Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ _____

April M. Klein Date

Water, Sanitation, and Hygiene in Emergencies: A Curriculum

By
APRIL M. KLEIN

Master of Public Health
Department of Global Health
Rollins School of Public Health
Emory University

Joanne A. McGriff, MD, MPH
Committee Chair
Department of Global Health
Rollins School of Public Health
Emory University

Lara Martin, MA, MPH
Committee Member
Center for Humanitarian Emergencies
Rollins School of Public Health

Water, Sanitation, and Hygiene in Emergencies: A Curriculum

By
APRIL M. KLEIN

Master of Public Health
Department of Global Health
Rollins School of Public Health
Emory University

Bachelor of Science
Biology
University of Texas at Arlington
2010

Thesis Committee

Joanne A. McGriff, MD, MPH
Committee Chair

Lara Martin, MPH, MA
Committee Member

An abstract submitted to the Faculty of the
Hubert Department of Global Health
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
2018

Abstract

Water, Sanitation, and Hygiene in Emergencies:
A Curriculum

In the wake of natural disasters and complex humanitarian emergencies, nearly half of the affected population's morbidity and mortality can be attributed to poor water and sanitation access and improper hygienic behavior (WASH). Effective and efficient WASH interventions provide life-saving basic needs to communities displaced or disrupted by emergencies. The Rollins School of Public Health offers graduate certificates in both WASH and Complex Humanitarian Emergencies, but there is no focused course which provides fundamental knowledge on the important intersection of these global health issues. The workforce of humanitarians and emergency responders also faces a shortage of technical experts, including from the WASH sector. A curriculum gap analysis and literature review were performed to inform the development of a syllabus and set of educational modules for an intended 'WASH in Emergencies' course. This course is intended to be offered through the Global Health department of the Rollins School of Public Health. Offering this course will contribute to a well-rounded education for students seeking to enter either the emergency response or WASH professional fields. A 'WASH in Emergencies' course is needed to fill the gap in both the current curriculum at the Rollins School of Public Health, and the workforce gap of future emergency WASH responders.

By
APRIL M. KLEIN

Water, Sanitation, and Hygiene in Emergencies: A Curriculum

By
APRIL M. KLEIN

Master of Public Health
Department of Global Health
Rollins School of Public Health
Emory University

Bachelor of Science
Biology
University of Texas at Arlington
2010

Thesis Committee

Joanne A. McGriff, MD, MPH
Committee Chair

Lara Martin, MA, MPH
Committee Member

A thesis submitted to the Faculty of the
Hubert Department of Global Health
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
2018

Acknowledgments

Many individuals have offered their support and guidance throughout the process of this curriculum development. Within the Hubert Department of Global Health, I want to first offer immense thanks to Dr. Joanne A. McGriff, for her patience, kindness, and expert knowledge that guided me through the writing. I must also thank Dr. McGriff for offering me this opportunity in the first place, which through the research process, has provided me with immense knowledge in the field of emergency response as it relates to water and sanitation. I also must acknowledge and thank Lara Martin, an expert humanitarian responder whose presence on my thesis committee provided a fundamental field-level perspective which was needed to pull all of this together. I'd also like to thank Dr. Richard Garfield, who's mentorship throughout the last two years has continued to inspire me to pursue humanitarian response professionally. I must also acknowledge Dr. Christine Moe and Dr. Matt Freeman at the Center for Global Safe Water, whose dedication to and impact in the field of water, sanitation and hygiene have also been critical to my decision to study water and sanitation issues. I also thank my parents, siblings, and friends, for all of their encouragement over the last two years. Finally, I want to thank the entire class of 2018 at Rollins School of Public Health for their collective passion and drive to make this world a better place though service to the health of others, which has certainly fueled my passions as well.

Table of Contents

I. Preface

List of Acronyms

BSHE	Behavioral Science and Health Education
CA	Cluster Approach
CERF	Central Emergency Response Fund
CGSW	Center for Global Safe Water
CHE	Complex Humanitarian Emergency
CLTS	Community-Led Total Sanitation
EH	Environmental Health
ERC	Emergency Response Coordinator
EWARN	Early Warning Alert and Response Network
GH	Global Health
GWC	Global WASH Cluster
HIS	Health Information System
IASC	Inter-Agency Standing Committee
IDSR	Integrated Disease Surveillance and Response
MEAL	Monitoring, Evaluation, Accountability and Learning
NFI	Non-food Items
OD	Open Defecation
ODF	Open Defection Free
POS	Point-of-source
POU	Point-of-use/consumption
RSPH	Rollins School of Public Health
UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
USG	Under-Secretary General for the UN
WASH	Water, Sanitation, and Hygiene
WEDC	Water, Engineering, and Development Centre
WHO	World Health Organization

II. Introduction

Background and Rationale

Addressing water, sanitation, and hygiene (WASH) needs is a top response priority in any natural disaster or complex humanitarian emergency (CHE) context. Along with food and shelter, WASH is among the top three immediate response needs, and one of the eleven areas of humanitarian activity which operate within the Cluster Approach[1](UNOCHA, 2012). In the context of emergencies, insufficient access to WASH facilities and improper hygiene practice are contributing factors to the high prevalence of communicable diseases compared to more stable regions (Connolly et al., 2004). Natural disasters and complex emergencies frequently cause population displacement and/or health, water, and sanitation infrastructure breakdown. As a result, affected populations face increased risk of exposure to WASH-related pathogens (such as *Vibrio cholera, E. coli, and Salmonella*) due to fecal contamination of water sources and the surrounding environment. Diarrhea is a largely preventable WASH-related illness, which can often be avoided with access to safe drinking water, proper excreta disposal, and practicing hygienic behavior. Yet, 40% of mortality in disaster and camp settings is caused by diarrhea (Kouadio, Aljunid, Kamigaki, Hammad, & Oshitani, 2012). High WASH-related morbidity and mortality illustrates the importance of a foundational understanding of the approaches and challenges to addressing WASH needs in emergencies for humanitarians and emergency responders..

The Rollins School of Public Health (RSPH) at Emory University is a leading public health research and academic institution offering an array of special graduate programs and certificates that transcend traditional public health training programs. Two examples of this are the graduate

[1] See UNOCHA (2012), The Cluster Approach is the standard humanitarian response and coordination system instituted in 2006 as a result of the Humanitarian Response Review and resulting Humanitarian Reform prompted by the Emergency Response Coordinator of the United Nations in 2005. It is the formal response coordination system employed in all new emergencies and disasters.

certificate programs in 1.) WASH and 2.) CHE. The WASH certificate is coordinated by Emory's Center for Global Safe WASH (CGSW) and aims to prepare students for WASH related careers by building competency in WASH laboratory methods, policy issues, multi-level WASH programs, and the entities and agencies that work in and support WASH globally ("WASH Certificate Program", n.d.). The CHE certificate is coordinated by Emory's Center for Humanitarian Emergencies in partnership with the Emergency Response and Recovery Branch of the Centers for Disease Control and Prevention. This certificate program aims to equip students interested in humanitarian response with the knowledge and skills to respond to public health challenges in humanitarian contexts, which are often complicated by limited resources, infrastructure breakdown, and even armed conflict ("Graduate Certificate," n.d.).

The existence and focus of Emory's Center for Global Safe WASH and the Center for Humanitarian Emergencies along with their corresponding graduate certificates illustrates the school's commitment to preparing students to address both WASH and humanitarian issues. These graduate certificate options also attract a unique cohort of students who seek an opportunity to build knowledge and skills relevant to careers in humanitarian response and WASH development. However, there is currently no academic course offering for students that provides focused and fundamental knowledge of the intersection of WASH and humanitarian emergencies and disasters. The lack of a 'WASH in Emergencies' course at RSPH represents a potential curriculum gap for these students, and a missed opportunity for RSPH to adequately contribute to the development of well-rounded, future WASH and emergency responders.

Problem Statement

WASH response is critical to reducing morbidity and mortality among disaster and crisis affected populations. The increasing threat of natural disasters makes WASH in emergencies a

key issue for students interested in both emergency response and global WASH in general. The lack of a focused 'WASH in Emergencies' course represents a curriculum gap for these students. The inclusion of a new course on 'WASH in Emergencies' could address this gap in the RSPH course offerings. Furthermore, there is a workforce gap in the professional field of humanitarian response which includes a lack of WASH technical experts ("Assessment of Needs," 2014). Providing students with foundational knowledge in WASH in Emergencies represents an opportunity for RSPH to contribute to building the capacity of the global humanitarian response workforce.

Purpose Statement

The purpose of this Special Studies Project (SSP) is to create a 'WASH in Emergencies' curriculum which could be implemented by the Hubert Department of Global Heath at RSPH. In doing so, students are provided with a comprehensive knowledge base and skill set in the fields of global WASH development and emergency response. By applying this acquired knowledge and skill, students will positively contribute to the workforce capacity of global WASH development and emergency response.

Objectives

1. Bring awareness to the Hubert Department of Global Health of the public health importance of WASH in Emergencies and the content gap in the RSPH curriculum
2. Create a curriculum for a 'WASH in Emergencies' course
3. Provide critical WASH in Emergencies knowledge and skills to students interested in careers in WASH and emergency response at RSPH

III. Methods

Justification for Course and Content Development

A curriculum gap analysis and comprehensive review of current RPSH course syllabi was completed in order to understand how much 'WASH in Emergencies' relevant education and training current students have access to. The competencies, learning objectives, and content of existing coursework was used to identify gaps and overlaps in potential WASH in Emergencies competencies and content. The results of this gap analysis were used to justify the need for this stand-alone 'WASH in Emergencies' course, as well as understand the level of understanding of this topic that students may have prior to participating in the course. A table outlining the content of the syllabi reviewed is found in Annex 1. A description of the courses and content gaps is described in greater detail in the 'Curriculum Gap Analysis' section of this manuscript.

As this is intended to be an intensive, content based short-course, the course offerings from the departments of Biostatistics and Epidemiology were not included in the review, as the course is not intended to teach these concepts. Biostatistics and epidemiology is undoubtedly related to understanding significant associations between WASH-illnesses and risk factors, as well as epidemiological trends of WASH-illness. Therefore, the course is intended to be offered in the spring so that all students will have received basic understanding of statistical and epidemiological methods which can be applied to the learning[2].

Following the curriculum gap analysis, a comprehensive review of academic and 'grey' literature and faculty-recommended publications was completed to identify the fundamental topic areas of 'WASH in Emergencies', as well as required and recommended readings for course

[2] Introductory biostatics as well as epidemiologic methods are required for all RSPH students, regardless of their department, in their first semester of study, which occurs in the fall.

participants. This research was also crucial to help prioritize key issues and determine how much time should be allotted for each topic area. The topic areas and identified reading material formed the basis of the course learning objectives, educational modules, course syllabus and schedule, and assessment tools developed for the course. The resulting course syllabus and schedule, module descriptions, and assessment tools can be found in the Annex section of this manuscript. An in-depth description of the literature reviewed can be found in the 'Review of Relevant Literature' section of this manuscript.

The urgent need for rapid response in the context of natural disasters and emergencies has resulted in a gap in peer-reviewed literature of the effectiveness of WASH response. To account for this gap, this course will seek to include guest lecturers which can bring an expert experiential knowledge of WASH in Emergencies practices to the students of the course.

Pedagogy

While the gap analysis and literature was used to inform the expected areas of content mastery included in the course, the structure, organization, and delivery of the educational module was built by combining Socratic and Didactic teaching methods which form the bases of Andragogy, or adult learning theory (Keegan, 1993; Knowles, 1978).

Didactic methods focus on instructor-led techniques for generating both stimulus and response in the classroom (Keegan, 1993). For new content areas, this method will be useful when introducing material that students may not be familiar with, and will be the primary method of instruction in the beginning of each module.

Socratic method focuses on instructor led stimulus in the classroom but seeks to generate response through student-led questions (Keegan, 1993). This method is useful for reinforcing learning through application of learned knowledge through activities such as instructor-led

discussion and case studies. This method will be utilized primarily at the end of modules, and during active learning activities.

An important principle of Andragogy is that adult students are motivated and self-directed (Knowles, 1978). As this is short intensive course, students will be expected to employ self-directed learning by completing a prerequisite online course which introduces them to the key principles of humanitarian response and coordination in CHEs. This will be in addition to required reading material to be completed before class.

These methods of pedagogy also contributed to the development of the course syllabus, schedule, and educational modules. Particularly, a synthesis of learnings from the literature review, gap analysis, and pedagogy methods led to the design of when and how to introduce topics and deliver learning exercises and activities.

IV. Curriculum Gap Analysis

Introduction

The following gap analysis describes the importance of WASH service delivery and interventions in humanitarian contexts, followed by a description and analysis of the competencies and learning objectives of RSPH's relevant courses. The goal in doing so is to understand what skills and competencies are missing from the current RSPH course offerings that could be included in a WASH in emergencies short- course.

WASH related illnesses are a major public health issue globally; in 2012 it was estimated that poor water, sanitation, and hygiene practice was responsible for 842,000 deaths worldwide (Prüss-Ustün et al., 2014). In emergency and post-emergency settings, issues such as overcrowding, population displacement and breakdown or lack of access to safe drinking water and sanitation infrastructure exacerbates the spread of WASH related illness. Fecal-oral diseases, such as dysentery and cholera, are common in emergency situations and may account for more than 40% of deaths in the acute phase of an emergency, most of which are children under two years of age (Connolly, et al, 2004). There is strong evidence that access to safe drinking water and sanitation services and practicing proper hygiene can interrupt the transmission of many WASH related illnesses and reduce related morbidity and mortality .

