

Willingness to pay for health apps, its sociodemographic correlates, and reasons for being unwilling to pay

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Abstract

Background: Knowledge about whether, how much, and why individuals are willing to pay for health apps is limited.

Objectives: This study aimed to examine (1) the proportion of individuals willing to pay for health apps, (2) their willingness to pay (WTP; i.e. the maximum price the individual is willing to pay) for health apps, (3) the sociodemographic correlates determining whether individuals are willing to pay for these apps, (4) the sociodemographic correlates of their WTP, and (5) reasons for being unwilling to pay.

Methods: Six hundred adults were invited to participate in a questionnaire survey examining their sociodemographic characteristics, WTP for health apps, and reasons for being unwilling to pay. Sociodemographic characteristics and WTP for health apps were analyzed using descriptive statistics. Logistic regression was applied to examine the sociodemographic variables correlated with whether individuals were willing to pay for health apps. Among those who were willing to pay, log-linear regression was conducted to examine the sociodemographic correlates of their WTP. The reasons for unwillingness to pay were descriptively analyzed.

Results: A total of 577 individuals completed the questionnaire. Of them, 58.9% were willing to pay for health apps. Their median WTP was HK\$50 (HK\$1 ≈ US\$0.13). Participants with a bachelor's degree or higher and those who had previously installed health apps were more inclined to pay for health apps. WTP was positively associated with the maximum price previously paid for a health app. The most frequently cited reasons for being unwilling to pay were the belief that the government should provide free health apps, distrust in health apps, and a lack of awareness of health apps and their benefits.

Conclusions: This study provides insights that can inform strategies to enhance the marketability, affordability, and accessibility of health apps.

Keywords

Health apps, mHealth, willingness to pay, sociodemographic correlates

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Introduction

Health applications (apps) are increasingly being used to support various healthcare activities, such as health knowledge exchange,^{1,2} chronic condition management,^{3,4} mental health care,^{5,6} and the promotion of physical exercise.^{7,8} These apps can potentially support health improvements

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and provide equitable healthcare access to individuals with diverse backgrounds and living situations.⁹ The accumulating evidence demonstrating the efficacy, cost-effectiveness, and usability of health apps has drawn substantial attention from public health decision makers. For instance, some countries, including Germany and the United Kingdom, have launched public health initiatives such as the Digital Health Applications, National Health Service Organisation for the Review of Care and Health Apps (ORCHA) App Library, and NHSX to endorse the use of health apps.

The benefits of health apps are contingent upon individual users' active purchase and consistent usage.¹⁰ In this regard, it is crucial to examine how many individuals are willing to pay for health apps, as well as their willingness to pay (WTP; i.e. the maximum price that an individual is willing to pay) for the apps and the reasons underlying their willingness. For health app developers, such valuable insights enable them to assess investment returns and refine pricing strategies and resource allocation, thereby facilitating the development of more marketable apps and enhancing business sustainability. For policymakers and researchers, insights from such research are instrumental in the development of strategies directed at enhancing the affordability and accessibility of health apps, thereby extending the benefits of health apps to a broader demographic.^{11,12}

Although the literature explored the prevalence and acceptance of health apps,^{13–16} individuals' preferences regarding health apps,^{17,18} and the facilitators of and barriers to health app use,^{19–21} there remains a notable gap in terms of understanding whether, how much, and why individuals are willing to pay for health apps. This knowledge shortfall may challenge the commercial success of health apps and limit the dissemination of their benefits. The aim of the current study was to bridge this knowledge gap by examining (1) the proportion of individuals who are willing to pay for health apps, (2) individuals' WTP for health apps, (3) the socio-demographic correlates determining whether individuals are willing to pay for these apps, (4) the sociodemographic correlates of their WTP, and (5) reasons for being unwilling to pay.

Methods

Study design

A cross-sectional questionnaire survey was conducted to gather the study participants' sociodemographic data, including their age, gender, household size, monthly household income, and education level. The questionnaire also included items to determine the participants' previous installation of health apps and the maximum price they had previously paid for these apps, to assess their WTP

for health apps, and to collect the reasons cited by those who were unwilling to pay.

