenya suggests that a comprehensive school WASH programme entitled 'SWASH+' (including improvements in hygiene, sanitation and water treatment) reduces absenteeism for girls, including absenteeism due to illness, but not necessarily for boys (presentation by Freeman, February 2011).

Three studies showed substantial reductions in absenteeism for both boys and girls combined (Blanton et al. 2010, Bowen et al. 2007, O'Reilly et al. 2007), but did not disaggregate the outcomes by sex. For example, a cluster-randomised trial of an intensive handwashing campaign in rural China reported 42% fewer absences, 54% fewer absence days, and 71% fewer childhood illnesses, for those in the intervention schools compared to control schools.

3.3 Related issues that emerged from the search

Two issues emerged as prominent in the literature resulting from the systematic scoping exercise: the issue of menstrual management in schools and its relationship with attendance; and the existing provision and conditions of school toilets. Studies addressing those issues are summarised below. As in the section above, these studies were not subjected to formal critical appraisal, because they were not designed or able to answer the key review Qs 1a or 1b.

3.3.1 Menstrual management in schools

A number of studies addressed the issue of menstrual management in schools. We were interested in whether those studies provided evidence that separate toilets

have an impact on girls' education *after puberty,* for example, to help manage menstruation. We did not identify any direct evidence that menstruation causes drop-out (Glynn et al. 2010); however, it was cited as a reason for absenteeism in several qualitative studies. For example, in focus group discussions in Malawi, South Africa and Ethiopia, schoolgirls admitted they stayed at home during menstruation, or left school early, sometimes pretending to be sick, for the following reasons:

- Pain and discomfort. 'If I experience menstrual pains, I ask permission to go home. I don't tell the truth. I just say I have a headache or a stomach ache. All our teachers are men.' (Amhara girl, aged 18, Ethiopia; Ngales 2007).
- Fears in the context of HIV/AIDS (Abrahams 2002).
- They cannot afford sanitary napkins.
- They lack underpants, or clean clothes for changing. 'Sometimes we stay home or we wear black or dark skirts in case the cloth is not sufficient,' (Dowa District, Malawi, McPhedran et al. 2010).

On the other hand, in some focus group discussions in Dowa District, Malawi, with females aged 14 (in standards 7 and 8), 'girls were not aware of any girls who did *not* go to schools and stated that despite feeling shy and awkward during menstruation they do still come to school.' In the same study in Malawi, girls in other focus groups admitted to missing school or leaving early during their menstruation, but did not cite sanitation conditions as a cause of dropping out of school; 'this was thought to be a more rural problem or a problem for orphans and those being forced to marry or becoming pregnant' (McPhedran et al. 2010).

Three studies attempted to quantify absenteeism due to menstruation and reported a low prevalence: Oster and colleagues (Oster and Thornton 2009) reported that schoolgirls in Nepal were 2.4 percentage points less likely to attend school when they had their period; and Mensch and colleagues (Mensch and Lloyd 1998) reported that 5% of girls in their rural Kenyan study claimed to have stayed away from school the last time they had their period. In a survey of 156 13- to 18-year-old girls in three towns in Ethiopia (purposively selected based on the existence of CARE projects), menstruation was not identified as one of the main reasons for girls' absenteeism: it was ranked eighth in importance after early marriage, absent parents, heavy work load at home, and other 'pull-out' factors. However, of the girls who had reached menarche, about 43% reported missing school at some point due to menstruation (Fehr 2010).

Where absenteeism is evident, it appeared that menstruation can serve as both a:

- *Pull out* factor, when girls do not attend school because of menstrual pain or family/cultural expectations to stay home, or where menarche leads to early sex, pregnancy, and/or marriage; and a
- *Push out* factor, whereby girls avoid or miss school because of inadequate facilities to manage their menstruation.

It is in the latter case that facilities at school (specifically separate toilets for girls) may reduce absenteeism. We did not identify any studies that showed an impact of separate toilets on menstrual management (and consequently kept girls in school). However, two studies claimed benefits of their WASH intervention. In the evaluation of SSHE in Kerala, India, girls in the control schools were more likely than girls in the intervention schools to report problems using facilities during menstrual periods (52% vs 25%, $p<0.001$), although the specific nature of those problems was not mentioned. And, in the six-country pilot study of UNICEF's SSHE,

one country reported that 'girls, who used to be absent during their menstrual period, seem to show improved school attendance.' The authors continue, 'However, hard data was not available. This deserves better study in the future' (UNICEF/IRC 2006).

3.3.2 The general state of school toilets for girls

As a whole, the studies we read painted a dire picture of the state of school toilet facilities. UNICEF's claim that there is a 'lack of gender-appropriate sanitation in schools' is no doubt accurate (UNICEF 2005). However, many schools seem to lack any adequate facilities at all. And even where separate toilets are provided for girls, their conditions often deem them unusable. In their comparison of high- and low-performing schools in Kenya, for example, Mensch and colleagues conclude: 'toilet facilities are equally inadequate in both groups. Many are neither clean, functional, nor secure from observation' (Mensch and Lloyd 1998)

While we did not propose to review studies describing the provision and conditions of school toilets, we provide examples below of how those issues are addressed in the studies we coded on full-text.

In terms of toilet provision, we encountered ratios such as those summarised in Table 3.2, where one toilet could be shared by 386 students in Ethiopia, and by 800 students in Senegal. And it was not uncommon for authors to report schools with no toilets at all. Some authors worried that the introduction of Universal Primary Education (MDG Goal 2) may exacerbate these conditions, by increasing the number of pupils but not toilet provision.

In Table 3.2, examples of actual ratios observed in studies are followed by a range of national standards, for comparison. For example, in Sweden, students are not expected to share a toilet with more than 14 other students. We were not able to find information on how common it is for schools to provide separate toilets for girls.

Table 3.2 Provision of toilets in schools

Author, Year	Setting	Ratio of toilets to pupils
Examples reported in studies		
Abrahams 2002	Malawi	1 : >100
Ngales 2007	Rural Ethiopia (Benishangul-Gumuz Regional State)	Range 1 : 46 to 1: 386 and some schools with no latrine
Koopman 1978	Cali, Colombia	1 : 41 [girls] 1 : 60 [boys]
Water and Sanitation Program Field Note 2007	Dakar, Senegal	Median 1 : 85 pupils Max 1 : 800 pupils

National standards		
Vernon et al. 2003	National standard for schools in England	1 : 20 pupils (> 5 years)
	National standard for schools in Sweden	1 : 15 pupils (>5 years)
UNICEF/IRC 2006 (Ministry of Education 'norms')	Colombia	1: 25 pupils
	Nepal	1 urinal : 40 pupils 1 toilet : 100 pupils
	Viet Nam	1 latrine for 100–200 (due to double school sessions each day)
	Zambia	1 : 40 [boys] 1 : 25 [girls]
WHO	WHO recommendation	1 : 30 pupils

Even where toilets are provided, studies show they are often left unused due to their condition. For example, a qualitative study in Dakar, Senegal, concluded that, 'Although most schools had some sort of sanitary facilities, they were often not functional, and many could not be used (e.g. no door, some fouled with several days' excreta, could not be flushed, appropriated by teachers)' (WSP Field Note 2007). Table 3.3 lists examples of the conditions of toilets in various studies from this review. Some of the factors impeding girls' use of toilets included the following:

