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Introduction of e-mental health in national health systems - A health professionals' perspective

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KEYWORDS

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Health professionals;
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Applications

Abstract

Objectives: Evidence exists that e-mental health applications for maternal depression could assist in diagnosing such conditions in an early stage. This study explores the intention of health professionals to use and recommend e-mental health applications and how they think these applications should be integrated in the national health system.

Methods: We applied an exploratory sequential mixed-method research design. First, we collect and analyze responses from 131 health professionals in the field of pregnancy and maternal care. Based on these findings, we conduct semi-structured interviews with 16 experts to expand on the initial results.

Results: Our study reveals that health professionals would in general intend to recommend and use e-mental health applications. However, their attitude towards e-mental health applications varies with respect to the coverage of the mental health process.

Conclusion: The results are of relevance for research and practice. Two scenarios are described that show how health professionals perceive an introduction of e-mental health to be useful.

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Introduction

The burden of mental illness on health has long been underestimated. A disease that is on the rise is depression,

particularly among women [1] and especially during and after pregnancy [2,3]. What is often referred to as “postpartum blues”, “postpartum psychosis”, and “postpartum depression” in many cases remains unnoticed and consequently untreated by health professionals in routine medical check-ups [4,5]. However, the percentage of women affected by maternal depression is significant [6,7]. Depending on the country of reference, prevalence of

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depressions during pregnancy ranges from 6% to 38% [8]. Women affected by this mental disease frequently feel hopeless or overstrained and might even not be able to cope with their role of being a mother [9]. In addition, women suffering from maternal depression frequently feel uncomfortable in disclosing their mental health issues to their physicians as they fear being judged or even reported to child protective services [5].

In this sense, e-mental health - an umbrella term for digital services addressing the psychological and emotional dimension of patients [10] - could be helpful in different ways: With e-mental health, pregnant women could independently gather information, perform screenings and psychological assessments, and obtain treatment by means of online therapy without getting the feeling of being stigmatized or discriminated [11,12]. Extant literature also attests positive effects in terms of costs and resource utilization within the health system [13].

In the past years, there has been a significant effort in capturing those individual and health systems related outcomes [14,15]. However, only little evidence exists about health professionals, who work in the area of clinical and health psychology in pregnancy, and their expectations, needs, and willingness to promote e-mental health for maternal depression [16]. In this paper, we therefore seek to answer the following research questions:

RQ1: Would health professionals in the area of pregnancy use and recommend e-mental health services?

RQ2: In which way should e-mental health services be implemented into the national health system from a health professionals' point of view?

In what follows, we provide a short description of the mental health process before we detail our mixed methods research approach. We then discuss the findings we obtained from an initial (quantitative) survey and from subsequent focused (qualitative) interviews. We conclude by providing a synthesis of our findings and by highlighting the major implications.

Understanding the mental health process

Since evidence suggests that the recommendation and guidance by trustworthy coaches, such as therapists, have a positive influence on the usage of e-mental health apps by patients [17-19], we find it important to study the perspective of healthcare professionals. Relatively little is known about the health professionals' view on e-mental health and which of the steps they generally perform by face-to-face sessions could be automatized or at least transferred to a digital communication channel. Early findings have shown that there is a great mistrust or fear among therapists of being replaced by e-mental health apps [20]. So far, we could not find any e-mental health app that sufficiently covered the entire mental health process, as shown in Figure 1, which leads us to believe that these concerns are - to a certain extent - ungrounded.

The aim of this paper is twofold. First, we want to explore if health professionals are generally willing to use and recommend e-mental health apps. Second, we want to know

for which activities or process steps e-mental health apps could be purposefully introduced. Based on [21], a generalized mental health process comprises the following: The process is typically initiated by a screening step. In this context, screening refers to an initial patient evaluation including medical and psychiatric history, mental status, as well as the patient's suitability for a particular treatment modality [22]. If screening outcomes show no risk tendencies, patients frequently anyway undergo a positive psychology intervention in order to increase their psychological resources to cope with daily stress [23-25]. If screening outcome indicates a risk of a psychological condition, the patient will be thoroughly assessed as well as diagnosed and, depending on the identified level of risk, transferred to a prevention [26,27] or treatment program [28]. It is recommended to conduct a follow-up assessment over time in order to verify that the prevention and treatment programs have the envisioned long-term results [29]. We will consider these steps in the course of further investigation.

