Review

Consumers' Willingness to Pay for eHealth and Its Influencing Factors: Systematic Review and Meta-analysis

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Abstract

Background: Despite the great potential of eHealth, substantial costs are involved in its implementation, and it is essential to know whether these costs can be justified by its benefits. Such needs have led to an increased interest in measuring the benefits of eHealth, especially using the willingness to pay (WTP) metric as an accurate proxy for consumers' perceived benefits of eHealth. This offered us an opportunity to systematically review and synthesize evidence from the literature to better understand WTP for eHealth and its influencing factors.

Objective: This study aimed to provide a systematic review of WTP for eHealth and its influencing factors.

Methods: This study was performed and reported as per the Cochrane Collaboration and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. PubMed, CINAHL Plus, Cochrane Library, EconLit, and PsycINFO databases were searched from their inception to April 19, 2022. We conducted random-effects meta-analyses to calculate WTP values for eHealth (at 2021 US dollar rates) and meta-regression analyses to examine the factors affecting WTP.

Results: A total of 30 articles representing 35 studies were included in the review. We found that WTP for eHealth varied across studies; when expressed as a 1-time payment, it ranged from US $0.88 to US $191.84, and when expressed as a monthly payment, it ranged from US $5.25 to US $45.64. Meta-regression analyses showed that WTP for eHealth was negatively associated with the percentages of women (β=−.76; *P*<.001) and positively associated with the percentages of college-educated respondents (β=.63; *P*<.001) and a country's gross domestic product per capita (multiples of US $1000; β=.03; *P*<.001). Compared with eHealth provided through websites, people reported a lower WTP for eHealth provided through asynchronous communication (β=−1.43; *P*<.001) and a higher WTP for eHealth provided through medical devices (β=.66; *P*<.001), health apps (β=.25; *P*=.01), and synchronous communication (β=.58; *P*<.001). As for the methods used to measure WTP, single-bounded dichotomous choice (β=2.13; *P*<.001), double-bounded dichotomous choice (β=2.20; *P*<.001), and payment scale (β=1.11; *P*<.001) were shown to obtain higher WTP values than the open-ended format. Compared with ex ante evaluations, ex post evaluations were shown to obtain lower WTP values (β=−.37; *P*<.001).

Conclusions: WTP for eHealth varied significantly depending on the study population, modality used to provide eHealth, and methods used to measure it. WTP for eHealth was lower among certain population segments, suggesting that these segments may be at a disadvantage in terms of accessing and benefiting from eHealth. We also identified the modalities of eHealth that were highly valued by consumers and offered suggestions for the design of eHealth interventions. In addition, we found that different methods of measuring WTP led to significantly different WTP estimates, highlighting the need to undertake further methodological explorations of approaches to elicit WTP values.

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KEYWORDS

systematic review; meta-analysis; willingness to pay; eHealth; contingent valuation; discrete choice experiment; mobile phone

Introduction

Advances in broadband technology and the Internet of Things have enabled the broad implementation of eHealth—the provision or acquisition of health information or services through electronic processes [1-7]. In recent years, a broad spectrum of eHealth interventions using various modalities has been developed and examined in health care research. Examples include websites, diagnostic and monitoring devices, smartphone apps, virtual reality systems, telephone and video calls, and electronic messages that provide health information or services [8-10]. Researchers have implemented these eHealth interventions into a range of health care activities, including teleconsultation [11,12], remote patient monitoring [13], self-management of diseases [14-16], disease rehabilitation [17], and disease prevention [18]. Promising results have emerged from these studies, which showed that eHealth interventions could facilitate the delivery of health care and improve patient outcomes [9-17]. It has also been shown that eHealth enables consumers to easily obtain information about health issues for decision-making, which could lead to more effective care, patient empowerment, and time savings [8,18-22].

Although eHealth is considered a promising complement to conventional health care systems, there are significant costs involved in its implementation arising from the purchase, development, and maintenance of hardware and software [23]. Therefore, when deciding to implement eHealth for personal use or public health, decision-makers need solid evidence that the costs of eHealth can be justified by its benefits [24]. This requires the quantification and measurement of the benefits of eHealth, which can then be aggregated with the costs of eHealth to understand its cost-effectiveness [25].

To measure the benefits of eHealth, willingness to pay (WTP) is a commonly used metric [26,27]. Welfare economics defines WTP as the maximum amount of money an individual is willing to pay for 1 unit of a good or service; it is an accurate proxy for the welfare (benefits) derived from that good or service [28-30]. A major advantage of the WTP approach is that it summarizes the benefits in monetary terms, making it comparable with the costs for use in cost-benefit analyses [26,31]. Another advantage is that WTP illustrates the perceived benefits from the perspective of consumers, which can be further analyzed to represent consumer preferences [32,33]. Therefore, the WTP approach is suitable for measuring the benefits of eHealth, as it can generate findings for the effective implementation of eHealth and provide insights into designing better eHealth technology and services.

Many studies [34-36] have examined consumers' WTP for eHealth using either of the 2 mainstream methods. The first is contingent valuation, a survey-based method in which people are asked to indicate the maximum price they are willing to pay for eHealth (eg, services) or associated eHealth technology. The second is the discrete choice experiment, sometimes referred to as conjoint analysis, which involves asking people to state their preference for hypothetical alternatives that describe eHealth or eHealth technology. Regardless of the methods used, these studies have provided insights into consumers' perceived eHealth benefits and the factors affecting these perceptions. If we synthesize and analyze these studies, we can obtain practical implications for the design, development, and implementation of eHealth and suggestions for future research. Thus, we systematically reviewed previous studies on consumers' WTP for eHealth and synthesized their findings through a meta-analysis to understand consumers' WTP for eHealth and examine its influencing factors. To the best of our knowledge, this is the first study of its kind.

Methods

Overview

This review was performed and reported according to the Cochrane Collaboration [37] and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Multimedia Appendix 1 provides the checklist) [38]. A total of 2 researchers (ZX and JC) independently screened the titles and abstracts of the articles identified in the literature search for eligibility, reviewed the full texts of potentially eligible articles for final inclusion in the review, extracted data from the final sample, critically appraised their methodological quality, and assessed the quality of the evidence. All disagreements between them were resolved through a consensus-based discussion.

Search Strategy

We searched PubMed, CINAHL Plus, Cochrane Library, EconLit, and PsycINFO databases from their inception to April 19, 2022, to obtain a preliminary list of relevant studies. A search strategy was developed based on the following concepts combined using "AND": WTP, money, and eHealth. For each concept, a set of keywords and their synonyms and variations were developed and combined in the search strategy using "OR." The following search terms were developed: ("willingness to pay" *OR* "WTP" *OR* "valuation" *OR* "preference") *AND* ("cost" *OR* "price" *OR* "expense" *OR* "money") *AND* ("eHealth" *OR* "electronic health" *OR* "digital health" *OR* "mHealth" *OR* "mobile" *OR* "web" *OR* "Internet" *OR* "online" *OR* "tele*" *OR* "medical informatics" *OR* "medical information systems"). These search terms were used to search for titles and abstracts in all the selected databases, with no filters or limits placed on the search.

Eligibility Criteria and Study Selection

We included all studies that (1) recruited participants who were consumers of eHealth, (2) measured and reported participants' WTP for eHealth or eHealth technology, and (3) were published in a peer-reviewed English-language journal. Studies were excluded if they examined WTP from a public payer's perspective (eg, WTP for public health programs through taxation) or a caregiver's perspective (eg, parents' WTP for their children). We also excluded reviews, case studies, poster presentations, and conference presentations but examined their references to identify additional relevant articles for inclusion. We also manually searched the reference lists of studies in the final sample for additional relevant articles.

Data Extraction and Management

We extracted the following data from each study: country where the study was conducted, year in which it was conducted, sample size, sample characteristics, modality used to provide eHealth, details of the eHealth examined, WTP, method used to measure WTP, and WTP factors examined. Regarding the methods used to measure WTP, the extracted information included the formats of the questions posed to the study participants (eg, open-ended questions, dichotomous choice, and bidding games), whether the participants had used eHealth at the time of evaluation (ex post or ex ante), and how zero responses were dealt with (all zero responses excluded, all zero responses included, or protest zero responses excluded). We contacted the authors for clarification and verification of cases where relevant data were missing or incomplete.

Critical Appraisal of Methodological Quality

The included studies were critically appraised for methodological quality using 17 criteria based on the Hoy risk of bias assessment tool [39] and a set of criteria specific for assessing WTP studies (Multimedia Appendix 2) [29,40].

Data Analysis

Descriptive Statistics and Narrative Synthesis of the Studies in the Final Sample

Descriptive statistics were used to summarize the characteristics of the included studies. Narrative synthesis was used to synthesize the WTP findings for eHealth in the studies, for which the means, SDs, 95% CIs, medians, IQRs, and ranges were reported. All WTP values were calculated at 2021 US dollar rates to facilitate quantitative synthesis and comparison. First, the WTP values in other currencies were converted to US dollars based on the purchasing power parity (PPP) exchange rate of the year in which the study was conducted, and then they were converted to 2021 US dollar values using gross domestic product (GDP) deflators. The PPP exchange rate and GDP deflator data were obtained from the International Monetary Fund's World Economic Outlook database [41]. For studies that did not report the year in which they were conducted, we used the year preceding the publication year of the articles for currency conversion.

Random-Effects Meta-analyses to Measure WTP

We performed random-effects meta-analyses to estimate the overall WTP value for eHealth and the WTP value for eHealth by different subgroups (ie, modalities used to provide eHealth and the region where the study was conducted) [42]. The WTP values were log-transformed to reduce skewness [43]. In the meta-analysis, the weight of each study was the inverse of the WTP variance. For studies that did not report variance (or SD), we obtained an estimate using (1) SE and sample size, (2) 95% CIs and sample size, (3) IQRs, or (4) range and sample size [37,44]. The I^2 test was used to measure heterogeneity in the synthesized studies [45], and the Egger test was used to assess the possibility of publication bias [46].

Meta-regression Analyses to Examine the Factors Affecting WTP

Univariate meta-regressions were conducted to examine whether WTP for eHealth was influenced by explanatory variables, including gender, age, and education level of the study sample; per capita GDP of the country where the study was conducted and the year in which it was conducted; the modality used to provide eHealth (ie, websites, medical devices, health apps, asynchronous communication, and synchronous communication); the format of the WTP questions (ie, open-ended, single-bounded dichotomous choice, double-bounded dichotomous choice, or payment scale); whether the participants of the study had used eHealth at the time of evaluation (ex post vs ex ante); and whether zero responses were excluded from the analysis of WTP values. A mixed-effects log-linear regression model was used, where the payment horizon (1-time or monthly payment) was modeled as a random effect and the explanatory variable was modeled as a fixed effect. We also narratively synthesized the WTP factors for eHealth examined in the included studies. All statistical analyses were performed in R (version 4.0.2, R Foundation for Statistical Computing) software using the *metafor* package.