- *Hygiene*. School observations often reported problems with toilets not being clean (e.g. major traces of fecal material). Some authors noted that, in this aspect, schools may actually pose a risk of infection to students (e.g. unclean toilets may provide more opportunities for hand contamination than no toilets at all). In many settings, children were often responsible for the cleaning, especially girls (Abrahams 2002), and this is often viewed as punishment, and not done very well. In many other schools, no maintenance is carried out at all. In a number of settings, better maintenance and cleanliness were associated with higher toilet use (Mathew et al. 2009, Njuguna et al. 2009).
- *Privacy*. The qualitative work in Dakar, Senegal, highlighted the importance of privacy, where boys and girls must share toilets: 'The lack of separate toilets causes great shame amongst girls and boys… The lack of privacy means that pupils would be aware of defecation activities, which is very shameful amongst children. This forces many pupils to wait until they return home before relieving themselves. Gender interactions among pupils, even at a young age, are very important and need to be taken more seriously,' (WSP Field Note 2007).
- *Privacy from other girls*. Even where separate toilets were provided for girls, and/or where toilets were well-used and maintained, girls noted their

discomfort where there was no privacy from other girls, e.g. for urination or menstrual management (UNICEF/IRC 2006, McPhedran et al. 2010).

- *Security*. In a number of studies, both boys and girls mentioned incidents of harassment, pushing and physical abuse in toilets, and cited fear as a reason for not using the toilets (Vernon et al. 2003, WSP Field Note 2007).
- *Comfort*. In a survey of adolescent girls in three town of Ethiopia, most (94%) said their school had a girls' latrine, however, only 55% were comfortable using the latrine. The main reasons for feeling uncomfortable about using the school latrine were: the girls were not used to using a latrine, it smelled bad, and it was not private. Girls also avoided using the toilet because it was crowded, dirty or scary (e.g. too dark), and because of the presence of flies.

Table 3.3 Examples of conditions of toilets in schools, as reported in a range of studies

Author(s), Year	Setting	Purpose and methods	Participants	Key findings	Examples/descriptions
Abrahams 2002	Malawi	Field observations during a review of the Malawi school sanitation and hygiene promotion project (SSHP).	Researcher observations.	In many cases, the facilities were poorly constructed, unsafe, vandalised and in poor sanitary condition.	'Naturally children, particularly young and disabled children, do not use these facilities and therefore revert to open defecation. Girls travel to neighbouring households to use the sanitation facilities, as well as up to a kilometre, two or three times a day, to fetch water.'
Ngales 2007	Rural Ethiopia (Benishangul-Gumuz Regional State)	Two-month study to assess all dimensions of hygiene and sanitation in sampled schools, to inform recommendations for improvement.	304 participants (age, gender, etc., not specified) in 32 sample schools.	Gender is not considered during latrine construction and maintenance. Although most schools nominally separate male, female and teachers' facilities, male students often ignore the signs. Concerns about privacy overwhelmingly affect girls and women, yet they play no part in the planning or design of school latrines.	'In many of the schools studied, the latrines are situated badly, such as close to a public road or to the classrooms, and in the majority of cases, the door is missing or broken.' (Authors) 'The flush toilets were new to me. Nobody taught us how to use them. As you can see most of them are broken even if they are newly constructed… We were told to use only tissue paper, which I cannot afford to buy.' (Gumuz girl, aged 18)

Author(s), Year	Setting	Purpose and methods	Participants	Key findings	Examples/descriptions
Mathew et. al. 2009	Kerala, India	To investigate the impact and sustainability of school interventions for water, sanitation and hygiene education.	569 small group interviews with children.	Many students, particularly boys, practised open-air defecation/urination. Better maintenance and cleanliness was associated with higher toilet use.	'Children repeatedly said that they need doors and latches for the toilets, and inside they need a bucket, mug and soap... Urinals need a roof, a sloping floor for drainage and running water.' (Authors)
McPhedran et al. 2010	Dowa District, Malawi	To assess the impact of school sanitation on adolescent girls in primary schools within Dowa District, Malawi.	Females aged 14 (in standards 7 and 8), in focus group discussions.	Older girls do not use the new girls' urinals, especially during menstruation, because the facilities are shared with younger girls and there is no privacy.	'In order to manage menstruation, we need privacy from both boys and younger girls. We need water, buckets and sanitary pads. We change our menstrual clothes at home as there are no facilities at school.' (standard 7 female)
Mensch and Lloyd 1998	Rural Kenya	To provide an in-depth look at the school environment and the ways it potentially can help or hinder adolescents.	1963 students in standards 7 and 8, in 36 primary schools.	Toilet facilities generally inadequate across a range of schools: many neither clean, nor functional, nor secure from observation.	'The toilets of this school are in a state of disrepair. The boys stand at the door and urinate while the girls are forced to go in. The wooden planks (the floor) look like they could give way any time.' (high-performing school) 'They have now completed a new toilet for boys because they're mischievous to girls in or near the toilet... Boys are "cheeky" with the girls close to the toilet.' (low-performing school)
Vernon et al. 2003	Newcastle upon Tyne, UK and Sweden	Survey to ascertain why children and parents frequently describe problems	Pupils aged 9–11 years in the UK (-=394) and Sweden	All school toilets cleaned once daily, but became dirtier as the day progressed (e.g. unflushed	Most children found school toilets unpleasant, dirty, and smelly, with no significant differences between

Author(s), Year	Setting	Purpose and methods	Participants	Key findings	Examples/descriptions
		with school toilets.	(N=157).	toilets). 62% of boys and 35% of girls in the UK avoided using the school toilet; 28% of boys and girls in Swedish site avoided using school toilet to defecate.	sexes in either country. Pupils described bullying including 'pushing, shoving, physical abuse and trying to kick the toilet door open while on the toilet' and 'they shove your head in the toilet bowl' (also described as being 'baptised').
Visscher et al.1996	40 highland communities in Ecuador	Participatory evaluation of the water supply and sanitation conditions in communities.	Schoolchildren aged between 10 and 12 years.	'With inadequate treatment and poor chlorination, the water [in schools] presents a considerable health risk.' 'If repairs are needed, the onus is on the parents who are also supposed to cover the costs.'	'I just go behind school, I don't use the latrine -- it's horrible! It smells and it's dirty. And you have to go a long way to fetch the water to flush it.' (girl participant) 'I just use the bush, because sometimes you can't wait, so you just sit down.' (Child participant)
WSP Field Note 2007	Dakar, Senegal	Formative research (through structured and checklist observations and diaries) was conducted to understand hygiene behaviour once facilities were in place in schools.	Primary school students	The research revealed a wide range of reasons why pupils avoid school toilets. They are associated with immorality and danger, including the presence of snakes, filth, sexual experiences, rapes and drug exchange. A major concern was to avoid the disgust and embarrassment of stepping on faeces.	'Children used many negative words to describe their experience of using school toilets, such as "going to war". They also compared it to their fear of exams.' (authors) 'During the drawing sessions the pupils revealed that it was shameful to ask for toilet paper in front of the whole class before going to the toilet. Hence the children resorted to using their underpants in place of toilet paper.' (Authors)

4. Conclusions and recommendations

4.1 Key findings

The primary aim of this systematic review was to identify and synthesise evidence of the impact of separate toilets for girls on their enrolment and attendance in schools. We did not identify any studies that were designed to assess the impact of separate-sex toilets. And while we identified some evaluations of school-based WASH programmes that included separate toilets for girls, the impact of separate toilets on girls' educational outcomes could not be assessed for at least one of the following reasons:

- All schools in the study had separate-sex toilets, thus precluding a comparison with other arrangements, such as shared toilets or no toilets.
- All schools in the study had shared toilets.
- The educational outcomes were not disaggregated by sex.
- As part of a broader, complex WASH intervention, the relative effects of single components, such as the separate-sex toilets, could not be distinguished.