Theoretical grounding

To investigate health professionals' intentions to recommend e-mental health services to their patients, our study relies upon the theory of planned behavior (TPB), which has a particular long history in health services research [30]. Following [31], the intention to perform a behavior is influenced by the individual's attitude, the subjective norms, and the perceived behavioral control. Since the behavioral intention correlates with the actual behavior, it is able to predict how individuals will act [32]. Since we could not find any evidence-based e-mental health app related to maternal depression, which sufficiently covered all the steps of the mental healthcare process, we were not able to measure actual behavior. Instead, we focused on the constructs behavioral intention, attitude, subjective norms, and perceived behavioral control, which were already purposefully validated in other studies [33] and which are described below.

According to TPB, any behavioral intention (BI) is positively influenced by attitude (AT), which can be understood as the degree to which a health professional has a favorable appraisal towards e-mental health apps in the context of maternal depression [32]. We therefore hypothesize:

Hypothesis 1: Positive attitudes increase the behavioral intention to recommend e-mental health apps in the context of maternal depression.

BI are also significantly influenced by subjective norms (SN) [34]. This means that if a health professional recommends e-mental health apps to his or her patients or not, also depends on what his or her colleagues think about e-mental health apps, and if they also recommend it or not. Accordingly, we hypothesize:

Hypothesis 2: Subjective norms that favor using e-mental health apps for maternal depression will have a positive effect on the health professional's behavioral intention.

Lastly, the recommendation of e-mental health is also dependent on perceived behavioral control (PB), or the degree to which a health professional feels able to

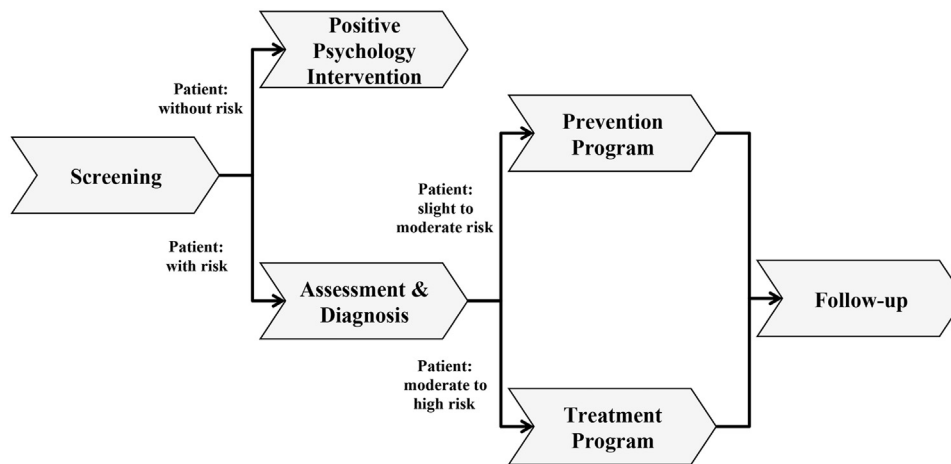


Figure 1 Schematic mental health process.

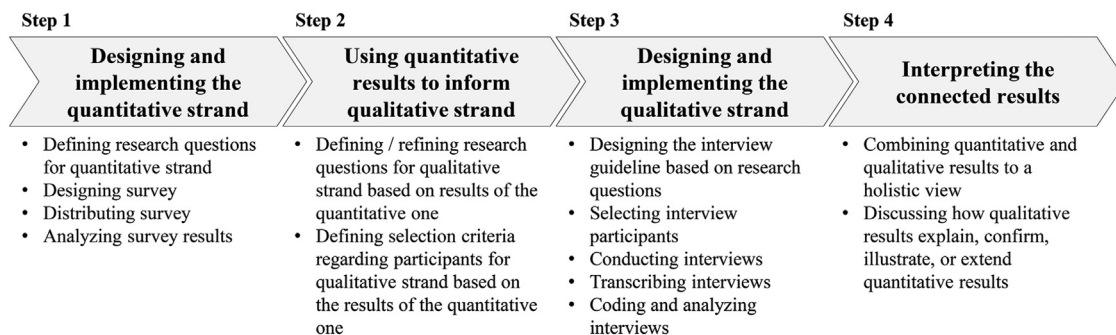


Figure 2 Exploratory sequential mixed-method research design based on [35].

recommend e-mental health apps or not [32]. We therefore hypothesize:

Hypothesis 3: Higher levels of perceived behavioral control will have a positive effect on the behavioral intention to recommend e-mental health apps for maternal depression.