Previous health app installation was assessed by asking the participants to list the types of health apps that they had installed previously (see Table 1). The maximum price they had previously paid for a health app was determined using the following question: "How much was the most expensive health app you have ever purchased (in HK\$)?" (HK\$1 ≈ US\$0.13). The participants' WTP for health apps was assessed using the following open-ended

Table 1. Types of health apps included in the questionnaire and their descriptions.

Type of health app	Description
No health app installed	I have not installed any health apps on my mobile devices.
Healthy living information	This type of health app can provide you with advice related to aspects of a healthy lifestyle such as diet, nutrition, exercise, etc.
Recovery and rehabilitation information	This type of health app can provide you with recovery training- and rehabilitation-related information, such as physical therapy instructions.
Assistance in diagnosis	This type of health app can provide you with information related to the symptoms of various diseases and help you with self-health diagnosis.
Telehealth	This type of health app can enable teleconsultation, remote symptom monitoring, or other related functions.
Health and medical reminders	This type of health app can provide you with regular reminder messages related to your medical needs, such as reminders about your period, taking medication, etc.
Emergency services	This type of health app can help you to get medical help or inform your emergency contacts in case of a medical emergency such as a fall, fainting, etc.
Vital measurements record	This type of health app can monitor your vital health indicators such as heart rate, blood pressure, etc.
Other health apps	Please specify.

question: “What would be the maximum amount of money (in HK\$) that you would pay for a health app?”. This open-ended approach was adopted to avoid an anchoring effect of WTP questions (e.g. payment scale and dichotomous choice) on the participants²² and thus obtain authentic responses. Participants who stated that their WTP for a health app was HK\$0 were classified as *unwilling to pay for health apps* and were asked to indicate their reasons for being unwilling to pay. Specifically, they were asked to choose from the following options (more than one option could be chosen) or provide their own reasons if none of the options applied: (1) I do not know what health apps are; (2) health apps offer me no benefits; (3) I do not trust health apps; (4) no health apps fit my needs; (5) I do not know how to use health apps; (6) I do not have time to use health apps; (7) I cannot afford to pay for a health app; or (8) the government should offer free health apps to me.

We presented the following definition to ensure that all participants had a consistent understanding of health apps: “Health apps are software programs installed in smartphones that aim to assist with health management. Some health apps can help you keep track of your health status by recording your health statistics (e.g. body weight, blood pressure, blood glucose, physical activity level, sleep quality, and diet). Some health apps can provide information to promote healthy behaviors that would benefit you. Health apps can teach you how to conduct certain physical exercises or maintain a healthy diet, or offer you information about the prevention and management of diseases. Moreover, health apps can send you reminders to follow these health behaviors.”

In a pilot test, the questionnaire was administered to a sample of 12 individuals to ensure its clarity and comprehensibility.

Participants and sample size

Individuals aged 18 years or above were eligible to participate in the study. Quota sampling was used to ensure representation across various demographics, including age groups (18–24, 25–34, 35–44, 45–54, 55–64, ≥65 years), gender (male and female), and residential areas (Hong Kong Island, Kowloon, and the New Territories).

We calculated the minimum sample size required to examine the proportion of individuals in the general public willing to pay for health apps. As we had no prior knowledge of this proportion, we conservatively assumed it to be 50% for sample size calculation, which maximizes variance and leads to a cautious estimate of the required sample size. Based on this, we estimated that a minimum of 385 participants were required to achieve a 95% confidence level with a ±5% margin of error. In addition to the minimum required sample size, we aimed to recruit as

many participants as possible within our budgetary limit to improve the representativeness and generalizability of our results. Consequently, we decided on a sample size of 600, which is similar to those used in comparable studies.^{13,14,23}

Data collection

We set sample quotas for each demographic group (see Table 2) according to the 2018 census data in Hong Kong. Once a quota for a specific group was met, no further participants from that group were included. A researcher randomly invited people in public places such as malls, subway stations, residential areas, and parks to complete the self-administered study questionnaire. These places were chosen because they have high foot traffic and are accessible to a diverse range of individuals, thus increasing the likelihood of obtaining a representative sample. All of the participants provided written informed consent before participating in the study, and the study protocol was approved by the Human Research Ethics Committee of the University of Hong Kong (No. EA1810020). Each participant received a HK\$50 grocery voucher upon completion of the questionnaire.

Table 2. Sample quotas for each demographic group.