Assessment of the Quality of Evidence

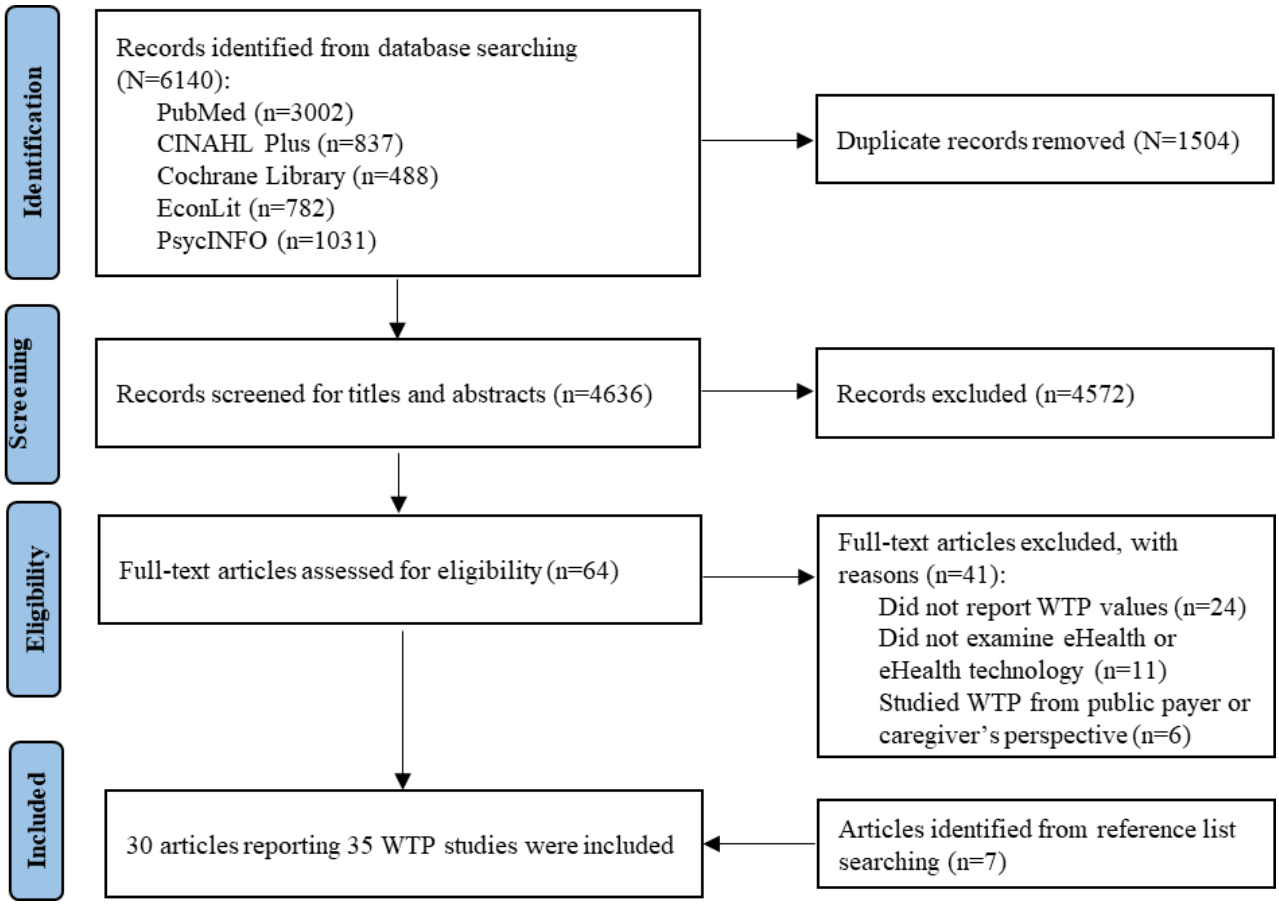
The quality of evidence of the meta-analysis results was assessed using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) framework [47]. We adopted the framework for rating the relative importance of outcomes (eg, values, preferences, and outcome importance) [48,49], which was more suitable for rating cross-sectional WTP surveys and discrete choice experiments than previous GRADE guidelines that focused on the effects of interventions. For each WTP outcome, the quality of evidence started from "high" and was downgraded by 1 level for every serious issue identified in the domains of risk of bias, inconsistency, indirectness, imprecision, and publication bias. The risk of bias domain was assessed by inspecting the potential bias in participant selection, measurement instruments, data collection, and data analysis. The inconsistency domain was assessed using I^2 values, and the GRADE quality was downgraded when $I^2 \geq 50\%$. The indirectness domain was assessed using the indirectness of the population, outcomes, options, and methodologies used to elicit the values of the outcomes. The imprecision domain was assessed using the width of the CIs of the estimates and sample size. The publication bias domain was assessed using the Egger test, and GRADE quality was downgraded for statistically significant findings ($P<.05$) on this test.

Results

Literature Search and Selection Process

Figure 1 shows the literature search and selection process. The search yielded 6140 articles, of which 30 (0.49%) articles representing 35 WTP studies were identified as eligible and included in the final review.

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram of the study selection process. WTP: willingness to pay.



Study Characteristics

The characteristics of the studies included in this review are presented in Table 1. Appraisals of the methodological quality are presented in Multimedia Appendix 2.

Table 1. Summary of the characteristics of the final studies (N=35).

Characteristics	Values, n (%)
Study location	
Africa	2 (6)
Asia	8 (23)
Europe	13 (37)
North America	9 (26)
Oceania	3 (9)
Year of publication	
2003-2010	8 (23)
2011-2015	8 (23)
2016-2021	19 (54)
Modality used to provide eHealth	
Websites	5 (14)
Medical devices	8 (23)
Health apps	5 (14)
Asynchronous communication (eg, SMS text messaging or email)	8 (23)
Synchronous communication (eg, telephone call or video call)	7 (20)
Not specified	2 (6)
Method used to measure willingness to pay	
Contingent valuation	26 (74)
Open-ended questions	13 (37)
Single-bounded dichotomous choice questions	1 (3)
Double-bounded dichotomous choice questions	4 (11)
Payment scale questions	2 (6)
Bidding games	2 (6)
Single-bounded dichotomous choice+payment scale questions	1 (3)
Not reported	3 (9)
Discrete choice experiment	9 (26)

WTP for eHealth: Narrative Synthesis

Table 2-Table 4 present the details of 74% (26/35) of studies that used contingent valuations and 26% (9/35) of studies that used discrete choice experiments.

Table 2. Details of the 26 contingent valuation studies included in the final sample.

Study	Country (year of study)	Population and sample size (N)	Age (years)	Women (%)	eHealth details	Measurement of WTP[a] (format, ex ante or ex post, and zeros)	WTP (PPP[b], and 2021 US dollar value)
Contingent valuation studies that reported WTP as a 1-time payment (n=17)							
Adedokun et al [50]	Nigeria (2011)	Patients at a family medicine unit (389)	Mean 42.1	54	An SMS text messaging–based appointment scheduling service: patients sent an SMS text message to book a clinic appointment and received a confirmation SMS text message and another SMS text message reminding them of the appointment	Open-ended; ex ante; all zeros excluded	Mean 2.81 (SD 3.88), range 0.06-38.26
Belkora et al [51]	United States (2007-2010)	Patients with breast cancer (34)	Mean 59	100	A telephone consultation planning service: before a clinical visit, a community health worker called the patient to check if they had any medical questions and then sent the list of questions to the patient's physician	Double-bounded dichotomous choice; ex post; all zeros included	Mean 191.84 (SD 242.91)
Bergmo and Wangberg (1) [52]	Norway (2003)	Patients at a primary clinic (52)	Mean 38	70	An internet-based messaging system that enabled patients to communicate with their health care providers by sending messages using a web browser	Open-ended; ex ante; protest zeros excluded	Mean 10.94 (95% CI 8.91-13.17); median 10.14 (IQR 5.07-20.26)
Bergmo and Wangberg (2) [52]	Norway (2003)	Patients at a primary clinic (38)	Mean 37	61	Same as Bergmo and Wangberg (1) [52]	Open-ended; ex post; protest zeros excluded	Mean 7.30 (95% CI 5.47-8.91); median 7.09 (IQR 2.03-10.14)
Brandling-Bennet et al [53]	Cambodia (2003)	Patients at a clinic (49)	Mean 39	61	A telemedicine service: local nurses recorded the medical history and conducted physical examinations of patients and sent this information to physicians at a remote place via email; the physicians would then reply with the treatment or referral decisions; the local nurses would execute the recommendations	Not reported; ex post; all zeros excluded	Median 0.90, range 0-72.53

Study	Country (year of study)	Population and sample size (N)	Age (years)	Women (%)	eHealth details	Measurement of WTP[a] (format, ex ante or ex post, and zeros)	WTP (PPP[b], and 2021 US dollar value)
Fawsitt et al (1) [54]	Ireland (2015)	Women in antenatal clinics (20)	Mean and median not reported	100	A mobile app that provided information about cesarean section and surgical site infections: users recorded symptoms, temperature, heart rate, and pain level based on which the app would provide health advice (eg, check body temperature or contact a general practitioner)	Open-ended; ex ante; all zeros included	Mean 30.96 (SD 58.28); median 13.98
Fawsitt et al (2) [54]	Ireland (2015)	Women in antenatal clinics (116)	Mean and median not reported	100	A mobile app that provided information about cesarean section and surgical site infections: users recorded symptoms, temperature, heart rate, and pain level, which would be checked daily by a midwife in the maternity hospital who would provide health advice to the user	Open-ended; ex ante; all zeros included	Mean 36.38 (SD 51.46); median 13.98
Fawsitt et al (3) [54]	Ireland (2015)	Women in antenatal clinics (44)	Mean and median not reported	100	A telephone call–based helpline service: users called a midwife in the maternity hospital, who would provide health advice and instructions	Open-ended; ex ante; all zeros included	Mean 32.76 (SD 47.73); median 13.98
Kaga et al [55]	Japan (2016)	General population (305)	Mean and median not reported	37	An internet-based telecare service for older adults, which connected the television at users' homes to the internet: health care information was displayed on the television; if the television was not used for 3 days, a telephone call would be made to the user, and if they did not answer the call, neighborhood associations and civil servant committees would visit them to ensure that they were fine	Double-bounded dichotomous choice; ex ante; all zeros included	Mean 8.58; median 4.57
Ngan et al [56]	Vietnam (2017)	Smokers who intended to quit (433)	Mean 33	0.8	An SMS text messaging–based smoking cessation service: SMS text messages with relevant health information, suggestions for controlling and preventing cravings, and encouragement were sent to users 2 to 4 times a day for 6 weeks	Single-bounded dichotomous choice; ex ante; all zeros included	Mean 59.99 (95% CI 46.92-73.07)