Method

Our study applies an exploratory sequential mixed-method research design [35]. In line with prior research [36], we first collected quantitative data to get a general understanding and to test our hypotheses about behavioral intentions. In this paper we expand the quantitative results by insights obtained from focused interviews to corroborate our previous findings, particularly related to diverging opinions regarding the digitalization of the mental health process [37]. Figure 2 illustrates the different steps of our research method.

Quantitative part: data collection and analysis

By following a purposive sampling approach, an invitation was sent to 300 psychologists, psychiatrists, doctors, and midwives in Europe and the United States via email and online platforms targeting health professionals in the field of pregnancy related work. We received 131 answers, resulting in a response rate of 43.67%. All answers were complete, since the online tool required the participants to

answer each question before they could proceed to the next one and only saved the answers after asking permission for it at the very end of the survey. On average, the health professionals were 46 years old (SD=10.34) and had an average job experience of 19 years (SD=11.10). The participants were mostly midwives and nurses involved in maternal care (60.31%), psychologists and psychiatrists (20.61%), as well as doctors (9.16%), whereas the remaining answers came from other health professionals (9.92%). The participation in this study was voluntary and anonymous. All health professionals taking part in this survey have been notified about their data privacy and data protection through an informed consent form based on Declaration of Helsinki on the first page of the online questionnaire.

To operationalize the constructs of our research model, as later shown in Table 2, we used measurement items, which had been applied and validated in prior research [e.g. 38,39] and were adapted to the context of e-mental health and maternal depression. A 5-point Likert scale anchored with 1=*strongly disagree* and 5=*strongly agree* was used for all ordinal items, including a question related to the usefulness of e-mental health per each step of the mental healthcare process. In addition, we also included a free text field for general comments. The draft version of the questionnaire was checked beforehand by leading experts in clinical psychology with a view to removing any inconsistencies and generally improving the structure of the survey.

To analyze the obtained data and to test our hypothesis, we employed a structural equation model with reflective

measurements and applied a partial least squares (PLS) approach using the SmartPLS2.0.M3 software [40]. We deemed this approach to be suitable as it allows for a simultaneous analysis of the relationship between latent variables (i.e. our constructs) and their respective indicators (our measurement items) [41]. Following, our model requires at least 30 responses as the sample size needs to be at least ten times the maximum number of measurement items (in our case ten times 3) or more [42]. We used the bootstrapping function with 500 resamples to verify the significances of all estimates and, thereby, ensuring valid estimates of p-values. The results of our quantitative analysis will be described in the subsequent Section 5.1.

Qualitative part: data collection and analysis

As mentioned before, our study follows a sequential mixed-method research design. The results of the quantitative part called for further explanation, confirmation, and illustration. More concretely, it became apparent that with our survey we could not answer the crucial question how an e-mental health service should be deployed from a health professionals' perspective and how it might alter the role of the health professional. Following [43], who stated that qualitative data is often best obtained from people with a special interest or authority and expertise in a topic, we therefore arranged 16 semi-structured interviews (cf. interview guide in the Appendix) with renowned professionals in the field of pregnancy in order to better understand how to introduce e-mental health in practice. A total of 16 interviews with 5 nurses and midwives, 5 psychologists and psychiatrists, and 6 doctors were conducted between June and September of 2016. The respondents taking part in the qualitative inquiry (5 male and 11 female) were, on average, 42.25 years of age ($SD=9.05$) and had worked for approximately 16.12 years ($SD=10.34$) in their current positions. Each interview lasted approximately 60 minutes. All interviews were recorded and the answers were transcribed verbatim, which were then analyzed throughout multiple rounds by 3 researchers using an open coding approach [44]. The answers to each question were grouped on the basis of thematic features, resulting in a reduced number of ideas. Most relevant findings will be described in Section 5.2.

Results

Quantitative part: structural model explaining health professionals' behavioral intention

The quantitative part of our overall study aimed at exploring the question if health professionals in the area of pregnancy would generally use and recommend e-mental health services (RQ1). In reporting the results of the quantitative part of our study, we need to consider the structural model describing the relationships or paths among structural dimensions, and a measurement model which links the constructs with a set of operational measures. Following this two-step analytical procedure, the measurement model was first examined and then the structural model was tested.

Table 1 Latent variables' correlations, square root of AVE on main diagonal, and quality criteria.