Age group (years)	Gender	Residential area		
		Hong Kong Island	Kowloon	New Territories
18–24	Male	5	10	18
	Female	6	10	18
25–34	Male	7	13	22
	Female	10	17	29
35–44	Male	7	13	23
	Female	11	19	35
45–54	Male	8	14	25
	Female	10	19	32
55–64	Male	9	16	28
	Female	10	17	29
≥65	Male	9	16	27
	Female	10	18	30

Data analysis

First, descriptive statistics were used to summarize the participants' characteristics and WTP for health apps. These characteristics included gender, age, monthly household income per capita, education level, previous health app installation, and the maximum price previously paid for a health app. The monthly household income per capita was calculated by dividing the monthly household income by the household size. Second, we conducted a logistic regression to examine the associations between the participants' characteristics and whether they were willing to pay for health apps. Third, among the participants who were willing to pay, we conducted a log-linear regression to examine the associations between their characteristics and WTP. Fourth, for the participants who were unwilling to pay for health apps, we analyzed the frequency of their reported reasons for being unwilling to pay. All statistical analyses were conducted using IBM SPSS Statistics (Version 28.0; IBM Corp., Armonk, NY, USA). Significance level was set at $p < 0.05$ for all tests.

Results

Participants' characteristics

We initially enrolled 600 individuals, of whom 23 were excluded from the analysis for failing to complete the questionnaire. A chi-square analysis did not show significant

Table 3. Characteristics of the participants (n = 577).

Characteristic	Number (percentage)
Age (years)	
18-24	60 (10.4)
25-34	100 (17.3)
35-44	111 (19.2)
45-54	101 (17.5)
55-64	99 (17.2)
≥65	106 (18.4)
Gender	
Male	263 (45.6)
Female	314 (54.4)

(continued)

Table 3. Continued.

Characteristic	Number (percentage)
Household size	
1	49 (8.5)
2	123 (21.3)
3	187 (32.4)
4	161 (27.9)
5	48 (8.3)
6	8 (1.4)
7	1 (0.2)
Monthly household income (HK\$ ^a)	
<6000	23 (4.0)
6000-9999	21 (3.6)
10,000-14,999	50 (8.7)
15,000-19,999	69 (12.0)
20,000-24,999	54 (9.4)
25,000-29,999	58 (10.0)
30,000-39,999	67 (11.6)
40,000-49,999	78 (13.5)
50,000-59,999	38 (6.6)
60,000-79,999	44 (7.6)
80,000-99,999	32 (5.5)
≥100,000	43 (7.5)
Education level	
Primary school or below	64 (11.1)
Some or completed secondary school	218 (37.8)
Diploma, advanced diploma, associate degree, or the equivalent	92 (15.9)
Bachelor's degree or above	203 (35.2)

(continued)

Table 3. Continued.

Characteristic	Number (percentage)
Previous health app installation	
No health app installed	306 (53.0)
Healthy living information	201 (34.8)
Recovery and rehabilitation information	10 (1.7)
Assistance in diagnosis	8 (1.4)
Telehealth	13 (2.3)
Health and medical reminders	50 (8.7)
Emergency services	8 (1.4)
Vital measurements record	110 (19.1)
Other health apps	11 (1.9)
Maximum price previously paid for a health app (HK\$ ^a)	
Never spent money on health apps (i.e. 0)	520 (90.1)
1-9	3 (0.5)
10-49	14 (2.4)
50-99	6 (1.0)
100-199	15 (2.6)
200-299	5 (0.9)
300-399	5 (0.9)
400-499	0 (0.0)
≥500	9 (1.6)

^aHK\$1 ≈ US\$0.13.

differences between non-completers and completers in terms of gender ($p = 0.30$), age group ($p = 0.26$), or residential area ($p = 0.13$). The subsequent analyses were based on the 577 participants who completed the questionnaire.

Table 3 presents the participants' characteristics. The average age of the participants was 46.2 years (standard deviation = 15.8, range: 18–82). Nearly half of them (47.0%, 271/577) had previously installed one or more health apps. The most frequently installed types of health apps were those pertaining to healthy living information (34.8%, 201/577), vital measurement records (19.1, 110/577), and health and medical reminders

Table 4. WTP for health apps (n = 577).

