Institution: University of Southampton

Unit of Assessment: 17B Geography, Archaeology and Environmental Studies

Title of case study: 17B-05 Supporting the Monitoring and Provision of Safe Drinking Water to the Poorest Communities in the Developing World

1. Summary of the impact

The impact of research by the University of Southampton into global access to safe drinking water has: (i) provided important evidence for new policy initiatives by the World Health Organisation and UNICEF to promote home water treatment to reduce the 1.9 million deaths each year due to water-related infections, and (ii) stimulated debate among a range of stakeholders, including the media, advocacy groups and UN bodies, by challenging the accuracy of the assertion by the UN Secretary General that the UN Millennium Development Goal for safe water access has been met.

2. Underpinning research

The UN Millennium Development Goals (MDGs) include a target (7c) to reduce by half, between 1990 and 2015, "the proportion of the population without sustainable access to safe drinking-water." The World Health Organisation (WHO) and UNICEF Joint Monitoring Programme tracks progress towards this goal but the definition of what constitutes safe drinking-water access has been questioned. Current guidelines dictate that access to piped water and protected dug wells constitutes 'safe' drinking-water. But critics argue they fail to account for source water quality, which varies widely from country to country. Piped water is sometimes inadequately treated.

Research carried out at Southampton by Dr Jim Wright, Senior Lecturer in Geographical Information Systems since 2004, has sought to provide more accurate data on safe drinking-water access in developing countries to maximise intervention effectiveness. Wright's research programme began as a Co-Investigator (Co-I) at the University of Bristol in 2000 with the EU-funded AQUAPOL project, which analysed the impact of water quality deterioration in rural Africa following collection from source. Wright moved to Southampton in June 2004 as an early career research (ECR), developing his own programme of work as Principal Investigator (PI) for the AQUATEST project, funded by the EU from 2006 to 2007 and the Gates Foundation from 2007 to 2012. The University of Bristol led the development of a low-cost water quality test that could be used on-site in developing countries while Wright's own £264,000 programme examined the policy implications of water quality monitoring (**3.1, 3.2**) and alternative low-cost water testing technologies (**3.3**).

From these projects, Wright and his collaborators evaluated the use of household water filters in Zimbabwe and South Africa to prevent diarrhoeal disease (**3.4**). When the fieldwork was conducted in 2003-4, there were no published studies documenting the health impact of home water treatment with ceramic filters in developing countries. The research by Wright and his collaborators was the first to document these important health impacts. Wright developed the study design as a Co-I and was directly responsible for health outcome assessment (**3.5**) and field data management (**3.6**). Sixty-one of 115 households were given ceramic filters and diarrhoea incidence in young children was recorded daily over six months. E.coli counts were reduced in the drinking-water of 57% of intervention households and statistically significant reductions in diarrhoea observed from filtration.

Desk-based research across five countries between 2008 and 2011 led to published papers in 2012-13 (**3.1, 3.2**) that also demonstrated limitations in the current UN-endorsed methodologies for monitoring global drinking-water safety. Wright was Southampton PI for this work with Hong Yang as PDRA. Previously, the rapid assessment of drinking-water quality (RADWQ) project conducted pilot studies (2004-5) in eight countries to assess drinking-water safety. RADWQ data assessed water quality rather than classifying water sources as safe based on source type. When Wright and his colleagues incorporated the RADWQ data from five countries into their analysis, the estimated

proportion of populations with access to safe drinking-water fell significantly in four countries: 11% in Ethiopia, 16% in Nicaragua, 15% in Nigeria and 7% in Tajikistan.

The UN Secretary General Ban Ki-Moon declared in March 2012 that MDG Target 7c had been reached in 2010, five years ahead of the 2015 deadline. Wright's research challenged this, showing that, across the five countries surveyed, the number of people with access to safe drinking-water should be reduced by 32m. These significant results demonstrate that the indicator used to monitor progress towards MDG Target 7c has led to substantial overestimation of the population with safe drinking-water.