The Global WASH Cluster (GWC) is a multi-agency working group that coordinates WASH response efforts in emergencies and works to provide or restore WASH services and practices that may have been disrupted or destroyed by natural or man-made disasters. For students hoping to work in disaster and emergency response, understanding the unique WASH related epidemiological issues and challenges of emergency settings, as well as the coordination of humanitarian aid providing WASH services is crucial. The following sections describe what is

included in the current RSPH curriculum that would be relevant to WASH in Emergencies knowledge and skills. Because WASH illness is often associated with environmental contamination and hygienic behavior, and the fact that natural disasters and conflict that contribute to acute emergencies are not limited to any one continent, the Environmental Health, Behavioral Science and Health Education, and Global Health course offerings were reviewed. Additionally, specific courses recommended or required by the WASH and CHE certificate programs were also reviewed.

Description of Competencies for Students Graduating from the Rollins School of Public Health with an MPH

Students pursuing an MPH or MSPH from RSPH regardless of department, are expected to demonstrate a set of core public health competencies upon graduation ("Competencies," n.d.). Additional competencies based on departmental focus may also apply. The RSPH core competencies are listed below, and department level competencies are provided in the following respective sections for the Environmental Health, Global Health, Behavioral Science and Health Education departments, as well as the WASH and CHE certificate programs.

Core MPH Competencies for RSPH Graduates

1. Use analytic reasoning and quantitative methods to address questions in public health and population-based research.
2. Describe behavioral and cultural factors that contribute to the health and wellbeing of individuals, communities, and populations.
3. Describe environmental conditions, including biological, physical, and chemical factors that affect the health of individuals, communities, and populations.

4. Describe the use of epidemiological methods to study the etiology and control of disease and injury in populations.
5. Discuss how health policy and finance affect the delivery, quality, access, and costs of health care for individuals, communities, and populations.
6. Assess global forces that influence the health of culturally diverse populations around the world.
7. Apply skills and knowledge in public health settings through planned and supervised experiences related to professional career objectives.
8. Integrate the broad base of public health knowledge and skills acquired from coursework, a practicum, and other learning activities into a culminating experience (thesis, special studies project, capstone, etc.).
9. Develop the capacity for life-long learning in public health.
10. Apply principles of ethical conduct to public health practice.

Review of relevant Courses from the Department of Behavioral Science and Health Education (BSHE)

Handwashing with soap is a basic hygiene behavior that reduces transmission of WASH related pathogens in non-emergency settings. Proper hygiene behavior in emergencies is especially challenging to address. Water sources may be disrupted, or access limited, which could impact how individuals prioritize the use of water for healthy hygiene practice (Vujcic, Ram, & Blum, 2015). In the acute phase, disruptions of sanitation infrastructure could result in increased risk of fecal contamination of the environment and exposure to fecal pathogens (Lillibridge, S.R.,

1997). Personal hygiene is an important step in reducing the risk of infection from environmental pathogens.

There are several concentrations within the BSHE department which include an extensive list of related competencies. In a review of the BSHE competencies, the following five competencies were identified as being potentially relevant to a WASH in emergencies course:

1. Implement an array of culturally relevant public health intervention strategies to communities in need.
2. Evaluate the dissemination, implementation and sustainability of culturally relevant health interventions for the greatest possible improvements in health.
3. Use community-engaged approaches in assessing community needs and assets, and planning and evaluating programs.
4. Analyze social, structural, policy and behavioral factors contributing to health.
5. Practice humility with people of different backgrounds (e.g. cultures, races, ethnic groups, socioeconomic backgrounds).

The core BSHE course, 'Behavioral and Social Sciences in Public Health' (BSHE 500) as well as 'Macrosocial Determinants of Health' (BSHE 535) were included in this analysis and the respective learning objective and competencies of these courses can be found in Annex 1. Both of these classes provide students with RSPH core competency number two listed in the previous section (evaluate the dissemination, implementation and sustainability of culturally relevant health interventions for the greatest possible improvements in health). However, none of the BSHE competencies considered to be relevant to WASH in Emergencies (noted above) were included in the syllabi of either BSHE 500 or BSHE 535. While these courses appear to lack BSHE

competencies relevant to WASH in Emergencies, there are course learning objectives in these BSHE courses that students interested in WASH in Emergencies could benefit from. For example, in BSHE 500, learning about the ecological framework and the multilevel influences on behaviors is important in understanding how the emergency context impacts healthy hygienic behaviors. Additionally, evaluating the effectiveness of health promotion interventions is a useful skill for WASH in Emergencies interventions, such as handwashing with soap. The BSHE 535 course offers useful and relevant knowledge regarding 'understanding the ways in which contextual or structural factors affect health'. This is especially pertinent to WASH in Emergencies as affected populations likely experience drastic changes to physical and social structures that could impact their behaviors around sanitation and hygiene. While these are useful learning objectives, content matter specific to how this might apply to emergency contexts was not described in either of these syllabi.

Review of relevant Courses from the Department of Environmental Health (EH)

A common result of disasters and emergencies is disruption of sanitation facilities and water supply as well as population displacement. These abrupt changes often impact the surrounding environment of affected populations in ways that may place them at higher risk of exposure to communicable and vector borne diseases (Adams, 2003). Understanding the environmental impacts of natural disasters and complex emergencies and approaches to mitigating the resulting public health risks is fundamental to basic knowledge in WASH in Emergencies. There are distinct differences in approaches to mitigating WASH related environmental risks depending on the context; especially between approaches that address immediate population needs in acute phases of emergencies and the more long-term solutions required in settings such as refugee camps. Environmental management after disasters and in complex emergencies may also

require approaches that are distinctly different from approaches applied in typical development settings (Adams, 2003). Understanding the environmental risks and appropriate environmental management approaches to disease mitigation is crucial knowledge required for persons interested in WASH in emergencies.

There are several concentrations within the EH department which include an extensive list of related competencies. In a review of the EH competencies, the following five competencies were identified as being relevant to WASH in emergencies:

1. Describe major environmental risks to human health ranging from the local to global scale
2. Assess the sources and movement of contaminants through the environment
3. Appraise the environmental, behavioral, and social factors that contribute to the emergence, re-emergence, and persistence of infectious diseases
4. Assess the major forces that influence the health of populations around the world
5. Critique major global priorities and the reasons for their prioritization

A review of the course offerings of the EH department at RSPH identified nine courses that include learning objectives and competencies that could be relevant to WASH in Emergencies. Those courses and their objectives and competencies can be found in Annex 1. While many of the EH courses included potentially relevant competencies and learning objectives, the courses that provide the most useful knowledge relevant to WASH in emergencies are Environmental Determinants of Infectious Disease (EH 570), Risk Assessment (EH 524), and Public Health Consequences of Natural Disasters (EH 581). These courses provide competence in the biological and environmental persistence of pathogens, environmental risks to health which include unsafe water and fecal contamination of the environment, methods for assessing environmental risks, and

public health impacts of disasters such as the breakdown or inaccessibility of sanitation facilities resulting in fecal contamination of the environment. Notably, EH 581 provided content specifically on WASH in emergency contexts and this was limited to one two-hour session focusing on impacts of natural disasters. Research Methods for Water and Health (EH 548) and Initiation and Management of Research Projects Under Constrained Conditions ((EH 590R-000) provide skills for research related to water and sanitation topics and in low-resource settings. However, these are not particularly relevant courses, as in emergency settings, funding is prioritized for response, and not research.

Review of relevant Courses from the Hubert Department of Global Health (GH)

Emergencies and disasters can occur anywhere in the world, in urban and rural communities, and in any country. Natural disasters are a global issue, and as the 2016 World Risk Report points out, low-income countries, particularly in the Global South, are at high risk for experiencing devastating consequences of natural disasters due to persistent infrastructure and technology challenges ("World Risk Report 2017," n.d.). Many of these countries are also prone to experiencing armed conflict which can compound and complicate recovery from disaster events (Leaning & Guha-Sapir, 2013). Providing safe drinking water and sanitation is a top priority when responding to global disasters and emergencies, which makes this topic particularly important to GH students.

There are several concentrations within the GH department which include an extensive list of related competencies. In a review of the GH competencies, the following four competencies were identified as being relevant to WASH in emergencies:

1. Assess the major forces that influence the health of populations around the world
2. Critique major global priorities and the reasons for their prioritization

3. Appraise the environmental, behavioral and social factors that contribute to the emergence, re-emergence, and persistence of infectious diseases
4. Operate in partnership with local, national and international organizations engaged in the health and social sectors

A review of the course offerings of the GH department at RSPH identified seven courses that include learning objectives and competencies that could be relevant to WASH in Emergencies. Those courses and their objectives and competencies can be found in Annex 1. Four out of the seven courses were classes that are prioritized for students enrolled in the CHE certificate program, but it is unlikely that many non-CHE students will have participated in these courses as they are not offered to non-CHE student until several weeks after enrollment opens. All but one CHE course has space for the CHE cohort, three nursing students, and between 3-5 other RSPH students due to their small class sizes. These courses include Preparedness and Planning for International Emergencies (GH 533), Health in Complex Humanitarian Emergencies (GH 512), Epidemiology in Complex Emergencies (GH 510), and Risk Communication for Global Public Health Emergencies (GH 532). Combined, these courses offer excellent foundational knowledge for students interested in emergency response. However, they offer predominantly generalized emergency response knowledge, and spend only two hours focused on WASH in Emergencies topics. The focus is primarily on the acute phase of disasters, with particular emphasis on cholera outbreaks.

Two GH courses offer an important knowledge base in waterborne diseases: Water Sanitation and Hygiene in Developing Countries (GH 529) and Environmental Microbiology of Food and Waterborne Disease (GH 580). GH 529 includes one full lecture totaling two hours

focused entirely on challenges and issues faced in WASH in Emergencies. GH 580 included a total of two and half hours focused on cholera, a pathogen that has caused multiple outbreaks in several disaster contexts.

Review of Water, Sanitation, and Hygiene (WASH) and Complex Humanitarian Graduate Certificate (CHE) Programs

The CHE certificate program is managed by the Center for Complex Humanitarian Emergencies under the Hubert Department for Global Health. The objectives of the program are listed below:

1. Describe a complex humanitarian crisis in terms of magnitude, person, time, and place
2. Calculate basic epidemiology measures
3. Evaluate the strengths and limitations of epidemiological data within the context of CHE
4. Develop public health programs and strategies responsive to the diverse cultural values and traditions of the community being served
5. Identify internal and external problems that may affect the delivery of essential public health services in a CHE
6. Collaborate with communication and informatics specialists in the process of design, implementation and evaluation of public health programs in CHE

The WASH graduate certificate program is managed by the Center for Global Safe Water (CGSW) at Emory University. The objectives of the program are listed below:

1. Describe the multidisciplinary nature of WASH-related issues;
2. Practice WASH-related laboratory methods;

3. Examine potential solutions for WASH-related challenges at the household and community level;
4. Recognize the role of policy in shaping the WASH landscape;
5. Identify entities working in the WASH sphere

All of the relevant courses that count towards either or both of these graduate certificates have already been discussed in previous departmental sections. Students enrolled in either or both of these certificates are likely to have a keen interest in obtaining foundational knowledge in WASH in Emergencies, but currently there is no single course that focuses on this topic. An WASH in Emergencies course would be an exciting and pertinent topic for students interested in response and/or global WASH issues. Offering this course would enhance the selection of appropriate electives toward both of these certificate programs.

Gap Analysis Conclusion

The Rollins School of Public Health offers specialized skills and knowledge to students interested in both global WASH, and humanitarian response, as evident by the popular graduate certificate programs in WASH and CHEs. WASH response is a priority issue in global disaster response and emergencies, yet there is no course that provides specialized knowledge in this field. Even for students interested in global WASH in general, as climate change increasingly threatens coastal cities and populations around the globe, WASH in Emergencies is an important knowledge area that should be addressed in the GH course offerings.

This gap analysis illustrates that existing courses at RSPH, which are potentially relevant to WASH in Emergencies, have adequately addressed important school and department level competencies, but there is a substantial gap in WASH in Emergencies content. The syllabus review identified only six and a half total hours of specific WASH in Emergencies content offered

at RSPH. All of the courses determined to be relevant are elective courses, many prioritized only for CHE certificate students, so it is unlikely that any student has obtained foundational knowledge of WASH in Emergencies issues. Offering a 'WASH in Emergencies' could fill an important knowledge gap needed for students at RSPH to become well-rounded global WASH and humanitarian emergency practitioners.

V. Review of Relevant Literature

The purpose of this literature review is to identify important content that may be included in the curriculum modules of an introductory WASH in Emergencies course offered at the Rollins School of Public Health. To identify the content, a web and database search for relevant peer reviewed and grey literature was performed, as well as a review of key emergency response and humanitarian agency websites. The review resulted in the following seven topical areas for which this literature review is structured:

1. Coordinating and Funding WASH in Emergency Efforts
2. WASH Related Illnesses and Outbreaks in Emergencies
3. Applications and Approaches for WASH in Emergencies
4. Unique Issues for At-Risk Populations
5. Response in Urban Settings
6. Sustainability and Transition from Response to Development
7. Evidence and Gaps Regarding the Effectiveness of WASH Interventions

Coordinating and Funding WASH in Emergency Efforts

Coordinating effective response efforts to restore infrastructure and provide basic needs to affected populations is fundamental to reduce morbidity and mortality in emergency situations. When disasters and complex emergencies occur, there is often a rapid deployment of emergency responders from many different humanitarian organizations including United Nations (UN) agencies, local and international non-governmental organization (NGOs), and local and international government. In 1991, the UN recognized that strengthening coordination between humanitarian organizations in emergencies was needed to effectively alleviate the suffering of

those affected. As a result, UN resolution 46/182 was adopted, titled "Strengthening of the coordination of humanitarian emergency assistance of the United Nations" (UN, 1991). The current system for humanitarian response, which explicitly includes a WASH element, is rooted in UN resolution 46/182. It includes the formation of the Inter-Agency Standing Committee (IASC) and the Cluster Approach (CA) to humanitarian response.

