////Stand-first:

Over the past few years, there has been an explosion in the number of applications – more commonly known as apps – that can be used on mobile phones. Vicki Clifton, Julia Dalton, Dianne Rodger, Michael Wilmore, Andrew Skuse, Sal Humphreys, and Margarita Flabouris, based at the Mater Research Institute and the University of Adelaide have developed Healthy-e Babies, a new pregnancy app for expecting mothers from socially disadvantaged backgrounds. Their work provides important insights into overcoming the challenges associated with providing information using new technologies to groups most in need of health education.

////Body text:

We are increasingly surrounded by technology in our everyday lives. It is now possible to find apps to perform just about any task on your phone, from managing a healthy diet to learning a new language. Apps designed for pregnant women are becoming an increasingly popular way for mothers-to-be to obtain information about pregnancy. They have the potential to improve women's understanding of their personal health, and also to provide information on the available healthcare options, facilitating informed decision-making during pregnancy.

Such apps are replacing more traditional approaches such as booklets and posters in providing pregnancy guidance. Professor Vicki Clifton, Research Midwife Julia Dalton, and Dr Dianne Rodger, have developed a phone app targeted towards pregnant women from socially disadvantaged backgrounds. This group is characterised by women with a history of stressful life events, mental health difficulties, low levels of education, and high levels of unemployment. It is known that factors such as poor health literacy are associated with poor health outcomes, but typically it has been difficult to engage socially disadvantaged women in health education during pregnancy. Effective health education is critical to promote the health and well-being of both mothers-to-be and their babies.

The Health-e Babies App developed by the Adelaide researchers covered a variety of topics, including foetal development, maternal changes, and provided explanations of the tests and medical procedures expecting mothers may undergo during pregnancy. The app also promoted healthy eating and regular exercise during pregnancy, and suggested ways to relax and control anxiety. From a practical point of view, it provided expecting mothers with quick access to hospital and health care services when needing advice. In addition, reminders popped-up as notifications to remind users about upcoming hospital appointments and to help keep the expecting mothers engaged with using the app.

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To test the feasibility of Health-e Babies, the researchers recruited pregnant women attending their first antenatal appointment. However, out of the original 150 women who signed up for the study, only 30 completed the trial, indicating a staggering drop-out rate of 76%. This low participation rate raises important questions about the difficulties in engaging pregnant women with the provision of health information – and the researchers were keen to explore the reasons why.

Past studies have pointed to language barriers, low socioeconomic status, and financial and time constraints as the causes of low participation in research. In this study, cultural and language barriers should not have been an issue, but the other factors may still have played a role and now

need to be explored further in future research focussing on the use of healthcare apps in socially disadvantaged pregnant women.

In this study, the researchers deliberately opted to leave participants to manage the app themselves to test to assess its usability in the real world. Although it may be tempting to assume that all young women are now 'tech savvy', this may not necessarily be the case. A small number of women struggled to download the app, forcing them to abandon the study. This is an important finding – as the researchers note, even the best app in the world is of limited use if the intended users cannot access it.

Another explanation for the low rate of participation may be that some of the pregnant women were already using a similar app and decided not to change. In fact, about half of the women reported that they were using a pregnancy app even before their first midwife appointment. Rather than the low rate of participation in this study hinting at low uptake of pregnancy apps, it may be that these new apps are, in fact, a very popular way to obtain information. It should be noted though, that few pregnancy apps have yet to be scrutinised in terms of their adherence to current obstetric guidelines.

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Based on their findings, the researchers considered ways to encourage pregnant women to make use of the Health-e Babies app. The first suggestion was for the healthcare professional to download the app at the time of each women's appointment to ensure it is compatible and functioning with their mobile phone. Observing this process this should also make it easier for women to download the app again in case they later change their mobile phone. The healthcare professional could also provide a tour of the app, demonstrating the main features and ways to use them. Although likely to significantly increase the use of the app once women have left their appointments, the researchers acknowledge that this suggestion may be difficult to implement due to the already considerable time pressures on healthcare providers.

The researchers speculated that some women may be have been concerned about additional costs associated with accessing external sites on their mobile phone. The best way to overcome this problem would be to limit the need to visit external websites by putting as much information as possible into the app itself.

A further way to encourage engagement would be to offer the option of listening to audio recordings and providing plenty of audio-visual material rather than relying exclusively on users having to read the articles. This could be particularly appealing to groups with low levels of literacy, as targeted by the Health-e Babies app.

The researchers further suggest that the support provided in terms of using the app should not stop after the first consultation. Ideally, about a week after the appointment, a follow-up text message could serve as a gentle reminder to use the app – or as a way to establish contact to find out and address any problems.

Finally, it was suggested that encouraging healthcare providers such as midwives and doctors to promote the app would increase the confidence of women in the information provided. The app could be used as a talking point at all appointments, acting an educational tool to provide information and to help answer different issues as the pregnancy progresses.

In conclusion, new technologies such as mobile apps offer an important approach in increasing the health literacy of communities most in need. By carefully considering the challenges and difficulties

faced by disadvantaged communities, apps such as Health-e Babies may provide an invaluable resource in widening access to health information and promoting health and well-being.

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