3. References to the research

Publications

3.1 Bain R, Gundry SW, Wright J, Yang H, Pedley S, and Bartram JK (2012): 'Accounting for water quality in MDG monitoring: lessons from five countries'. *Bulletin of the World Health Organization* 90: 228-235

3.2 Yang H, Bain R, Bartram J, Gundry S, Pedley S and Wright JA (2013) 'Water safety and inequality in access to drinking-water between rich and poor households'. *Environmental Science & Technology* 47 (3): 1222-1230

3.3 Wright JA, H Yang, K Walker, S Pedley, J Elliott and SW Gundry (2013): 'The H2S test versus standard indicator bacteria tests for faecal contamination of water: systematic review and meta-analysis'. *Tropical Medicine and International Health* 17 (1), 94-105

3.4 Du Preez M, Conroy RM, Wright JA, Moyo S, Potgieter N, Gundry SW (2008) : 'Use of ceramic water filtration in the prevention of diarrhoeal disease : a randomised controlled trial in rural South Africa and Zimbabwe'. *American Journal of Tropical Medicine and Hygiene* 79 (5): 696-701

3.5 Wright JA, SW Gundry, R Conroy, D Wood, M du Preez, A Ferro-Luzzi, B Genthe, M Kirimi, S Moyo, C Mutisi, J Ndamba, and N Potgieter (2006): 'Defining episodes of diarrhoea: results from a three-country study in sub-Saharan Africa'. *Journal of Health, Population, and Nutrition*, 24 (1), 8-16.

3.6 Wright JA, SW Gundry, B Genthe, M du Preez, S Moyo, N Potgieter, and J Ndamba (2004): 'Use of hand-held computers for collecting water quality data in developing countries'. *Water International* 29 (4), 517 - 522.

Grants

1) Gundry S (Co-ordinator); Wright J (PI at Southampton): *AQUATEST – low-cost water test for developing countries: a preparatory study*. European Union FP6. Jul 2006 – Dec 2007. Value to Southampton: £37,000.

2) Gundry S (Co-ordinator); Wright J (PI at Southampton): *AQUATEST 2*. Oct 2007 – Sep 2012. Value to Southampton: £227,000.

3) Gundry S (Co-ordinator): AQUAPOL: The Policy Implications of Contamination of Rural Water between Source and Point-of-Use in Kenya, S. Africa and Zimbabwe. 2000 – Sep 2005. Value to University of Bristol: £230,000.

4. Details of the impact

Research conducted at the University of Southampton has a) **challenged conventional wisdom** held by the UN bodies and **stimulated public debate** on safe water statistics and b) **informed policies of the UN, WHO, and UNICEF on safe drinking water.**

Wright's discovery that **current UN guidelines overestimate access to safe drinking water has informed a contentious policy debate** over the methodology used to assess progress towards Target 7c in the MDGs. The Global Water Forum, a UNESCO initiative to present knowledge and

insight from leading water researchers and practitioners, published a summary of the findings in July 2012, which said that 32m represented a "*sizeable difference compared to the 70m that have begun to use improved water sources in these countries between 1990 and 2008."*

The research findings on progress towards Target 7c of the MDGs has also made an impact by **contributing to public debate.** In March 2012 the BBC Radio 4 and World Service programme *More or Less*, which questions and debunks official statistics in the news, carried the findings in an interview with Wright's co-authors at Bristol (**5.1**). Two months later the BBC's Environment Analyst Roger Harrabin, drawing on Wright's research data from Jordan and Nicaragua, reported that the number of people without drinking water may be much higher than UN estimates (**5.2**). The report quoted WHO sources as having "*let Mr Ban (Ki-Moon) know in no uncertain terms that his office has badly understated the scale of the drinking water crisis*." In May 2012, the findings were discussed in a Scientific American article (**5.3**). A blog post in August 2012 by the director of the Australia-based Development Policy Centre cited both the BBC and the Global Water Forum reports in its criticism of the UN. Wright's work has therefore made an impact on health through the **provision of better indicators for monitoring health and well-being**.