The IASC is a forum of humanitarian leaders which acts as the primary mechanism for coordinating response efforts in emergencies. IASC was formed in June of 1992 to address the UN's resolution 46/182 to strengthen humanitarian coordination. The group advises on strategy and policy, advocates for humanitarian principles, designates humanitarian coordinators, and highlights areas of need to the UN regarding emergency response efforts. The group meets twice a year in meetings chaired by the Emergency Response Coordinator (ERC), who acts as a communication bridge between the IASC and the UN Secretary General. The IASC also produces manuals for standards and best practices for humanitarian response efforts ("Welcome to the IASC," n.d.).

The coordination of humanitarian response is known as the Cluster Approach (CA). The CA emerged in 2005, fifteen years after the adoption of UN resolution 46/182, as part of the Humanitarian Reform Agenda, which aimed to increase predictably, accountability, and partnerships between humanitarian organizations and actors. The CA seeks to reduce gaps and overlaps in response efforts which should result in effective use of human, financial, and material resources for response, and the best possible outcomes for disaster and CHE affected populations. There are eleven 'clusters' which are specific working groups representing sectors of humanitarian response. The clusters are designated by IASC, and include WASH, shelter, protection, nutrition, logistics, health, food security, telecommunication, education, recovery,

and camp management ("What is the Cluster Approach," n.d.). Each cluster is comprised of several humanitarian organizations, but there is a designated 'cluster lead' for each sector which is responsible for defining the roles and responsibilities of each cluster member (Humanitarian Response, n.d.).

Within the CA is the Global WASH Cluster (GWC) which is responsible for providing safe drinking water, access to sanitation facilities, and hygiene promotion to populations affected by disasters and emergencies. The GWC is made up of more than 76 UN and non-UN humanitarian organizations, with UNICEF as the designated cluster lead for the GWC. Globally, the GWC aims to strengthen WASH preparedness and technical capacity to respond to emergency events and ensures that leadership and accountability is defined in advance. At the country level, the GWC works to prioritize the use of resources and the division of labor among organizations. Designation of points of contact for communication also occurs at the country level. Some of the main donor agencies which provide financial support for GWC include The United States Agency for International Development (USAID), the United Kingdom Department for International Development (DFID), European Commission for Humanitarian Assistance and Civil Protection, Ministry of Foreign Affairs of the Netherlands, Norwegian Ministry of Foreign Affairs, Swedish International Development Cooperation Agency (SIDA) and Swiss Agency for Development and Cooperation (SDC) ("WASH Cluster -," n.d.). Most donations go directly to the Central Emergency Response Fund, which is managed by the USH and ERC of the UN, and is intended to make funds available quickly for emergency response needs ("Who We Are | CERF," n.d.).

WASH Related Illness and Outbreaks in Emergencies

In the context of disasters and CHEs, mass population displacement is the most significant risk factor associated with WASH-related illness. In refugee camp settings which result from mass displacement, diarrheal illnesses account for up to 40% of the under-five mortality rate (Connolly et al., 2004). Mass population displacement and associated largescale disease outbreaks are more common in CHEs than in natural disasters, which is an important factor when planning effective and appropriate response efforts for specific contexts (Spiegel, Le, Ververs, & Salama, 2007). Also important to consider, is that the risk of communicable disease outbreaks is relatively low in emergency contexts that do not result in population displacement (Watson, Gayer, & Connolly, 2007).

Displacement is problematic because it often causes additional environmental and behavioral factors which leave individuals at higher risk of exposure to disease causing pathogens. Risk factors associated with displacement include minimal or no disease surveillance and response networks, loss of access to healthcare services and WASH infrastructure, food and water contamination, and crowding (Bartlett, 2008). Specific pathogenic diseases that are commonly associated with high rates of WASH-related morbidity and mortality in camp settings and among displaced populations include cholera, shigella, salmonella, hepatitis A, and hepatitis E (Bartlett, 2008; Kouadio et al., 2012).

Discussions around WASH-related illness in emergencies is often centered around diarrhea and communicable diseases. However, in emergency and disaster contexts, lack of water can contribute to unhygienic environments which may increase the risk of non-communicable diseases such as tetanus (Watson et al., 2007). Additionally, in flood disasters, open and uncontrolled water sources can affect the ecological dynamics of mosquitoes and other

disease vectors which rely on open water for breeding. This can contribute to the spread of diseases such and malaria and dengue fever (Connolly et al., 2004; Ivers & Ryan, 2006).

Applications and Approaches for WASH in Emergencies

Approaches to implementing WASH interventions in emergencies will differ depending on the phase of the disaster and corresponding phase of disaster management. The four chronological phases of disaster management are (Adams, 2003):

1. Mitigation: Efforts to minimize the effects of a potential disaster
2. Preparedness: Development of disaster response strategy and Standard Operating Procedures
3. Response: Efforts to minimize the effects of hazards after the onset of a disaster
4. Recovery: Efforts to return affected communities to a functional state similar to what existed prior to the onset of emergency

Emergency management can occur and start at any phase. The focus of this section will be on the response phase which occurs after the onset of a disaster, with later sections directed on transition from response to recovery. Response occurs in the early or acute phase of an emergency where immediate provision of basic life necessities is prioritized. Response often overlaps with recovery, which occurs after disasters have stabilized, or, result in protracted emergencies and long-term refugee camps. In any disaster or emergency, according to the Sphere Project, the objective of response and recovery efforts are to provide "conditions which allow disaster-affected populations to survive and recover with dignity ("The Sphere Handbook," n.d.)." The Sphere Project outlines minimum standards for all sectors of humanitarian response, and those related to water, sanitation, and hygiene are outlined in Table 1. Key actions and indicators for meeting the standards can be found in the Sphere Handbook; a web link is provided in Annex 2.

Table 1: Minimum Standards for WASH Services in Emergencies (Sphere, 2011)

WASH Focus	Sphere Standards
Water	1. All people have safe and equitable access to a sufficient quantity of water for drinking, cooking and personal and domestic hygiene. Public water points are sufficiently close to households to enable use of the minimum water requirement 2. Water is palatable and of sufficient quality to be drunk and used for cooking and personal and domestic hygiene without causing risk to health 3. People have adequate facilities to collect, store and use sufficient quantities of water for drinking, cooking and personal hygiene, and to ensure that drinking water remains safe until it is consumed
Excreta Disposal	1. The living environment in general and specifically the habitat, food production areas, public centers and surroundings of drinking water sources are free from human fecal contamination 2. People have adequate, appropriate and acceptable toilet facilities, sufficiently close to their dwellings, to allow rapid, safe and secure access at all times, day and night
Hygiene	1. Affected men, women and children of all ages are aware of key public health risks and are mobilized to adopt measures to prevent the deterioration in hygienic conditions and to use and maintain the facilities provided 2. The disaster-affected population has access to and is involved in identifying and promoting the use of hygiene items to ensure personal hygiene, health, dignity and well-being

Water

Rapid provision of sufficient quality and quantity of water for drinking as well as for personal hygiene is protective against disease in disasters and emergencies. (Brown, Cavill, Cumming, & Jeandron, 2012). Delayed provision of potable water has been linked to increased fecal-oral disease in several emergency context (Sencan, Sahin, Kaya, Oksuz, & Yildirim, 2004). A sustainable water source will provide long term benefits, but is not always the quickest or easiest to provide, which complicates decision making around the appropriate water intervention in the acute phase of an emergency. Water-trucking is the most common strategy for providing water in the acute phase of emergencies, along with point-of-source (POS) and point-of-use (POU) water treatments. All three face challenges related mostly to cost, sustainability or appropriate adherence to water treatment (Brown & Clasen, 2012).

Emergencies could contain a number of factors which contribute to inaccessibility of potable water including drought conditions, broken or damaged water pipes, and displacement to areas with no access to piped or potable water. When entire communities are in sudden need of water for drinking and hygienic purposes, trucking in water is often the first step while more sustainable approaches are considered. Most water trucks hold 5,000L of water. If possible, water trucks are filled at nearby boreholes or sources near the affected area, and it is most efficient if water from trucks can be dispensed into community storage tanks. Agencies such as UNICEF, Oxfam, and ACTED are common suppliers and coordinators of water trucking and storing in emergencies ("Updated WHO/WEDC Technical Notes" n.d.). Water trucking is a relatively simple intervention, and allows for easy chlorination to reduce pathogens such as shigella and cholera, but it also comes with many challenges and constraints. For example, water trucking is unsustainable, costly, and the quality of water (taste, smell, color, etc.) is often variable. There

have been documented cases where variability in trucked water quality have resulted in avoidance of trucked water by the population (Atayumbe, 2011). Instead people chose to consume water from nearby untreated surface water sources (Atayumbe, 2011).

Although water trucking has serious challenges, it is often the only feasible option, especially in drought emergencies. While it is often considered a short-term solution, some long-term refugee camps continue to receive trucked water even several years after the initial camp establishment. In many cases, the trucked water is integrated with other water supply strategies ("What water and latrines mean in Nyarugusu Refugee Camp," 2015; "Zaatari Refugee Camp - Factsheet, November 2016," n.d.). Alternatives to meeting the immediate water needs in acute emergencies include setting up mobile water purification units at surface water sources near the affected populations. In non-displaced emergency settings, repair of water catchment and piping systems is also a viable option.

Water treatment at the source, usually through filtration and chlorination, is a common approach to providing potable water in emergencies. However, recent studies to assess the effectiveness of water treatment in emergencies have focused on treating water at the point of consumption (or "point of use"). These POU approaches are considered to be more effective than point-of-source (POS) approaches at reducing the risk of exposure to waterborne pathogens because the process of transporting water from the source to the consumption point offers many opportunities for contamination (Brown et al., 2012). POU approaches include both treatment and safe storage techniques. Treatment often includes chlorination, filtration, boiling, flocculation, coagulation, or a combination of two or more of these techniques. Safe storage includes storage in narrow-necked containers, and containers with controlled access (Adams, 2003).

Sanitation

Rapid and safe excreta disposal is an important line of defense against transmission of disease causing fecal-oral pathogens in emergencies, but is challenging due to the time, cost, and resource inputs required. In emergency situations where sanitation infrastructure has been damaged, destroyed, or is non-existent, intense input of human and material resources is needed to restore or construct sanitation facilities. Restoration and construction of sanitation facilities is often time consuming, and individuals may open defecate (OD) or use plastic bags (flying latrines) as toilets if no other options are available (P. A. Harvey & Reed, 2005). Practice of OD and 'flying latrines' contribute to fecal contamination of the environment and increases the risk of human exposure to fecal pathogens. A common first approach to sanitation for displaced populations in the acute phase of emergencies is the designation of defecation fields, trench latrines, and chemical latrines. More long-term approaches include simple and ventilated improved pit latrines, and in protracted settings, septic tanks and pour flush latrines could be introduced (P. Harvey, Baghri, & Reed, 2002).

Regardless of the type of sanitation option that is selected, the challenge of removing accumulated human waste in emergencies must also be addressed. There is currently no standard guideline on how to address fecal sludge management (FSM) in emergencies. Bioadditives for latrines exists which can accelerate the rate of fecal decomposition, reducing sludge volumes, resulting in less frequent emptying of latrines. However, results from trials to test the rate of sludge reduction from use of these bioadditives in emergencies ranged from 5%-50% (Redhouse, 2001). Fecal sludge accumulates rapidly in emergencies because of high person to latrines ratios. The appropriateness of using these additives to reduce sludge volume is questionable (P. Harvey & Water, 2007).

Ideally, to reduce the frequency of using desludging pumps, trucks and other machinery, latrine construction would be designed using large enough pits, or pits that can be replaced or moved. However, this is not always possible in challenging scenarios such as areas with scarce land availability, high water tables or impermeable ground or hard rock. In these circumstances, use of septic tanks and regular desludging machinery is usually necessary (P. Harvey & Water, 2007).

In many emergency situations, such as flooding, repair of existing sewerage systems may be possible. There are many emerging technologies and approaches for addressing interim sanitation in these situations. After a flood in the Philippines in 2010, bags for urine and excreta were distributed to affected populations, where they would be disposed of in buckets, and collected by boat and delivered to treatment facilities. In both Haiti after the 2010 earthquake and in the Philippines in 2010, temporary raised latrines were constructed from kits for use while sanitation infrastructure was restored. 'Pee-poo bags' are also useful in urban environments affected by disasters (Tratschin & Spuhler, n.d.)

One of the most popular modern approaches to sanitation in the context of development is Community Led Total Sanitation (CLTS). CLTS and similar approaches seek to empower communities to take full responsibility for their sanitation options and create open-defecation free (ODF) communities. One of the fundamental elements of CLTS is 'subsidy-free sanitation', meaning communities should decide which sanitation option is best for them, and finance it individually or as a community, with no financial input from external sources. The approach relies on creating new social norms that reject practicing OD, with the intended outcome being collective accountability to keep communities clean by stopping OD ("The CLTS approach," 2008). While the CLTS approach has seen varying levels of success in its application in many countries around

the world, it may not be appropriate for emergency contexts. Managers of emergency WASH programs should consider the ethics of applying this approach, especially in the acute phase of emergencies where individuals may have lost their personal belongings and the social structure has been devastated. Because CLTS relies on subsidy-free sanitation, it is not appropriate or ethical to ask displaced communities to produce funds and develop strategies for building their sanitation infrastructure. Additionally, some CLTS approaches include shaming individuals that OD as a means to enforce the social norm around ODF, which also seems inappropriate considering the mental and emotional stresses that disaster affected individuals face. Recent lessons learned from applying CLTS in emergency and post-emergency contexts include recommendations for adapting some elements of CLTS to encourage community ownership of maintenance and operation of sanitation facilities. The CLTS may also be more applicable in emergency contexts where some level of sanitation has been established and community structure is re-emerging (Balfour, Mutai, Otieno, & Johnston, 2015).

