

Impact case study (REF3)

Institution: The University of Manchester		
Unit of Assessment: 22a (Development Studies)		
Title of case study: Preventing cardiovascular disease in rural Indonesia by using a smartphone app in a socio-medical intervention		
Period when the underpinning research was undertaken: 2016 – 2019		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Gindo Tampubolon	Lecturer	2011 – present
Period when the claimed impact occurred: 2018 – 2020		
Is this case study continued from a case study submitted in 2014? No		
<p>1. Summary of the impact</p> <p>Cardiovascular disease accounts for 1 in 3 deaths in Indonesia. Research by Tampubolon demonstrated that nearly 70% of Indonesians aged 40 and older with moderate to high cardiovascular risk were not receiving cardiovascular care. The research led to the development of SMARThealth, an intervention which improves care by providing village health workers with training and technology to share data with qualified health professionals, who prescribe treatment. As a result, 3,750 people out of 6,579 identified as at risk of cardiovascular death benefited from extended life expectancy. SMARThealth has been adopted by Malang's District Government as part of its public health programme, and is being scaled up to make it available to 3,000,000 residents in the region.</p>		
<p>2. Underpinning research</p> <p>Cardiovascular disease is an increasing cause of mortality in the Global South; yet it remains under-researched and inadequately addressed. Health-care provision is limited in Indonesia, with people only seeking primary care when urgently required, which is often too late. Identifying and managing people who are at risk early is critical, especially in communities not close to a hospital. This is a particular challenge for cardiovascular disease, which accounts for 1 in 3 deaths in the country. Research by Dr Tampubolon and collaborators in Indonesia demonstrated that nearly 70% of Indonesians aged 40 and older with moderate to high cardiovascular risk were not receiving cardiovascular care, posing an urgent unmet need [1]. The study sample of 3,046 was representative of 83% of the national population.</p> <p>This research came to the attention of the George Institute for Global Health, a leading independent medical research institute with offices in the Universities of Oxford, Peking and New South Wales. As a result, Dr Tampubolon was invited by them to jointly design a new research-policy collaboration between the George Institute, Universities of Manchester and Brawijaya, Indonesia and the District Government of Malang. Dr Tampubolon was subsequently appointed co-Principal Investigator in the funded project [i]. This collaborative project involved the design of a socio-medical intervention, SMARThealth, to address the challenge of cardiovascular disease, and assess its implementation in Malang.</p> <p>Dr Tampubolon and his collaborators designed an algorithm identifying normal-medium-high risk villagers, and advocated an innovative approach based on training village health workers (known as <i>kaders</i>). The training consisted of modules to improve <i>kaders</i>' knowledge about cardiovascular disease and associated risk factors, as well as the technical use of the SMARThealth platform (mobile tablet, SMARThealth application and basic medical equipment). The SMARThealth programme drew on already existing technology, which was now applied for the first time in Indonesia [2]. This technology was not guaranteed to work,</p>		

as evidenced by prior attempts of other researchers to apply it in India and China [reviewed in 2,3]. An important difference in Indonesia was the collaborative role the *kaders* played in collecting blood samples. These samples were analysed in real time using the app to produce a simple traffic light system (green-amber-red) to indicate cardiovascular risk. The system drew on Tampubolon's 2014 research [1], which identified the importance of keeping assessment simple, so that the tests could be performed by *kaders*. In practical terms, this meant replacing the WHO's complex grading system (based on five levels of cardiovascular death risk scores) with a simpler traffic light system of three levels that could be more easily applied in situ.

Research to assess the effectiveness of SMARThealth was carried out in East Java, with primary care doctors and *kader* serving approximately 48,000 people across 8 villages (involving a randomly sampled targeted group and a control group). Over two years, 12,000 individuals over the age of 40 were screened for heart disease and diabetes. The research findings [2,3] show a reduction in the risk of cardiovascular deaths by identifying people at risk, having doctors prescribe lifestyle (e.g. exercise and dietary) and drug interventions (captopril, amlodipine and simvastatin) and sharing information with health providers through cloud infrastructure. The research, published in a highly regarded journal [2], attracted an editorial commentary from cardiologists, highlighting its unique success compared to similar socio-medical interventions elsewhere. This successful intervention subsequently received a four-year research grant [i] from the Australian National Health and Medical Research Council to scale up evaluation between 2019 and 2023. This is a matching grant to support the Malang local government's commitment to implement the intervention reported in [2] and [3].