Study	Country (year of study)	Population and sample size (N)	Age (years)	Women (%)	eHealth details	Measurement of WTP[a] (format, ex ante or ex post, and zeros)	WTP (PPP[b], and 2021 US dollar value)
Raghu et al (1) [57]	United States (2013-2014)	Patients waiting for general consultation (214)	Mean and median not reported	Not reported	A teledermoscopy service: a clinician at a health center used a smartphone (with a Canfield Dermscopefield) to capture images of skin lesions and send them to a dermatologist, who then wrote a medical note and sent it to the clinician	Double-bounded dichotomous choice; ex ante; all zeros included	Mean 63.12 (SD 44.66); median 55.77
Raghu et al (2) [57]	United States (2013-2014)	Patients with skin lesions (41)	Mean and median not reported	Not reported	Same as Raghu et al (1) [57]	Double-bounded dichotomous choice; ex ante; all zeros included	Mean 59.81 (SD 30.33); median 54.83
Ramchandran et al [58]	United States (2017)	Patients with diabetes (23)	Mean 56	52	A teleophthalmology service: a technician or nurse used a nonmydriatic fundus camera to take photos of the patient's eye and send them to an ophthalmologist, who then replied with a diagnosis and recommended follow-up care	Payment scale; ex ante; all zeros included	Mean 29.96 (SD 8.53)
Rochat et al [59]	Switzerland (2014)	People visiting a travel clinic (162)	Mean and median not reported	53	A telemedicine service for travelers providing pretravel information; medical advice for upcoming trips; and health advice when the traveler was abroad through telephone calls, video calls, or emails	Not reported; ex ante; all zeros excluded	Median 57.10 (IQR 34.26-57.10)
Ruby et al [60]	United States (2008)	Adolescents with persistent subthreshold depression (34)	Mean 17	57	An internet-based depression prevention intervention for adolescents: 14 modules for depression prevention were provided through a website	Not reported; ex post; all zeros included	Median 50.15 (IQR 19.59-62.68); range 0-626.84
Shariful Islam et al [61]	Bangladesh (2013-2014)	Patients with type 2 diabetes (352)	Mean 50	56	An SMS text message–based health service for patients with type 2 diabetes, which provided medication reminders and relevant health information (eg, diabetes complications and recommended diet and physical activities) through SMS text messages	Open-ended; ex ante; all zeros included	Median 0.88 (IQR 1.99)
Stahl et al [62]	United States (2007-2008)	Patients visiting a primary care physician (101)	Mean 46	60	An internet-based primary care service: a primary care physician took the patient's medical history, conducted a visual inspection, decided on treatment, and arranged follow-up care through videoconferencing	Payment scale; ex post; all zeros included	Mean 25.71 (SD 15.88)[c]

Study	Country (year of study)	Population and sample size (N)	Age (years)	Women (%)	eHealth details	Measurement of WTP[a] (format, ex ante or ex post, and zeros)	WTP (PPP[b], and 2021 US dollar value)
Contingent valuation studies that reported WTP as monthly payments: WTP per month (n=9)							
Cocosila et al [63]	Canada (2006-2007)	General population (51)	Median 21	57	An SMS text message–based health reminder service: users received SMS text messages reminding them to take vitamin C pills	Open-ended; ex post; no zero responses	Median 5.25; range 0.52-31.47
Contreras-Somoza et al [64]	Spain, Serbia, Netherlands, France, Israel, Italy, or Slovenia (not reported)	Patients aged >60 years with mild cognitive impairment (30)	Mean 73.3	60	An internet-based information and communication technology platform (ehcoBUTLER system) for older people: the platform hosted several social and health apps to support the daily activities of older people and improve their health, quality of life, and independence	Not reported; ex ante; all zeros excluded	Median 14.64
Jacobs et al [65]	Belgium (2009)	General population (135)	Mean 41	34	A cardiovascular disease prevention program with internet-based components: the program comprised cardiovascular risk assessment, communication, follow-up care, a website providing health information on cardiovascular disease, advice on physical activity and diet, guidelines for behavioral changes, and individual coaching by a health psychologist	Single-bounded dichotomous choice+payment scale; ex post; all zeros included	Mean 13.41 (SD 14.42); median 5.64
Rasche et al [66]	Germany (2017)	General population (96)	Mean 63.8	51	A mobile app for fall prevention: the app had features such as detecting the risk of falling, recommendations for reducing this risk, storing other health-related data, and providing advice on how to prevent and respond to a fall	Open-ended; ex ante; all zeros included	Median 7.41 (IQR 14.83); range 0-118.61
Somers et al (1) [34]	United Kingdom (2015)	General population (1697)	Mean 47	51	A mobile app for improving well-being outcomes: the app had features such as calling and messaging friends or families or local health care providers, setting health goals, tracking health status, sharing health data, and receiving information about the local community	Open-ended; ex ante; all zeros included	Mean 24.31; median 7.46; range 0-1344.36

Study	Country (year of study)	Population and sample size (N)	Age (years)	Women (%)	eHealth details	Measurement of WTP[a] (format, ex ante or ex post, and zeros)	WTP (PPP[b], and 2021 US dollar value)
Somers et al (2) [34]	United Kingdom (2015)	General population (305)	Mean 48	72	Same as Somers et al (1) [34].	Open-ended; ex ante; ell zeros included	Mean 20.13; median 7.46; range 0-896.62
Tran et al [67]	Vietnam (2012)	Patients with HIV or AIDS (1016)	Mean 35.4	36	A mobile phone–based medication reminder service for patients with HIV: SMS text messages, telephone calls, or automated voice calls were used to remind patients to take their medication on time	Not reported; ex ante; all zeros included	Mean 8.42
Tsuji et al [68]	Japan (not reported)	General population (291)	Mean and median not reported	Not reported	A telehealth system for older people: health-related data such as blood pressure, oxygen saturation, heart rhythm, electrical activity, and heart rates were measured at the user's home and sent to a remote clinic where nurses studied them and reported any unusual symptoms to the user and physicians; monthly health reports were created and sent to users	Bidding game; ex post; all zeros included	Mean 45.64
Tsuji et al [69]	Japan (not reported)	General population (145)	Mean 74	74	Same as Tsuji et al [68]	Bidding game; ex ante; all zeros included	Mean 29.68

[a]WTP: willingness to pay.

[b]PPP: purchasing power parity.

[c]The WTP values were obtained by combining the WTP values for subgroups, as reported in the articles.

Table 3. Demographic and eHealth details of the 9 discrete choice experiment studies included in the final sample.

Study	Country (year of study)	Population	Sample size, N	Age (years)	Women (%)	eHealth details
Discrete choice experiment studies that reported WTP[a] as a 1-time payment (n=6)						
Buchanan et al [35]	United Kingdom (2018)	General population	734	Mean 47	51	Web-based consultation with a primary care physician
Park et al [70]	South Korea (2009-2010)	Patients in endocrinology and metabolism clinics	118	Mean 57	58	A telemedicine service for patients with diabetes
Snoswell et al [71]	Australia (not reported)	General population	113	Mean 40	74	A mobile teledermoscopy service for skin cancer screening: users used a dermoscopic smartphone attachment and app to take photos and send them to a dermatologist, along with relevant clinical information
Snoswell et al [36]	Australia (2019)	Patients who had a video consultation in the previous year	62	Mean and median not reported	62.9	Web-based consultation with a specialist physician through videoconferencing
Spinks et al [72]	Australia (not reported)	People aged 50 to 64 years at high risk of melanoma	35	Mean and median not reported	54	A teledermoscopy service for skin cancer screening: using a dermatoscope to take photos which were sent to a dermatologist for diagnosis
van der Pol and McKenzie [73]	United Kingdom (not reported)	General population	90	Mean and median not reported	62	A telemedicine service for ear, nose, and throat examination: patients sent endoscopic images to and videoconferenced with a specialist
Discrete choice experiment studies that reported WTP as monthly payments (n=3)						
Ahn et al [74]	South Korea (2011)	General population	400	Mean 44	51	A telemedicine service system that measured vital signs of users and transmitted patient data to care providers
Chang et al [75]	United States (2009-2010)	General population	6271	Mean and median not reported	52	A web-based health service that provided remote diagnosis, treatment, monitoring, and consultation
Deal et al [76]	Canada (not reported)	Patients with cardiovascular disease	74	Mean 68.9	50	A web-based system that tracked and displayed patients' details on 15 outcomes related to cardiovascular disease risk, the target value of these outcomes for better control of their condition, the last time the outcome was checked, and brief advice for patients and clinicians

[a]WTP: willingness to pay.

Table 4. WTP[a] details of the 9 discrete choice experiment studies included in the final sample.

Study, attribute (reference level), and desired level or levels of the attribute	Marginal WTP (PPP[b], 2021 US dollar value)
Discrete choice experiment studies that reported WTP as a 1-time payment (n=6)	
Buchanan et al [35]	
How similar was your consultation to a traditional "face-to-face" appointment (the same)	
Video consultation	–7.02
Symptoms submitted via an electronic form	–15.40
How long did you have to wait for a consultation	
Reduced by 1 hour	0.22
Reputation of the GP[c] (2 stars)	
5 stars	13.65
Collecting antibiotics (taking a paper prescription to a pharmacy located in the same building as the local medical center)	
Prescription emailed to a pharmacy in another building as the local medical center	–11.38
Form of consultation (at local medical centers)	
Via the internet (–10.83)	–17.09
Park et al [70]	
Service platform (the internet)	
Mobile phone	22.72
Service providers (small- and medium-sized hospitals and clinics)	
Large general hospitals	21.64
Service scope (glucose management only)	
Comprehensive diabetes care	24.23
Personalization of consultation (absent)	
Present	11.87
24-hour service accessibility (absent)	
Present	10.27
Reply time (within 3 days)	
Within 1 day	8.45
Assurance of service (low assurance)	
High assurance	18.61
System failure (system down 1%-5%)	
System down <1%	12.68
Confidentiality (1%-5% confidentiality breaches)	
<1% confidentiality breaches	8.78
Snoswell et al [71]	
Method of screening (by a GP)	
Mobile teledermoscopy	0.88
Time away from usual activities (>4 hours)	
3-4 hours	6.11
1-2 hours	53.75
Chances of detecting a melanoma if one is present (65%–75%)	
85%-95%	54.37
≥95%	87.73