Hygiene and Behavior

Access to WASH hardware alone does not reduce exposure to WASH-related pathogens. Adherence to proper hygienic behavior and use of WASH hardware is also needed (Brown et al., 2012; Lantagne & Clasen, 2012). Research evidence also shows that there is better use and maintenance of hygiene facilities in emergencies when WASH hardware provision is paired with hygiene promotion interventions (Flachenburg, 2014). Considering the stress and despair experienced by populations in emergencies, hygiene promotion should be kept simple and culturally appropriate, and focus only on the following five key areas (P. Harvey & Water, 2007):

1. Appropriate use and maintenance of excreta disposal facilities;

2. Safe disposal of feces (especially child feces);
3. Handwashing after defecation and prior to food preparation;
4. Use and safe disposal of appropriate anal-cleansing material;
5. Control of flies and other insect vectors.

When developing hygiene promotion messages and activities, practitioners should keep the following principles in mind (Curtis; 1999):

1. Target a small number of risk practices
2. Target specific audiences with specific messages (i.e., mothers for disposal of child feces, community leaders for maintenance of sanitation facilities)
3. Identify motives for changed behavior
4. Provide positive hygiene messaging
5. Identify appropriate channels of communication, and a cost-effective mix of channels to reach whole community
6. Include monitoring and evaluation plans for hygiene promotion activities

Unique Issues for At-Risk Populations

Gender Considerations

Women and young girls are particularly vulnerable in emergency situations due to the gender roles around water collection in many cultures, issues around menstrual hygiene management, privacy concerns, and gender-based violence. In many cultures, the burden of collecting water for households falls on women, and these cultural traditions do not necessarily change in the face of disasters and displacement. It is important to include the voices of women

when deciding on WASH systems which do not place undue burden upon them, such as walking long distances to water collection points. Sphere guidelines state that water collection points should be no more than a 500m distance from households. WASH interventions should pay special attention to ensure that this standard is met for all women in the affected area.

Women and girls also face unique challenges when it comes to privacy and space to manage menstruation. Many guidelines include recommendations for addressing the WASH needs of women in planning during emergencies. In some cases, appropriate approaches such as private bathing and menstruation units were implemented. (Nawaz, Lal, Raza, & House, 2010). In other recent emergencies, women and girls have expressed that their menstruation needs are not being met (Schmitt et al., 2017). If the perceived needs of women and girls are not being met in emergency response, this could indicate that emergency response efforts are not prioritizing the special needs of women and girls. In addition to spaces for managing menstruation, women also need culturally appropriate menstruation supplies and materials, which should be included when providing hygiene kits (Sommer, 2012). Many response initiatives utilize 'Cash for Work' programs, which hire individuals from emergency affected populations to implement interventions, including hygiene promotion and WASH infrastructure development ("Cash for Work in Zaatari Camp," n.d.). These programs present an opportunity to directly include women in the development and management of emergency WASH interventions, potentially increasing the likelihood women's needs are sufficiently met. The following are additional recommendations for addressing menstruation needs in emergencies (Harvey, 2007; Sommer, 2012):

1. Women in the community should be consulted on what are culturally appropriate methods for menstruation management

2. Pads should be avoided, unless they are the most culturally appropriate option, and if so, provision should be paired with education on disposal and environmental implications
3. If washable menstruation cloths are provided, they should be dark in color, and enough water and soap should provide for washing, as well as a private space for drying

In many cultures, women and girls are vulnerable to gender-based violence related to WASH, mostly as a result of travelling long distances alone to collect water and being outside alone at night to urinate or defecate. Documentation of similar issues in emergencies is limited, but a recent review of the evidence of WASH and violence in humanitarian settings found mostly anecdotal reports of rape and sexual assault or harassment linked to WASH in IDP camps in Haiti, Somalia and the Philippines (Sommer, Ferron, Cavill, & House, 2015). Reports of women and girls being raped and even killed when defecating in open fields because latrines were too far and too dark to use at night has also been reported from a refugee camp in Uganda (Harvey, 2007). The following recommendations are made to support the safety of women and girls when designing WASH facilities (Sommer et al., 2015), and a gender and WASH toolkit can be found in Annex 2:

1. Train WASH mangers to address the safety of women and girls when designing and implementing WASH programming
2. Provide latrines to households and avoid communal latrines, if possible
3. Place communal latrines close enough to homes that women feel safe walking there, and ensure they are locked, and gender specific
4. Place and maintain lighting both inside and outside of latrines

Elderly and Disabled

Disasters and armed conflict contribute to injury and disablement among affected populations. When these events occur, 20% of the population could become disabled as a result (Jones et el., 2002). Elderly individuals and the disabled may face similar mobility issues, which make traditional or 'normal' WASH hardware inaccessible. Emergency response efforts often prioritize rapid provision of sanitation facilities, and it is common to overlook the needs of the elderly and disabled to when planning and selecting WASH hardware and approaches in emergencies. However, there are some simple measure that can be taken in order to make facilities more accessible for elderly and disabled users (Harvey, 2007):

1. Deliberate inclusion of the voices and needs of elderly and disabled populations in the assessment and planning process for WASH provision
2. Placement of latrines close to households
3. Provision of larger cubicles with handrails designated for elderly and the disabled
4. Placement of door handles and locks low enough for people in wheelchairs to access them
5. Design handwashing facilities which are simple to operate
6. Encourage community support among family, response staff, and community members around disability issues

Children

Children, especially those under five, with underdeveloped immune systems, are especially vulnerable WASH-related illness. Children are also major contributors to indiscriminate OD and fecal contamination of the environment. While most guidelines for WASH in emergencies address

the needs of children, there is still a lack of focus on addressing the needs of children of different ages (Ferron & Lloyd, 2014). Some of the existing guidelines for addressing WASH needs of children are as follows (Harvey, 2007):

1. Inclusion of the voices and perception of mothers during the assessment phase to determine appropriate options for managing excreta from infant and children under five years old
2. Provision of family latrines rather than communal, if possible
3. Provision of latrines for children in schools, in the case of protracted and stable emergencies
4. Provision of special child-appropriate latrines if communal latrines are necessary
5. Provision of washable cloth diapers, but if disposable diapers are necessary, provide education on proper disposal

Response in Urban Settings

In recent disasters and CHEs, the majority of displaced individuals are moving into urban settings, which could be an IDP camp, informal settlement or slum, or a formal residence. Considering this, humanitarian responders should prepare for the challenges faced by cities when there is a massive influx of people into already crowded spaces. Crisp et. al point out that humanitarian responders should anticipate this type of movement and be prepared to partner not only with national governments, but local municipalities and city leaders when planning for WASH response in urban settings (Crisp, Morris, & Refstie, 2012).

The issues of disasters striking urban environments and mass population displacement into urban areas pose unique challenges not faced in rural settings. In rural settings, there is usually more land and space available for installing sanitation hardware, and less people at risk. The UN Department of Economic and Social Affairs projects that by 2050, 66% of the world's population

will be living in urban environments with the majority of people living in coastal regions (UN, 2014). The increasing concentration of people in coastal urban environments means that more and more people are at risk during natural disasters such as floods and tropical storms, which requires more financial and material resources for response. Massive influx of people into urban environments may breach water and sewerage or septic capacity. Overcrowding increases the risk of outbreaks, and surveillance of WASH-related disease outbreaks may be inadequate for the large size of the affected population (Zetter & Deikun, 2010). The amount of resources needed to provide for the amount of people affected by disasters in urban settings puts serious strain on the ability of humanitarian agencies to respond. A few of the recommendations for immediate response in urban settings include (Harvey, 2007; Zetter & Deikun, 2010):

1. Build partnership with municipal authorities for provision of water and disease surveillance
2. Use of drop-hole latrines directly over sewers through open inspection covers
3. Provision of temporary toilets or 'port-a-johns'
4. Provision of latrines feeding into septic tanks

   Construction of communal toilet facilities, as the large population size may make household provision of toilets unfeasible

Sustainability: Transition from Response to Development

Sustainability of WASH infrastructure is often not prioritized in the acute phase of an emergency when the focus is on meeting basic needs as quickly as possible. However, many refugee camps that exist today have been established for years, and now resemble permanent towns more so than temporary settlements. In the Zaatari refugee camp in Jordan, approximately 80,000 people live in the camp which was established in 2012 (van der Helm, Bhai, Coloni, Koning, & de Bakker, 2017). The Algerian refugee camp in Tindouf has been home to refugee families since

1975 (Reuters, 2016). The commonality of long-term refugee camps highlights the need for implementation of sustainable WASH approaches early on in response efforts, or at minimum, a plan to switch from emergency approaches to more sustainable options.

Some evidence suggests that community ownership approaches such as CLTS and other demand-driven approaches will contribute to the sustainability of WASH supplies (Boydell, 1999). However, other WASH practitioners and researchers point out that anything other than top-down, supply-side approaches are inappropriate in the acute phase of emergencies (Brown et al., 2012). Provision of sustainable WASH infrastructure may not be possible immediately, but anticipation of switching to sustainable approaches is necessary, and possible as Zaatari refugee camp proves. The case of Zaatari refugee camp in Jordan presents a unique case of switching approaches to promote a more stable WASH system. For the first four years of its establishment, water access was achieved via trucked in water. This method was costly and inefficient. There is now a network of piped water in the camp which delivers water to households. Additionally, most households now dispose of excreta in septic tanks hooked up to private toilet systems, when communal latrines were previously the only option (van der Helm et al., 2017).

Evidence and Gaps Regarding the Effectiveness of WASH Interventions

Evidence of WASH Interventions for Outbreak Response in Emergencies

While there is a set of commonly used methods for WASH service delivery in emergencies, the evidence remains weak on how effective these approaches are in actually reducing the burden of WASH-related illnesses in emergency contexts (Yates, Allen, Leandre Joseph, & Lantagne, 2017). There are a number of likely reasons for this: 1) In emergency and humanitarian contexts, rapid response is prioritized over research that could determine the efficacy and effectiveness of the approaches utilized; 2) In these contexts, it is difficult to attribute reductions in illness to any

one WASH intervention or combination of interventions; 3) Rapidly changing environments makes scientific research in emergency contexts a challenge. Although the evidence base for the effectiveness of WASH interventions in emergencies is limited, a recent systematic review that synthesizes evidence on the effectiveness of WASH interventions for outbreak response in emergencies does provide some insight (Yates et al., 2017)

Yates et al., (2017) reviewed WASH interventions from 52 humanitarian settings in 19 low to middle income countries (LMIC). The bulk of evidence from these studies focused on water interventions, and largely household water treatment interventions (HWT) or POU. Less evidence was presented regarding sanitation and hygiene interventions, as this research was largely qualitative and anecdotal. The review included studies focused on outbreaks of cholera, Ebola, hepatitis E, hepatitis A, typhoid, acute watery diarrhea, and/or shigellosis. Overall, the review described the following factors as contributing to the success of a WASH interventions for outbreak response in humanitarian contexts:

1. Acceptable taste and smell of provided water
2. Appropriate use of communication channels (radio and town-hall style meetings were most frequently stated as the preferred method)
3. Perceptions of humanitarian actors and issues of trust and distrust

Out of ten types of WASH interventions reviewed, only HWT with chlorination or PUR, boiling, safe water storage, and other POU interventions such as SODIS showed any significant improvement in health outcomes. However, the quality of the evidence in all instances was low. Anecdotal data provided for sanitation interventions and hygiene interventions indicated positive perceptions toward initiatives such as CLTS and environmental hygiene, but the quality of this

evidence was also low. A summary of the interventions and associated health outcomes reviewed is summarized in Table 2.

Table 2: Summary of Health Impacts of WASH Interventions for Outbreak Response In Emergencies

Intervention	Description	Health Impact
Well disinfection	Disinfecting a contaminated well with chlorine	Unable to determine
Source based water treatment (POU)	Water treatment that occurs at the source itself, including chlorine dispensers and bucket chlorination	Unable to determine
HWT with chlorine	Chlorine tablets or liquid distributed for household water treatment	Unable to determine
HWT with non-chorine substance	Treatment of household water with non-chlorine substance such as PUR, or solar disinfection (SODIS)	PUR-67% reduction in diarrhea incidence, 77% reduction in diarrhea prevalence in one case Simple filters, SODIS, and safe storage showed significant reduction in diarrhea prevalence in some cases
CLTS or similar	Approach to adjusting social norms and building collective accountability to eliminate OD, and implement community wide sanitation	Ebola rates 17 times less in ODF communities than in communities with to CLTS program
Hygiene promotion	Sharing of personal and environmental hygiene-related information to educate emergency-affected populations with the goal of reinforcing or changing behaviour	Anecdotal descriptions of disease or disease risk reductions
Social Mobilization	Strategies for involving or engaging communities in the outbreak response, with responders facilitating communities to address identified risks with local solutions.	Anecdotal descriptions of disease impact and reduced risk of Ebola evaluated
Hygiene kit distribution	Distributions of items such as HWT products, soap and safe water storage containers	Unable to determine
Environmental hygiene	Efforts aim to protect populations by reducing environmental transmission of disease.	Very weak evaluation methods consistently reportedly reduced disease transmission from chlorine disinfection
WASH package	Combination of WASH interventions to address multiple possible transmission routes and provide comprehensive protection to beneficiaries.	Anecdotal descriptions of disease reductions

*adapted from Yates, et al., (2017)

Concluding Remarks on Literature Review

Coordinating and Funding: The agencies leading emergency response efforts, such as the UN and ICRC, have recognized and responded to the need for efficient and effective programming to restore dignity and quality life to disaster affected populations. This is evident

from the formation of UN Resolution 46/182 and implementation of response strategies, including the humanitarian cluster system. Better strategies for collecting and utilizing heath and programmatic data is needed to further inform best practices for emergency response, and improve the effectiveness of emergency programming, which includes addressing WASH needs.

