

56.8-90.6%. The exception was sanitation; all sanitation exposures increased the odds of cholera. In sensitivity analyses, three associations of 70 (4.3%) changed directionality or significance, all among protective factors. Discussion. As expected, all predicted risk factors identified in the theory of change increased the odds of cholera. However, not all predicted protective factors reduced the odds of cholera, and the heterogeneity and sensitivity for predicted protective factors was higher than for predicted risk factors. Although the WASH programmatic data was insufficiently described in the manuscripts to ascertain why this was so, we postulate the reason predictive protective factors may not be protective is that they are not effectively implemented such that risks are reduced. It is recommended that cholera response activities focus on reducing transmission risks, that WASH programming is monitored to ensure risks are effectively reduced, and that case control study manuscripts include information on the design and implementation of interventions.

Dogwood

Unfinished Business: Water, Sanitation and Hygiene in Remote Indigenous Communities in Australia's Northern Territory

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Improving water, sanitation and hygiene (WASH) outcomes for the ~60,000 Indigenous people living in remote communities in Australia's Northern Territory (NT) remains an important but unresolved policy challenge. Despite major national reforms aimed at bolstering Australia's water security over the last decade, the WASH situation in remote Indigenous communities (RICs) has attracted little attention. This study sheds new light on this issue by assessing the status of WASH indicators (access, behaviours, health outcomes) and identifying obstacles that constrain progress. Up-to-date information on access to WASH services in RICs in NT is scant. We piece together historical data to deduce that there is now almost universal access to improved water sources and sanitation facilities. At least 90% of dwellings currently have a piped water supply and a private sanitation facility. In the 72 largest communities, the quantity of water used by households is far greater than the Australian average, and regular testing reveals the water supplied is of good microbiological quality. The main infrastructure shortfalls - in terms of access, reliability and safety - can be found in the more than 400 small homeland communities, most of which have a population of less than 50. Notwithstanding nearly universal access to services, the burden of WASH-related diseases remains substantial. Indigenous children in remote communities are twice as likely to be hospitalised for intestinal infection as non-Indigenous children. Environmental enteropathy and prevalence of intestinal parasitic infestation (e.g. *Strongyloides*) provide further markers of excreta-related disease transmission. Trachoma remains endemic in many RICs despite repeated mass drug administrations. Skin infections are also prevalent, and these are thought to underlie disproportionately high rates of acute glomerulonephritis and acute rheumatic fever, both of which lead to chronic and life-threatening kidney and heart diseases. The WASH landscape in RICs therefore presents a paradox: widespread access to WASH infrastructure but a continued high burden of WASH-related diseases. The underlying reasons for the situation are complex and inseparable from the

entrenched socio-economic disadvantage that characterise many households in RICs. However, evidence points to several proximate causes that contribute to the high burden of WASH-related diseases: (i) problematic hygiene practices; (ii) non-functional health hardware within the home (taps, toilets); and (iii) high household occupancy rates. We conclude that past and current service delivery investments have helped to reduce WASH access disparities between Indigenous and non-Indigenous Australians, but they have failed to close the WASH-related disease gap. If future WASH investments in RICs are to yield optimal health dividends, the broader ecosystem must also be tackled, namely hygiene practices, maintenance of household-level hardware, and overcrowding.

Relocatable Sanitation Systems for Climate Displaced Communities

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The first human solid waste bioreactor to be deployed in North America will soon arrive in Kivalina, Alaska, over 80 miles above the Arctic Circle. Over one hundred years ago, Kivalina--a coastal Inupiaq whaling community living on the Chukchi Sea--began discussing plans to relocate their village. The Kivallīñigmiut people were forcibly settled onto a 27-acre barrier island at the edge of their 2,200-square-mile traditional estate in 1905. As early as 1911, people began discussing relocating to a new site in anticipation of erosion, and to provide more space for homes, access to clean water and sanitation, and economic opportunities for young people. Today, there is still no running water or toilets in Kivalina homes, and agencies are reluctant or unwilling to invest in expensive infrastructure for a village pursuing relocation. Kivalina's ongoing water, sanitation, and housing issues are now severely compounded by the effects of an Arctic that is warming twice as fast as the rest of the world. Relocatable, biochar sanitation technologies like the Kivalina Biochar Reactor could be transformational in climate affected communities like Kivalina where the infrastructural, environmental, and funding challenges to deploying centralized sewerage sanitation systems are well documented. The pioneering Kivalina Biochar Reactor is a pipeless and fully containerized mobile solution that can be easily relocated to a new village site when the community moves. It processes solid human waste separated at the home by Urine Diverting Dry Toilets and transforms the waste into biochar--a carbon-rich, pathogen-free, value-added byproduct. Relocatable technologies like the Kivalina Biochar Reactor can benefit climate displaced communities in Alaska and beyond offering a more affordable and resilient alternative to piped infrastructure in zones subject to climate risk.

Missing School in Australia due to Gaps in Menstrual Health Management

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A recent scan of water, sanitation and hygiene (WaSH) status in remote Australian Aboriginal communities identified a range of issues arising from a lack of Menstrual Health Management (MHM) options for young girls. These include logistical challenges in feminine hygiene supplies to a lack of appropriate health education tools delivered through culturally-sensitive channels. The impacts of this lack of MHM has caused regular school absences, an inherent sense of