Study, attribute (reference level), and desired level or levels of the attribute	Marginal WTP (PPP[b], 2021 US dollar value)
Wait time for results (3 days)	
<4 hours	4.92
Person reviewing the results (GP)	
Dermatologist	32.21
Number of moles removed to find 1 melanoma (5)	
3	31.51
Snoswell et al [36]	
Type and mode of consultation (local in-person consultation with a generalist physician at a GP clinic or small hospital)	
In-person consultation with a specialist physician at a large metropolitan hospital	9.88
Videoconference with a specialist physician from a local GP clinic or small hospital	91.33
Videoconference with a specialist from home	33.53
Time away from home, office, or usual activities, including travel (half a day)	
1 full day	–11.80
≥2 full days	–113.66
Perceived benefit from the consultation (limited)	
Partial benefit	53.86
Benefit	111.28
Consulted or not (attending a consultation)	
No consultation chosen	–175.14
Spinks et al [72]	
WTP for teledermoscopy service, in addition to skin self-examination, GP screening, and clinic skin cancer screening	84.38
van der Pol and McKenzie [73]	
Type of clinic	
Telemedicine	773.31
Face-to-face	873.45
Driving time (up to 30 minutes)	
30-60 minutes	–57.49
60-90 minutes	–74.18
2-4 hours	–155.77
Wait time	
Each additional week	–27.82
Discrete choice experiment studies that reported WTP as a monthly payment: WTP per month (n=3)	
Ahn et al [74]	
Device type (smartphone)	
Smart home	138.29
Wearable device	632.49
Service type (management of oxygen saturation level)	
Blood glucose	30.27
Blood pressure	–56.35
Service tailoring (absent)	
Present	82.76

Study, attribute (reference level), and desired level or levels of the attribute	Marginal WTP (PPP[b], 2021 US dollar value)
Reply time (usual)	
1-hour reduction	3.57
Chang et al [75]	
Per household	5.40[d]
Deal et al [76]	
Speed of adding new information to the system (2 weeks)	
1 week	5.70
48 hours	7.60
Overnight	2.85
1 hour	0
Individual patient tracker values displayed (most recent values only)	
2 most recent	8.55
12-month history	13.31
5-year history	8.55
Complete history	–5.70
Nurse coordinator tasks or duties (no nurse coordinator)	
Basic duties[e]	16.16
Basic duties and input data	20.91
Basic duties and information sessions	17.11
Basic duties, phone, and email	33.27
Basic duties and reminders	19.96
Frequency of contacting nurse coordinator (no contact)	
1 day per month	6.65
2 days per month	10.45
1 day per week	5.70
2 days per week	10.91
5 days per week	1.90
Number of visits to a physician per year (1)	
2	19.01
3	25.66
4	27.56
6	7.60

[a]WTP: willingness to pay.

[b]PPP: purchasing power parity.

[c]GP: general practitioner.

[d]95% CI 3.79-7.02.

[e]Basic duties of the nurse coordinator: assist the physician in using the tracker, keep tracker information updated, and ensure action is taken to address uncontrolled cardiovascular disease risks.

WTP for eHealth: Meta-analysis

Approximately 60% (21/35) of studies reported sufficient data for inclusion in the meta-analysis. Among the 21 studies, 16 (76%) reported that WTP was measured as a 1-time payment, whereas 5 (24%) reported that it was measured as monthly payments. Table 5 presents the mean WTP for eHealth obtained through the meta-analysis.

Table 5. Overall WTP[a] for eHealth, WTP by the modality used to provide eHealth, and WTP by the region where the study was conducted (N=21).

Variables	Studies, n (%)	Sample size	WTP (PPP[b], 2021 US dollars), mean (95% CI)	I^2 (%)	Egger test		GRADE[c] quality of evidence
					z score	*P* value	
Studies that measured WTP as a 1-time payment (n=16) [50-62]							
Overall WTP	16 (76)	2102	25.00 (12.79-48.87)	99.69	0.72	.47	Low
Modality used to provide eHealth							
Websites	1 (5)	34	111.46 (84.55-146.92)	N/A[d]	N/A	N/A	Very low
Medical devices	3 (14)	278	48.34 (30.17-77.44)	97.86	0.10	.92	Low
Health apps	2 (10)	136	35.86 (28.05-45.85)	N/A	N/A	N/A	Low
Asynchronous communication (eg, SMS text messages and email)	6 (28)	1313	7.76 (2.39-25.21)	99.55	1.67	.10	Low
Synchronous communication (eg, telephone and video call)	4 (19)	341	52.59 (22.15-124.90)	99.23	0.74	.46	Very low
Region							
North America	6 (28)	447	61.92 (33.94-112.97)	99.01	3.30	.001	Low
Europe	6 (28)	432	22.65 (12.05-42.60)	98.16	0.24	.81	Moderate
Asia	3 (14)	834	9.93 (0.84-117.06)	99.76	1.3	.19	Low
Africa	1 (5)	389	2.81 (2.45-3.22)	N/A	N/A	N/A	Low
Studies that measured WTP as monthly payments: WTP per month (n=5) [34,63,65,66]							
Overall WTP	5 (24)	2284	18.53 (11.81-29.08)	94.71	0.24	.81	Moderate
Modality used to provide eHealth							
Websites	1 (5)	135	13.41 (11.19-16.08)	N/A	N/A	N/A	Moderate
Health apps	3 (14)	2098	28.89 (21.71-38.44)	44.49	−1.73	.08	Moderate
Asynchronous communication	1 (5)	51	10.62 (8.89-12.68)	N/A	N/A	N/A	Low
Region							
North America	1 (5)	51	10.62 (8.89-12.68)	N/A	N/A	N/A	Low
Europe	4 (19)	2233	21.81 (13.91-34.20)	91.27	−0.12	.91	Moderate

[a]WTP: willingness to pay.

[b]PPP: purchasing power parity.

[c]GRADE: Grading of Recommendations, Assessment, Development, and Evaluation.

[d]N/A: not applicable (as <3 experiments were analyzed).

Among the 16 studies that measured WTP as a 1-time payment, the mean WTP was US $25.00 (95% CI 12.79-48.87). The highest mean WTP was for eHealth provided through websites (US $114.46, 95% CI 84.55-146.92), followed by synchronous communication (US $52.59, 95% CI 22.15-124.90), medical devices (US $48.34, 95% CI 30.17-77.44), health apps (US $35.86, 95% CI 28.05-45.85), and asynchronous communication (US $7.76, 95% CI 2.39-25.21). In terms of region, the WTP value was the highest in North America (US $61.92, 95% CI 33.94-112.97), followed by Europe (US $22.65, 95% CI 12.05-42.60), Asia (US $9.93, 95% CI 0.84-117.06), and Africa (US $2.81, 95% CI 2.45-3.22).

Among the 5 studies that measured WTP as monthly payments, the mean WTP was US $18.53 (95% CI 11.81-29.08) per month. The highest mean WTP per month was for eHealth provided through health apps (US $28.89, 95% CI 21.71-38.44), followed by websites (US $13.41, 95% CI 11.19-16.08), and asynchronous communication (US $10.62, 95% CI 8.89-12.68). In terms of region, the mean WTP per month was US $21.81 (95% CI 13.91-34.20) in Europe and US $10.62 (95% CI 8.89-12.68) in North America.

Factors Affecting WTP for eHealth: Meta-regression and Narrative Synthesis

Table 6 presents the results of the univariate log-linear meta-regression analyses of WTP-related factors for eHealth.

The results showed that higher percentages of women (β=−.76; *P*<.001) were associated with a lower mean WTP value for eHealth, and more people with a college education (β=.63; *P*<.001) were associated with a higher mean WTP value for eHealth. No significant evidence was found to support the association between age and WTP for eHealth (*P*=.57). A higher GDP per capita was found to be related to a higher WTP value for eHealth (β=.03; *P*<.001). Compared with eHealth provided through websites, the respondents had a lower WTP value for asynchronous communication (β=−1.43; *P*<.001) and a higher WTP value for medical devices (β=.66; *P*<.001) and synchronous communication (β=.58; *P*<.001). Studies eliciting WTP values using the single-bounded dichotomous choice format (β=2.13; *P*<.001), double-bounded dichotomous choice format (β=2.20; *P*<.001), payment scale format (β=1.11; *P*<.001), and unspecified formats (β=1.89; *P*<.001) had higher mean WTP values than those using open-ended formats. Ex post evaluations had lower WTP values (β=−.37; *P*<.001) than ex ante evaluations. However, there was no significant difference in WTP between studies that excluded protest zero responses or all zero responses and studies that included all zero responses in their analysis (*P*=.37).

Among the studies included in this review, 40% (14/35) examined WTP-related factors for eHealth, and their findings were narratively synthesized (Tables 7 and 8). The factors of interest included the characteristics of the eHealth technology or service and the study participants' sociodemographic characteristics, health conditions, current health care services, psychosocial characteristics, familiarity with information technology, and attitudes.

Table 6. Univariate log-linear meta-regression analyses of WTP[a]-related factors for eHealth.

Explanatory variable	Outcome variable (mean WTP)	
	β (SE, 95% CI)	*P* value
Gender (women; %)	−.76 (0.14, −1.03 to −0.49)	<.001
Age (years)	.002 (0.003, −0.004 to 0.01)	.57
Education (completed college; %)	.63 (0.18, 0.29 to 0.98)	<.001
GDP[b] per capita (US $)	.03 (0.001, 0.025 to 0.027)	<.001
Modality used to provide eHealth		
Websites	—[c]	—
Medical devices	.66 (0.08, 0.49 to 0.82)	<.001
Health apps	.25 (0.1, 0.06 to 0.44)	.01
Asynchronous communication (eg, SMS text messages and email)	−1.43 (0.09, −1.60 to −1.27)	<.001
Synchronous communication (eg, telephone and video call)	.58 (0.08, 0.42 to 0.74)	<.001
WTP question format		
Open-ended	—	—
Single-bounded dichotomous choice	2.13 (0.12, 1.90 to 2.36)	<.001
Double-bounded dichotomous choice	2.20 (0.06, 2.09 to 2.31)	<.001
Payment scale	1.11 (0.05, 1.01 to 1.21)	<.001
Not reported	1.89 (0.05, 1.80 to 1.98)	<.001
Ex post vs ex ante	−.37 (0.04, −0.45 to −0.28)	<.001
Protest zero or all zero responses excluded vs all zeros included	.02 (0.02, −0.02 to 0.05)	.37

[a]WTP: willingness to pay.

[b]GDP: gross domestic product.

[c]Not available because it was the reference level.

Table 7. WTP[a]-related factors for the examined eHealth in studies that reported WTP as a one-time payment.