WASH-Illness and Outbreaks: Diarrheal illness, which is frequently associated with poor WASH access, is a major contributor to high mortality in emergency contexts, especially when mass displacement occurs. Yates et al. highlight that while some emergency WASH interventions have proven to significantly reduce WASH-related illness in emergencies, there is a gap in the evidence base, and the data which exists for most emergency WASH interventions is low quality. This illustrates a paradox in WASH Cluster response efforts: experts have stated the need for better evidence to inform emergency WASH programming, but this is not always possible when the delivery of needed services must be prioritized over research efforts.

Approaches for Providing WASH Programming: In both emergency and non-emergency contexts, evidence suggests that WASH hardware access paired with positive hygienic behavior is protective against WASH-related illness. There is a wealth of published and grey literature which provides guidance and best practice on the most appropriate approaches for addressing WASH needs in emergencies (see Annex 2). However, professionals working in humanitarian and emergency response have expressed the need for better attention to specific areas. 'WASH in Emergency' interventions need to provide programming which better addresses the needs of at-risk populations including women, children, elderly, and the disabled. WASH planning in the acute phase of emergencies needs to include plans for transitioning to sustainable and long-term approaches. More research and strategies for FSM is needed. International response efforts in

urban-settings needs to improve partnerships with municipalities and integration of programs with existing systems.

Although major gaps exist in both evidence of effectiveness and delivery of services for WASH in emergencies, WASH still encompasses a basic need that contributes to the health of people in humanitarian and emergency contexts. While information from the literature, as well as standard guidelines and best practices will be important to include in a WASH in Emergencies course at RSPH, this material could be supplemented by offering contextual and experiential perspectives from professional humanitarian responders. There is an accessible group of experts from the Centers for Disease and Prevention that could offer their personal experiences delivering WASH services in emergencies in order to supplement the course and address the gaps that have been identified for students in the course.

VI. Results and Conclusion

Course Structure and Additional Subtopics

The purpose of the literature review was to identify key topic areas to be included in a 'WASH in Emergencies' course, but the seven topics presented do not translate 'as is' into separate educational modules. The foundation of the course will be based on providing understanding of the appropriate approaches for water, sanitation, and hygiene in emergencies. These approaches were presented together in the 'Applications and Approaches for WASH in Emergencies' section of the literature review. Each type of approach (for water, sanitation or hygiene) warrants an individual educational module, which will include sessions on cross-cutting topics of 'Unique Issues for At-Risk Populations', 'Response in Urban Settings', 'Sustainability and Transition from Response to Development' and 'Operation and Maintenance'. The literature review topics of 'Coordinating and Funding WASH in Emergencies' and 'WASH Related Illnesses and Outbreaks in Emergencies' will encompass separate individual educational modules. In order to synthesize the learning from all educational modules, a case analysis which provides a real-world example of the application of approaches and related issues in an emergency setting will be inserted into several modules. A culminating module on integration of WASH approaches will also be added. A summary of the modules and sessions is described in Table 3, and a more detailed outline of the modules is included in Annex 4.

Several important 'WASH in Emergencies' topics were not identified in the initial selection of topics, but recognized later through the literature review. These topics include logistics and distribution of WASH-related non-food items (NFI), monitoring and evaluation (M&E), disease surveillance systems, and complications in emergency contexts experiencing armed conflict. Logistics refers to the procurement, mobilization, and storage of the materials and

supplies needed for response effort ("WASH Cluster Coordinator Handbook," n.d.). Logistics in emergencies requires close coordination with all clusters, as NFIs must be mobilized efficiently to meet nutrition, sheltering, and health needs, alongside WASH needs (Ferron, 2017). The WASH Cluster Coordination Handbook (2009) includes guidance on cross-sector planning for logistics in emergencies, and this information will contribute to a logistics session in Module 1, which focuses on coordination.

The WASH Cluster Coordination Handbook also includes guidance on M&E of WASH response efforts. This M&E guidance along with programmatic indicators for 'WASH in Emergencies' provided by the Sphere project will comprise an M&E session also placed in Module 1.

Disease surveillance systems are important for reducing morbidity and mortality by investigating, identifying, and responding to outbreaks of disease. In refugee camp settings, the United Nations High Commissioner of Refugees (UNHCR) has standardized the implementation of a camp Health Information System (HIS) for collecting population health data, and detecting outbreaks and illnesses of concern (Haskew, Spiegel, Tomczyk, Cornier, & Hering, 2010). In non-camp settings in many African and Eastern Mediterranean countries, the Integrated Disease Surveillance and Response network (IDSR) is often in place ("Integrated Disease Surveillance and Response (IDSR)" n.d.). IDSR is routine ongoing disease surveillance, but in the case of an outbreak or emergency, an Emergency Alert and Response Network (EWARN) can be activated. EWARN provides additional support for detecting and responding to cases of illness with high outbreak potential ("WHO | Outbreak Surveillance and Response," n.d.). A description of these systems will form a session in Module 2, which focuses on WASH-related outbreaks in emergencies.

Disasters and emergencies sometimes occur in areas where armed conflict is present. Guidelines for humanitarian and emergency response operations operating in these settings was difficult to identify, but a recent study by Geneva Call assessed the perceptions of armed non-state actors in emergency contexts in several countries regarding humanitarian aid. Overall, most armed actors expressed support for humanitarian operations, but also expected to be co-opted in efforts within areas of their control ("In Their Words," n.d.). This evidence regarding humanitarian support from armed groups is somewhat contracted by other evidence suggesting that attacks against humanitarian actors and health facilities/initiatives is on the rise ("Aid Worker Security Report" n.d.). It is not clear from the literature exactly how emergency WASH response is intercepted or impacted by armed conflict, but it is important for all humanitarians and emergency responders to remain neutral and impartial when providing aid and emergency interventions. This issue will also be addressed in Module 1 on coordination and planning.

Syllabus and Module Development

The literature review and gap analysis helped inform the weighting of course modules for the schedule and the competencies and learning objectives included in the syllabus (found in Annex 3). The majority of literature identified and reviewed focused on technology, approaches, and effectiveness of 'WASH in Emergency' interventions. Therefore, individual modules on approaches for water, sanitation, and hygiene interventions will comprise half of the lecture time, and encompass eight hours of the sixteen total hours of assumed classroom time. These eight hours will include cross-cutting themes of unique issues for at-risk groups, sustainability, response in urban settings, and operation and maintenance.

The remaining eight hours of classroom instruction will be composed of an introductory module on coordination and funding, a culminating module on integration of approaches, and an

in-class case analysis activity. The annex section includes descriptions of all modules (Annex 4) a detailed outline for Module 1 (Annex 5), and a reference table of useful resources (Annex 2).

Course Prerequisites

In addition to the schedule, competencies, and learning objectives for the 'WASH in Emergencies' course, the syllabus also includes consideration of what students are expected to know prior to participating in the course. 'WASH in Emergencies' is a somewhat niche field of global WASH, and it is expected that students who enroll in the course are serious about pursuing careers in WASH development, and/or emergency response. This course will be intended for second year students who have completed at least one WASH relevant course and have maintained a deep interest and intention to pursue WASH professionally. In order to ensure a homogenous level of understanding of the humanitarian response system among the students, course prerequisites will include completion of Unit 2 and Unit 6 of the 'Building a Better Response' online certificate program. Unit 2, entitled "International Humanitarian Architecture" provides in-depth information on the cluster system and coordinating emergency response efforts, which will reduce the amount of lecture time needed for introductory information in Module 1. Unit 6, entitled " Complex Humanitarian Emergencies" focuses on unique issues often present in CHEs, with special attention on emergency response in the context of armed conflict . Understanding conflict dynamics and the implications for response are important factors for students to consider throughout the course.

Table 3: Summary of Modules and Sessions for Course

Module	Session
1. Coordination and Funding for WASH in Emergencies (Annex 4, pg. 54)	1. The Cluster Approach, Global WASH Cluster And Funding for WASH in Emergencies
	2. Rapid Assessments for Selecting WASH Interventions
	3. Emergency WASH Management: Logistics and NFIs, Monitoring and Evaluation
2. WASH Illnesses and Outbreaks in Emergencies (Annex 4, pg. 55)	1. WASH-related Disease Burden and Risk Factors
	2. Overview of Most Common WASH-related Pathogens, Illnesses, and Transmission Pathways
	3. Non-communicable Infectious Disease
	4. Disease and Outbreak Surveillance Systems
3. Approaches for Providing Clean Water (Annex 4, pg. 56)	1. Overview of Commonly Used Approaches for Water
	2. Special Consideration for 'At-Risk' Populations
	3. Urban vs. Rural Response
	4. Sustainability and Transition to Development
	5. Operation and Maintenance
	6. Case analysis of Zaatari
4. Approaches for Sanitation and Excreta Disposal (Annex 4, pg. 57)	1. Overview of Commonly Used Approaches for Sanitation
	2. Special Consideration for 'At-Risk' Populations
	3. Urban vs. Rural Response
	4. Sustainability and Transition to Development
	5. Operation and Maintenance
	6. Case Analysis of Zaatari
5. Approaches for Promoting Hygienic Behavior in Emergencies (Annex 4, pg. 58)	1. Overview of Commonly Used Approaches for Hygiene Promotion
	2. Special Consideration for 'At-Risk' Populations
	4. Sustaining Positive Hygiene Behaviors
	5. Case Analysis of Zaatari
6. Integration of Approaches and Social Mobilization (Annex 4, pg. 59)	1. Community Engagement and 'Cash for Work' programs
	2. Integrating approaches and the 'WASH Block' approach
	3. Case Analysis of Zaatari

VII. Annexes

Annex 1: Summary Table of RSPH Curriculum Gap Analysis

Course Number	Course Title	Relevant Content	WinE* Content Hours
BSHE 535	Macrosocial Determinants of Heath	N/A	0
EH 530	Environmental and Occupational Epidemiology	N/A	0
EH 548	Research Methods for Studies of Water & Health	N/A	0
EH 571	Environmental Health Policy: Power, Science and Justice	N/A	0
EH 579	WASH in Schools	WASH in refugee camp schools	.25
EH 581	Public Health Consequences of Natural Disasters	Diseases associated with natural disasters	2
EH 590R	Management of Research Projects Under Constrained Conditions	N/A	0
EH 524	Risk Assessment	N/A	0
EH 583	Spatial Analysis in Disease Ecology	N/A	0
EHS 750	Environmental Determinants of Infectious Diseases	N/A	0
GH 510	Epidemiology in Complex Humanitarian Emergencies	Cholera outbreaks in CHEs	1
GH 512	Health in Complex Humanitarian Emergencies	WASH approaches in CHEs	1
GH 511	International Infectious Diseases: Control and Prevention	N/A	0
GH 532	Risk Communications for Global Public Health Emergencies	N/A	0
GH 580	Control of Food and Waterborne Diseases	Cholera outbreaks in disasters and CHEs	2.5
GH 529	WASH in Developing Countries	WASH in Emergencies (general)	2
GH 533	Preparedness and Planning for International Emergencies	N/A	0
Total WinE Relevant Lecture Hours in Current RSPH Curriculum: 8.75			

*WinE = Wash in Emergencies

Annex 2: Useful Guidelines, Manuals, and Toolkits

Document Title and Link to Source
Title: The Sphere Handbook http://www.sphereproject.org/handbook/
Title: Environmental Health in Emergencies and Disasters: A Practical Guide (e- book available at Emory Library) http://www.who.int/water_sanitation_health/hygiene/emergencies/em2002intro.pdf
Title: Adapting the Capacities and Vulnerabilities Approach: A Gender Analysis Tool https://academic.oup.com/heapro/article-abstract/32/6/930/2951037?redirectedFrom=fulltext
Title: Enabling Access to Non-Food Items in an Emergency Response: A review of Oxfam Programs https://policy-practice.oxfam.org.uk/publications/enabling-access-to-non-food-items-in-an-emergency-response-a-review-of-oxfam-pr-620325
Title: WASH Cluster Coordination Handbook https://www.humanitarianresponse.info/files/documents/files/WASH%20Cluster%20Coordinator%20Handbook.pdf
Title: Updated WHO/WEDC Technical Notes on WASH in Emergencies http://www.who.int/water_sanitation_health/publications/technotes/en/
Title: Water Treatment Guidelines for Use in Emergencies (Oxfam) http://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/OXFAM/OXF5%20-%20Oxfam%20guidelines%20for%20water%20treatment%20in%20emergencies.PDF
Title: Outbreak Surveillance and Response in Humanitarian Emergencies http://apps.who.int/iris/bitstream/handle/10665/70812/WHO_HSE_GAR_DCE_2012_1_eng.pdf;jsessionid=9F4185CCD336ECDCE09BC1A6A080ED7A?sequence=1
Title: Keeping it Simple: A Gender-specific Sanitation Tool for Emergencies https://www.developmentbookshelf.com/doi/abs/10.3362/1756-3488.2014.006
Title: Emergency Water Sources: Guidelines for Selection and Treatment https://wedc-knowledge.lboro.ac.uk/details.html?id=18064
Title: Excreta Disposal in Emergencies https://www.unicef.org/cholera/Chapter_9_community/19_Interagency-Excreta_disposal_in_emergencies.pdf
Title: Hygiene Promotion in Emergencies http://www.unicefinemergencies.com/downloads/eresource/docs/WASH/WASH%20Hygiene%20Promotion%20in%20Emergencies.pdf
Title: Global WASH Cluster Strategic Plan, 2011-2015 http://www.unicefinemergencies.com/downloads/eresource/docs/WASH/Global%20WASH%20Cluster%20Strategic%20Plan%202011-2015%20Vs3.pdf
Title: WASH in Humanitarian Actions (UNICEF Resource Website) http://www.unicefinemergencies.com/downloads/eresource/Water_sanitation_and_hygiene.html

Annex 3: Syllabus and Schedule

ROLLINS SCHOOL OF PUBLIC HEALTH
EMORY

DEPARTMENT: Global Health **COURSE NUMBER:** GH (TBD)
CREDIT HOURS: 1 **TITLE:** Water and Sanitation in Emergencies
DATES: (TBD) 2019 **LOCATION:** (TBD)

INSTRUCTORS

Instructor: Dr. Joanne McGriff **Phone**:(404)727-8732 **E-mail:** joanne.a.mcgriff@emory.edu

COURSE DESCRIPTION

This is an introductory course to introduce students to key programmatic components related to WASH in Emergencies. It covers challenges and approaches to delivering WASH interventions in acute and protracted emergencies as a result of natural disasters and complex humanitarian emergencies (CHE). It will cover different approaches for WASH service delivery for refugees in camps and internally displaced populations, particularly in urban settings. The course includes modules on the Global WASH Cluster and sector priorities, outbreaks, behavioral and environmental interventions, community engagement, and cross-cutting issues related to at-risk groups and sustainability.