	AT	SN	PB	BI	AVE	CA	CR
AT	0.94				0.89	0.94	0.96
SN	0.49	0.96			0.92	0.96	0.97
PB	0.65	0.40	0.83		0.69	0.78	0.87
BI	0.79	0.45	0.76	0.83	0.69	0.76	0.86

Note: AT=attitude, AVE=average variance explained; BI=behavioral intention; CA=Cronbach's alpha; CR=composite reliability; PB=perceived behavioral control; SN=subjective norms.

To check for internal consistency of our measurement model, we examined Cronbach's alpha (CA) and composite reliability (CR). An acceptable value for CA and CR is 0.7 or higher [45], which is true for all our constructs, as Table 1 shows. Indicator reliability is given when an item's variation is explained to a large extent by its construct. As Table 2 indicates, all but one of our measurement items meets this criterion. We opted not to delete the measurement item because of practical relevance of the question as well as because the CA and CR values showed sufficient thresholds. To test for convergent validity, we examined the average variance extracted (AVE), which represents the communality of a construct. An AVE value of 0.50 or higher is considered acceptable [45]. Discriminant validity reflects the degree to which the constructs differ from each other. According to the Fornell-Larcker criterion discriminant validity is given when a construct's square root of the AVE is greater than its correlations with the other constructs. This criterion is met for all our constructs, as Table 1 shows.

The structural model is evaluated by analyzing the significance levels of the path estimates and the variance explained [46]. Regarding the former, the path estimates of the attitudes (AT) and perceived behavioral control (PB) constructs are highly significant as is shown in Figure 3.

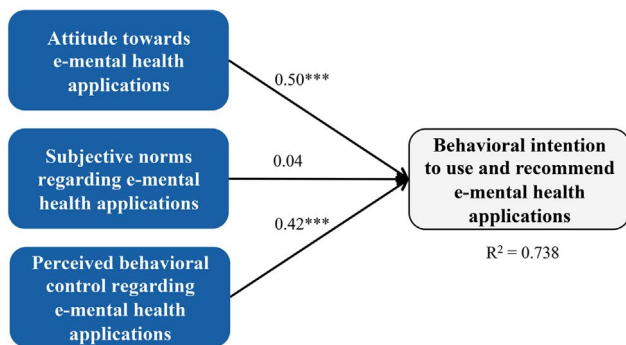
However, SN does not have a significant path estimate. With an R^2 of 0.738, the model explains the variance of the construct BI to a large extent. To further support the good value of R^2 , we calculated the Stone-Geisser value Q^2 , which should be greater than 0 to confirm that the model has predictive power [45]. As our model has a Q^2 of 0.4988, the BI to use and recommend e-mental health apps for maternal depression can be predicted by the constructs AT, SN, and PB.

After evaluating the quality criteria of the measurement model and the structural model, the results can be analyzed. Regarding the exogenous constructs, AT is the one with the highest level of agreement for its measurement items. Overall, health professionals seem to have a positive attitude towards e-mental health apps for maternal depression (all measurement items' mean values of $AT > 3$). On average, health professionals also agree that it is in their control to use and recommend these e-mental health apps (all measurement items' mean values of $PB > 3$). However, there does not seem to be pressure from colleagues or other important people in the health professional's environment to do so (all measurement items' mean values of $SN < 3$). But since the path coefficient of the construct SN is not significant, the missing pressure does not have a relevant impact on the health

Table 2 Measurement model (incl. mean value μ , standard deviation σ , and factor loading λ).

Items	Description	μ	σ	λ^{***}
AT1	In terms of cost-benefit, it is beneficial to use e-mental health apps in the context of maternal depression.	3.60	1.17	0.93
AT2	E-mental health apps would be useful in the context of maternal depression.	3.65	1.22	0.95
AT3	Using e-mental health apps in the context of maternal depression is in general a good idea.	3.66	1.20	0.96
SN1	People who influence my clinical behavior think that I should recommend and use e-mental health apps in the context of maternal depression.	2.79	1.31	0.94
SN2	People who are important in the selection of my healthcare services think that I should recommend and use e-mental health apps in the context of maternal depression.	2.90	1.29	0.97
SN3	People who are important in assessing my patient care and management think that I should recommend and use e-mental health apps in the context of maternal depression.	2.95	1.25	0.97
PB1	I would have the ability to recommend and use e-mental health apps in the context of maternal depression.	3.56	1.33	0.91
PB2	Recommending and using e-mental health apps in the context of maternal depression would be totally in my control.	3.34	1.30	0.84
PB3	I would have the knowledge to recommend and use e-mental health apps in the context of maternal depression.	3.02	1.41	0.74
BI1	I would be willing to inform pregnant women / new mothers I attend of e-mental health apps and their utility.	3.78	1.35	0.90
BI2	Whenever possible I intend to recommend and use e-mental health apps in the context of maternal depression.	2.90	1.39	0.60
BI3	I would recommend and use e-mental health apps in the context of maternal depression.	3.47	1.36	0.95