WTP for health apps (HK\$ ^a)	Number (percentage)
0	237 (41.1)
1-9	14 (2.4)
10-49	105 (18.2)
50-99	72 (12.5)
100-199	97 (16.8)
200-299	17 (3.0)
300-399	10 (1.7)
400-499	1 (0.2)
500-999	10 (1.7)
≥1000	14 (2.4)

^aHK\$1 ≈ US\$0.13.

WTP: willingness to pay.

(8.7%, 50/577). Additionally, 9.9% of the participants (57/577) had previously paid for at least one health app. The mode, median (1st quartile, 3rd quartile), and mean (standard deviation) of the maximum price they had previously paid for a health app were HK\$100, HK\$100 (30, 250), and HK\$268.40 (515.13), respectively.

WTP for health apps

Table 4 presents the distribution of the participants' WTP for health apps. Over half of the participants (58.9%; 340/577) were willing to pay for health apps, and the mode, median (1st quartile, 3rd quartile), and mean (standard deviation) of WTP were HK\$100, HK\$50 (20, 100), and HK\$170.41 (647.71), respectively.

Sociodemographic correlates of whether individuals were willing to pay for health apps

Table 5 presents the sociodemographic correlates of whether individuals were willing to pay for health apps. Of the factors examined, holding a bachelor's degree or higher (odds ratio = 2.59, $p = 0.01$) and having previously installed health apps (odds ratio = 1.90, $p < 0.01$) was significantly associated with a higher likelihood of being willing to pay for health apps.

Table 5. Analysis of sociodemographic correlates of whether individuals were willing to pay for health apps.

Sociodemographic characteristics	Odds ratio	Standard error	p-value
Gender (<i>female vs. male</i>)	0.99	0.18	0.96
Age	0.99	0.01	0.13
Monthly household income per capita	1.00	0.08	0.98
Education level			
<i>Primary school and below (reference)</i>	–	–	–
<i>Some secondary school or completed secondary school</i>	1.16	0.36	0.64
<i>Diploma, advanced diploma, associate degree, or the equivalent</i>	1.80	0.66	0.11
<i>Bachelor's degree or above</i>	2.59	0.96	0.01*
Having installed health apps (<i>yes vs. no</i>)	1.90	0.37	< 0.01*
Maximum price previously paid for a health app (>HK\$0 vs. HK\$0) ^a	1.00	0.00	0.08
Constant	1.04	0.54	0.94
Pseudo R ²	0.08		

p* < 0.05.^aHK\$1 ≈ US\$0.13.Table 6.** Analysis of sociodemographic correlates of WTP for health apps.

Sociodemographic characteristics	Coefficients	Standard error	p-value
Gender (<i>female vs. male</i>)	–0.25	0.14	0.07
Age	0.01	0.01	0.23
Monthly household income per capita	–0.06	0.67	0.35
Education			
<i>Primary school and below (reference)</i>	–	–	–
<i>Some secondary school or completed secondary school</i>	0.46	0.30	0.12
<i>Diploma, advanced diploma, associate degree, or the equivalent</i>	0.44	0.33	0.18
<i>Bachelor's degree or above</i>	0.57	0.33	0.08
Having installed health apps (<i>yes vs. no</i>)	0.08	0.15	0.60
Maximum price previously paid for a health app (in HK\$ ³)	0.002	<0.001	<0.01*
Constant	3.41	0.44	<0.01*
R ²	0.13		

**p* < 0.05.^aHK\$1 ≈ US\$0.13.

WTP: willingness to pay.

Table 7. Reasons for being unwilling to pay^a (N = 577).

Reasons for being unwilling to pay for health apps	Number (percentage)
I do not know what health apps are.	57 (9.9)
Health apps offer me no benefits.	55 (9.5)
I do not trust health apps.	59 (10.2)
There are no health apps that fit my needs.	30 (5.2)
I do not know how to use health apps.	36 (6.2)
I do not have time to use health apps.	28 (4.9)
I cannot afford to pay for a health app.	37 (6.4)
The government should offer free health apps to me.	69 (12.0)
Other reasons	15 (2.6)
No reasons provided	5 (0.9)
Not applicable (WTP > HK\$0) ^b	340 (58.9)

^aParticipants could choose more than one reason.

^bHK\$1 ≈ US\$0.13.

WTP: willingness to pay.