Factors	Adedokun et al [50]	Bergmo and Wangberg [52]	Kaga et al [55]	Ngan et al [56]	Raghu et al (1) [57]	Raghu et al (2) [57]	Shariful Islam et al [61]	Stahl et al [62]
Characteristics of the eHealth or eHealth technology								
Favorable features	__[b]	—	—	—	—	—	—	Positive[c]
Technical quality	—	—	—	—	—	—	—	Not significant
Service convenience	—	—	—	—	Positive	Positive	—	—
Satisfaction with the service	—	—	—	—	Not significant	Not significant	—	—
Brand reputation	—	—	—	—	Positive	Positive	—	—
Sociodemographic characteristics								
Gender (women)	Not significant	Not significant	Negative	—	—	—	Negative	Not significant
Age	Not significant	Positive	Not significant	Positive	—	—	—	Not significant
Education	Not significant	Not significant	—	Not significant	Not significant	Negative	Positive	—
Income	—	Not significant	Not significant	Positive	Not significant	Positive	Positive	—
Employment	Not significant	—	—	—	Not significant	Not significant	—	—
Occupation	Not significant	—	—	Not significant	—	—	—	—
Living alone	—	—	Not significant	—	—	—	—	—
Residential area	—	—	—	Not significant	—	—	—	—
International student	—	—	—	—	Negative	Not significant	—	—
Health conditions								
Chronic conditions	—	Not significant	—	—	—	—	Not significant	—
Smoking status	—	—	—	Not significant	—	—	—	—
Attempts to quit smoking	—	—	—	Not significant	—	—	—	—
Current health care services								
Number of visits to a physician	—	—	—	—	—	—	Not significant	—
Time taken and cost of travel to see a physician	—	—	—	—	—	—	—	Not significant
Psychosocial characteristics								
Health anxiety	—	—	Not significant	—	—	—	—	—
Health consciousness	—	—	Positive	—	—	—	—	—
Having an acquaintance who lives alone	—	—	Not significant	—	—	—	—	—
Not having seen people for over a week	—	—	Positive	—	—	—	—	—

Factors	Adedokun et al [50]	Bergmo and Wangberg [52]	Kaga et al [55]	Ngan et al [56]	Raghu et al (1) [57]	Raghu et al (2) [57]	Shariful Islam et al [61]	Stahl et al [62]
Experience with information technology								
Having used eHealth	—	Negative	—	—	—	—	—	—
Internet use	—	Not significant	—	—	—	—	—	—
Attitudes								
Willingness to use	—	—	Positive	—	—	—	—	—

[a]WTP: willingness to pay.

[b]The factor was not examined in the study.

[c]The favorable feature examined in the study was to involve family and friends.

Table 8. WTP[a]-related factors for the examined eHealth in studies that reported WTP in monthly payment.

Factors	Cocosila et al [63]	Jacobs et al [65]	Rasche et al [66]	Somers et al (1) [34]	Somers et al (2) [34]	Tran et al [67]
Characteristics of the eHealth or eHealth technology						
Favorable features	—[b]	—	Positive[c]	—	—	Positive[d]
Sociodemographic characteristics						
Gender (women)	Not significant	—	Not significant	Not significant	Negative	—
Age	Negative	—	Not significant	Negative	Negative	—
Education	—	—	Not significant	—	—	Positive
Income	—	—	—	Positive	Not significant	—
Health literacy	—	—	Not significant	—	—	—
Health conditions						
Perceived health status	—	—	—	Positive	Positive	—
Chronic conditions	—	—	Not significant	Not significant	Not significant	—
Health risk	—	—	Not significant	—	—	—
Taking regular medication	—	—	—	Not significant	Not significant	Not significant
Dosage of medication	—	Positive	—	—	—	—
Current health care services						
Level of the health system	—	—	—	—	—	Negative
Psychosocial characteristics						
Perceived autonomy support	—	Positive	—	—	—	—
Experience with information technology						
Having used eHealth	—	—	—	—	—	—
Internet use	—	—	—	Positive and negative[e]	Not significant	—
SMS text messaging use	Not significant	—	—	—	—	—
Computer use	—	—	—	Negative[f]	Not significant	—
Smartphone use	—	—	—	Not significant	Not significant	—
Times without a mobile phone	—	—	—	—	—	Positive
Mobile app use	—	—	—	Not significant	Not significant	—
Amount spent on the phone, the internet, and additional features	—	—	—	Positive	Positive	Positive
Amount spent on health apps	—	—	—	Positive	Positive	—
Attitudes						
Attitude toward intervention	—	—	Not significant	—	—	—
Ready for technology innovation	—	—	Not significant	—	—	—
Willingness to use	—	—	—	—	—	Positive

[a]WTP: willingness to pay.

[b]The factor was not examined in the study.

[c]Favorable features examined in the study included decisions regarding treatment, description of physical exercise to reduce the risk of falls, continuous workout programs, and making new social contacts.

[d]Favorable features examined in the study included direct counseling with physicians and booking check-ups.

[e]Individuals who had access to the internet at home but never used it showed higher WTP than those who did not have internet access at home; individuals who had access to the internet at home and used it regularly showed lower WTP than those who did not have internet access at home.

[f]Individuals who owned a computer but rarely used it showed a lower WTP than those who did not own a computer.

Discussion

Principal Findings

To the best of our knowledge, this study is the first systematic review and meta-analysis of WTP for eHealth and meta-regression analysis of WTP-related factors for eHealth. We summarized and analyzed the findings of relevant scientific papers and found that the WTP value reported in each study varied significantly depending on the study population, modality used to provide eHealth, and methods used to measure WTP.

WTP for eHealth was higher in North America and Europe than in Asia and Africa, which is in line with the positive association between GDP per capita and WTP found in our meta-regression analysis. These findings suggest that even after adjusting for PPP, the overall economic condition of a country is related to people's WTP for eHealth. Furthermore, several studies have shown that individual or household income was positively associated with WTP for eHealth in their samples, suggesting that the economic condition of an individual also predicts their WTP for eHealth. A commonly cited reason for this finding is that economic conditions affect individuals' ability to pay, which in turn affects their WTP [77]. Another reason may be that individuals with a higher income or those in more economically developed countries have better access to and are more familiar with eHealth and have a higher intention to use and pay for it [78].

The demographic characteristics related to WTP for eHealth were gender, age, and educational level. The meta-regression analysis showed that women were associated with lower WTP values, which is in line with the findings of some studies in which women were willing to pay less than men for eHealth [34,55,61]. A possible reason for this may be that men tend to be more concerned about their health because of the higher risks of life-threatening chronic diseases than women and are more willing to pay for tools to help manage their health conditions [79,80]. Another reason may be that men tend to have a more favorable attitude toward technology than women [81] and may be more likely to accept and favor eHealth. Regarding the association between age and WTP for eHealth, there were mixed results (ie, nonsignificant, significantly positive, and significantly negative associations) among the included studies. This suggests that the association may vary drastically, depending on the context of each study (eg, population, examined eHealth, clinical setting, and alternative health services). Educational level was also related to WTP for eHealth; studies with a higher percentage of college graduates reported higher WTP values than those with a lower percentage of college graduates. This could be explained by the fact that people with higher education levels had higher eHealth literacy levels [82], perceived fewer barriers to using eHealth, and were more willing to pay for eHealth.

People were more willing to pay for eHealth provided through a specific medical device (eg, dermatoscope, nonmydriatic fundus camera, or vital sign measurement system) than for eHealth provided through websites, probably because of the advantage of obtaining accurate measurements for better clinical diagnoses. The results also showed that people were more willing to pay for eHealth provided through synchronous communication (eg, telephone calls and videoconferencing) than for health-related websites that allow for little to no interaction between users and health care providers, probably because synchronous communication enables real-time communication between users and their health care providers. Asynchronous eHealth also enables communication with health care providers through store-and-forward methods, such as SMS text messaging or email. However, the mean WTP for asynchronous eHealth was much lower than that for synchronous eHealth, probably because the timeliness of communication cannot be guaranteed through asynchronous eHealth, and the amount of health information delivered through SMS text messages or emails is limited.

The methods used to measure WTP also influenced the WTP values. Our meta-regression analysis showed that posing open-ended questions to participants resulted in lower WTP values than any other contingent valuation method. The reason may be that open-ended questions yield more 0 responses [83,84]; alternatively, answering "yes" and anchoring effects can occur when the dichotomous choice or payment scale approach is used [85]. The meta-regression analysis also revealed that ex post evaluations led to lower WTP values than ex ante evaluations, probably because individuals who had not used eHealth tended to have higher expectations and value it more. Another explanation may be that some eHealth interventions were less user-friendly [52] or failed to meet user needs in practice [86].

Implications for Practice, Policy, and Future Research

The results of this review reflect the value of eHealth from the perspective of users, who are important sources of practical implications for the development and implementation of eHealth [87,88]. Our results showed that users place a high value on an eHealth technology that offers accurate diagnoses of health problems, has interactive features, and facilitates real-time communication with health professionals [89-91]. They also favor eHealth technology that enables shared decision-making, physical exercise training, socializing, and booking health examinations [62,66,67,92,93]. In addition, users find convenient and easy-to-use eHealth to be more attractive, suggesting that usability and technology acceptance should be taken into consideration when designing and implementing technology for eHealth, which is consistent with the literature [86,94-103].

Our results revealed the gender, education, and economic differences in the WTP for eHealth. Despite that eHealth has great potential to improve the accessibility of care by delivering health care and health information remotely and at a low cost; it might be more accessible to and create more benefits for individuals or populations that have more resources to use and are more capable of using eHealth [104]. It is a challenge for researchers, eHealth developers, and public health decision-makers to ensure that eHealth helps resolve health disparities instead of exacerbating them. We recommend identifying and removing barriers to eHealth access among disadvantaged populations [105] and keeping users' needs and

eHealth literacy levels in mind when developing eHealth interventions [106].

Our review showed that the most common approach to elicit WTP for eHealth was open-ended questions, as researchers do not have to provide cues for a reasonable WTP value, and it is easy to use. However, many participants may have never been asked these types of questions in real life and may have found it difficult to answer, leading to a low response rate and more zero responses, especially "protest zeros" [83,84]. In comparison, other formats that gave participants a starting value to consider, such as single- and double-bounded dichotomous choice models, payment scales, and bidding games, may have made it easier for them to answer the questions but could have led to anchoring bias by making the participants believe that the starting value was an appropriate value, which could have biased their responses toward that value [85]. Some studies used discrete choice experiments, in which each attribute of the good or service was valued separately instead of the full package. Discrete choice experiments generally have higher internal and external validity but require more time and effort for study design and data collection than contingent valuation studies [107]. The perfect approach for WTP evaluation remains debatable, and it seems that the approaches cannot substitute each other, which underscores the need to undertake further methodological comparisons between different approaches and explore other approaches to elicit WTP.

Limitations

This study had some limitations that should be acknowledged. First, all the studies identified in this review were stated preference studies that used hypothetical questions to measure WTP values instead of observing actual purchases or choices made by the respondents (ie, revealed preferences). This inevitably led to a hypothetical bias, with participants reporting higher WTP values than what they would pay in real life [108-111]. The dearth of revealed preference studies in this field calls for further investigation into how much people are willing to pay for eHealth in real life and a comparison of WTP values elicited through stated preference and revealed preference methods. Second, articles written in languages other than English were excluded from this review, which may have led to language and publication bias. Third, there was great heterogeneity in the meta-analysis results, which limited the generalizability of the reported mean WTP values. Meta-analysis and meta-regression results should be interpreted with caution. Finally, we conducted a univariate meta-regression analysis as the rule of thumb is that the number of studies to be used in an analysis should be at least 10 times the number of explanatory variables in the regression [37]. Hence, this review did not use multivariate regression to control for all potential confounders and covariates when examining the associations between exploratory variables and WTP for eHealth.