***All factor loadings are significant with $\alpha < 0.01$; item scale: 1=strongly disagree and 5=strongly agree.



Note: ***Significant path coefficient with $\alpha < 0.01$

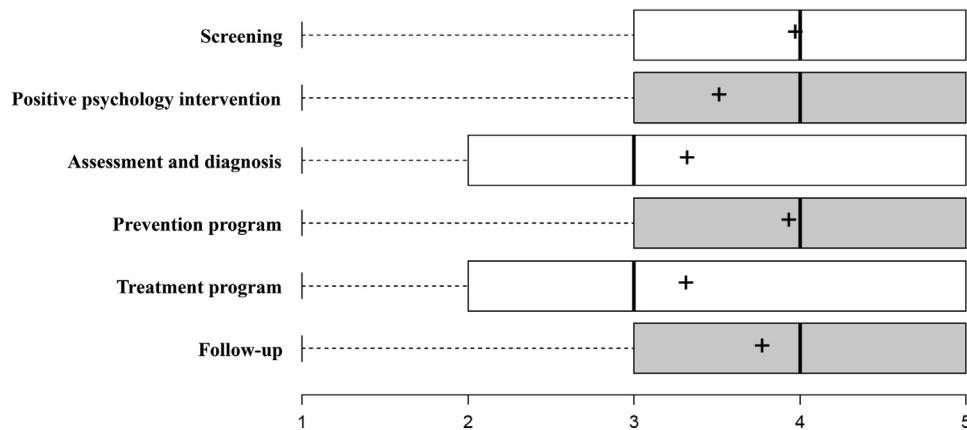
Figure 3 Structural model results.

professional's behavioral intention. Unlike SN, the constructs AT and PB have significant path coefficients. As these path coefficients are positive, [Hypothesis 1](#) and [Hypothesis 3](#) are corroborated. This means that the higher the degree of favorable appraisal for e-mental health apps in the context of maternal depression and the more health professionals feel they are in control to use and recommend them, the higher their intention is to recommend an e-mental health app to their patients and fellow colleagues. Moreover, our results indicate that the participants of our survey would, on average, intend to use e-mental health apps for maternal

depression (two of the three measurement items' mean values of $BI > 3$), but there seem to be exceptions where they would refrain from doing so (mean value of $BI2 < 3$). Besides analyzing average opinions, we also explored our data to see if there are considerable differences in the judgment of health professionals regarding the usefulness of e-mental health apps depending on distinct activities in the mental health process (cf. [Figure 1](#)). Our results, illustrated in [Figure 4](#), show that health professionals perceive e-mental health apps to be useful for all activities in mental health (all mean values > 3). Such apps seem to be of particular usefulness when it comes to screening for maternal depression and supporting the prevention program and the follow-up after the interventions.

Qualitative part: Health professionals' view on how to implement e-mental health

Based on the previous quantitative findings, semi-structured interviews were conducted to expand the findings on the motives why health professionals would use and recommend e-mental health services and, particularly, to capture their opinions on how e-mental health services should be implemented into the national health system to maximize its potential use (RQ2). We summarize the main findings from our interviews in [Table 3](#) and detail some interesting thoughts next.



Note: Line denotes median value and cross average value.

Figure 4 Box plot showing perceived usefulness of e-mental health apps depending on activity in mental health process (1=not at all useful to 5=extremely useful).

In general, all interviewed health professionals were positive about the availability of e-mental health services for maternal depression (“[...] *it will be fantastic, very useful and necessary*”, “[...] *I think it's useful because of the high prevalence of depression*”). The interviewees think that an e-mental health app will generate value in different ways: First, e-mental health could be a low cost and effective way to reach women with services (e.g. online screening, delivering pregnancy-related information, referral to local therapists, forms of online therapy) they otherwise would not have used because of social or economic reasons. Second, e-mental health could also be extremely useful for health professionals (e.g. as an uncomplicated means for communicating with patients and colleagues, decision-support, information source). Third, the interviewees think that a properly designed e-mental health service could have an immediate (short-term) impact on babies' health and an indirect (long-term) impact on the public health system and society as a whole, as it is thought to improve health outcomes and adherence to national/international standards as well as increase awareness about mental health diseases in general. However, the interviewees were discordant about the fact if e-mental health would also reduce their efforts and overall costs for the health system. Reasons for that mainly relate to the actual design of the app (“[...] *an e-mental health service will only be successful when it's easy to understand and adaptable to a woman's specific situation*”, “[...] *the app will need to have good privacy, security, and reliability of data*”) and the implementation into the health system (“[...] *we don't have enough time*”, “[...] *nobody will pay us our extra-effort*”).