Thus, in the absence of identified studies in this area, we did not find evidence either for or against the impact of separate toilets for girls on their educational outcomes (equipoise). To understand why this question has not been studied, we posed the following scenarios to the project advisors:

- Is this area of research missing a gender lens? (e.g. would that explain the lack of sex-separated data?)
- Is there inadequate research capacity in this field?
- Is the question not considered important, or relevant to practice?
- Or: 'we already know, and don't need research studies to tell us' that separate toilets benefit girls' education?

The project advisors suggested that all of these possibilities may apply, to an extent. For example, the lack of sex-disaggregated data (with regard to school toilets as well as health and educational outcomes) may stem from a lack of gender awareness in the field of hygiene and sanitation. Also, it was acknowledged that there is a lack of research capacity, particularly for designing and implementing rigorous evaluations that can measure the effects of different components of comprehensive interventions. Collaboration between governments, NGOs and researchers with evaluation expertise would help generate empirical evidence and build research capacity, but such collaborations are rare (in this and other fields).

4.2 Strengths and limitations of the review

The review benefited from a broad, systematic search to ensure we identified as many relevant studies as possible. This was complemented by the active involvement of project advisors, who helped to inform the research questions and protocol, identify studies that were either underway or not published in academic journals, and reflect on the findings and implications. Contact with authors also helped to ensure relevant, unpublished data were identified. However, due to limited time and resources a number of studies –

particularly in languages other than English – could not be obtained, and it is possible that important studies were missed as a result.

4.3 Priorities for future research

While the review question was considered to be important, 'practitioner wisdom', or field experience, has already convinced many of those in the sector that providing separate toilets for girls is not only the right thing to do, from a human rights' perspective, but because it facilitates girls' educational experience. How much priority is placed on this may depend on whether there is an opportunity cost of investing in separate toilets. For example, if separate toilets are no more expensive than shared toilets, then one could easily argue for the former. However, if it is more expensive to provide separate toilets and could result in less funding for other intervention measures (e.g. school books), therefore it is worth investing in further evaluation of the impact of separate toilets on educational outcomes.

However, the Advisory Team agreed it would be helpful first to step back from the specific question of separate toilets, to understand the following:

- Are there *enough* toilets in schools (what is the provision)?
- And are the conditions of toilets *good enough* (what is the quality)?

The former would ensure adequate *access* for both boys and girls. Findings from studies identified in this review suggest that access is largely inadequate in most schools – a situation being exacerbated by expansion of the primary system in many settings. However, the sanitation conditions of most schools in most countries are not well documented or understood. The latter (quality) would help ensure that, where provided, girls and boys *use* the toilets. So, 'enough' and 'good enough' toilets may be more important than separate toilets. On the other hand, gender separation can potentially influence girls' access and usage of toilets, and may be necessary for both.

Further understanding of what is meant by a 'separate' toilet, may be needed for going forward in this area. For example, research could help to qualify what constitutes a separate toilet. Is it about the privacy of a toilet, whether gender-segregated or not? Is physical separation essential? If so, are separate stalls adequate, or must boys and girls toilets be provided in separate blocks? Can toilets to be separated by time rather than space; for example, with different 'shifts' for boys and girls? And who defines whether and how toilets are separate? While schools may label toilets as separate, this does not ensure they will be used that way. Examples were cited in Section 3.3 of teachers appropriating student toilets, boys using girls' toilets, and the removal or breakage of physical features – like curtains and doors – designed to separate boys and girls' toilets.

It was also apparent from existing research (in Section 3.3) that, even where provided, the conditions of girls-only toilets meant that girls either could not or chose not to use them. Examples in a range of contexts showed that girls were less likely to use toilets that were not secure or clean or functional or private (from other girls as well as boys); or where girls were unfamiliar with a new type of latrine; or where amenities like water, soap, toilet paper and supplies for menstrual management were not provided. Thus, while gender separation may be a necessary component of acceptability to girls, it is not sufficient. Older girls in particular may also require privacy from other girls, especially younger girls, as well as sanitary supplies, clean water, and menstrual hygiene education (Sommer 2009).

Future research can more clearly define the determinants of girls' acceptability and use of school toilets, including the nature and role of separation from boys, at different ages and stages of development, and in different contexts. This can help inform the implementation and uptake of programmes, since toilets can only benefit girls' educational outcomes if girls are actually using them.

4.4 Specific recommendations for future research

The authors, in conjunction with the project advisors, developed a number of specific recommendations to strengthen the evidence base in this area. These include opportunities to learn from existing resources and efforts, as well as new research.

4.4.1 Learning from existing resources

- It would be useful to conduct a 'review of reviews' to better understand the causes of poor educational attainment, absenteeism and drop-out for girls, at different ages and stages of development. In particular: what is the contribution of school WASH conditions and is poor school sanitation an important 'push-out' factor for girls and/or boys?
- The database resulting from this review (5,082 citations) may provide an opportunity to identify studies in related areas, and ask related questions such as: What kinds of programmes have improved menstrual management and hygiene through schools? Is there evidence of an impact of gender-separate toilets in schools in high-income countries (including historical research)? What is known about access to toilets for disabled pupils?

4.4.2 Learning from existing conditions and efforts

- Given how little is known about the provision and conditions of school toilets in general, a lot could be learned from 'surveillance' or 'auditing' of existing school facilities. Yet no such efforts appear to be underway. (Can we learn from EFA (Education for All) monitoring efforts? Or the World Bank initiative around benchmarking of school health and nutrition?)
- It would be useful to map government policies or regulations related to ratios of latrines to pupils, and whether and how toilets should be separated for girls and boys. And to assess how well practice reflects policy (e.g. by comparing school WASH audits with policy mapping).
- It would be useful to document models of best practice in this area, by governmental or non-governmental efforts to improve WASH conditions in schools.
- It would be useful to build strong monitoring and evaluation plans into existing programmes to improve WASH conditions in schools (ideally from the design stage).
- In some cases, large-scale programmes are providing girls-only toilets and supplies for menstrual management in school WASH interventions – for example, in over 3,000 secondary schools in Bangladesh – but not collecting data on attendance, which would allow impact on girls' educational outcomes to be assessed (Kathleen Shordt, personal communication, January 2011). Such programmes could be encouraged to collect absenteeism and drop-out data.

4.4.3 New qualitative research

This would be useful to help explore:

- The meaning and importance of 'separate' toilets. Given that toilets may be separated in different ways, in different settings, what are we trying to measure? And who defines it?
- The value placed on toilets by girls, relative to other aspects of their school. Is there a difference in what girls of different ages consider important and acceptable?

4.4.4 Generating evidence of impact

Since the provision of separate-sex toilets is probably necessary but not sufficient to impact on girls' educational outcomes, the review team felt that the most useful question to answer was Q3 of this review: *Is there evidence that any school-based WASH interventions have an impact on girls' educational outcomes?* The 'SWASH+'[2] study currently underway in Kenya may help to answer this question. However, at least two additional well-designed, cluster-randomised trials are needed to generate sound evidence from different contexts, where cultural and environmental factors differ (e.g. religion and access to water, respectively). For example, multi-site studies in Africa and Asia were suggested. Randomised and controlled trials were considered the most useful design for this question, given the preponderance of potential confounders.