The debates have prompted the UN Secretary General's Advisory Board on Water and Sanitation **to recommend more meaningful and better resourced international monitoring**. In their report on Post-2015 Global Goal on Water, where they cite the work of Wright and his co-authors, they state that '*Indicators and effective monitoring mechanisms need to be built and adequately financed to measure progress towards these 3 objectives*', which include '*universal access to sustainable sanitation and drinking water that is really safe*' (**5.4**: p. ii).

Wright's research that highlighted the effectiveness of ceramic water filters in Zimbabwe and South Africa was one of just three such studies included in an early Cochrane Systematic Review and one of five studies in a later review (**5.5**, **5.6**). The systematic reviews were taken up by UNICEF and WHO, as is normal practice**, to develop a new policy-drive to push home water treatment**. The Cochrane Review conducted by Clasen et al. (**5.5**) was used in a 2008 UNICEF policy paper to justify the new initiative, pointing out that low-cost home water treatment interventions can result in net savings to the public purse (**5.7**). A 2011 WHO report, *Strategic Consultation on Household Water Treatment and Safe Storage*, cited the Hunter review (**5.6**) to stress that home water treatment can reduce diarrhoeal incidence, presenting the case for rolling out new treatment systems (**5.8**). These policy papers in turn led to proposals to promote home water treatment by the 163 members of the International Network to Promote Household Water Treatment and Safe Storage, which is co-hosted by the WHO and UNICEF. The stated aim of the network, made up of government health departments and NGOs, is "*to contribute to a significant reduction in waterborne disease, especially among vulnerable populations, by promoting household water treatment and safe storage as a key component of water, sanitation and hygiene programmes*."

On **influencing practitioners and NGOs**, Wright et al.'s research is cited by *appropedia*, which promotes technology that works. The website promotes the Kisii Filter Bucket, and Wright's work is one of three cited references on the filters' effectiveness (**5.9**).

5. Sources to corroborate the impact

Reports

5.1 More or Less: Behind the Stats, 2012. [radio programme] BBC, BBC World Service, 11 March 2012.

5.2 Harrabin R (2012): 'Harrabin's Notes: Safe assumptions'. [online; accessed 2/5/13]

5.3 Harmon K (2012): 'Improved but not always safe: despite global efforts, more than 1 billion people likely at risk for lack of clean water.' *Scientific American*, May 21st [online; Accessed 3 May 2013]

5.4 UNSGAB (2013): Water and Sanitation for All: Securing our Future, Preserving our Planet.

UNSGAB's call for a Post-2015 Global Goal on Water. United Nations Secretary-General's Advisory Board on Water and Sanitation, New York. **See page v which cites work by Wright and co-authors.**

5.5 Clasen T. Roberts I, Rabie T, Schmidt W, Cairncross S (2006): 'Interventions to improve water quality for preventing infectious diarrhoea'. Cochrane Database of Systematic Reviews Jul 19 (3): CD004794. **du Preez et al cited on p. 8, final para**

5.6 Hunter P (2009): 'Household Water Treatment in Developing Countries: Comparing Different Intervention Types Using Meta-Regression'. Environ. Sci. Technol. 43 (23): 8991–8997. **du Preez et al cited in Fig. 1b**

5.7 UNICEF (2008): Promotion of household water treatment and safe storage in UNICEF wash programmes. **Clasen review cited on p. 2, para 1**

5.8 WHO (2011) Strategic Consultation on Household Water Treatment and Safe Storage. Report No: WHO/HSE/WSH/11.06 **Hunter review cited on p. 8, para 1**

5.9 Sabet A (2012): 'Kisii water filter' [online; accessed 30/7/12] http://www.appropedia.org/Kisii_Water_Filter