Assuming that the e-mental health service is properly designed, we also asked health professionals if they feared to be substituted by it in a near future. All of them denied this (“*No, because all these things are not being covered by the public health system*”, “[*E-mental health*] *will always remain a complementary service*”). In this sense, they considered e-mental health to be a useful addition supporting their daily work with perinatal women. However, some interviewees anticipate a change in the way in which

patients will interact with therapists as well as how therapists will rearrange their work schedule because of it (“*Many of us will probably leave the screening to the apps and rather concentrate on therapeutic measures*”, “[...] *our role will be the one of a supervisor and coach*”).

While not all of the interviewees shared the vision of becoming an active promoter of e-mental health, all health professionals agreed that e-mental health particularly makes sense for covering the screening of patients, positive psychology interventions, prevention, and follow-up. To some extent the interviewees also consented to the use of e-mental health for activities related to the assessment and diagnosis of non-severe cases, but only under supervision by a specialist. In line with our quantitative results, most disagreement was found with respect to using e-mental health for treatment activities. The interviewees had no consensus regarding the question where such e-mental health apps should be used, resulting in half of the interviewees advocating the use of these apps outside their area of influence (e.g. at patients' home or hospitals) and the other half in areas where they would have possibilities for direct action and control (e.g. at their office or waiting room).

Despite these differences, all health professionals concurred that for complex or severe cases (e.g. women with additional disorders like psychosis, hypochondria, personality disorders), and when basic requirements for using digital services are not met (e.g. women without access to Internet or low proficiency of the language), it would be best to stick with traditional mental health services. Besides that, some interviewees also were concerned with the complexity and technical requirements for running e-mental health services in their offices. Others found tight time schedules and lacking possibilities for remuneration of extra-efforts to be major barriers with respect to the implementation of e-mental health in today's health systems (“*I'm afraid that my colleagues and I won't use e-mental health when it's not cost-covering [...]*”). Moreover, therapists who worked in the public health service particularly questioned the mindset of public managers of not being open to systematically explore this avenue for a

Table 3 Main findings from the semi-structured interviews.

Interview questions	Range of answers identified during coding
For whom should e-mental health services be designed?	<ul style="list-style-type: none"> • Exclusively for health professionals (as a guidance for screening, assessment, diagnosis and referral, among other services) • Exclusively for patients (data accessible by pregnant women only) • For both as a means for sharing data between pregnant women and therapists (some personal data is shared upon consent)
What would be the related value of such e-mental health services?	<ul style="list-style-type: none"> • Resources for health professionals (information about how to conduct screenings, decision-making aid for diagnosis, communication support etc.) • Resources for women (information about professional services in the area of living, recommendations, chat with other women, etc.) • No, it wouldn't substitute the services provided by health professionals • Immediate impact on babies health protection • Indirect impact on public health system (long-term health outcomes) • Adherence to national/international health standards • Rising society's awareness about mental health diseases
Would the service substitute the health professional? If not, what would be the role of the health professional in the future?	<ul style="list-style-type: none"> • E-mental health will not change the role of health professionals • E-mental health will mainly change the way how patients interact with therapists; health professionals will become promoters of apps • E-mental health will mainly change the way how therapists work in future (e.g. rather passive role as supervisor of e-treatment instead of active role)
When does e-mental health not make sense?	<ul style="list-style-type: none"> • E-mental health always makes sense • Complex cases: When pregnant women have additional psychological disorders (e.g. psychosis, hypochondria, personality disorders, etc.) • Severe cases: When there are indications of immediate need of help. • When basic requirements for using digital services are not met (e.g. women without access to Internet or low command of the language)
Where should the use of such e-mental health services take place?	<ul style="list-style-type: none"> • At pregnant women's private environment • Primary care (e.g. therapist's office and/or waiting room) • Secondary care (e.g. hospitals, special clinics etc.)
What are factors positively influencing diffusion of e-mental health services?	<ul style="list-style-type: none"> • The solution itself (e.g. good validity and reliability data, privacy and security of data, useful information/recommendations for users) • Pregnant women (e.g. word-of-mouth, proof of real need within the health system) • Health professionals (e.g. better outcomes of therapies, more and accurate data about patients, adherence to clinical guidelines) • Health system (e.g. good governance structures, incentive systems)
What are factors negatively influencing diffusion of e-mental health services?	<ul style="list-style-type: none"> • The solution itself (e.g. technical requirements, complexity) • Pregnant women (e.g. cultural background, IT literacy) • Health professionals (e.g. attitudes towards use, fear of getting replaced, possibilities for remuneration, time restrictions) • Health policy and resource allocation (e.g. mindset of public managers, maturity level of existing IT landscape, etc.)