Such studies would investigate whether and how a comprehensive school sanitation and hygiene intervention impacts on both educational outcomes (such as attendance or reduced absence) and health outcomes, including soil-transmitted helminth infection, reduced fecal exposure (viral or bacterial infection), and experiences of harassment and humiliation. More distal outcomes like educational attainment and achievement could require prohibitively large study sizes to detect important effects.

Such an intervention could be delivered as part of a broader school health programme; for example, based on the four pillars of the FRESH framework (described in Section 2.1.1). In such a programme, safe water and sanitation – considered to be essential steps toward a healthy learning environment – would be implemented alongside:

- Skills-based health education;
- School-based health and nutrition services; and
- Health-related school policies.

The specific impact of girls' toilets could be measured by phasing in the sanitation 'hardware' before other components (e.g. education and training, and 'low cost recurring' components like soap, brooms, toilet paper, menstrual supplies), or through a factorial study design.

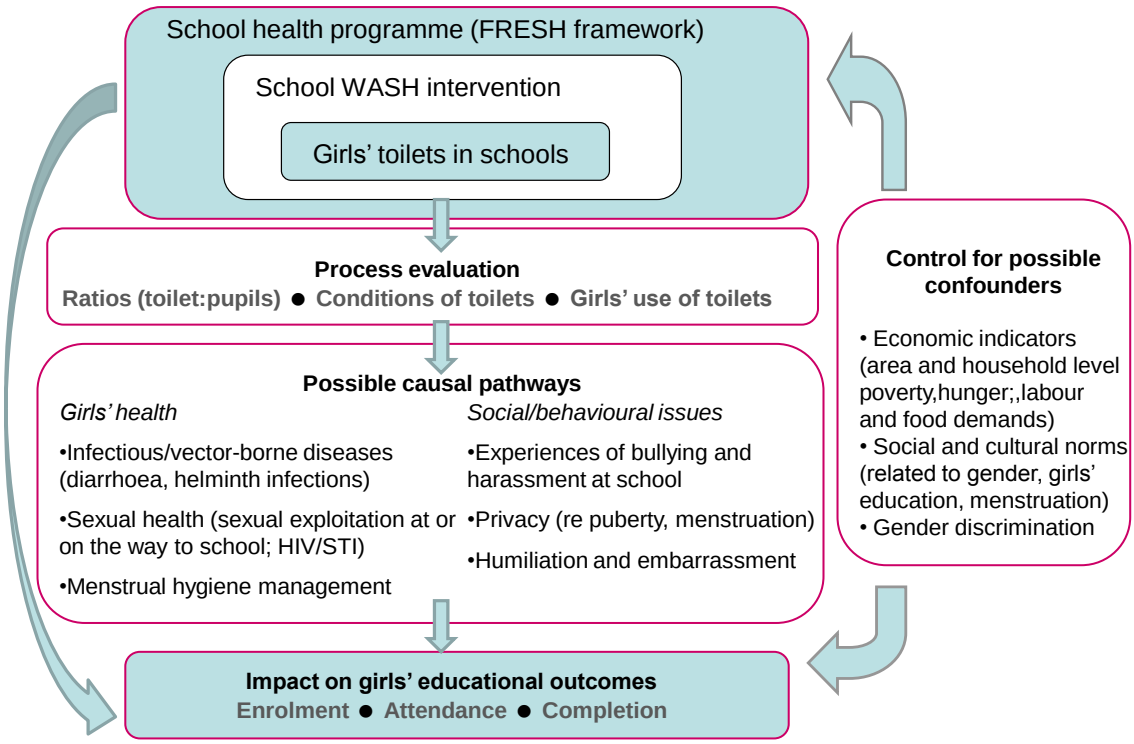
It would also be important to incorporate:

- Process evaluation, to assess changes in toilet provision (ratios) and conditions (whether they are adequate and acceptable), and behavioural change (including the use of toilets by girls and boys); and
- Qualitative research to help explain the mechanism and context of the findings.

[2] www.swashplus.org/

The conceptual framework used to guide this review is revised (in Figure 4.1) to reflect these recommendations, and help guide the planning of future research in this area.

Figure 4.1 Guiding framework for future research



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Appendix 1.1: Authorship of this review

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Conflicts of interest

None of the authors have any financial interests in this review topic. Matt Freeman has been involved in the evaluation of related interventions (school-based water, sanitation and hygiene), with related primary research; however, this work has not addressed the specific question of separate toilets in schools.

Acknowledgements

We are grateful for the encouragement and guidance of the project advisors, the support of our respective institutions and research centres, and insight of our peer reviewers. We appreciate the responsiveness and helpfulness of many authors who responded to requests for relevant research, particularly Sue Caville, and those who provided further details about their studies and datasets. We also acknowledge the input and financial support of the UK Department for International Development, specifically Maxime Gasteen and Nicola Crissel and our Policy Leads Guy Howard and Sanjay Wijesekera.

Appendix 2.1: Generic search terms used to create search strings

WASH interventions	Setting/population	Research methods
Sanitation/facilities	School* (variations of)	Intervention*
Sanitary	Primary	Evaluation*
Hygiene	Secondary	Trial*
Water quality	Elementary	Controlled
Toilets*	Pupil*	Impact
Water closet	Education*	Perception*
Latrine*	Student*	
Privy / Privies	Girl*	
Lavatory/lavatories		
Facilities		
Handwashing		
Soap		
Girl-friendly		

Appendix 2.2: Search strategy for electronic databases

Database / Platform	Date	String	Hits
Pubmed	15 July 2010	((pupils[TIAB] OR pupil[TIAB] OR student[TIAB] OR students[TIAB] OR schoolchildren[tiab] OR schoolchild[tiab] OR schoolgirls[tiab] OR schoolgirl[tiab]) OR (children[TIAB] OR child[TIAB] OR girl[TIAB] OR girls[TIAB] AND (education[TIAB])) OR ((schools[MeSH Terms:noexp]) OR (students[MeSH Terms:noexp]) OR (colleges[TIAB]) OR (college[TIAB]) OR (schools[TIAB]) OR (school[TIAB]) OR (educational institution[TIAB]) OR (educational institutions[TIAB]) OR (educational establishment[TIAB]) OR (educational establishments[TIAB]) OR (educational facilities[TIAB]) OR (educational facility[TIAB]))) AND (toilet facilities[MeSH Terms] OR (toileting[tiab]) OR (bathroom facilities[tiab]) OR (hand-washing[tiab]) OR (toilet*[tiab]) OR (toilet[tiab] OR toilets[tiab]) OR (latrine[tiab] OR latrines[tiab]) OR (privy[tiab] OR privies[tiab]) OR (water closet[tiab]) OR (lavatory[tiab] OR lavatories[tiab]) OR (water closets[tiab]) OR (handwashing[tiab]) OR (handwash[tiab]) OR ((sanitary[tiab] OR sanitation[tiab] OR hygienic[tiab] OR hygiene[tiab]) AND (facilities[tiab] OR facility[tiab])) OR girl-friendly[tiab])	850