3. References to the research

1. Maharani, A. and **Tampubolon, G.** (2014). 'Unmet need for cardiovascular care in Indonesia'. *PLoS One*. doi: [10.1371/journal.pone.0105831](https://doi.org/10.1371/journal.pone.0105831).
2. Patel, A. Praveen, D. Maharani, A. Oceandy, Pilard Q., Kohli, P. Sujarwoto, S. and **Tampubolon, G.** (2019). 'Association of multifaceted mobile technology-enabled primary care intervention with cardiovascular disease risk management in rural Indonesia'. *JAMA Cardiology*. doi: [10.1001/jamacardio.2019.2974](https://doi.org/10.1001/jamacardio.2019.2974). (This journal is ranked fourth in cardiology with an impact factor of 11.9. Dr Tampubolon was one of the senior authors – in biomedical journals the key authors are commonly listed first and last.)
3. Maharani, A. Sujarwoto, S. Praveen, O. Oceandy, D. **Tampubolon, G.** and Patel, A. (2019). 'Cardiovascular disease risk factor prevalence and estimated 10-year cardiovascular risk scores in Indonesia: the SMARThealth extend study'. *PLoS One*. doi: [10.1371/journal.pone.0215219](https://doi.org/10.1371/journal.pone.0215219).

Related Grants

- i) Research grant in the [Global Alliance for Chronic Disease](#) (June 2019 – May 2023), Tampubolon as Co-PI. 'Scale up of primary care intervention for cardiovascular risk management in Indonesia awarded to Patel, A. Sujarwoto, S. Praveen, D. Maharani, A. **Tampubolon, G.** Abimbola, S. Peiris, D. Angell, B. Abdurrahman, A. Jaya. C. From [Australian Government, National Health and Medical Research Council](#), amount AUD756,087 (GBP 410,155).

4. Details of the impact

SMARThealth has been implemented by the Malang district government, and 12,000 people have received treatment. "The project has significantly reduced preventive cardiovascular disease healthcare disparities and improved community awareness [of] non-communicable diseases in the intervention villages" (SMARThealth Program Co-ordinator, Malang District Health Agency)[A]. Treatment as a result of the intervention led to 3,750 people gaining an extended life expectancy [3]. The research-policy collaboration outlined in Section 2, above, assessed the effectiveness of SMARThealth in East Java, with primary care doctors and *kader* serving approximately 48,000 people across 8 villages, and is being scaled up to

reach 3,000,000 individuals. More generally, the SMARThealth app has been commended by national government [B] and has won support from health-care professionals, communities and academics.

Improved cardiovascular care for individuals

Over a two year period, 12,000 individuals over the age of 40 in 8 villages were screened for heart disease and diabetes, of whom 6,579 were identified as being at high risk of cardiovascular deaths, leading to the prescribed SMARThealth intervention [2,3]. The results indicated a 14.5% reduction in the number of those at high risk, and a 10% reduction in their levels of systolic blood pressure compared to a control group (5%) [2]. The findings, reported in *JAMA Cardiology* (2019), show a reduction in the risk of cardiovascular deaths by identifying those at risk, prescribing lifestyle and drug interventions (captopril, amlodipine & simvastatin prescribed by doctors), and sharing information with health providers through cloud infrastructure [2] [A].

Based on modelling estimates, SMARThealth has already extended the life expectancy of 3,750 people [2]; 57% of the 6,579 individuals identified as high risk are now using blood pressure-lowering medication, compared to just 16% in villages that did not receive the SMARThealth intervention. Not only are individuals benefitting from access to medication, they also now have access to the most effective combination of medications. 15.5% of high-risk individuals now use the most effective combination of blood pressure-lowering medications, including statins and antiplatelet drugs, compared with just 1% in the control villages [2].

Two beneficiaries, one male and one female, offered testimonies via video [C]: “*before SMARThealth, whenever I feel unwell I get drugs from the local kiosk, but since SMARThealth, I have found out that I suffer from high blood pressure and now take part in the programme*” [male]; “*I am 54 but I was not aware that I suffer from high blood pressure until the [SMARThealth programme]*” [female]. The programme will continue to benefit 3,000,000 residents in the Malang district [C] and save many more lives in future.

Enhanced community health care

The SMARThealth programme has been adopted by the district of Malang as its own public health programme, and is being made available to 3,000,000 residents in the region. In conducting the research, *kaders* living in the communities were identified by the research-policy collaboration as key field partners, a role they had not previously played. Their traditional role is to support infant and maternal health but, with training and support from the SMARThealth app, they were able to provide effective cardiovascular screening, thereby forming a key bridge to local communities and ensuring that cardiovascular risk is managed and care needs met at community level [C,D].