Conclusions

We found that WTP for eHealth varies greatly depending on the modality used to provide eHealth, study population, and methods used to measure WTP. We found that consumers favored and valued several eHealth modalities and features, which should be considered for adoption in future eHealth interventions. User-centered, convenient, and easy-to-use eHealth interventions should be developed, keeping in mind their usability and acceptance. Our results also showed that different population segments have significantly different WTP values for eHealth, which calls for further efforts to ensure the effective implementation of eHealth among disadvantaged populations and resolve health disparities. Thus far, there has been no consensus on the optimal approach to elicit WTP values, necessitating the exploration of other methods.

Conflicts of Interest

None declared.

Multimedia Appendix 1

PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist.
[DOCX File , 32 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Critical appraisal of the methodological quality.
[DOCX File , 40 KB-Multimedia Appendix 2]

References

1. Boogerd EA, Arts T, Engelen LJ, van de Belt TH. "What is eHealth": time for an update? JMIR Res Protoc 2015 Mar 12;4(1):e29 [FREE Full text] [doi: 10.2196/resprot.4065] [Medline: 25768939]
2. Or C. Pre-implementation case studies evaluating workflow and informatics challenges in private primary care clinics for electronic medical record implementation. Int J Healthc Inf Syst Inform 2015;10(4):56-64. [doi: 10.4018/ijhisi.2015100104]
3. Or C, Tong E, Tan J, Chan S. Exploring factors affecting voluntary adoption of electronic medical records among physicians and clinical assistants of small or solo private general practice clinics. J Med Syst 2018 May 29;42(7):121. [doi: 10.1007/s10916-018-0971-0] [Medline: 29845400]
4. Xie Z, Nacioglu A, Or C. Prevalence, demographic correlates, and perceived impacts of mobile health app use amongst Chinese adults: cross-sectional survey study. JMIR Mhealth Uhealth 2018 Apr 26;6(4):e103 [FREE Full text] [doi: 10.2196/mhealth.9002] [Medline: 29699971]

5. Or CK, Karsh BT. A systematic review of patient acceptance of consumer health information technology. J Am Med Inform Assoc 2009;16(4):550-560 [FREE Full text] [doi: 10.1197/jamia.M2888] [Medline: 19390112]
6. Eysenbach G. What is e-health? J Med Internet Res 2001;3(2):E20 [FREE Full text] [doi: 10.2196/jmir.3.2.e20] [Medline: 11720962]
7. Or CK, Holden RJ, Valdez R. Human factors engineering and user-centered design for mobile health technology: enhancing effectiveness, efficiency, and satisfaction. In: Duffy VG, Ziefle M, Rau PL, Tseng MM, editors. Human-Automation Interaction: Mobile Computing. New York, NY, USA: Springer International Publishing; 2022.
8. Slattery BW, Haugh S, O'Connor L, Francis K, Dwyer CP, O'Higgins S, et al. An evaluation of the effectiveness of the modalities used to deliver electronic health interventions for chronic pain: systematic review with network meta-analysis. J Med Internet Res 2019 Jul 17;21(7):e11086 [FREE Full text] [doi: 10.2196/11086] [Medline: 31317869]
9. Slattery BW, Haugh S, Francis K, O'Connor L, Barrett K, Dwyer CP, et al. Protocol for a systematic review with network meta-analysis of the modalities used to deliver eHealth interventions for chronic pain. Syst Rev 2017 Mar 03;6(1):45 [FREE Full text] [doi: 10.1186/s13643-017-0414-x] [Medline: 28253909]
10. Chen J, Xie Z, Or C. Effectiveness of immersive virtual reality-supported interventions for patients with disorders or impairments: a systematic review and meta-analysis. Health Technol 2021 Jul 16;11(4):811-833. [doi: 10.1007/s12553-021-00561-7]
11. Verhoeven F, van Gemert-Pijnen L, Dijkstra K, Nijland N, Seydel E, Steehouder M. The contribution of teleconsultation and videoconferencing to diabetes care: a systematic literature review. J Med Internet Res 2007 Dec 14;9(5):e37 [FREE Full text] [doi: 10.2196/jmir.9.5.e37] [Medline: 18093904]
12. O'Cathail M, Sivanandan MA, Diver C, Patel P, Christian J. The use of patient-facing teleconsultations in the national health service: scoping review. JMIR Med Inform 2020 Mar 16;8(3):e15380 [FREE Full text] [doi: 10.2196/15380] [Medline: 32175911]
13. de Farias FA, Dagostini CM, de Assunção Bicca Y, Falavigna VF, Falavigna A. Remote patient monitoring: a systematic review. Telemed J E Health 2020 May;26(5):576-583. [doi: 10.1089/tmj.2019.0066] [Medline: 31314689]
14. Kelly M, Fullen B, Martin D, McMahon S, McVeigh JG. eHealth interventions to support self-management in people with musculoskeletal disorders, "eHealth: it's TIME"-a scoping review. Phys Ther 2022 Apr 01;102(4):pzab307 [FREE Full text] [doi: 10.1093/ptj/pzab307] [Medline: 35079826]
15. Liu K, Xie Z, Or CK. Effectiveness of mobile app-assisted self-care interventions for improving patient outcomes in type 2 diabetes and/or hypertension: systematic review and meta-analysis of randomized controlled trials. JMIR Mhealth Uhealth 2020 Aug 04;8(8):e15779 [FREE Full text] [doi: 10.2196/15779] [Medline: 32459654]
16. Or CK, Tao D. Does the use of consumer health information technology improve outcomes in the patient self-management of diabetes? A meta-analysis and narrative review of randomized controlled trials. Int J Med Inform 2014 May;83(5):320-329. [doi: 10.1016/j.ijmedinf.2014.01.009] [Medline: 24534118]
17. Chen J, Or CK, Chen T. Effectiveness of using virtual reality-supported exercise therapy for upper extremity motor rehabilitation in patients with stroke: systematic review and meta-analysis of randomized controlled trials. J Med Internet Res 2022 Jun 20;24(6):e24111 [FREE Full text] [doi: 10.2196/24111] [Medline: 35723907]
18. Widmer RJ, Collins NM, Collins CS, West CP, Lerman LO, Lerman A. Digital health interventions for the prevention of cardiovascular disease: a systematic review and meta-analysis. Mayo Clin Proc 2015 Apr;90(4):469-480 [FREE Full text] [doi: 10.1016/j.mayocp.2014.12.026] [Medline: 25841251]
19. Elbert NJ, van Os-Medendorp H, van Renselaar W, Ekeland AG, Hakkaart-van Roijen L, Raat H, et al. Effectiveness and cost-effectiveness of ehealth interventions in somatic diseases: a systematic review of systematic reviews and meta-analyses. J Med Internet Res 2014 Apr 16;16(4):e110 [FREE Full text] [doi: 10.2196/jmir.2790] [Medline: 24739471]
20. Kampmeijer R, Pavlova M, Tambor M, Golinowska S, Groot W. The use of e-health and m-health tools in health promotion and primary prevention among older adults: a systematic literature review. BMC Health Serv Res 2016 Sep 05;16 Suppl 5:290 [FREE Full text] [doi: 10.1186/s12913-016-1522-3] [Medline: 27608677]
21. Or C, Tao D. A 3-month randomized controlled pilot trial of a patient-centered, computer-based self-monitoring system for the care of type 2 diabetes mellitus and hypertension. J Med Syst 2016 Apr;40(4):81. [doi: 10.1007/s10916-016-0437-1] [Medline: 26802011]
22. Or CK, Liu K, So MK, Cheung B, Yam LY, Tiwari A, et al. Improving self-care in patients with coexisting type 2 diabetes and hypertension by technological surrogate nursing: randomized controlled trial. J Med Internet Res 2020 Mar 27;22(3):e16769 [FREE Full text] [doi: 10.2196/16769] [Medline: 32217498]
23. Sülz S, van Elten HJ, Askari M, Weggelaar-Jansen AM, Huijsman R. eHealth applications to support independent living of older persons: scoping review of costs and benefits identified in economic evaluations. J Med Internet Res 2021 Mar 09;23(3):e24363 [FREE Full text] [doi: 10.2196/24363] [Medline: 33687335]
24. Bergmo TS. How to measure costs and benefits of eHealth interventions: an overview of methods and frameworks. J Med Internet Res 2015 Nov 09;17(11):e254 [FREE Full text] [doi: 10.2196/jmir.4521] [Medline: 26552360]
25. Fanta G, Pretorius L, Erasmus L. Economic analysis of sustainable eHealth implementation in developing countries: a systematic review. In: Proceedings of the 27th Annual Conference of the International Conference on Management of Technology. 2018 Presented at: IAMOT '18; April 22-26, 2018; Birmingham, UK.

