The Non-medical Dimensions of Paediatric Dengue Fever in Southeast Asia:

Looking through the Lens of Environmental and Socioeconomic Factors

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To many policy-makers, medical experts and the lay public living in Southeast Asia (SEA), dengue fever would not be an unfamiliar disease since the first dengue hemorrhagic fever outbreak struck Philippines in 1953, followed by many subsequent cyclical epidemics.[1] Despite much effort has been put forth to suppress its resurgence, this arboviral infection remains a major public health concern in Southeast Asia, Africa, South America and Central America.[2] The causative virus (Flavivirus) spreads mainly by the Aedes aegypti mosquito; less efficiently by Aedes albopictus and Aedes polynesiensis.[1] A person can contract the disease up to four times due to the presence of four antigenically similar but immunologically distinct viral serotypes (DEN1-DEN4).[1] Studies have estimated that, globally, 390 million dengue infections occur per year (clinically apparent in 96 million and inapparent in 294 million).[2]

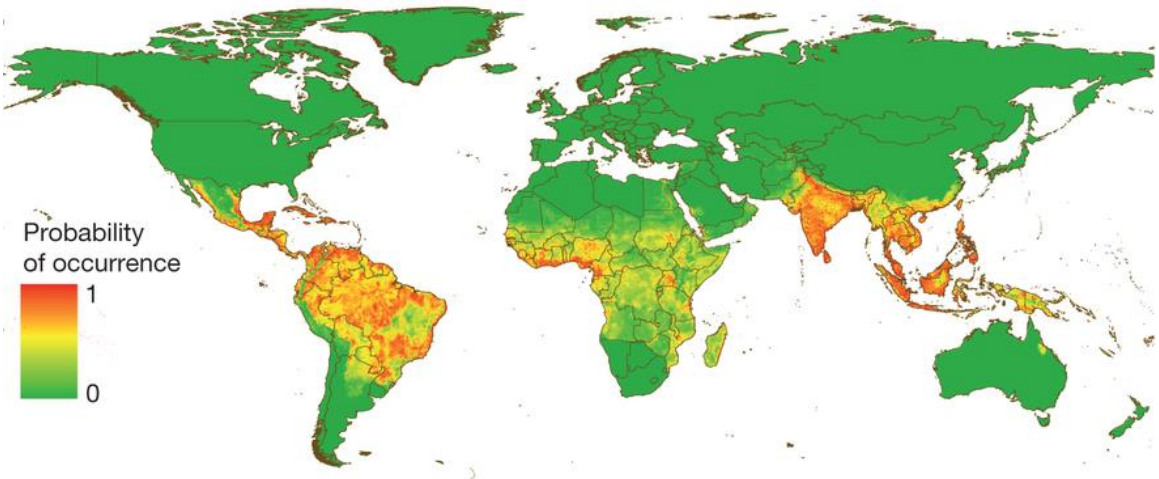

Figure 1: Probability of dengue occurrence. Areas with a high probability of dengue occurrence are shown in red and areas with a low probability in green.

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Narrowing down to SEA, the disease has spread to almost every country in the region; eight countries are now hyperendemic.[3] Although dengue fever affects all age groups, children are particularly susceptible to developing severe dengue.[4] In fact, nearly 95% of dengue cases worldwide are made up of children less than 15 years of age.[2] In some countries in SEA, dengue is a leading cause of hospitalization and death in children.[4] Since the definition of children varies among literature, the one proposed by the United Nations Convention on the Rights of the Child, which includes every human being below the age of 18, will be adopted. Similarly, the scope of discussion will include the whole disease spectrum ranging from dengue fever, dengue haemorrhagic fever and dengue shock syndrome.[4] This commentary aims to address why dengue fever in children is more than a medical issue in SEA by looking into the driving forces contributing to the epidemic, and some negative impacts imposed by the problem.

Environmental factors, such as urbanization and climate change, are believed to play a role in propagating dengue fever. Since proliferation of Aedes is climate dependent, a higher temperature improves its survival and prolongs infective period.[3] Furthermore, equatorial climate in SEA which is hot, humid and high rainfall, coupled with the monsoon seasons and global warming, can result in urban flooding.[5] When water pools in gutters, discarded tires and water storage containers, these serve as perfect breeding grounds for mosquitoes.[5] On the other hand, urbanization causes migration of rural citizens to cities, leading to hurried but unplanned growth of urban centres.[1] Problems such as overcrowding, poor quality housing and poor maintenance of public space will soon surface and contribute to an ideal ecology for mosquitoes.[6] To make things worse, many countries in SEA have poor public health infrastructure (poor disease surveillance, inadequate laboratory support, crowded wards) which leads to inadequate care of paediatric patients.[1] Moreover, many urban slums have poor tap water supply. This may force people to store water in their households, which imposes higher risk of mosquito breeding. While these factors seem to affect all age groups, children are more likely to stay indoors (at home or school) than their working parents and play in public space. This leads to higher infection rates as the Aedes aegypti mosquitoes are highly domesticated.[1] To support this argument, a high incidence of dengue and other diseases have been reported among slum children in Manila, illustrating the poor health status of children in urban slums.[7] Even if treatment is given, they will go back to the same poor housing conditions. That continues to expose them to the next episode of dengue, which will be more severe and fatal than the first one.[4]