A major socio-medical challenge was to ensure adult villagers respected the *kaders*, who were previously dealing with infants. The *kaders*' central role in the intervention and their link with doctors via the app has boosted their status within the community [C]. The data are also used by the health authority to supply drugs, reinforcing the *kaders*' legitimacy across the health system.

Government adoption

Research impact was scaled up from the local (i.e. village) level to the regional level (i.e. multiple villages) through adoption of the SMARThealth programme by the district of Malang in 2019 as part of its public health programme, which resulted in an additional 24,000 adults having been screened by August 2019 [E]. A video of Dr Tampubolon explaining the risk of cardiovascular disease and how to treat it in community settings is now being used in staff training for the Malang district health authority. Previously such exposure and awareness had often been fatally lacking [F].

Malang's District Government has adopted the estimates of cardiovascular risk as its basis for budgeting for secondary prevention drugs for cardiovascular disease. The SMARThealth Program Co-ordinator wrote, "*I can confirm that the District Health Agency in Malang will allocate funding for implementation. Specifically, the District Health Authority will fund costs associated with health promotion, training, and equipment for the relevant workforce as well as medications*" [A].

In order to continue scaling up the programme, the Malang District Government committed to funding to ensure the sustainability of the intervention beyond the original research allocation that ended in 2018. The IDR1,000,000,000,000 (GBP50,000,000) sum for basic services, including non-communicable disease intervention, committed by the Regent (elected district head) was reported in the local newspaper, *Radar Malang* [G]. The intervention was awarded the national Innovative Government Award 2019 in the category of best app for public service [B,H].

The University of Brawijaya has committed to its collaboration with the village communities in which it undertook the initial research, thereby helping to ensure the sustainability of the resulting interventions. This new round of research–policy collaboration enables the collection of fresh data pertaining to survival and deaths from cardiovascular disease; this longitudinal extension to the work will enable the research team to strengthen the evidence base beyond ascertaining the impact of the intervention programme on enhancing the control of blood pressure to an evaluation of its efficacy in reducing the number of fatalities. The Dean detailed specific responsibilities, including "*performing the research together with the partners [the George Institute and the University of Manchester] and Malang district health [authority]...and disseminat[ing] the research findings to providers of services to older people*" [I].

The scale up of intervention has continued despite Covid-19, with *kaders* receiving personal protective equipment to carry out their role safely [J].

5. Sources to corroborate the impact

- A. Testimonial from the SMARThealth Program Co-ordinator, Malang District Health Agency. Provided 18 July 2018.
- B. Letter announcing the Innovative Government Award 2019 for the SMARThealth public health programme. Dated 23 September 2019. (Source in Indonesian)
- C. Testimonial video (<https://youtu.be/1cb32uPwfUo>) featuring villagers benefiting from the programme and programme activities (September 2019; source in Indonesian).
- D. Records of programme activities recorded on blog space by local partners <https://idsmarthealth.blogspot.com/>. (Source in Indonesian)
- E. Video of the launch of the scale-up of the SMARThealth programme. The scale-up was jointly launched by the Regent, the head of the health authority and Dr Tampubolon <https://www.youtube.com/watch?v=f5-N4qbV2ic> (5 August 2019).
- F. Video produced and used by the health authority in its public health programme for non-communicable disease featuring Dr Tampubolon (November 2016; source in Indonesian)
- G. Local news article, featuring: (1) a picture of the Regent and the health authority chief who appeared in the launch video [F]; (2) A quote from Dr Tampubolon describing the mortality burden of non-communicable disease in Indonesia, which provided the title (one in three deaths); and (3) a quote from the Regent allocating IDR1,000,000,000,000 for basic services, including this programme (August 2019; source in Indonesian)
- H. Central government official examining the practice of the programme as part of the judging process for the national Innovative Government Award, at <https://www.timesindonesia.co.id/read/news/228867/masuk-nominasi-innovative-government-award-2019-pemkab-malang-suguhkan-158-inovasi> (September 2019; source in Indonesian)

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- I. Letter from the Dean of the Faculty of Medicine, University of Brawijaya, confirming funding for an extra round of longitudinal study of SMARThealth, thus ensuring programme sustainability. Provided 28 September 2019.
- J. SMARThealth blog post describing how the programme has adapted to continue during the Covid-19 pandemic: <http://idsmarthealth.blogspot.com/2020/10/kegiatan-posbindu-anggrek-2-kepanjen-di.html> (October 2020; source in Indonesian)