ERIC via CSA	15 July 2010	((KW=toilet*) or(KW=(privy or privies)) or(KW=(lavatory or lavatories)) or(KW=latrine*) or(KW=(girl friendly)) or(KW=(hand washing)) or(KW=soap) or(KW=(water closet)) or(KW=sanitation) or(KW=(sanitary facilities)) or(KW=hygiene)) and((DE=("community schools" or "day schools" or "elementary schools" or "nursery schools" or "public schools" or "rural schools" or "secondary schools" or "slum schools" or "small schools" or "state schools" or "suburban schools" or "traditional schools" or "urban schools")) or(DE=("elementary secondary education" or "access to education")) or(DE=("elementary school students" or "secondary school students")))	503
SSCI	15 July 2010	(Topic=(sanitary OR sanitation OR hygienic OR hygiene) AND Topic=(facilities OR facility)) OR (Topic=(toileting OR bathroom facilities OR hand-washing OR toilet OR toilets OR latrine OR latrines OR privy OR privies OR water closet OR lavatory OR lavatories OR water closets OR handwashing OR handwash OR girl-friendly) AND Topic=(pupils OR pupil OR student OR students OR schoolchildren OR schoolchild OR colleges OR college OR schools OR school OR educational institution OR educational institutions OR educational establishment OR educational establishments OR educational facilities OR educational facility) OR Topic=(children OR child OR girl OR girls) AND Topic=(education) OR Topic=(schoolgirls) OR Topic=(schoolgirl)	623

IBSS	5 August	TX toilet* or latrine* or privy* or bathroom* or sanitation* or hygien* or 'girl-friendly* or *aemoglo* or hand washing or water closet* or water quality or aemoglob* or ((DE "Sanitation") or (DE "Water quality")) or (DE "Hygiene") AND TX pupils OR pupil OR student OR students OR schoolchildren OR schoolchild OR colleges OR college OR schools OR school OR educational institution OR educational institutions OR educational establishment OR educational establishments OR educational facilities OR educational facility OR girl OR girls AND education OR schoolgirls OR schoolgirl	443
LILACS	24 August 2010	"TOILETS" or "HANDWASHING" or "HANDWASHING/" or "TOILET facilities" or "flush TOILETs" or "TOILET facilities" or "SANITATION" or "basic SANITATION" or "school SANITATION" or "personal HYGIENE" [Subject descriptor] or toileting OR bathroom facilities OR hand-washing OR toilet OR toilets OR latrine OR latrines OR privy OR privies OR water closet OR lavatory OR lavatories OR water closets OR handwashing OR handwash OR girl-friendly OR latrina OR letrina OR toalete OR banho OR banheiro OR lavabo OR lavatoria [Words] and pupils OR pupil OR student OR students OR schoolchildren OR schoolchild OR colleges OR college OR schools OR school OR educational institution OR educational institutions OR educational establishment OR educational establishments OR educational facilities OR educational facility OR children OR child OR girl OR girls OR schoolgirl OR schoolgirls [Words]	272
Adolec	24 August 2010	"TOILET FACILITIES/" or "HANDWASHING/" or "SANITATION/" or "TOILETING" or "TOILET" or "LATRINE" or "LATRINES/" [Subject descriptor] or toileting OR bathroom facilities OR hand-washing OR toilet OR toilets OR latrine OR latrines OR privy OR privies OR water closet OR lavatory OR lavatories OR water closets OR handwashing OR handwash OR girl-friendly OR latrina OR letrina OR toalete OR banho OR banheiro OR lavabo OR lavatoria	138

Medcarib	24 August 2010	“TOILET FACILITIES/” or “HANDWASHING/” or “SANITATION/” or “TOILETING” or “TOILET” or “LATRINE” or “LATRINES/” [Subject descriptor] or toileting OR bathroom facilities OR hand-washing OR toilet OR toilets OR latrine OR latrines OR privy OR privies OR water closet OR lavatory OR lavatories OR water closets OR handwashing OR handwash OR girl-friendly OR latrina OR letrina OR toalete OR banho OR banheiro OR lavabo OR lavatoria [Words]	116
REPIDISCA	24 August 2010	handwashing OR “school sanitation” or “LATRINES” or “LATRINES (ENVIRONMENTAL HEALTH)” or “LATRINES (ENVIRONMENTAL HEALTH)/” or “LATRINES/” or “TOILET” or “TOILET FACILITIES” or “TOILET FACILITIES/” [Subject descriptor] or toileting OR bathroom facilities OR hand-washing OR toilet OR toilets OR latrine OR latrines OR privy OR privies OR water closet OR lavatory OR lavatories OR water closets OR handwashing OR handwash OR girl-friendly OR latrina OR letrina OR toalete OR banho OR banheiro OR lavabo OR lavatoria [Words] and pupils OR pupil OR student OR students OR schoolchildren OR schoolchild OR colleges OR college OR schools OR school OR educational institution OR educational institutions OR educational establishment OR educational establishments OR educational facilities OR educational facility OR children OR child OR girl OR girls OR schoolgirl OR schoolgirls [Words]	288
PAHO	24 August 2010	(“TOILETS” or “HANDWASHING” or “HANDWASHING/” or “TOILET facilities” or “flush TOILETs” or “TOILET facilities” or “SANITATION” or “basic SANITATION”) or “HYGIENE” [Subject descriptor] or toileting OR bathroom facilities OR hand-washing OR toilet OR toilets OR latrine OR latrines OR privy OR privies OR water closet OR lavatory OR lavatories OR water closets OR handwashing OR handwash OR girl-friendly OR latrina OR letrina OR toalete OR banho OR banheiro OR lavabo OR lavatoria [Words] and pupils OR pupil OR student OR students OR schoolchildren OR schoolchild OR colleges OR college OR schools OR school OR educational institution OR educational institutions OR educational establishment OR educational establishments OR educational facilities OR educational facility OR children OR child OR girl OR girls OR schoolgirl OR schoolgirls [Words]	77

WHOLIS		(“TOILETS” or “HANDWASHING” or “HANDWASHING/” or “TOILET facilities” or “flush TOILETs” or “TOILET facilities” or “SANITATION” or “basic SANITATION”) or “HYGIENE” [Subject descriptor] or toileting OR bathroom facilities OR hand-washing OR toilet OR toilets OR latrine OR latrines OR privy OR privies OR water closet OR lavatory OR lavatories OR water closets OR handwashing OR handwash OR girl-friendly OR latrina OR letrina OR toalete OR banho OR banheiro OR lavabo OR lavatoria [Words] and pupils OR pupil OR student OR students OR schoolchildren OR schoolchild OR colleges OR college OR schools OR school OR educational institution OR educational institutions OR educational establishment OR educational establishments OR educational facilities OR educational facility OR children OR child OR girl OR girls OR schoolgirl OR schoolgirls [Words]	40
Global Health	7 October 2011	toilet facilities OR toileting OR bathroom facilities OR toilet OR toilet* OR latrine OR latrines OR privy OR privies OR water closet OR lavatory OR lavatories OR water closets OR handwash* OR sanitary OR sanitation OR girl-friendly OR facility OR facilities AND pupil* OR student* OR schoolchild* OR schoolgirl* OR child* OR girl* AND School* OR educational institution* OR educational establishment* OR educational facilit*	2385

Appendix 2.3: The 'Request for relevant research' issued via email

Dear colleague,

We would like to share with you a new research project, and a way in which we would like you to be involved.