Since urbanization is inevitable, vector control has then become an important initiative to uproot the problem. However, it is labour-intensive as sustainable vector control requires sound policies, good implementation, expert knowledge and active public participation. Although different ways have been used to kill the vector (fogging, biological control with copepod crustaceans, genetically altered mosquitoes), in the whole Asia itself, no elimination goal for dengue or its vector has been officially proposed.[2]On one hand, this may be simply due to the lack of manpower and resources. In fact, scarce resource for effective prevention is a major contributor to the propagation of dengue fever in developing countries.[8] On the other hand, the low case fatality rate of dengue (<0.2% in Thailand)[4] may not seem as pressing to governments compared to issues like HIV and tuberculosis, not to mention other economical and political priorities. All these could be the reasons that environmental clean-up campaigns were rarely demonstrated on a national scale (except Singapore).[2]

Looking from a micro-perspective, the success of vector control program also greatly depends on human behaviour. In Malaysia, indoor ornamental plants are common breeding grounds for mosquitoes in high-rise buildings; while storing water is still a widespread practice in rural areas despite water scarcity being rarely a major problem.[9] Vector control becomes more difficult because the Aedes mosquitoes are predominantly active during daytime,[3] making insecticides treated bednets ineffective. Schooling children remain vulnerable as the time they go to school fits the biting time of Aedes mosquitoes. Moreover, in a disease like dengue fever which severely compromises children's health, the behaviour of caretakers, especially mothers, is of utmost importance. In term of health care seeking behaviour, a study conducted in Cambodia showed that most respondents (women) had used home treatment as their first action when their children were ill; some took no action, or saw a fortune teller.[6] Therefore, we can conclude that not only does human behaviour decide the success of the vector control program, it also directly influences the fate of children in SEA.

When vector control fails and incidence rate continues to rise, many parties anticipate for a vaccine which prevents dengue fever. In fact, the tetravalent dengue vaccine may soon become a reality as the first phase 3 trial has shown promising results.[10] While issues stemmed from dengue vaccine (vaccine safety, immunogenicity, efficacy) seem very much to be medical problems, the birth of dengue vaccine does not equate to eradication of this disease among children in SEA as

other non-medical issues still need to be solved. This brings me to my next point, which is the economic burden of the disease in SEA.

Economic factors can be explored from two dimensions: causes and consequences. Poverty remains a major factor in influencing whether or not people can afford the direct and indirect costs of treatment.[6] In Cambodia, very poor women had no option but to treat the child at home although they recognized the severity of their child's conditions and regarded dengue as serious and potentially fatal.[6] Furthermore, the high financial burden imposed by the treatment was incriminated as causing low hospitalization rates of dengue infected children from poor homes in Cambodia.[8] Therefore, it is worth noting that poverty may result in under-reporting, and the true disease burden may be much worse than the already bad situation.

In term of economic impact brought about by dengue fever, a national cost of 485 million USD was reported in Thailand in 2005.[8] In the same year, Southern Vietnam documented a cost of USD 61 per household of dengue hemorrhagic fever treated in hospital.[8]Although statistics collected from SEA is mainly taken from hospitalized cases among children according to the WHO,[4] there is a missing picture of the economic impact caused by paediatric dengue alone as studies specific to this age group are scarce. Since data on disease burden and economic burden often decide the direction of policies, the missing statistics may hinder solutions specific to children to be devised. Although the future development of dengue vaccine remains optimistic, country and age specific data must be obtained and factors such as affordability of developing countries in SEA must be looked into in scrutiny. At the same time, sociocultural issue such as religion must not be overlooked since the preparation of vaccine involves dog kidney tissues,[2] which is not "halal" in Islam and may not be accepted by people in countries where Muslims predominate (Indonesia and Malaysia). While the post-vaccine era may save treatment cost, the efficacy of vaccine towards all the serotypes must be reviewed. There is risk that the rates of severe disease can be enhanced in recipients.[10]That will worsen the economic and disease burden, which defies the purpose of vaccination in the first place.

In conclusion, dengue fever in children is a multifaceted problem intertwined with many complex factors and goes way beyond the edges of the medical field. Its complexity is heightened especially in a developing region like SEA where problems derived from urbanisation, environmental and socioeconomic climate continue to plague the humanity. To curb this problem

in children, we must understand that the essence to the solution is not formulating "children-only" approaches, but also targeting the root of the problem by introducing integrated regional approaches to effect positive changes in the healthcare infrastructure, socioeconomic climate and people's awareness. After all, this delicate but vulnerable group lives in a society shaped by us. Therefore, we should make the world a better place for them.

(Word Count: 1490)

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