26. Olsen JA, Smith RD. Theory versus practice: a review of 'willingness-to-pay' in health and health care. Health Econ 2001 Jan;10(1):39-52. [doi: 10.1002/1099-1050(200101)10:1<39::aid-hec563>3.0.co;2-e] [Medline: 11180568]
27. Robinson R. Cost-benefit analysis. BMJ 1993 Oct 09;307(6909):924-926 [FREE Full text] [doi: 10.1136/bmj.307.6909.924] [Medline: 8241859]
28. Soekhai V, de Bekker-Grob EW, Ellis AR, Vass CM. Discrete choice experiments in health economics: past, present and future. Pharmacoeconomics 2019 Feb;37(2):201-226 [FREE Full text] [doi: 10.1007/s40273-018-0734-2] [Medline: 30392040]
29. Nosratnejad S, Rashidian A, Dror DM. Systematic review of willingness to pay for health insurance in low and middle income countries. PLoS One 2016 Jun 30;11(6):e0157470 [FREE Full text] [doi: 10.1371/journal.pone.0157470] [Medline: 27362356]
30. Sunstein CR. Willingness to pay versus welfare. Harv Law Rev 2007;1:303.
31. Borghi J. Aggregation rules for cost-benefit analysis: a health economics perspective. Health Econ 2008 Jul;17(7):863-875. [doi: 10.1002/hec.1304] [Medline: 17992709]
32. de Bekker-Grob EW, Ryan M, Gerard K. Discrete choice experiments in health economics: a review of the literature. Health Econ 2012 Feb;21(2):145-172. [doi: 10.1002/hec.1697] [Medline: 22223558]
33. Ryan M, Scott DA, Reeves C, Bate A, van Teijlingen ER, Russell EM, et al. Eliciting public preferences for healthcare: a systematic review of techniques. Health Technol Assess 2001;5(5):1-186 [FREE Full text] [doi: 10.3310/hta5050] [Medline: 11262422]
34. Somers C, Grieve E, Lennon M, Bouamrane MM, Mair FS, McIntosh E. Valuing mobile health: an open-ended contingent valuation survey of a national digital health program. JMIR Mhealth Uhealth 2019 Jan 17;7(1):e3 [FREE Full text] [doi: 10.2196/mhealth.9990] [Medline: 30664488]
35. Buchanan J, Roope LS, Morrell L, Pouwels KB, Robotham JV, Abel L, et al. Preferences for medical consultations from online providers: evidence from a discrete choice experiment in the United Kingdom. Appl Health Econ Health Policy 2021 Jul;19(4):521-535 [FREE Full text] [doi: 10.1007/s40258-021-00642-8] [Medline: 33682065]
36. Snoswell CL, Smith AC, Page M, Caffery LJ. Patient preferences for specialist outpatient video consultations: a discrete choice experiment. J Telemed Telecare (forthcoming) 2021 Jun 18:1357633X211022898. [doi: 10.1177/1357633X211022898] [Medline: 34142895]
37. Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al. Cochrane Handbook for Systematic Reviews of Interventions. Version 6.1. London, UK: The Cochrane Collaboration; 2020.
38. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann Intern Med 2009 Aug 18;151(4):264-W64 [FREE Full text] [doi: 10.7326/0003-4819-151-4-200908180-00135] [Medline: 19622511]
39. Hoy D, Brooks P, Woolf A, Blyth F, March L, Bain C, et al. Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. J Clin Epidemiol 2012 Sep;65(9):934-939. [doi: 10.1016/j.jclinepi.2011.11.014] [Medline: 22742910]
40. Smith RD. Construction of the contingent valuation market in health care: a critical assessment. Health Econ 2003 Aug;12(8):609-628. [doi: 10.1002/hec.755] [Medline: 12898660]
41. World Economic Outlook Database: 2021. International Monetary Fund. 2021. URL: https://www.imf.org/en/Publications/WEO/weo-database/2021/October [accessed 2022-09-05]
42. Van Houtven G. Methods for the meta-analysis of willingness-to-pay data: an overview. Pharmacoeconomics 2008;26(11):901-910. [doi: 10.2165/00019053-200826110-00003] [Medline: 18850760]
43. Higgins JP, White IR, Anzures-Cabrera J. Meta-analysis of skewed data: combining results reported on log-transformed or raw scales. Stat Med 2008 Dec 20;27(29):6072-6092 [FREE Full text] [doi: 10.1002/sim.3427] [Medline: 18800342]
44. Wan X, Wang W, Liu J, Tong T. Estimating the sample mean and standard deviation from the sample size, median, range and/or interquartile range. BMC Med Res Methodol 2014 Dec 19;14:135 [FREE Full text] [doi: 10.1186/1471-2288-14-135] [Medline: 25524443]
45. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. BMJ 2003 Sep 06;327(7414):557-560 [FREE Full text] [doi: 10.1136/bmj.327.7414.557] [Medline: 12958120]
46. Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ 1997 Sep 13;315(7109):629-634 [FREE Full text] [doi: 10.1136/bmj.315.7109.629] [Medline: 9310563]
47. Guyatt G, Oxman AD, Akl EA, Kunz R, Vist G, Brozek J, et al. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. J Clin Epidemiol 2011 Apr;64(4):383-394. [doi: 10.1016/j.jclinepi.2010.04.026] [Medline: 21195583]
48. Zhang Y, Alonso-Coello P, Guyatt GH, Yepes-Nuñez JJ, Akl EA, Hazlewood G, et al. GRADE Guidelines: 19. Assessing the certainty of evidence in the importance of outcomes or values and preferences-Risk of bias and indirectness. J Clin Epidemiol 2019 Jul;111:94-104. [doi: 10.1016/j.jclinepi.2018.01.013] [Medline: 29452223]
49. Zhang Y, Coello PA, Guyatt GH, Yepes-Nuñez JJ, Akl EA, Hazlewood G, et al. GRADE guidelines: 20. Assessing the certainty of evidence in the importance of outcomes or values and preferences-inconsistency, imprecision, and other domains. J Clin Epidemiol 2019 Jul;111:83-93. [doi: 10.1016/j.jclinepi.2018.05.011] [Medline: 29800687]

50. Adedokun A, Idris O, Odujoko T. Patients' willingness to utilize a SMS-based appointment scheduling system at a family practice unit in a developing country. Prim Health Care Res Dev 2016 Mar;17(2):149-156. [doi: 10.1017/S1463423615000213] [Medline: 25851031]
51. Belkora J, Stupar L, O'Donnell S, Loucks A, Moore D, Jupiter C, et al. Decision support by telephone: randomized controlled trial in a rural community setting. Patient Educ Couns 2012 Oct;89(1):134-142. [doi: 10.1016/j.pec.2012.06.009] [Medline: 22776761]
52. Bergmo TS, Wangberg SC. Patients' willingness to pay for electronic communication with their general practitioner. Eur J Health Econ 2007 Jun;8(2):105-110. [doi: 10.1007/s10198-006-0014-5] [Medline: 17186205]
53. Brandling-Bennett HA, Kedar I, Pallin DJ, Jacques G, Gumley GJ, Kvedar JC. Delivering health care in rural Cambodia via store-and-forward telemedicine: a pilot study. Telemed J E Health 2005 Feb;11(1):56-62. [doi: 10.1089/tmj.2005.11.56] [Medline: 15785221]
54. Fawsitt CG, Meaney S, Greene RA, Corcoran P. Surgical site infection after caesarean section? There is an app for that: results from a feasibility study on costs and benefits. Ir Med J 2017 Sep 18;110(9):635. [Medline: 29372950]
55. Kaga S, Suzuki T, Ogasawara K. Willingness to pay for elderly telecare service using the Internet and digital terrestrial broadcasting. Interact J Med Res 2017 Oct 24;6(2):e21 [FREE Full text] [doi: 10.2196/ijmr.7461] [Medline: 29066428]
56. Ngan TT, Do VV, Huang J, Redmon PB, Minh HV. Willingness to use and pay for smoking cessation service via text-messaging among Vietnamese adult smokers, 2017. J Subst Abuse Treat 2019 Sep;104:1-6. [doi: 10.1016/j.jsat.2019.05.014] [Medline: 31370973]
57. Raghu TS, Yiannias J, Sharma N, Markus AL. Willingness to pay for teledermoscopy services at a university health center. J Patient Exp 2018 Sep;5(3):212-218 [FREE Full text] [doi: 10.1177/2374373517748657] [Medline: 30214928]
58. Ramchandran RS, Yilmaz S, Greaux E, Dozier A. Patient perceived value of teleophthalmology in an urban, low income US population with diabetes. PLoS One 2020 Jan 9;15(1):e0225300 [FREE Full text] [doi: 10.1371/journal.pone.0225300] [Medline: 31917793]
59. Rochat L, Genton B. Telemedicine for health issues while abroad: interest and willingness to pay among travellers prior to departure. J Travel Med 2018 Jan 01;25(1):tay028. [doi: 10.1093/jtm/tay028] [Medline: 29718404]
60. Ruby A, Marko-Holguin M, Fogel J, Van Voorhees BW. Economic analysis of an Internet-based depression prevention intervention. J Ment Health Policy Econ 2013 Sep;16(3):121-130 [FREE Full text] [Medline: 24327482]
61. Shariful Islam SM, Lechner A, Ferrari U, Seissler J, Holle R, Niessen LW. Mobile phone use and willingness to pay for SMS for diabetes in Bangladesh. J Public Health (Oxf) 2016 Mar;38(1):163-169. [doi: 10.1093/pubmed/fdv009] [Medline: 25687131]
62. Stahl JE, Dixon RF. Acceptability and willingness to pay for primary care videoconferencing: a randomized controlled trial. J Telemed Telecare 2010;16(3):147-151. [doi: 10.1258/jtt.2009.090502] [Medline: 20386035]
63. Cocosila M, Archer N, Yuan Y. Would people pay for text messaging health reminders? Telemed J E Health 2008 Dec;14(10):1091-1095. [doi: 10.1089/tmj.2008.0047] [Medline: 19119832]
64. Contreras-Somoza LM, Irazoki E, Castilla D, Botella C, Toribio-Guzmán JM, Parra-Vidales E, et al. Study on the acceptability of an ICT platform for older adults with mild cognitive impairment. J Med Syst 2020 May 25;44(7):120. [doi: 10.1007/s10916-020-01566-x] [Medline: 32451740]
65. Jacobs N, Drost R, Ament A, Evers S, Claes N. Willingness to pay for a cardiovascular prevention program in highly educated adults: a randomized controlled trial. Int J Technol Assess Health Care 2011 Oct;27(4):283-289. [doi: 10.1017/S0266462311000341] [Medline: 22004768]
66. Rasche P, Mertens A, Brandl C, Liu S, Buecking B, Bliemel C, et al. Satisfying product features of a fall prevention smartphone app and potential users' willingness to pay: Web-based survey among older adults. JMIR Mhealth Uhealth 2018 Mar 27;6(3):e75 [FREE Full text] [doi: 10.2196/mhealth.9467] [Medline: 29588268]
67. Tran BX, Houston S. Mobile phone-based antiretroviral adherence support in Vietnam: feasibility, patient's preference, and willingness-to-pay. AIDS Behav 2012 Oct;16(7):1988-1992. [doi: 10.1007/s10461-012-0271-5] [Medline: 22814571]
68. Tsuji M, Suzuki W, Taoka F. An empirical analysis of a telehealth system in terms of cost-sharing. J Telemed Telecare 2003;9 Suppl 1:S41-S43. [doi: 10.1258/135763303322196303] [Medline: 12952719]
69. Tsuji M, Iizuka C, Taoka F, Teshima M. The willingness of Japanese citizens to pay for e-Health systems. J Inf Technol Healthc 2006 Apr;4(2):103-110 [FREE Full text]
70. Park H, Chon Y, Lee J, Choi IJ, Yoon KH. Service design attributes affecting diabetic patient preferences of telemedicine in South Korea. Telemed J E Health 2011;17(6):442-451 [FREE Full text] [doi: 10.1089/tmj.2010.0201] [Medline: 21631382]
71. Snoswell CL, Whitty JA, Caffery LJ, Loescher LJ, Gillespie N, Janda M. Direct-to-consumer mobile teledermoscopy for skin cancer screening: preliminary results demonstrating willingness-to-pay in Australia. J Telemed Telecare 2018 Dec;24(10):683-689. [doi: 10.1177/1357633X18799582] [Medline: 30343653]
72. Spinks J, Janda M, Soyer HP, Whitty JA. Consumer preferences for teledermoscopy screening to detect melanoma early. J Telemed Telecare 2016 Jan;22(1):39-46. [doi: 10.1177/1357633X15586701] [Medline: 26026184]
73. van der Pol M, McKenzie L. Costs and benefits of tele-endoscopy clinics in a remote location. J Telemed Telecare 2010;16(2):89-94. [doi: 10.1258/jtt.2009.090609] [Medline: 20139140]