COURSE STRUCTURE

Students are expected to complete the assigned readings prior to arriving at class each day. Additionally, students are expected to complete the Building a Better Response online training modules for Units 2 and 6 prior to the first day of class. Each day of the course will begin with a short quiz on the required readings for the day. For each course topic, there will be a series of lectures and case study activities or a journal discussion. Each day will conclude with a case study or discussion to reinforce the topics covered in the readings and lectures. The course hours are 9:00am to 5:00 pm. There will be a one hour lunch break and two 10 minute breaks each day.

SCHOOL LEVEL, DEPARTMENT, AND/ OR PROGRAM COMPETENCIES

School level Competencies:

1. Describe behavioral, social, and cultural factors that contribute to the health and well-being of individuals, communities, and populations
2. Assess global forces that influence the health of culturally diverse populations around the world
3. Apply principles of ethical conduct to public health practice

Department of Global Health Competencies:

1. Critique major global priorities and the reasons for their prioritization
2. Operate in partnership with local, national and international organizations engaged in the health and social sectors

WASH Certificate Competencies

1. Describe the multidisciplinary nature of WASH-related issues
2. Examine potential solutions for WASH-related challenges at the household and community level
3. Identify entities working in the WASH sphere

LEARNING OBJECTIVES ASSOCIATED WITH THE COMPETENCIES

By the end of the course, students will be able to:

1. Describe the key agencies and actors involved in funding, coordinating, and implementing WASH interventions in emergencies
2. Describe the unique challenges of delivering WASH interventions in emergencies with a special focus on cultural, gender, disability, and sustainability issues
3. Differentiate between WASH interventions that are appropriate for acute phases and stabilized emergency settings
4. Explain key WASH indicators and benchmarks used in CHEs and the best methods to gather data to track these indicators;
5. Describe new and commonly used WASH methods and technologies used in emergencies and list the strengths and limitations of each
6. Describe the steps involved in rapid assessments and selection of appropriate WASH interventions in different emergency contexts

EVALUATION

Students will be evaluated on:

(1) In-class quizzes based on daily readings
   a. Quizzes will cover material in the assigned reading for the day. **Quizzes will be closed book/computer, however students will be allowed to use hand-written or typed notes that they have taken on a separate sheet of paper (1 page maximum).** No make-up quizzes will be given.

(2) Journal entries
   a. Students are expected to post a thoughtful response to a discussion question on a case study following each day of class. These questions will be posted to the Canvas 'Discussion' page and should be completed by 11:59pm

(3) Class attendance and participation

(4) Final Project - The final project details will be provided on the last day of class to be completed at home. The final project write up must be uploaded to the Canvas course site by 5 p.m. on___ 2019. No late papers will be accepted. The course TA can be contacted for any questions regarding the quizzes or final project.

Final course grades will be calculated as follows:

20%-Daily quizzes
20%-Journal entries
10%-Class attendance and participation
50%-Final project

ACADEMIC HONOR CODE

The RSPH requires that all material submitted by a student in fulfilling his or her academic course of study must be the original work of the student.

INCLEMENT WEATHER POLICY

In the case that RSPH closes due to inclement weather, class will be held in an online format using Adobe Connect with the following meeting room link:

DAY 1 Schedule

Time	Topic / Activity	Facilitator(s)
9:00-9:10	Instructor and Course Introduction and Announcements	TBD
9:10-9:20	Day 1 Quiz	TBD
9:20-9:50	Emergency WASH Funding and the Humanitarian Cluster System	TBD
9:50-10:20	Assessments for Selection of WASH Interventions	TBD
10:20-10:50	Emergency WASH Program Management (M&E, Logistics, NFIs)	TBD
10:50-11:00	Break	
11:00-12:00	WASH-Related Illness, Outbreaks, and Disease Burden in Emergencies	TBD
12:00-1:00	Lunch	
1:00-1:30	Disease Surveillance Systems in Emergencies	TBD
1:30-3:00	Overview of Approaches for Clean Water in Emergencies	TBD
3:00-3:10	Break	
3:10-4:10	Inclusive and Equitable Water Provision-Unique People, Places, and Contexts	TBD
4:10-4:25	Operations and Maintenance of Emergency Water Sources	TBD
4:25-4:40	Discussion on Water in Zaatari Refugee Camp in Jordan	
4:40-4:50	Wrap-up Q &A	TBD
4:50-5:00	Mid-course Evaluation and Feedback	TBD

DAY 1 Reading

Required reading:

1. Sphere Minimum Standards - Handbook pp. 97-104
   http://www.ifrc.org/PageFiles/95530/The-Sphere-Project-Handbook-20111.pdf

2. Global WASH Cluster Strategic Plan, 2011-2015
   http://www.unicefinemergencies.com/downloads/eresource/Water_sanitation_and_hygiene.html

3. Environmental Health in Disasters and Emergencies: A Practical Guide, Ch. 7
   https://ebookcentral.proquest.com/lib/emory/detail.action?docID=284759

4. van der Helm, A. W. C., Bhai, A., Coloni, F., Koning, W. J. G., & de Bakker, P. T. (2017). Developing water and sanitation services in refugee settings from emergency to sustainability – the case of Zaatari Camp in Jordan. *Journal of Water Sanitation and Hygiene for Development*.

5. Watson, J. T., Gayer, M., & Connolly, M. A. (2007). Epidemics after Natural Disasters. *Emerging Infectious Diseases*, *13*(1), 1–5. https://doi.org/10.3201/eid1301.060779

6. Connolly, M. A., Gayer, M., Ryan, M. J., Salama, P., Spiegel, P., & Heymann, D. L. (2004) Communicable diseases in complex emergencies: impact and challenges. *Lancet*, *364*, 1974–1983.

Optional suggested reading:

1. Updated WHO/WEDC Technical Notes on WASH in Emergencies-Notes 1-6, 11, and 12

2. WASH Cluster Coordination Handbook, Ch. 6-Mobilizing Resources (available online)

3. A Quick Guide to Monitoring, Evaluation, Accountability and Learning (MEAL) in Fragile Contexts (available online)

4. Ferron, S. (2017). *Enabling Access to Non-Food Items in an Emergency Response: A review of Oxfam programmes*. Oxfam.

5. Yates, T., et al., Effectiveness of Chlorine Dispensers in Emergencies: Case Study Results from Haiti, Sierra Leone, Democratic Republic of Congo, and Senegal Environmental Science & Technology **2015** 49 (8), 5115-5122

6. Lantagne, D. S., & Clasen, T. F. (2012). Use of household water treatment and safe storage methods in acute emergency response: case study results from Nepal, Indonesia, Kenya, and Haiti. *Environ Sci Technol*, *46*, 11352–11360

DAY 2 Schedule

Time	Topic / Activity	Facilitator(s)
9:00-9:10	Day 2 Quiz	TBD
9:10-9:20	Overview of Day 2 Learning Objectives	TBD
9:20-10:40	Overview of Sanitation Approaches in Emergencies	
10:40-10:50	Break	
10:50-12:00	Inclusive and Equitable Sanitation-Unique People, Places, and Contexts	TBD
12:00-1:00	Lunch	
1:00-1:15	Operation and Maintenance of Sanitation Facilities in Emergencies	TBD
1:15-1:30	Discussion on Sanitation in Zaatari	TBD
1:30-2:45	Hygiene Promotion in Emergencies	TBD
2:45-3:15	Hygiene for At-Risk Groups-Special Focus on Women's Issues	TBD
3:15-3:30	Discussion on Hygiene Communication Programs in Zaatari	TBD
3:30-3:40	Break	
3:40-4:40	Integration of Approaches and Social Mobilization	TBD
4:40-4:50	Wrap up Q & A	TBD
4:30-5:00	Mid-course Evaluation and Feedback	TBD

DAY 2 Reading

Required reading:

1. Sphere Minimum Standards - Handbook pp. 91, 105,

http://www.ifrc.org/PageFiles/95530/The-Sphere-Project-Handbook-20111.pdf

2. Excreta Disposal for Physically Vulnerable People in Emergencies-Oxfam

http://www.unicefinemergencies.com/downloads/eresource/docs/WASH/Excreta%20disposal%20for%20physically%20vulnerable.pdf

3. Environmental Health in Disasters and Emergencies: A Practical Guide, Ch.7 https://ebookcentral.proquest.com/lib/emory/detail.action?docID=284759

4. Introduction into Hygiene Promotion in Emergencies-Tools and Approaches-UNIFEF pp. 1-9

http://www.unicefinemergencies.com/downloads/eresource/docs/WASH/WASH%20Introduction%20to%20Hygiene%20Promotion.Tools%20and%20Approaches.pdf

5. Schmitt, M. L., Clatworthy, D., Ratnayake, R., Klaesener-Metzner, N., Roesch, E., Wheeler, E., & Sommer, M. (2017). Understanding the menstrual hygiene management challenges facing displaced girls and women: findings from qualitative assessments in Myanmar and Lebanon. *Conflict and Health*, *11*, 19.

Optional reading:

1. Excreta Disposal in Emergencies

https://www.unicef.org/cholera/Chapter_9_community/19_Interagency-Excreta_disposal_in_emergencies.pdf

2. Sustainable Sanitation for Emergency and Reconstruction Situations, Johannessen, A., Patinet, J., Carter, W., Lamb, J. (2012)

3. Updated WHO/WEDC Technical Notes on WASH in Emergencies-Notes 7, 10, 13, 14

4. Vujcic, J., Ram, P. K., & Blum, L. S. (2015). Handwashing promotion in humanitarian emergencies: strategies and challenges according to experts. *Journal of Water Sanitation and Hygiene for Development*, *5*(4), 574–585.

5. Nawaz, J., Lal, S., Raza, S., & House, S. (2010). Oxfam experience of providing screened toilet, bathing and menstruation units in its earthquake response in Pakistan. *Gender & Development*, *18*, 81–86

6. Jordan: Wash infrastructure & services assessment in Zaatari camp Assessment Report (March 2017) https://reliefweb.int/report/jordan/jordan-wash-infrastructure-services-assessment-zaatari-camp-assessment-report-march

Annex 4: Module Outlines

Session	Learning Objectives	Reference Material
Module 1: Coordination and Funding-1 hour 30 min		
1. The Cluster Approach, Global WASH Cluster, and Funding (30 min)	Describe the humanitarian coordination system and the clusters within it Describe the role of the IASC and ERC List the key actors and agencies involved in delivering WASH aid to humanitarian contexts Name the WASH cluster lead and describe role List major sources of funding for WASH interventions in emergencies Describe the role of CERF	UNHCR Emergency Handbook https://emergency.unhcr.org/entry/61190/cluster-approach-iasc GWC Website http://washcluster.net/ CERF Website https://cerf.un.org/about-us/who-we-are
2. Assessments for Selecting WASH Interventions in Emergencies (30 min)	Name the Sphere minimum standards for WASH and describe how these standards contribute to selection of WASH interventions Describe steps for assessing environmental conditions, available resources, and community needs for water Describe steps for assessing environmental conditions, available resources, and community needs for sanitation Describe how assessment contributes to the selection of appropriate WASH interventions and approaches	Harvey, P., Baghri, S., & Reed, B. (2002). *Emergency sanitation: assessment and programme design*. WEDC, Loughborough University. Harvey, P., & Water, E., and Development Centre. (2007). *Excreta disposal in emergencies: a field manual : an inter-agency publication*. Loughborough: Loughborough University. Water, Engineering and Development Centre (WEDC). Adams, J. (2003). *Environmental Health in Emergencies and Disasters: A Practical Guide*. Albany, SWITZERLAND: World Health Organization.
3. Emergency WASH Program Management (30 min)	Describe logistical processes and distribution of NFIs for WASH interventions Describe M&E process in emergencies and how M&E contribute to Learning and program improvement Describe challenges of delivering aid in armed conflict settings	The WASH Cluster Coordination Handbook In Their Words: Perceptions of Non-State Actors on Humanitarian Actions https://genevacall.org/wp-content/uploads/dlm_uploads/2016//09/WHS_Report_2016_web.pdf

Session	Learning Objectives	Reference Material
Module 2: WASH Illnesses and Outbreaks in Emergencies -1 hour 30 min		
1. Disease Burden and Risk Factors (20 min)	Describe the disease burden of WASH-related illness in emergencies in terms of morbidity and mortality List the most significant risk factors associated with WASH-related illness in emergencies	Connolly, M. A., Gayer, M., Ryan, MJ., Salama, P., Spiegel, P., & Heymann, D. L. (2004). Communicable diseases in complex emergencies: impact and challenges. *Lancet*, *364*, 1974–1983. Bartlett, J. G. (2008). Infectious diseases associated with natural disasters. *The Social Ecology of Infectious Diseases*. Kouadio, I. K., Aljunid, S., Kamigaki, T., Hammad, K., & Oshitani, H. (2012). Infectious diseases following natural disasters: prevention and control measures. *Expert Review of Anti-Infective Therapy*, *10*(1), 95–104.
2. Outbreaks in Emergencies (25 min)	Describe the transmission pathways of at least three pathogens responsible for high rates of WASH-related illness in emergencies Name three major WASH-related disease outbreaks in emergencies and associated causes	Bartlett, J. G. (2008). Infectious diseases associated with natural disasters. *The Social Ecology of Infectious Diseases*. Kouadio, I. K., Aljunid, S., Kamigaki, T., Hammad, K., & Oshitani, H. (2012). Infectious diseases following natural disasters: prevention and control measures. *Expert Review of Anti-Infective Therapy*, *10*(1), 95–104.
3. Non-Communicable infectious diseases in Emergencies (15 min)	Name three non-communicable infectious diseases in emergencies Describe WASH-related risk factors which contribute to the proliferation of non-communicable diseases in emergencies Describe at least one strategy for vector control in emergencies	Watson, J. T., Gayer, M., & Connolly, M. A. (2007). Epidemics after Natural Disasters. *Emerging Infectious Diseases*, *13*(1), 1–5 Ivers, L. C., & Ryan, E. T. (2006). Infectious diseases of severe weather-related and flood-related natural disasters. *Current Opinion in Infectious Diseases*, *19*(5), 408
4. Disease Surveillance Systems (30 min)	Name and describe the three main disease surveillance systems used in emergency contexts	Haskew, C., Spiegel, P., Tomczyk, B., Cornier, N., & Hering, H. (2010). A standardized health information system for refugee settings: rationale, challenges and the way forward. *Bulletin of the World Health Organization*, *88*(10), 792–794. Integrated Disease Surveillance and Response (IDSR) | Division of Global Health Protection | Global Health | CDC.