Sociodemographic correlates of WTP for health apps

Table 6 presents the sociodemographic characteristics analyzed to identify correlates of WTP for health apps among the participants who were willing to pay for health apps. The analysis revealed a significant positive correlation between WTP and the maximum price previously paid for a health app (coefficient = 0.002, $p < 0.01$).

Reasons for being unwilling to pay for health apps

The participants who were unwilling to pay for health apps (41.1%, 237/577) gave the reasons why they were unwilling to pay, which are summarized in Table 7. The most frequently cited reasons for being unwilling to pay were “The government should offer free health apps to me” (12.0%, 69/577), “I do not trust health apps” (10.2%, 59/577), “I do not know what health apps are” (9.9%, 57/577), and “Health apps offer me no benefits” (9.5%, 55/577).

Discussion

Previous health app installation and payment

Nearly half of the participants had installed health apps before. The most commonly installed health apps were those that

provided healthy living information, recorded vital measurements, and offered health and medical reminders. This finding reveals a rise in the uptake of health apps compared with a previous study,¹⁴ indicating an increase in proactive health app use over these years. This trend is likely to have been driven by recent advancements in smartphone capabilities and increased smartphone accessibility. To further promote health app use, public media channels (e.g. social media, blogs, and podcasts) could be used to encourage the general public to learn about and use health apps by elucidating the functionalities and advantages of these apps. Additionally, authorities could encourage healthcare organizations to integrate health apps into existing public health infrastructure to improve the accessibility and convenience of healthcare services. Such integration would encourage patients to use health apps and thus benefit from the associated improvements in healthcare experiences.

Despite their interest in installing health apps, more than half of the participants had not paid for health apps previously. This finding reflects hesitancy about paid apps, which may be due to uncertainty about their advantages over free alternatives, as well as the financial constraints faced by some participants. To overcome the barrier of paying for apps, health app developers could offer a free version of their apps alongside paid options to provide users with the opportunity to evaluate the app’s usefulness before committing to a purchase. This “try before you buy” approach could enhance user familiarity and/or satisfaction with the technology and potentially lead to increased purchases. Moreover, to address financial constraints and increase the affordability of health apps for a wider population, developers could implement flexible pricing options such as tiered pricing plans or subscription models. This strategy would not only accommodate users with financial constraints by providing choices to suit different budgets but also foster broader adoption by tailoring app access to the users’ needs and financial capabilities. Additionally, providing incentives to purchase/use the apps or subsidies to pay for them to economically disadvantaged groups could further improve the equitability of access to these digital health tools.

WTP for health apps

The study revealed that a considerable segment of the study sample was willing to pay for health apps, and their median WTP was HK\$50 (1st quartile: HK\$20, 3rd quartile: HK\$100). The finding indicates both a substantial opportunity for the health app market and a pricing window that consumers find acceptable. Developers and marketers can leverage this insight to devise pricing strategies that align with potential customers’ expectations. Moreover, the market demand implied by this study highlights the increasing need for high-quality, evidence-based, and user-friendly health apps.

Sociodemographic correlates of whether individuals are willing to pay for health apps

Education level. This study identified a positive correlation between a higher educational level, specifically bachelor's degree or above, and being willing to pay for health apps. One possible explanation for this finding is that individuals with higher education levels are more accepting of and more likely to use health technologies, such as health apps,^{11,13,14,16,24} and thus are more likely to be willing to pay for these technologies. Another possible explanation is that individuals with higher education levels tend to have a higher level of health literacy,²⁵ which may facilitate their use of health apps and allow them to understand the benefits that health apps can offer.²⁶ We further infer from this finding that due to their intricacy, the use of certain health apps may be challenging for individuals with a lower level of educational attainment or health literacy. It is therefore crucial for developers to make health apps more accessible and user-friendly by prioritizing intuitive design in their health apps; this can be done by integrating concise instructions and optimizing the user interface design.

Previous health app installation. In our study, participants who had previously installed health apps were more likely to be willing to pay for health apps. This inclination to pay for apps may have stemmed from the perceived benefits that the participants had gained from previously installed apps, leading them to believe that other health apps could offer similar advantages²⁶ and thus increasing their willingness to invest in additional apps. This finding further supports our suggestion that health app developers offer a free "lite" version of their apps that users can test. Once a user benefits from a health app, they may be more likely to be willing to pay for similar health apps.