74. Ahn J, Shin J, Lee J, Shin K, Park H. Consumer preferences for telemedicine devices and services in South Korea. Telemed J E Health 2014 Feb;20(2):168-174. [doi: 10.1089/tmj.2013.0101] [Medline: 24303932]
75. Chang J, Savage SJ, Waldman DM. Estimating willingness to pay for online health services with discrete-choice experiments. Appl Health Econ Health Policy 2017 Aug;15(4):491-500. [doi: 10.1007/s40258-017-0316-z] [Medline: 28290107]
76. Deal K, Keshavjee K, Troyan S, Kyba R, Holbrook AM. Physician and patient willingness to pay for electronic cardiovascular disease management. Int J Med Inform 2014 Jul;83(7):517-528. [doi: 10.1016/j.ijmedinf.2014.04.007] [Medline: 24862891]
77. Donaldson C. Valuing the benefits of publicly-provided health care: does 'ability to pay' preclude the use of 'willingness to pay'? Soc Sci Med 1999 Aug;49(4):551-563. [doi: 10.1016/s0277-9536(99)00173-2] [Medline: 10414814]
78. Reiners F, Sturm J, Bouw LJ, Wouters EJ. Sociodemographic factors influencing the use of eHealth in people with chronic diseases. Int J Environ Res Public Health 2019 Feb 21;16(4):645 [FREE Full text] [doi: 10.3390/ijerph16040645] [Medline: 30795623]
79. Rieker PP, Bird CE. Rethinking gender differences in health: why we need to integrate social and biological perspectives. J Gerontol B Psychol Sci Soc Sci 2005 Oct;60 Spec No 2:40-47. [doi: 10.1093/geronb/60.special_issue_2.s40] [Medline: 16251589]
80. Chung WS, Shin KO, Bae JY. Gender differences in body image misperception according to body mass index, physical activity, and health concern among Korean university students. J Mens Health 2019 Jan 22;15(1):e1-e9. [doi: 10.22374/1875-6859.15.1.1]
81. Cai Z, Fan X, Du J. Gender and attitudes toward technology use: a meta-analysis. Comput Educ 2017 Feb;105:1-13. [doi: 10.1016/j.compedu.2016.11.003]
82. Tennant B, Stellefson M, Dodd V, Chaney B, Chaney D, Paige S, et al. eHealth literacy and Web 2.0 health information seeking behaviors among baby boomers and older adults. J Med Internet Res 2015 Mar 17;17(3):e70 [FREE Full text] [doi: 10.2196/jmir.3992] [Medline: 25783036]
83. Donaldson C, Thomas R, Torgerson DJ. Validity of open-ended and payment scale approaches to eliciting willingness to pay. Appl Econ 1997;29(1):79-84. [doi: 10.1080/000368497327425]
84. Whynes DK, Frew E, Wolstenholme JL. A comparison of two methods for eliciting contingent valuations of colorectal cancer screening. J Health Econ 2003 Jul;22(4):555-574. [doi: 10.1016/S0167-6296(03)00006-7] [Medline: 12842315]
85. Frew EJ, Whynes DK, Wolstenholme JL. Eliciting willingness to pay: comparing closed-ended with open-ended and payment scale formats. Med Decis Making 2003;23(2):150-159. [doi: 10.1177/0272989X03251245] [Medline: 12693877]
86. Granja C, Janssen W, Johansen MA. Factors determining the success and failure of eHealth interventions: systematic review of the literature. J Med Internet Res 2018 May 01;20(5):e10235 [FREE Full text] [doi: 10.2196/10235] [Medline: 29716883]
87. Hensher M, Cooper P, Dona SW, Angeles MR, Nguyen D, Heynsbergh N, et al. Scoping review: development and assessment of evaluation frameworks of mobile health apps for recommendations to consumers. J Am Med Inform Assoc 2021 Jun 12;28(6):1318-1329 [FREE Full text] [doi: 10.1093/jamia/ocab041] [Medline: 33787894]
88. Martin-Payo R, Carrasco-Santos S, Cuesta M, Stoyan S, Gonzalez-Mendez X, Fernandez-Alvarez MD. Spanish adaptation and validation of the User Version of the Mobile Application Rating Scale (uMARS). J Am Med Inform Assoc 2021 Nov 25;28(12):2681-2686. [doi: 10.1093/jamia/ocab216] [Medline: 34613400]
89. Runz-Jørgensen SM, Schiøtz ML, Christensen U. Perceived value of eHealth among people living with multimorbidity: a qualitative study. J Comorb 2017 Aug 24;7(1):96-111 [FREE Full text] [doi: 10.15256/joc.2017.7.98] [Medline: 29359124]
90. Hersh WR, Hickam DH, Severance SM, Dana TL, Pyle Krages K, Helfand M. Diagnosis, access and outcomes: update of a systematic review of telemedicine services. J Telemed Telecare 2006;12 Suppl 2:S3-31. [doi: 10.1258/135763306778393117] [Medline: 16989671]
91. Akesson KM, Saveman BI, Nilsson G. Health care consumers' experiences of information communication technology--a summary of literature. Int J Med Inform 2007 Sep;76(9):633-645. [doi: 10.1016/j.ijmedinf.2006.07.001] [Medline: 16931133]
92. Chen T, Or CK. Development and pilot test of a machine learning-based knee exercise system with video demonstration, real-time feedback, and exercise performance score. Proc Hum Factors Ergon Soc Annu Meet 2021 Nov 12;65(1):1519-1523. [doi: 10.1177/1071181321651109]
93. Chan KL, Leung WC, Tiwari A, Or KL, Ip P. Using smartphone-based psychoeducation to reduce postnatal depression among first-time mothers: randomized controlled trial. JMIR Mhealth Uhealth 2019 May 14;7(5):e12794 [FREE Full text] [doi: 10.2196/12794] [Medline: 31094354]
94. Dopp AR, Parisi KE, Munson SA, Lyon AR. Aligning implementation and user-centered design strategies to enhance the impact of health services: results from a concept mapping study. Implement Sci Commun 2020 Feb 26;1:17 [FREE Full text] [doi: 10.1186/s43058-020-00020-w] [Medline: 32885179]
95. Barello S, Triberti S, Graffigna G, Libreri C, Serino S, Hibbard J, et al. eHealth for patient engagement: a systematic review. Front Psychol 2016 Jan 8;6:2013 [FREE Full text] [doi: 10.3389/fpsyg.2015.02013] [Medline: 26779108]
96. Or C, Tao D. Usability study of a computer-based self-management system for older adults with chronic diseases. JMIR Res Protoc 2012 Nov 08;1(2):e13 [FREE Full text] [doi: 10.2196/resprot.2184] [Medline: 23612015]
97. Karsh BT, Holden RJ, Or CK. Human factors and ergonomics of health information technology implementation. In: Carayon P, editor. Handbook of Human Factors and Ergonomics in Health Care and Patient Safety. 2nd edition. Boca Raton, FL, USA: CRC Press; 2011:249-264.

98. Liu K, Or CK, So M, Cheung B, Chan B, Tiwari A, et al. A longitudinal examination of tablet self-management technology acceptance by patients with chronic diseases: integrating perceived hand function, perceived visual function, and perceived home space adequacy with the TAM and TPB. Appl Ergon 2022 Apr;100:103667. [doi: 10.1016/j.apergo.2021.103667] [Medline: 34920356]
99. Or CK, Valdez RS, Casper GR, Carayon P, Burke LJ, Brennan PF, et al. Human factors and ergonomics in home care: current concerns and future considerations for health information technology. Work 2009;33(2):201-209 [FREE Full text] [doi: 10.3233/WOR-2009-0867] [Medline: 19713630]
100. Xie Z, Kalun Or C. Acceptance of mHealth by elderly adults: a path analysis. Proc Hum Factors Ergon Soc Annu Meet 2021 Feb 09;64(1):755-759. [doi: 10.1177/1071181320641174]
101. Yan M, Or C. Factors in the 4-week acceptance of a computer-based, chronic disease self-monitoring system in patients with type 2 diabetes mellitus and/or hypertension. Telemed J E Health 2018 Feb;24(2):121-129. [doi: 10.1089/tmj.2017.0064] [Medline: 28737995]
102. K.L. C, Karsh BT. The patient technology acceptance model (PTAM) for homecare patients with chronic illness. Proc Hum Factors Ergon Soc Annu Meet 2006 Oct 1;50(10):989-993. [doi: 10.1177/154193120605001040]
103. Scheibner J, Sleigh J, Ienca M, Vayena E. Benefits, challenges, and contributors to success for national eHealth systems implementation: a scoping review. J Am Med Inform Assoc 2021 Aug 13;28(9):2039-2049 [FREE Full text] [doi: 10.1093/jamia/ocab096] [Medline: 34151990]
104. Viswanath K, Kreuter MW. Health disparities, communication inequalities, and eHealth. Am J Prev Med 2007 May;32(5 Suppl):S131-S133 [FREE Full text] [doi: 10.1016/j.amepre.2007.02.012] [Medline: 17466818]
105. Mangin D, Parascandalo J, Khudoyarova O, Agarwal G, Bismah V, Orr S. Multimorbidity, eHealth and implications for equity: a cross-sectional survey of patient perspectives on eHealth. BMJ Open 2019 Feb 12;9(2):e023731 [FREE Full text] [doi: 10.1136/bmjopen-2018-023731] [Medline: 30760515]
106. Kayser L, Kushniruk A, Osborne RH, Norgaard O, Turner P. Enhancing the effectiveness of consumer-focused health information technology systems through eHealth literacy: a framework for understanding users' needs. JMIR Hum Factors 2015 May 20;2(1):e9 [FREE Full text] [doi: 10.2196/humanfactors.3696] [Medline: 27025228]
107. Breidert C, Hahsler M, Reutterer T. A review of methods for measuring willingness-to-pay. Innov Mark 2006;2(4):8-32. [doi: 10.1007/978-3-8350-9244-0_4]
108. Voelckner F. An empirical comparison of methods for measuring consumers' willingness to pay. Market Lett 2006 Apr;17(2):137-149. [doi: 10.1007/s11002-006-5147-x]
109. Botelho A, Pinto LC. Hypothetical, real, and predicted real willingness to pay in open-ended surveys: experimental results. Appl Econ Lett 2002 Dec;9(15):993-996. [doi: 10.1080/13504850210148143]
110. Wertenbroch K, Skiera B. Measuring consumers' willingness to pay at the point of purchase. J Mark Res 2002 May 1;39(2):228-241. [doi: 10.1509/jmkr.39.2.228.19086]
111. Kanya L, Sanghera S, Lewin A, Fox-Rushby J. The criterion validity of willingness to pay methods: a systematic review and meta-analysis of the evidence. Soc Sci Med 2019 Jul;232:238-261 [FREE Full text] [doi: 10.1016/j.socscimed.2019.04.015] [Medline: 31108330]

Abbreviations

GDP: gross domestic product
GRADE: Grading of Recommendations, Assessment, Development, and Evaluation
PPP: purchasing power parity
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
WTP: willingness to pay

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