

The imperative of urban-rural rebalance concerning mosquito vectored disease threats in Taiwan

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With the threat posed by the spread of the Zika virus, many governments have scrambled to expand their public health efforts to prevent and contain this biological threat. For Taiwan, the island's tropical climate makes this a pressing situation. In the past, Taiwan has long grappled with containing outbreaks of Dengue. Unfortunately, the Zika virus is also spread by the bites of the *Aedes* mosquito. This has been a point of concern for many Taiwanese health authorities since southern Taiwan has often struggled to manage large numbers of these mosquitos.

In recent history, Taiwan's public health policies and organization have helped it to minimize the impact of SARS and influenza outbreaks. However, new diseases bring with them a new set of challenges and threats. Taiwan has already reported its first Zika case arriving from an infected foreign national [1]. There is a large body of literature which points to highly urbanized centers as being at greatest risk for infectious disease proliferation. And in fact, historically, many of Taiwan's most serious Dengue outbreaks have been concentrated in urban regions [2]. While these findings make it medically prudent to invest

the majority of detection and containment resources towards large urban centers where it is most likely that Zika infections would enter, it is equally important not to neglect Taiwan's rural regions.

In stark contrast to the "urban-centered" model of infectious disease proliferation, several studies on Dengue in Southeast Asia have pointed to a markedly different conclusion: that the incidence and threat of Dengue may be equal or even greater in rural areas than in urban centers of the same region [3-5]. Such studies, conducted in Sri Lanka, Cambodia, and Vietnam, have demonstrated that the proliferation of Dengue in rural areas is often underreported and unchecked. This is exacerbated by greater numbers of mosquitos and lower quality water supply in these areas. The results of these studies draw several parallels with Taiwan's current situation. Firstly, the tropical nations mentioned bear similar climates to that of Taiwan. Secondly, many of Taiwan's rural areas lag behind in medical infrastructure and availability. Myriad studies have demonstrated distinct rural healthcare inequity in Taiwan with relation to psychiatric treatment [6], gynecological care [7], and gastrointestinal ambulatory care [8] to name several.

Ultimately, of the parallels mentioned, Taiwan's tropical nature cannot be changed. Instead, it is imperative for Taiwan's public health system to undergo a careful rebalance to help bridge the disparity in pandemic preparedness between its rural and urban

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regions. The existence of this disparity is best illustrated by the 2003 SARS epidemic where many rural Taiwanese medical centers were forced to transfer infectious patients due to the paucity of proper isolation rooms [9]. This example highlights a particular gap in infectious disease control and containment efforts between rural and urban Taiwan. If unresolved, this inequity in pandemic preparedness may lead to a disastrous situation if a disease such as Zika were to proliferate into rural areas, beyond the limited geo-medical grasp of urban disease containment resources.

Since the outbreak of the Zika virus, the Taiwan CDC has been robust in its response. It has introduced the “2226 Principle,” which sets guidelines for returning travelers in how to minimize their potential to transmit Zika. Critically, the Taiwan CDC has also established a nationwide Zika Diagnostic Network which establishes testing facilities in 9 major hospitals and 2 CDC labs across Taiwan. These measures place focus on arresting any potentially imported Zika at major hubs of travel. Furthermore, many local rural governments, in response to cases of Dengue this year, have begun urging citizens to eliminate the breeding sites of mosquitos.

Ultimately, the formation of the Zika Diagnostic Network is limited in that it does not extend testing measures to rural areas. With respect to the short-term epidemic stage, the 2226 Principle and urban centered Zika Diagnostic Network will help to retard the spread of the Zika virus into Taiwan. However, in a long term perspective, this strategy is not sustainable. Should the Zika virus spread beyond these urban centers (a likely scenario), urban testing facilities will not provide adequate medical reach to cope with the spreading virus. The eradication of mosquito breeding sites as directed by local rural governments is a promising method. However, if it is to be

effective in the long term, it must be scaled up to a policy of systematic implementation wherein the public is fully engaged. This is best illustrated by recent efforts by the Singapore government’s “Do the Mozzie Wipeout” campaign which engages the public in actively reducing breeding sites of mosquitos to curb the spread of Zika. In short, an effective long term plan to curb the spread of Zika and Dengue would entail firstly, a gradual expansion of permanent testing centers into rural areas and secondly, a more systematic and government supported public effort to eliminate mosquito breeding sites in rural environments.

It is crucial that Taiwanese public health authorities recognize that the Achilles heel of Taiwan’s infectious disease vulnerability lies squarely in its rural medical inadequacies. Rising global temperatures and increased globalization mean that the current public health system of screening, detection, and quarantine that is solely concentrated in urban centers may not provide a sufficient medical infrastructure to prevent the entrance and spread of these mosquito vectored diseases. Furthermore, the nature of the spread of modern disease highlights the pervasive and urgent need for Taiwanese public health authorities to implement a shift, or “rural rebalance,” to more inclusively and thoroughly address a very real and neglected threat to the public health security of Taiwan.

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