With funding and guidance from DFID, we are working together to conduct a systematic review to answer the following question:

"What impact does the provision of separate toilets for girls at schools have on their enrolment, attendance and completion of primary and secondary schooling?"

We would like to ask your help identifying relevant research to include in the review. In particular, if you know of studies (published or unpublished) that have assessed the impact of either:

separate sex toilets; or

other school-based WASH interventions

on girls' health or educational outcomes, please forward any documents or details to wash.review@lshtm.ac.uk

We would also be interested to receive any photographs showing what separate toilets look like in schools around the world.

With are grateful for your help to ensure we capture all evidence that is available. Please also let us know if you would like to receive a copy of the final report when it is available.

Yours sincerely,

Isolde Birdthistle, Oona Campbell and Sandy Cairncross (London School of Hygiene and Tropical Medicine, UK)

Kelly Dickson (Institute of Education, UK)

Matt Freeman and Rick Rheingans (Emory University Center for Global Safe Water)

Seung Lee (Save the Children)

Murat Sahin (UNICEF)

Appendix 2.4: Sample request for additional data about separate toilets for girls

Dear Marielle Snel,

We have read with interest your study published in *Waterlines*, 2009 ('The sustainability and impact of school sanitation, water and hygiene education in southern India). We believe it may be helpful for a systematic review we are conducting with funding from the UK Department for International Development.

The systematic review aims to answer the following question:

"What impact does the provision of **separate toilets for girls** at schools have on their enrolment, attendance and completion of primary and secondary schooling?"

We see you have collected information about boys and girls toilets (e.g., the pupil:latrine ratio) and would be interested to see whether it is possible to assess the impact of having separate toilets for girls. For example, is it possible to know whether the educational and/or behavioural outcomes you measured differed in schools with separate sex toilets compared to those with either shared or no toilets? If so, would you be willing to share these data? As an example, we have prepared dummy tables that would be helpful in answering the study question (see attached). To be included in the review, we would need to receive data by 18 January 2011.

With are grateful for your consideration of this request, and look forward to hearing from you soon.

Yours sincerely,

Isolde Birdthistle, Leila Javidi, Oona Campbell (MARCH Ctr, London School of Hygiene and Tropical Medicine, UK)

– working in partnership with the SHARE Consortium (LSHTM), the Institute of Education UK, Save the Children, and UNICEF

Data request for DFID systematic review, for evidence of an impact of separate-sex toilets on:

any *educational* outcomes for girls (e.g., absenteeism, enrolment, completion, performance); and/or

any *health* or *social* outcomes for girls (e.g., illness, infection, humiliation, menstrual hygiene, harassment, violence).

		EXAMPLE OUTCOMES: At school or individual level		Measure of association (w/ confidence interval) Or test for significance
		GIRLS' EDUCATION=WORSE (Absenteeism = less Enrolment = less Completion = less)	GIRLS' EDUCATION=BETTER (Absenteeism = more Enrolment = more Completion = more)	
INTERVENTION or existing conditions at school	School toilets = separate-sex	(n)	(n)	
	vs School toilets = shared boys and girls	(n)	(n)	
	or vs No school toilets	(n)	(n)	

		EXAMPLE OUTCOMES: At school or individual level		Measure of association (w/ confidence interval) Or test for significance
		Any girls' health /social outcome=WORSE	Any girls' health / social outcome=BETTER	
INTERVENTION or existing conditions at school	School toilets = separate-sex	(n)	(n)	
	vs School toilets = shared boys and girls	(n)	(n)	
	or vs No school toilets	(n)	(n)	

Appendix 2.5: Coding tool

Section one: Administrative details	
1.1 What is the status of the paper? *Please use one code only*	1.1.1 Peer reviewed journal article 1.1.2 Book/book chapter 1.1.3 Published report or conference papers *(e.g. reports for WHO, IRC, or papers presented at conferences, e.g. newsletter summaries and other webpages)* 1.1.4 Unpublished *e.g. thesis or author manuscripts*
Section two: Study aims and method	
2.1 What is the purpose of the study? *Please indicate what the purpose of the study is. For example; code as:* *2.1 – to evaluate the outcome of an intervention / programme – if the study measures effectiveness – i.e. the impact of a specific intervention or programme on a defined sample of recipients or subjects of the programme or intervention.* *2.2 – to evaluate the delivery of an intervention/programme – if the study explores the relationships between variables – Please use this code for a study type which examines relationships and/or statistical associations between variables in order to build theories and develop hypotheses. These studies may describe a process or processes (what goes on) in order to explore how a particular state of affairs might be produced, maintained and changed. These relationships/associations may be discovered using qualitative techniques, and/or statistical analyses.*	2.1.1 to evaluate the outcome of an intervention/programme (effectiveness) 2.1.2 to evaluate the delivery of an intervention/programme (process) 2.1.3 to explore the relationships/associations between variables (observational)
2.2 What is the method used in the study? *2.2.1 =Please use this code if the outcome evaluation employed the design of a randomised controlled trial. E.g. (i) compare two or more groups which receive different interventions or different intensities/levels of an intervention with each other; and/or with a group which does not receive any intervention at all. AND (ii) allocate participants (individuals, groups, classes, schools) or sequences to the different groups based on a fully random schedule (e.g. a random numbers table is used). If the report states that random allocation was used and no further information is given then please keyword as RCT. If the*	2.2.1 Experiment with random allocation to groups (randomised controlled trial, cluster-randomised trial) 2.2.2 Experiment with non-random allocation to groups (quasi random/controlled trial) 2.2.3 One group pre- and post-test (e.g. before and after the intervention) 2.2.4 One group post-test only (e.g. no baseline data)

allocation is NOT fully randomised (e.g. allocation by alternate numbers by date of birth) then please keyword as a non-randomised controlled trial *2.2.2 =Please use this code if the evaluation compared two or more groups which receive different interventions, or different intensities/levels of an intervention to each other and/or with a group which does not receive any intervention at all BUT DOES NOT allocate or sequences in a fully random manner. This keyword should be used for studies which describe groups being allocated using a quasi-random method (e.g. allocation by alternate numbers or by date of birth) or other non-random method.* *2.2.3 =Please use this code where a group of subjects e.g. a class of schoolchildren is tested on outcome of interest before being given an intervention which is being evaluated. After receiving the intervention the same test is administered again to the same subjects. The outcome is the difference between the pre- and post-test scores of the subjects.* *2.2.4 =Please use this code where one group of subjects is tested on outcome of interest after receiving the intervention which is being evaluated.* *2.2.5 =Please use this code where researchers prospectively study a sample (e.g. learners), collect data on the different aspects of policies or practices experienced by members of the sample (e.g. teaching methods, class sizes), look forward in time to measure their later outcomes (e.g. achievement) and relate the experiences to the outcomes achieved. The purpose is to assess the effect of the different experiences on outcomes.* *2.2.6 =Please use this code where researchers compare two or more groups of individuals on the basis of their current situation (e.g. 16-year-old pupils with high current educational performance compared to those with average educational performance), and look back in time to examine the statistical association with different policies or practices which they have experienced (e.g. class size; attendance at single-sex or mixed-sex schools; non school activities).* *2.2.7 =Please use this code where researchers have used a survey to collect quantitative data about items in a sample or population.* *2.2.8 =Please use this code where the researchers try to understand phenomenon from the point of the 'worldview' of a particular, group, culture or society. In these studies there is attention to subjective*	2.2.5 Cohort study (observation, no intervention/programme) 2.2.6 Case-control study 2.2.7 Cross-sectional study (e.g. survey for quantitative data) 2.2.8 Views study (please specify) 2.2.8 .1 Questionnaires 2.2.8 .2 Interviews (semi/open ended) 2.2.8 .3 Focus groups 2.2.8 .4 Group work (e.g. activities used to identify people's views/experiences/opinions) 2.2.9 Case study (provide detail) 2.2.10 Secondary data analysis (provide detail)