Session	Learning Objectives	Reference Material
Module 3: Approaches for Providing Clean Water-3 hours		
1. Overview of Commonly Used Approaches for Water (90 min)	Describe the benefits and challenges of POS water interventions in emergencies Describe the benefits and challenges of POU interventions in emergencies Describe approaches for overcoming challenges for water supply in drought, high water table, and long-term response situations	Yates, T., et al., Effectiveness of Chlorine Dispensers in Emergencies: Case Study Results from Haiti, Sierra Leone, Democratic Republic of Congo, and Senegal Lantagne, D. S., & Clasen, T. F. (2012). Use of household water treatment and safe storage methods in acute emergency response: case study results from Nepal, Indonesia, Kenya, and Haiti. Environmental Health in Disasters Emergencies: A Practical Guide, Ch. 7
2. Special Consideration for 'At-Risk' Populations (20 min)	List three ways in which water interventions can be designed to improve safety and well-being of women and children in emergencies Describe how water taps and showering spaces should be designed for inclusivity of elderly and disables	Environmental Health in Disasters Emergencies: A Practical Guide, Ch. 7 Adapting the Capacities and Vulnerabilities Approach: A Gender Analysis Tool
3. Urban vs. Rural Response (20 min)	List three challenges for emergency water provision in urban settings Describe the importance of municipality partnership in emergency urban response as it relates to water	Environmental Health in Disasters Emergencies: A Practical Guide, Ch. 7
4. Sustainability and Transition to Development (20 min)	Describe best practices for implementing sustainable water interventions at the onset of emergencies Explain two types of water technology which facilitate sustainable solutions for water in long-term refugee camp settings	Environmental Health in Disasters Emergencies: A Practical Guide, Ch. 7
5. Operation and Maintenance (15 min)	Describe how operation and maintenance overlaps with logistics planning and needs assessments Describe approaches for utilizing affected community members in operations and maintenance of water sources	Environmental Health in Disasters Emergencies: A Practical Guide, Ch. 7 WASH Cluster Coordination Handbook
6. Case analysis of Zaatari (15 min)	Describe the process for immediate provision of water in Zaatari camp Describe the differences in water provision between the acute and stabilized phase in Zaatari camp	van der Helm, A. W. C., Bhai, A., Coloni, F., Koning, W. J. G., & de Bakker, P. T. (2017). Developing water and sanitation services in refugee settings from emergency to sustainability – the case of Zaatari Camp in Jordan. *Journal of Water Sanitation and Hygiene for Development*.

Session	Learning Objectives	Reference Material
Module 4: Approaches for Sanitation in Emergencies-3 hours		
1. Overview of Commonly Used Approaches for Sanitation (90 min)	Describe the benefits and challenges of communal sanitation facilities in emergencies Describe the benefits and challenges of pit latrines in emergencies Describe appropriate emergency settings for use of septic tanks for emergency sanitation Describe approaches for short-term interim sanitation when repair of existing infrastructure is possible	Harvey, P. A., & Reed, R. A. (2005). Planning environmental sanitation programmes in emergencies. *Disasters*, *29*, 129–151. Harvey, P., & Water, E., and Development Centre. (2007). *Excreta disposal in emergencies: a field manual : an inter-agency publication*. Loughborough: Loughborough University. Water, Engineering and Development Centre (WEDC). Updated WHO/WEDC Technical Notes on WASH in Emergencies-Notes 7, 10, 13, 14
2. Special Consideration for 'At-Risk' Population (20 min)	List three ways in which sanitation in emergencies can be designed to improve safety for women and children in emergencies Describe how toilet and latrine spaces should be designed for inclusivity of elderly and disabled	Harvey, P. A., & Reed, R. A. (2005). Planning environmental sanitation programmes in emergencies. *Disasters*, *29*, 129–151. Harvey, P., & Water, E., and Development Centre. (2007). *Excreta disposal in emergencies: a field manual : an inter-agency publication*. Loughborough: Loughborough University. Water, Engineering and Development Centre (WEDC).
3. Urban vs. Rural Response (20 min)	List three challenges and approaches for emergency sanitation in urban settings Describe the importance of municipality partnership in emergency urban response as it relates to sanitation	Environmental Health in Emergencies and Disasters: A Practical Guide (e- book available at Emory Library) http://www.who.int/water_sanitation_health/hygiene/emergencies/em2002intro.pdf
4. Sustainability and Transition to Development (20 min)	Describe different scenarios which would warrant use of defecation fields or trench latrines at the onset of an emergency Describe sustainable solutions for sanitation in refugee camp settings	Environmental Health in Emergencies and Disasters: A Practical Guide (e- book available at Emory Library) http://www.who.int/water_sanitation_health/hygiene/emergencies/em2002intro.pdf
5. Operation and Maintenance (15 min)	Describe how operation and maintenance overlaps with logistics planning and needs assessments for sanitation Describe approaches for FSM in emergencies Describe approaches for utilizing affected community members in operations and maintenance of sanitation	Harvey, P., & Water, E., and Development Centre. (2007). *Excreta disposal in emergencies: a field manual : an inter-agency publication*. Loughborough: Loughborough University. Water, Engineering and Development Centre (WEDC). Cash for Work in Zaatari Camp, Basic Needs and Livelihoods Working Group - April 2017. (n.d.).https://reliefweb.int/report/jordan/cash-work-zaatari-camp-basic-needs-and-livelihoods-working-group-april-2017 WASH Cluster Coordination Handbook https://www.humanitarianresponse.info/files/documents/files/WASH%20Cluster%20Coordinator%20Handbook.pdf
6. Case analysis of Sanitation Zaatari (15 min)	Describe the process for immediate provision of water in Zaatari camp Describe the differences in water provision between the acute and stabilized phase in Zaatari camp	van der Helm, A. W. C., Bhai, A., Coloni, F., Koning, W. J. G., & de Bakker, P. T. (2017). Developing water and sanitation services in refugee settings from emergency to sustainability – the case of Zaatari Camp in Jordan.

Session	Learning Objectives	Reference Material
Module 5: Hygiene Promotion In Emergencies-2 hours		
1. Overview of Commonly used Approaches for Hygiene Promotion (1 hour)	Explain how women from affected communities can contribute to hygiene promotion in emergency response Describe the importance of cultural sensitivity and competency when designing hygiene promotion activities	Hygiene Promotion in Emergencies (UNICEF)- Link Annex 2
2. Special Consideration for 'at-risk' Populations (20 min)	Describe the gaps in menstrual hygiene management which exist in emergency response Describe the importance of gender separated shower and hygiene facilities	Sommer, M. (2012). Menstrual hygiene management in humanitarian emergencies: gaps and recommendations. *Waterlines*, *31*, 83–104. Sommer, M., Ferron, S., Cavill, S., & House, S. (2015). Violence, gender and WASH: spurring action on a complex, under-documented and sensitive topic. *Environment and Urbanization*, *27*, 105–116.
3. Sustaining Positive Hygienic Behaviors (20 min)	Describe how improper operation and maintenance of water and sanitation can contribute to low adherence to hygienic behavior Explain how women in the community can contribute to development of sustainable hygiene behavior change and adherence	Hygiene Promotion in Emergencies (UNICEF)- Link Annex 2
4. Case analysis of Zaatari (20 min)	Describe the hygiene approaches and outcomes applied in Zaatari refugee camp	van der Helm, A. W. C., Bhai, A., Coloni, F., Koning, W. J. G., & de Bakker, P. T. (2017). Developing water and sanitation services in refugee settings from emergency to sustainability – the case of Zaatari Camp in Jordan. *Journal of Water Sanitation and Hygiene for Development*.

Session	Learning Objectives	Reference Material
Module 6: Integration of Approaches and Social Mobilization-1 hour		
1. Community Engagement and "Cash for Work" Programs (20 minutes)	Describe the components of "Cash for Work" programs and how they contribute to integration of water, sanitation, and hygiene interventions in emergencies Describe how social mobility initiatives such as "Cash for Work" contribute to sustainability and appropriateness of WASH interventions in emergencies	van der Helm, A. W. C., Bhai, A., Coloni, F., Koning, W. J. G., & de Bakker, P. T. (2017). Developing water and sanitation services in refugee settings from emergency to sustainability – the case of Zaatari Camp in Jordan. *Journal of Water Sanitation and Hygiene for Development*. Cash for Work in Zaatari Camp, Basic Needs and Livelihoods Working Group - April 2017. (n.d.).https://reliefweb.int/report/jordan/cash-work-zaatari-camp-basic-needs-and-livelihoods-working-group-april-2017
2. Integration of Approaches and "WASH Block" Approach (20 minutes)	Describe the implementation components of communal "WASH Blocks" in refugee camps Describe the benefits and challenges of large scale 'WASH Blocks" in refugee camp settings	van der Helm, A. W. C., Bhai, A., Coloni, F., Koning, W. J. G., & de Bakker, P. T. (2017). Developing water and sanitation services in refugee settings from emergency to sustainability – the case of Zaatari Camp in Jordan. *Journal of Water Sanitation and Hygiene for Development*. Zaatari Refugee Camp - Factsheet, November 2016. (n.d.). https://reliefweb.int/report/jordan/zaatari-refugee-camp-factsheet-november-2016
3. Case analysis of Zaatari Camp (20 minutes)	List three reasons why "WASH Blocks" became problematic in Zaatari camp Explain how social mobilization and 'Cash for Work' benefitted the WASH situation in Zaatari	van der Helm, A. W. C., Bhai, A., Coloni, F., Koning, W. J. G., & de Bakker, P. T. (2017). Developing water and sanitation services in refugee settings from emergency to sustainability – the case of Zaatari Camp in Jordan. *Journal of Water Sanitation and Hygiene for Development*.

Annex 5: Introduction Lecture Outline

Module 1: Coordination and Funding for WASH in Emergencies

I. The Cluster Approach

A. Brief History (important developments)

1. 1991-UN Resolution 46/182 was created to strengthen coordination of international humanitarian response and assistance of the UN in such efforts
2. 2005-Creation of 'Cluster Approach' consisting on eleven 'clusters' which organize response for the areas of shelter, protection, WASH, nutrition, logistics, health, food security, telecommunication, education, recovery, and camp management

B. Purpose: improve the predictability, timeliness, and effectiveness of humanitarian response, to facilitate recovery from disasters and CHEs.

