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Improving the public health impact of eHealth and mHealth interventions

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With more than three billion internet users worldwide,¹ it is hard to overstate the potential benefits for public health of electronic and mobile technologies. These technologies offer the opportunity to deliver tailored interventions to the population with high fidelity at low cost, and can provide a means of addressing health inequities by enabling the delivery of sophisticated public health services to communities that find traditional forms of healthcare inaccessible.² Harnessing electronic health (eHealth) and mobile health (mHealth) technologies to advance public health, however, has proven challenging. Despite widespread promotion,³ evidence supporting the effectiveness of technology-based interventions in addressing non-communicable disease is varied. Evaluations of activity trackers, smartphone applications (apps) and web-based programs as the vehicle to deliver health interventions have reported such technologies are no more effective than paper-based approaches,⁴ or offer no additional benefit as an adjunct intervention.⁵ Although recent systematic reviews of eHealth and mHealth interventions targeting health behaviours provide some evidence for short-term benefit, effects are modest, and long-term efficacy is yet to be established.^{4,6}

A number of factors appear to be limiting the impact of such technology-based interventions. First, process evaluation of intervention trials have identified a lack of initial and sustained engagement of users as a key constraint on the effectiveness of interventions.⁷ Research on typical use of health apps by consumers has also identified that fewer than 10% continue their use of

apps for longer than seven days.⁸ Similarly, for wearable devices (e.g. Fitbits), 50% of users abandon their device within two weeks.⁹ As intervention exposure is the fundamental driver of intervention effects,¹⁰ strategies that improve user engagement with technology will likely amplify the public health impact of these innovations. Despite the importance of user engagement, health technologies including apps do not routinely incorporate user-engaging features,¹¹ and trials that test strategies to maximise user engagement with eHealth and mHealth interventions are only beginning to emerge.¹² Research to better understand user-preferred design features and functions of technologies to maintain engagement is therefore warranted.¹³

Second, the potential benefits of eHealth and mHealth interventions are impeded as they compete with each other in a crowded marketplace. Although more than 165,000 apps are dedicated to improving health and fitness,¹⁴ audits have found the most commonly selected apps are not evidence-based and are of poor information quality.^{10,15} Further, user selection appears mostly influenced by recommendations of family and friends,¹⁶ perceived relevance, brand recognition and user ratings,¹³ rather than evidence of effectiveness. To counter this, the UK National Health Service and US National Health Institute have funded online libraries of evidence-based and publicly endorsed health apps (<https://www.nhs.uk/oneyou/apps>; <https://www.nlm.nih.gov/mobile/>). Co-ordinated efforts by health professionals, health services and societal systems to recommend use of evidence-based apps may increase the use and impact of these interventions. Further, displaying evidence

ratings within 'app stores' may improve the uptake and sustained use of evidence-based apps in the community.

A further limitation of many existing eHealth and mHealth technologies, such as health and fitness apps and web-based programs, is their focus on improving health behaviour through targeting individual users and personal determinants of health; that is, a person's individual characteristics and behaviours such as user knowledge, skills, self-efficacy and intention. While such interventions have their place in public health practice, the drivers of chronic disease are complex and multi-factorial, and operate within societal and institutional systems and environments (e.g. supermarkets, workplaces, schools). The application of technology to modify institutional systems to create environments supportive of health behaviours is likely a more effective and sustainable means of improving community health, compared to those targeting individual users and individual determinants. Recent systematic reviews of eHealth and mHealth trials, however, have failed to identify any interventions applied within institutional systems and environments to address non-communicable disease risks.^{4,12}

Nonetheless, promising opportunities to leverage technologies to improve community environments or institutional systems to promote public health are emerging. For example, within the field of public health nutrition, online communication platforms used by schools and childcare services for reporting, co-ordinating organisational activities and communicating with parents are becoming increasingly popular. Surveys conducted by the authors found 74% of childcare services¹⁷ and 62% of schools within New South Wales use such systems, as do 70% of parents with children attending these schools (unpublished data). These platforms are being modified to incorporate tools to ensure food provision in these organisations is consistent with dietary guidelines.¹⁸ With the expansion in online purchasing of groceries and foods, interventions embedded in online ordering systems¹⁹ have been developed to change the relative availability of healthy products and improve healthy food purchasing at schools and grocery stores.²⁰ Amending existing technologies routinely used by the target population may

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also overcome some of the engagement challenges experienced by technologies that require users to locate, download and frequently log in to programs.

EHealth and mHealth technologies have considerable potential to improve public health. The current focus of the field on the development of interventions targeting individual determinants of health behaviour has not yielded the benefit to the community that these technologies have the capacity to deliver. Greater investment in improving user engagement with eHealth and mHealth interventions, and the application of such technology to create systems and community environments more supportive of health promotion, represent promising means of maximising the benefit of these interventions.

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