Sociodemographic correlates of WTP for health apps

Maximum price previously paid for a health app. The price previously paid for a health app was found to be positively associated with the participants' WTP for health apps. One explanation is that individuals who stated a high WTP may have always placed a high value on health and viewed health apps as a worthwhile investment. It is also possible that individuals who had previously purchased high-priced health apps found them to be satisfactory, which in turn raised their expectations for other health apps and increased their WTP. This finding emphasizes that it is crucial for the health app industry to continually innovate and introduce new features and functionalities to keep pace with consumers' expectations. By doing so, the industry can not only sustain interest and satisfaction among existing users but also foster long-term sustainability. This commitment to advancement could help health apps to remain relevant, effective, and highly valued in the competitive digital marketplace.

Reasons for being unwilling to pay for health apps

Provision of free health apps by the government. In our sample, the most cited reason for being unwilling to pay for health apps was the expectation that the government should provide health apps free of charge. This sentiment may reflect a greater level of confidence in health apps endorsed by governmental authorities (vs. those from industry) and underscores the significant role that these authorities play in the promotion of health technologies. In some countries, such as Germany, the demonstrated potential of apps to provide effective public healthcare has led third-party organizations to incorporate health apps into their medical reimbursement systems.^{27,28} By offering free health apps to the public, authorities can improve access to health-related information and services, thereby improving public health, alleviating the strain on healthcare systems, and increasing the efficiency of healthcare resource allocation. For example, the provision of free health apps during the COVID-19 pandemic was instrumental in facilitating healthcare service provision and minimizing the risks of disease exposure and transmission in many countries.^{29,30}

Distrust in health apps. Distrust also emerged as a significant barrier to the participants' WTP for health apps.^{16,31} Distrust of a technology may be related to its reliability, effectiveness, and security. To address such distrust, health app developers should consult healthcare professionals to ensure the clinical relevance and accuracy of their health apps. Regulatory agencies could establish trustworthy oversight mechanisms to make sure that health apps meet specific quality standards before entering the market. Moreover, health apps with poor usability can lead to user errors and, eventually, distrust of the technology. Developers can mitigate this distrust by conducting usability testing to identify and address problems at an early stage.^{8,32-34} Concern about the misuse of personal health information is another potential reason for distrust in health apps.³⁵ Developers can take several steps to resolve users' concerns and improve trust, including offering transparent data control options accompanied by straightforward guidelines, clearly informing users about how their data will be collected and used, and implementing strong security measures to prevent data leaks. Policymakers should also consider regulating the collection, use, and transfer of personal information by health apps.

Unawareness of health apps and their benefits. A lack of awareness or understanding of health apps and their potential benefits was another major reason for the participants' disinterest in paying for health apps. Such unawareness may stem from a low level of health literacy and digital health literacy,^{25,36} which can impede an individual's

ability to recognize the value and advantages of health services and technologies.^{37–39} To increase potential users' awareness of health apps, educational and awareness campaigns targeting the general public could be launched to impart essential health knowledge and actively promote the use of health apps. Concurrently, healthcare professionals could be encouraged to prescribe health apps to patients to supplement the self-management of their conditions.⁴⁰ However, further research is required to substantiate the effectiveness of these health apps and thus encourage this approach in the medical community.⁴¹

Limitations

This study has several limitations. First, the determination of WTP for health apps was based on hypothetical payments that the participants self-reported and thus may not accurately capture behavior in a real-world payment situation.⁴² Second, the questionnaire used in this study was not formally validated, which may have influenced the findings. Third, the participants were recruited in public areas and thus were of sufficiently good health to engage in outdoor activities, which may have led to selection bias. Fourth, the study did not explore how variations in the types of health apps or different methods of measuring WTP may have influenced the results.¹¹ Future studies could focus on addressing these limitations to provide more accurate and comprehensive insights.

Conclusions

This study examined whether, how much, and why individuals are willing to pay for health apps. The results indicate the increasing potential of the health app market and provide implications for improving their adoption and use. Developers are recommended to focus on enhancing the quality, usability, and value propositions of health apps to establish trust and attract potential customers. Policymakers and regulatory bodies should take responsibility for ensuring transparency and quality assurance in the health app market.

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