meaning, perspectives and experience. *2.2.9 =Please use this code when researchers refer specifically to their design/approach as a 'case study'. Where possible further information about the methods used in the case study should be coded.* *2.2.10 =Please use this code where researchers have used data from a pre-existing dataset to answer their 'new' research question.*	
Section three: Population focus	
3.1 Which country are the population sampled from? Tick all that apply – if country not on the list please add	Low, lower middle, and middle income countries See list on EPPI-Reviewer 3.1.1 Lower middle-income countries – see checklist on EPPI-Reviewer 3.2.1 Upper middle-income countries – see checklist on EPPI-Reviewer
3.2 What ages are covered by the actual sample? *Please give the numbers of the sample that fall within each of the given categories. If necessary refer to a page number in the report (e.g. for a useful table).If more than one group is being compared, please describe for each group. If follow-up study, age of entry to the study*	3.2.1 Details
3.3 What is the sex of the participants? *Please provide details of the sex of participants included in the study* *Not mutually exclusive - tick all the apply*	3.3.1 Mixed sample (boys and girls) 3.3.2 Girls only 3.3.3 Boys only 3.3.4 Adults (male or female)
Section four: Description of toilet intervention, provision, experience *The aim of this section is to identify what the studies are focusing on in terms of the provision of toilets.*	
4.1 What type of toilet intervention, provision, and/or experience is described in the study? *Please indicate what type of intervention or program is being investigated. Tick all that apply*	4.1.1 Separate toilets 4.1.2 Shared toilets 4.1.3 Toilets not specified if separate or shared 4.1.4 Other toilet provisions (e.g. handwashing, menstrual management, quality of toilet) 4.1.5 Hygiene education related to toilets
4.2 What are the comparisons?	4.2.1 Separate vs shared toilets 4.2.2 Separate vs no toilets 4.2.3 Toilets vs no toilets (not specified if

	separate) 4.2.4 'Girl-friendly' toilets with menstrual supplies vs separate toilets without supplies, etc. 4.2.5 Received hygiene education vs did not receive 4.2.6 Same group before and after WASH intervention/WASH education
Section five: Outcomes reported	
5.1 Which *educational* outcomes did the study report? *Always code each outcome reported in the study whether mixed or single-sex. Tick child code when reported for girls only.*	Enrolment 5.1.1 Enrolment: reported separately for girls? (tick if yes) 5.1.2 Absenteeism 5.1.2.1 Absenteeism: reported separately for girls? (tick if yes) 5.1.3 Attendance 5.1.3.1 Attendance: reported separately for girls? (tick if yes) 5.1.4 Completion 5.1.4.1 Completion: reported separately for girls? (tick if yes) 5.1.6 Performance in school 5.1.6.1 Performance: reported separately for girls? (tick if yes) 5.1.7 Other
5.2 Which *health* outcomes did the study report?	5.2.1 Add detail (please add category) 5.2.1.1 Category: reported separately for girls? (tick if yes)
5.3 Which social/emotional outcomes did the study report?	5.3.1 Dignity 5.3.2 Humiliation/embarrassment 5.3.3 Harassment 5.3.4 Stigma 5.3.5 Other (please add category)
5.4 What *process* outcomes did the study report? (e.g. change in the use, conditions, number of toilets)	5.4.1 Change in the usage of toilets 5.4.2 Conditions of toilet 5.4.2.1 Lighting 5.4.2.2 Security 5.4.2.3 Amenities, e.g. toilet paper 5.4.2.4 Privacy 5.4.3 Number of toilets

	5.4.4 Other
5.5 What other outcomes did the study report?	5.5.1 Details (open text box), e.g. cost effectiveness
Section six: Potential review questions	
6.1 Can the study answer the following potential review questions? Tick all that apply	6.1.1 Q1a: Is there any evidence of an impact of providing single-sex toilets on the enrolment, attendance and/or completion of girls' education in primary or secondary schools? (Q1a) 6.1.2 Q1b: Is there evidence of associations between separate toilets and girls' educational outcomes? 6.1.3 Q2a.What is the impact of separate toilets on girls' health? 6.1.4 For those health factors shown to be influenced by separate toilets, is there any evidence of their impact on girls' educational outcomes? (Q2b.) 6.1.5 Of factors known to influence girls' educational outcomes (e.g. poverty and gender norms and expectations) which are important determinants of whether schools provide separate toilets for girls? (Q3) 6.1.6 Is there evidence that any school-based WASH interventions have an impact on girls' educational outcomes? (Q4)

Appendix 3.1: Authors' responses to request for separate-sex data (on toilets and/or educational outcomes)

Author(s), Year	Study title	Authors' response
Koopman 1978	'Diarrhea and school toilet hygiene in Cali, Colombia'	Sex-specific data were not collected. Sex-separate facilities were not provided in many of these schools. There were individual toilet doors with common washing facilities.
Njuguna et al.2009	'The sustainability and impact of school sanitation, water and hygiene education in Kenya'	Data were made available for further analysis. The authors also noted that all schools in the sample had separate latrines for girls and boys (having been part of a UNICEF programme).
Mensch and Lloyd 1998	'Gender differences in the schooling experiences of adolescents in low-income countries'	Data were made available for further analysis.
O'Reilly et al. 2007	'The impact of a school-based safe water and hygiene programme on knowledge and practices of students and their parents: Nyanza Province, western Kenya.'	Sex-specific absentee data were not available.
Bowen et al. 2007	'A cluster-randomized controlled trial evaluating the effect of a handwashing-promotion program in Chinese primary schools'	Data about separate toilets were not collected. The authors also noted that that the schools almost always had gender-specific toilets.
Wagbatsoma and Aimiuwu 2008	'Sanitary provision and helminthiasis among school children in Benin City, Nigeria'	Data on separate toilets for males and females were not collected, and educational outcomes were not compared for males and females.
Blanton et al. 2010	'Evaluation of the role of school children in the promotion of point-of-use water treatment and handwashing in schools and households – Nyanza Province, western Kenya, 2007'	Did not collect gender specific outcomes.
Mathew et al. 2009	'The sustainability and impact of school sanitation, water and hygiene education in southern India'	No confirmation received.
UNICEF/IRC 2006	'School sanitation and hygiene education results from the assessment of a six-country pilot'	No confirmation received.

Appendix 3.2: Studies assessed to answer review Question 3 (impact of *any* WASH intervention on girls' educational outcomes)

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact on girls' educational outcomes?
Alibhai et al. 2001	To facilitate the adoption of healthy behaviours (hygiene) by involving children in the educational process.	Pakistan, location unclear. Sample size unclear.	Knowledge attitudes and practices survey (before and after), interviews (type not mentioned) with mothers and children, evaluations by teachers, direct observation of behaviours. More specific methods not identified.	Child-to-child training and hygiene education in >100 school.	None.	None listed.
Blanton et al. 2010	To assess uptake and sustained use of water treatment at home.	Nyanza Province, Kenya 2007–08. 666 pupils from grades 4–8 attending public primary school and their parents.	Before and after survey of 17 schools. Absenteeism collected from registry, 2005–08.	Drinking water and handwashing stations, provision of flocculant-disnfectant for point-of-use water treatment, hygiene education for teachers.	None.	26% reduction in absence. No data for girls only.