C. Organization

1. Inter-Agency Standing Committee: Designating body of cluster system which reports to the Emergency Response Coordinator
2. Emergency Response Coordinator: Chairs meetings of IASC and reports to the Un Under-Secretary General (USG)
3. Clusters: Groups of humanitarian organizations representing the eleven main sectors of humanitarian response. Each sector includes a lead agency responsible for reporting progress and activities to the IASC

II. The Global WASH Cluster

A. GWC Cluster Lead: UNICEF

1. Purpose: WASH agency lead responsible for defining roles and responsibilities of WASH response actors and monitoring and reporting progress of GWC response to IASC and ERC

B. Examples of Major GWC Agencies/NGOs: Oxfam, ACTED, UNICEF, WaterAid, WaterMission, Save the Children, MercyCorps, MedAir, CARE, IRC, ICRC

C. Funding for GWC Efforts

2. Flash Appeals

a. Purpose: Generate donor funding to support life-saving interventions which can be implemented within first 3-6 months of an emergency
b. Mechanism: Multiple donor agencies use flash appeals to deliver funds quickly to UN and NGO humanitarian programs they want to support

3. CERF Mechanism
a. Purpose: Complement existing funding mechanisms by providing short-term immediate funding while Flash Appeal is generated, and provide additional support to under-funded emergencies
b. Mechanism:

4. Consolidated Appeals Process
a. Purpose: Generate larger funding amounts from multiple donors to support coordinated response efforts across sectors, agencies, international and local humanitarian response actors
b. Mechanism: Uses the Common Humanitarian Action Plan (CHAP), which includes input from all sectors and multiple response agencies, to identify and provide funding for wide ranging humanitarian needs of situation

III. Assessments for Selection of WASH Interventions

A. Pre-Cluster Assessment
1. Should occur at onset of disaster/emergency (within 1-2 days)
2. Usually occurs before Wash Cluster Coordinator (WCC) arrives
3. Undertaken by in-country team UN team (UNCT)
4. Purpose: Decide if GWC mobilization in required; collect satellite, anecdotal, and contextual information on the extent of damage and estimation of humanitarian needs, initiate Flash Appeal for CERF funding

B. Rapid Assessment
1. Should occur within one week of onset of disaster
2. Usually an inter-cluster assessment collecting data on health, sheltering, nutritional, and WASH needs of affected population

3. Purpose: collect more detailed baseline data, determine program indicators, determine necessary supplies and training needed for response

C. Comprehensive Assessment
   1. Ongoing process beginning from one week after emergency onset
   2. Incudes focus groups with affected population to inform appropriate selection of context-specific WASH interventions
   3. Purpose: Ensure GWC response plans, indicators, and program targets remain appropriate and effective

IV. Logistics and Inter-sector Planning Process

A. Quantification of supplies needed
   1. Estimated during initial and ongoing needs assessment in coordination with other priority sectors such as health, nutrition, and sheltering
   2. Can occur and re-occur throughout response, at preparedness, planning, and response phases

B. Procurement of supplies
   1. Should prioritize partnership with local and sustainable procurement sources if possible
   2. Appropriate type and amount of supplies are informed by needs assessment and quantification process

C. Importation of supplies
   1. Imported supplies must be registered or approved for use in country where they will be delivered

D. Warehousing of materials
   1. Options for warehousing must be identified at port of entry through final destination
   2. Consideration of security capacity of local warehouse staff is important
   3. Warehousing of materials should also be coordinated with other response sectors

E. Transport of materials
   1. Multiple transport routes and detours for supply caravans should be identified in advance to avoid complication due to road block

2. Special consideration should be taken in conflict affected countries and avoid passing through areas where aid supplies could be intercepted
3. If working in conflict affected countries, logistics and supply chain operators should be trained in negotiation techniques

F. Distribution of materials

1. Deep understanding of clearance procedures and regulations is needed to prepare for quick release of imported materials for distribution
2. Points of distribution of supplies should be determined in advance
3. Distribution of supplies may require a phased approach in the early stages while needs assessments and procurement of additional goods is ongoing

V. Monitoring and Evaluation

A. Timeline

1. In acute phase, weekly review of monitoring data is advised
2. In stabilized situations, data reviews can occur monthly

B. Indicators

1. Quantitative: measures quantities of supplies distributed and number of people reached
2. Qualitative: measures effectiveness, appropriateness, and inclusiveness of WASH interventions based on perceptions of affected individuals
3. SMART: Indicators should be Specific, Measurable, Relevant, and Timebound
4. Development: Program indicators can be informed by a combination of Sphere minimum standards, programmatic inputs, and context specific needs

C. Purpose

1. Track changes in situation and evolving needs
2. Assess progress of response
3. Facilitate stakeholder accountability
4. Highlight achievements and lessons learned to inform future decision making and improve intervention

VIII. Literature Cited

Adams, J. (2003). *Environmental Health in Emergencies and Disasters: A Practical Guide*. Albany, SWITZERLAND: World Health Organization. Retrieved from http://ebookcentral.proquest.com/lib/emory/detail.action?docID=284759

Aid Worker Security Report 2017 - Behind the attacks: A look at the perpetrators of violence against aid workers. (n.d.). Retrieved April 14, 2018, from https://reliefweb.int/report/world/aid-worker-security-report-2017-behind-attacks-look-perpetrators-violence-against-aid

Balfour, N., Mutai, C., Otieno, P., & Johnston, D. (2015). CLTS in fragile and insecure contexts. *Waterlines*, *34*(3), 269–276.

Bartlett, J. G. (2008). Infectious diseases associated with natural disasters. *The Social Ecology of Infectious Diseases*.

Brown, J., Cavill, S., Cumming, O., & Jeandron, A. (2012). Water, sanitation, and hygiene in emergencies: summary review and recommendations for further research. *Waterlines*, *31*, 11–29.

Brown, J., & Clasen, T. (2012). High Adherence Is Necessary to Realize Health Gains from Water Quality Interventions. *PLoS ONE*, *7*(5).

Cash for Work in Zaatari Camp, Basic Needs and Livelihoods Working Group - April 2017. (n.d.). Retrieved April 14, 2018, from https://reliefweb.int/report/jordan/cash-work-zaatari-camp-basic-needs-and-livelihoods-working-group-april-2017

Competencies. (n.d.). Retrieved February 4, 2018, from www.sph.emory.eduacademics/competencies/index.html

Connolly, M. A., Gayer, M., Ryan, M. J., Salama, P., Spiegel, P., & Heymann, D. L. (2004). Communicable diseases in complex emergencies: impact and challenges. *Lancet*, *364*, 1974–1983.

Course: Building a Better Response, Unit 6: Complex Humanitarian Emergencies. (n.d.). Retrieved April 8, 2018, from http://www.buildingabetterresponse.org/course/view.php?id=27

Crisp, J., Morris, T., & Refstie, H. (2012). Displacement in urban areas: new challenges, new partnerships. *Disasters*, *36 Suppl 1*, S23-42.

Ferron, S. (2017). *Enabling Access to Non-Food Items in an Emergency Response: A review of Oxfam programmes*. Oxfam.

Ferron, S., & Lloyd, A. (n.d.). Emergency WASH for Children, 62.

Graduate Certificate. (n.d.). Retrieved January 14, 2018, from http://www.che.emory.edu/what-we-do/graduate-certificate/index.html

Harvey, P. A., & Reed, R. A. (2005). Planning environmental sanitation programmes in emergencies. *Disasters*, *29*, 129–151.

Harvey, P., Baghri, S., & Reed, B. (2002). *Emergency sanitation: assessment and programme design*. WEDC, Loughborough University.

Harvey, P., & Water, E., and Development Centre. (2007). *Excreta disposal in emergencies: a field manual : an inter-agency publication*. Loughborough: Loughborough University. Water, Engineering and Development Centre (WEDC).

Haskew, C., Spiegel, P., Tomczyk, B., Cornier, N., & Hering, H. (2010). A standardized health information system for refugee settings: rationale, challenges and the way forward. *Bulletin of the World Health Organization*, *88*(10), 792–794.

In Their Words: Perceptions of armed non-State actors on humanitarian action. (n.d.). Retrieved April 15, 2018, from https://reliefweb.int/report/world/their-words-perceptions-armed-non-state-actors-humanitarian-action

Integrated Disease Surveillance and Response (IDSR) | Division of Global Health Protection | Global Health | CDC. (n.d.). Retrieved April 8, 2018, from https://www.cdc.gov/globalhealth/healthprotection/idsr/index.html

Ivers, L. C., & Ryan, E. T. (2006). Infectious diseases of severe weather-related and flood-related natural disasters. *Current Opinion in Infectious Diseases*, *19*(5), 408.

Keegan, M. (1993). Optimizing the Instructional Moment: A Guide to Using Socratic, Didactic, Inquiry, and Discovery Methods. *Educational Technology*, *33*(4), 17–22.

Knowles, M. S. (1978). Andragogy: Adult Learning Theory in Perspective. *Community College Review*, *5*(3), 9–20.

Kouadio, I. K., Aljunid, S., Kamigaki, T., Hammad, K., & Oshitani, H. (2012). Infectious diseases following natural disasters: prevention and control measures. *Expert Review of Anti-Infective Therapy*, *10*(1), 95–104.

Lantagne, D. S., & Clasen, T. F. (2012). Use of household water treatment and safe storage methods in acute emergency response: case study results from Nepal, Indonesia, Kenya, and Haiti. *Environ Sci Technol*, *46*, 11352–11360.

Leaning, J., & Guha-Sapir, D. (2013). Natural disasters, armed conflict, and public health. *New England Journal of Medicine*, *369*(19), 1836–1842.

Nawaz, J., Lal, S., Raza, S., & House, S. (2010). Oxfam experience of providing screened toilet, bathing and menstruation units in its earthquake response in Pakistan. *Gender & Development*, *18*, 81–86.

Prüss-Ustün, A., Bartram, J., Clasen, T., Colford, J. M., Cumming, O., Curtis, V., … Cairncross, S. (2014). Burden of disease from inadequate water, sanitation and hygiene in low- and middle-income settings: a retrospective analysis of data from 145 countries. *Tropical Medicine & International Health: TM & IH*, *19*(8), 894–905.

Sahrawi refugee camps in Algeria's arid south. (2016, March 4). *Reuters*. Retrieved from https://www.reuters.com/article/us-algeria-sahara/sahrawi-refugee-camps-in-algerias-arid-south-idUSKCN0W626J

Schmitt, M. L., Clatworthy, D., Ratnayake, R., Klaesener-Metzner, N., Roesch, E., Wheeler, E., & Sommer, M. (2017). Understanding the menstrual hygiene management challenges facing displaced girls and women: findings from qualitative assessments in Myanmar and Lebanon. *Conflict and Health*, *11*, 19.

Sencan, I., Sahin, I., Kaya, D., Oksuz, S., & Yildirim, M. (2004). Assessment of HAV and HEV seroprevalence in children living in post-earthquake camps from Düzce, Turkey. *European Journal of Epidemiology*, *19*(5), 461–465.

Sommer, M. (2012). Menstrual hygiene management in humanitarian emergencies: gaps and recommendations. *Waterlines*, *31*, 83–104.

Sommer, M., Ferron, S., Cavill, S., & House, S. (2015). Violence, gender and WASH: spurring action on a complex, under-documented and sensitive topic. *Environment and Urbanization*, *27*, 105–116.

Spiegel, P. B., Le, P., Ververs, M.-T., & Salama, P. (2007). Occurrence and overlap of natural disasters, complex emergencies and epidemics during the past decade (1995–2004). *Conflict and Health*, *1*, 2.

The CLTS approach. (2008, November 11). Retrieved March 18, 2018, from http://www.communityledtotalsanitation.org/page/clts-approach

The Sphere Handbook | What is Sphere? (n.d.). Retrieved April 2, 2018, from http://www.spherehandbook.org/en/what-is-sphere/

Tratschin, R., & Spuhler, D. (n.d.). Immediate and short-term Emergency Sanitation | SSWM. Retrieved March 18, 2018, from https://www.sswm.info/water-nutrient-cycle/wastewater-treatment/hardwares/sanitation-emergencies/immediate-and-short-term-emergency-sanitation

UN. (1991, December). A/RES/46/182. Strengthening of the coordination of humanitarian emergency assistance of the United Nations. Retrieved March 15, 2018, from http://www.un.org/documents/ga/res/46/a46r182.htm

UNOCHA. (2012). *What is the Cluster Approach?* United Nations Office of Humanitarian Coordination and Assistance. Retrieved from https://www.unocha.org/sites/unocha/files/dms/Documents/120320_OOM-ClusterApproach_eng.pdf

van der Helm, A. W. C., Bhai, A., Coloni, F., Koning, W. J. G., & de Bakker, P. T. (2017). Developing water and sanitation services in refugee settings from emergency to sustainability – the case of Zaatari Camp in Jordan. *Journal of Water Sanitation and Hygiene for Development*.

Vujcic, J., Ram, P. K., & Blum, L. S. (2015). Handwashing promotion in humanitarian emergencies: strategies and challenges according to experts. *Journal of Water Sanitation and Hygiene for Development*, *5*(4), 574–585.

WASH Certificate Program - CGSW at Emory University. (n.d.). Retrieved January 14, 2018, from http://www.cgswash.org/for-students/wash-certificate/

WASH Cluster -. (n.d.). Retrieved February 26, 2018, from http://washcluster.net

WASH Cluster Coordinator Handbook | HumanitarianResponse. (n.d.). Retrieved April 15, 2018, from https://www.humanitarianresponse.info/en/coordination/clusters/document/wash-cluster-coordinator-handbook

Watson, J. T., Gayer, M., & Connolly, M. A. (2007). Epidemics after Natural Disasters. *Emerging Infectious Diseases*, *13*(1), 1–5.

Welcome to the IASC | IASC. (n.d.). Retrieved March 15, 2018, from https://interagencystandingcommittee.org/

What is the Cluster Approach? | HumanitarianResponse. (n.d.). Retrieved March 15, 2018, from https://www.humanitarianresponse.info/en/about-clusters/what-is-the-cluster-approach

What water and latrines mean in Nyarugusu Refugee Camp. (2015, July 20). Retrieved April 2, 2018, from https://cwsglobal.org/what-water-and-latrines-mean-in-nyarugusu-refugee-camp/

WHO | Outbreak surveillance and response in humanitarian emergencies. (n.d.). Retrieved April 15, 2018, from http://www.who.int/diseasecontrol_emergencies/publications/who_hse_epr_dce_2012.1/en/

WHO | Updated WHO/WEDC Technical Notes on WASH in Emergencies. (n.d.). Retrieved March 17, 2018, from http://www.who.int/water_sanitation_health/publications/technotes/en/

Who We Are | CERF. (n.d.). Retrieved April 8, 2018, from https://cerf.un.org/about-us/who-we-are

Adams, J. (2003). *Environmental Health in Emergencies and Disasters: A Practical Guide*. Albany, SWITZERLAND: World Health Organization. Retrieved from http://ebookcentral.proquest.com/lib/emory/detail.action?docID=284759

World Risk Report 2017. (n.d.). Retrieved April 15, 2018, from https://reliefweb.int/report/world/world-risk-report-2017

Yates, T., Allen, J., Leandre Joseph, M., & Lantagne, D. (2017). WASH Interventions in Disease Outbreak Response. *Policy & Practice*. Retrieved from https://policy-practice.oxfam.org.uk/publications/wash-interventions-in-disease-outbreak-response-620202

Zaatari Refugee Camp - Factsheet, November 2016. (n.d.). Retrieved April 2, 2018, from https://reliefweb.int/report/jordan/zaatari-refugee-camp-factsheet-november-2016

Zetter, R., & Deikun, G. (2010). Meeting humanitarian challenges in urban areas. *Forced Migration Review; Oxford*, (34), 5–7.