longer period of time as well as the low maturity level of existing information technology infrastructure in the public health system of being capable to effectively realize e-mental health in practice (“[...] *the public health system is not prepared for the digital age*”).

In this sense, the interviewees found the existence of a kind of incentive system or “*carrot and stick policy*” as used for the introduction of electronic medical records in the U.S. [47,48] as well as working governance structures to be the most important enablers for a favorable e-mental health implementation. Furthermore, most of the interviewees mentioned specific technical requirements, such as good validity and

reliability of the collected and presented data, advanced privacy and security settings, and adaptable interfaces and content to be crucial factors for a future success. Lastly, some interviewees also mentioned the importance of a quick expansion by means of positive word-of-mouth from patients as well as more evidence-based studies that report on the long-term effects of e-mental health on the health outcome of patients. This particular lack of evidence with respect to the effectiveness of treatments together with low awareness about the possibilities about what can be done with today's technology are major inhibiting factors for the rapid implementation of e-mental health in practice.

Table 4 Prospective implementation scenarios for e-mental health.

	<i>Scenario I: Loose integration in health system (add-on)</i>	<i>Scenario II: Tight integration in public health system (standard process)</i>
<i>Main assumption</i>	<ul style="list-style-type: none"> • Patient decides; no mandatory process to follow; data is shared with health professionals only with patient consent; adoption rate dependent on promoters and word-of-mouth of other patients 	<ul style="list-style-type: none"> • E-mental health is standard process to receive treatment defined by health authority; data is shared automatically with treating health professional; adoption rate is 100 percent
<i>Role of health professional</i>	<ul style="list-style-type: none"> • Possible promoter of e-mental health; main user are pregnant women 	<ul style="list-style-type: none"> • Executor of the process and main user of e-mental health
<i>Direct value for patients</i>	<ul style="list-style-type: none"> • Evidence-based self testing tool; awareness of the topic; empowerment; anonymous and trustful source of information; improving well-being for woman and baby 	<ul style="list-style-type: none"> • Evidence-based self testing tool; awareness of the topic; feeling that health professionals know what they are doing; improving well-being of woman and baby; referral of patients
<i>Direct value for health professionals</i>	<ul style="list-style-type: none"> • Access to patients (clients) at early stage of depression 	<ul style="list-style-type: none"> • Training; awareness and professionalism concerning depression; more detailed evidence-based information about patients; efficient information sharing; integration of multi-disciplinary data
<i>Indirect value from a societal point of view</i>	<ul style="list-style-type: none"> • Overall reduction of costs due to early detection of depression; better health outcome; no systematic data base for research and health system's planning 	<ul style="list-style-type: none"> • Overall reduction of costs due to early detection of depression; better health outcome; extensive data for research and strategic planning of the health system

Discussion

Future scenarios of e-mental health use in practice

Both quantitative and qualitative data showed that health professionals have a different vision about e-mental health, which to a certain extent can be explained by the international origin and occupational diversity of the respondents in our study. Synthesizing our fragmented view on e-mental health, we could say that health professionals either envisioned a (i) scenario where e-mental health is loosely integrated into the structures of the public and private health system or (ii) rather the opposite case, where e-mental health becomes an integral part of existing public health services and processes (cf. Table 4).