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact on girls' educational outcomes?
Bowen et al. 2007	To determine whether less intensive, scalable interventions involving hygiene education and soap provision can improve health.	Fujian Province, China; 2003–04. 3962 first-grade students in 90 schools over 10 weeks of follow-up (52,342 pupil-weeks of observation).	Cluster-randomised trial. Random selection and assignment into three study arms. Teacher absence records and teacher interviews with parents to assess illness. Teachers were trained by a pediatrician on 10 symptoms to identify illness.	Arm1: hygiene education at school through teachers' training. 30 schools. Arm 2: hygiene education at school through teacher training + provision of soap + students enlisted as handwashing champions. 30 schools.	Only government-sanctioned hygiene education. 30 schools.	Schools in the expanded intervention (Arm2) reported 42% fewer absences, 54% fewer absence days, 71% fewer in-class illnesses (against controls) Schools in basic hygiene (Arm 1) reported reductions in the above, though not statistically significant. No differentiation by gender.
Kahn et al. 2008	To assess the ability of children to change their own behaviours and serve as change agents as a result of a school sanitation and hygiene education project.	Muzzafarad and Nelum districts, Pakistan.	Case study; descriptive. Overall methods unclear.	School-led total sanitation.	None.	Reported girls increase in enrolment, though data not shown.

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact on girls' educational outcomes?
Mathew et al. 2009	To understand the impact and sustainability of WASH in schools interventions and, secondarily, examine the associations between inputs at the school level conditions and pupil practices.	Kerala State, Allapuzha, Pattanamthitta, and Kottayam districts, India; 2006–07. The intervention took place prior to 2003. 300 (75 in each intervention, 150 in control) primary schools within 50 metres of a water supply facility.	Cross-sectional study. Two intervention districts with one post-intervention control district, chosen for similarities of geography, economics, and socially (not specified). 569 small group interviews with 7,835 children; 764 household visits. Direct observation of school conditions. Semi-structured interviews. Class voting exercise.	District-wide intervention in two districts for one year prior to 2003. 'Software' (training) and 'hardware' (construction of water, sanitation, and handwashing facilities).	Pupils from 150 schools selected as comparisons for the purposes of the study (no a priori random allocation).	Intervention schools had better WASH facilities four years after an intervention. Identified policy of gender-differentiated toilets and evidence of better girl:latrine ratio than boy:latrine ratio. Girls found latrines more convenient to use than boys. 25% of girls in intervention schools had special problems using latrines during menstruation, compared to 50% in control ($p<0.01$). Relationship between these outcomes and educational impact are not reported.
McPhedran et al. 2010	To assess impact of school sanitation on girls' attendance.	Dowa District, Malawi. Six schools.	Retrospective study of six schools. Sanitation survey, questionnaires, interviews and FGDs. School registers.	Three schools received school sanitation intervention by UNICEF (N=3).	Post-intervention comparison (N=3).	Girls' enrolment data shown, but differences could not be attributed to the sanitation intervention. Reported that sanitation

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact on girls' educational outcomes?
						access impacts absence (from pupil FGDs), though the data are severely limited and do not conclusively support this finding. FGDs: some girls reported leaving early or missing school during menstruation.
Ngales 2007	To develop recommendations to improve hygiene and sanitation status of schools by using feedback of all stakeholders.	304 participants (assumed to be female, though not specifically mentioned) in 32 schools; Benishangul-Gumuz Regional State, Ethiopia.	Qualitative research (no mention of methods).	None.	None.	None mentioned.
Njuguna et al. 2009	To understand (i) what makes a programme effective, and (ii) what are the impacts of a WASH-in-schools programme.	100 schools in Nairobi, Mombasa and Kwale District, Kenya. >5000 children either observed or involved in classroom voting. Year: 2007.	Cross-sectional study. Observation of handwashing (N=1,000 pupils), classroom voting (N=4,900 pupils), small group discussion (16 schools).	50 schools provided with 'software' (teacher training) and 'hardware' (construction of water, sanitation, and hygiene facilities) at schools, 2005–07. Inputs provided by UNICEF.	50 schools not provided with infrastructure and 'software' from UNICEF.	When there was water in the toilets, more girls tended to WASH their hands (not for boys). Girls were less-often absent where there was more handwashing ($p<0.043$) and very high toilet (>90%) use ($p<<0.048$). No association for cleanliness of toilets.

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact on girls' educational outcomes?
						Girls in two of 16 small groups mentioned that girls sometimes ask to go home during menstruation.
O'Reilly et al. 2007	To assess differences in pupil absence; impact of a school intervention on household uptake of water treatment and hygiene behaviours.	Nyanza Province, Kenya (2005–06). 753 primary school-age pupils, grades 4–8 (390 at baseline, 363 at follow-up) and their parents.	Before and after survey for intervention; absenteeism analysed retrospectively from school records for attendance. Schools not randomly allocated.	Water treatment technology, handwashing containers, hygiene education for teachers. Nine schools randomly selected from villages	Nine schools prospectively chosen.	Reduction of school absence by 35%. No domain analysis for gender.
Oster and Thornton 2010	To assess the role of menstruation in girls' absence; estimate the impact of provision of menstrual cups in mitigating absence during menstruation.	Chitwan District, Nepal, 2006–08, for one school year. 198 girls in 6th and 7th grades.	Absence due to menstruation: menstrual calendars of girls in control group. Reduction due to menstrual cup provision: individual randomisation and longitudinal follow-up.	99 girls provided with menstrual cups.	101 girls randomly allocated.	A girl is 2.4 percentage points less likely to attend school when she has her period. Menstruation has a small role in girls absence (0.4 days per 180 school days); provision of cups does not reduce that gap ($p<0.01$)

Author(s), Year	Purpose of the study	Setting and sample	Methodology	Intervention(s) provided	Comparison group(s)	Key findings re impact on girls' educational outcomes?
Tadesse and Hagos 2009	To quantify and qualify impacts of a WASH in schools project.	Benishangul Gumuz Woreda, Ethiopia. Three schools. Pupil sample size unclear. Year: 2008.	Descriptive study. Pupil and teacher surveys (type unspecified); unspecified qualitative data collection.	WaterAid constructed water supply schemes and sanitation facilities in proximity to the school.	None.	Only descriptive statistics reporting differences in reported absence; no statistical comparisons conducted.
UNICEF 1994	To assess the impact of sanitation facilities on girls attendance.	Bangladesh, 1993–94. 228 randomly selected schools. Sample size calculated based on assumed latrine quality.	Retrospective survey of WASH conditions and attendance records.	Sanitation and water supply, gender-separate girls latrines.	None.	Overall impact on girls' education; 11% increase in girls' attendance. Reasons for increase are sanitation facilities (reported by teachers), even without hygiene education or improved hygiene practices. However, cannot rule out influence of other, simultaneous government 'schemes' to increase enrolment (including financial support to families of girls).

The authors of this report were supported by the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre).

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This material has been funded by the Department for International Development. However the views expressed do not necessarily reflect the department's official policies. The report was first published in 2011 by:

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ISBN: 978-1-907345-17-3

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