The first scenario thus describes a demand-driven, free-market approach where e-mental health is perceived as add-on to traditional health services. Patients decide whether to use digital services or not (e.g. by downloading a specific app to their mobile devices). In such a scenario, health professionals are not the primary users of e-mental health, but active promoters instead. Accordingly, pregnant women are the main beneficiaries in this scenario because apps are designed for creating awareness of the topic, increasing empowerment, and health outcome. Such digital services could be of particular interest for health professionals operating outside the structures of public health, as it may allow them to access patients/clients who are in an early stage of depression. Overall, e-mental health in such a scenario could lead to cost reductions in the health system, however, a systematic gathering of evidence for research and policy planning would be difficult as use would be on a voluntary basis.

The second scenario describes the mental framework of most health professionals working within the structures of public health. In this context, e-mental health is fully integrated with public health policy and practices. Accordingly, an almost complete adoption throughout the health

system is expected, as it will become the standard process to receive mental healthcare. Health professionals are thus the main users of e-mental health and major drivers and executors of the process defined by health authorities. Certainly, there would be value for pregnant women as well as “integration effects” such as efficient information sharing among health professionals and an enhanced availability of multi-disciplinary data for research and strategic planning of the health system.

Open questions for future research

Our investigation showed that health professionals see great potential and value in e-mental health, particularly for the case of maternal depression. But how to move forward? From a health policy perspective, many questions remain unanswered by our research. In order that one of the discussed implementation scenarios actually becomes reality, we would like to point to the following issues, which need to be addressed in the course of the process:

- Solving the “chicken-egg problem”: The market for digitized services in healthcare is two-sided in nature [49]. This means that at least two distinct user groups exist which generate value for each other in symbiosis. In an early stage, such services frequently suffer from having little value (as it may unequally focus on the needs of one side) and thus need a proper ecosystem in order to unfold value for all stakeholders. In doing so, the question arises about which stakeholders (i.e. patients or health professionals) should be addressed how and which institution should mediate between the lines as well as nurture the ecosystem.
- Ownership and/or its institutional arrangements: Frequently, e-mental health apps depend heavily on the co-creation of content (e.g. psychologists answering questions, patients describing personal coping

strategies). While this is important for creating mutual value for all stakeholders, it also raises questions concerning the ownership, property rights, and/or institutional arrangements regarding the shared information [49].

- Dealing with privacy and security concerns: The influence of privacy and security concerns on digitized health services usage has been largely explored in previous studies [50]. It has often been shown that both patients and health professionals have limited trust in online offerings and that the fear of privacy breaches is constant. Measures like the creation of a certified community of trust consisting of various institutional, non-profit, and for-profit organizations could help to extend trustworthiness of the e-mental health app [49].
- Sustainability of the business model: Finally, it is important to acknowledge that the development and maintenance of e-mental health services is costly. In view of the constantly contested budgets in healthcare, it is more than ever important to think about alternative business models and revenue mechanisms to finance e-mental health apps over time [51].

Limitations

Despite our efforts to achieve the highest levels of objectivity, accuracy, and validity, our work is not without limitations. First, as it is not our aim to evaluate a specific e-mental health app, but the attitudes of health professionals to use and recommend such apps, we use a psychometric approach by measuring attitudes of health professionals. In this sense, our results do not emphasize a particular instantiation but a general sentiment or shared vision to automatize parts of the mental health process with suitable electronic means. Accordingly, different reactions regarding the usefulness, ease-of-use, and ultimately willingness to use a particular instantiation of an e-mental health app are possible. Second, this study purposefully focused on maternal depression as a major disease, which might benefit from e-mental health interventions. Again, health professionals specialized in other psychological disorders may show a different willingness to use e-mental health apps as they may not be suitable for diagnosis and treatment for their area of expertise. Third, we acknowledge the inherent limitation of a cross-sectional study design and using an online survey with a limited number of participants per country in the first step of our mixed methods approach. This prevented us from conducting a comparative study between different countries (e.g. in order to identify geographical and/or cultural differences between health systems) as well as exploring shifts in attitudes over time. Fourth, this initial survey sample upon which our qualitative sampling was based may reflect multiple directions of response bias, as the interviewed health professionals may have had more positive or negative experiences than others depending on the particular institution or health system they work in. The most likely scenario in the future may lie somewhere in between the two implementation scenarios we examined. The impact of e-mental health is, at least partly, determined by policy-makers and not by chance. Further work is therefore

needed to explore policy options and formulate detailed proposals for implementing e-mental health as well as weighing the relative importance of the different opinions and needs of different actors described in this study.

Author contribution

TM contributed to the study design. ME and JO contributed to the data collection. All authors contributed to the analysis of the data. All authors wrote and discussed the results and implications and commented on the manuscript at all stages.

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