



# Telehealth Services Designed for Women: An Evidence Map

November 2017

## Prepared for:

Department of Veterans Affairs  
Veterans Health Administration  
Quality Enhancement Research Initiative  
Health Services Research & Development Service  
Washington, DC 20420

## Prepared by:

Evidence-based Synthesis Program (ESP) Center  
Durham, NC  
John W. Williams, Jr., MD, MHSc, Director

## Investigators:

### Co-Principal Investigators:

Karen M. Goldstein, MD, MSPH  
Jennifer M. Gierisch, PhD, MPH

### Co-Investigators:

Leah L. Zullig, PhD, MPH    Suchita Shah Sata, MD  
Amir Alishahi, MD, MPH    John D. Whited, MD, MHS  
Timothy Brearly, PsyD    Hayden B. Bosworth, PhD  
Eric A. Dedert, PhD    Jennifer McDuffie, MPH  
Giselle Raitz, MD    John W. Williams, Jr., MD, MHSc

### Research Associates:

Megan von Isenburg, MSLS  
Avishek Nagi, MS

### Medical Editor:

Liz Wing, MA



## PREFACE

The VA Evidence-based Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted healthcare topics of particular importance to clinicians, managers, and policymakers as they work to improve the health and healthcare of Veterans. QUERI provides funding for four ESP Centers, and each Center has an active University affiliation. Center Directors are recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Centers. The ESP is governed by a Steering Committee comprised of participants from VHA Policy, Program, and Operations Offices, VISN leadership, field-based investigators, and others as designated appropriate by QUERI/HSR&D.

The ESP Centers generate evidence syntheses on important clinical practice topics. These reports help:

- Develop clinical policies informed by evidence;
- Implement effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- Set the direction for future research to address gaps in clinical knowledge.

The ESP disseminates these reports throughout VA and in the published literature; some evidence syntheses have informed the clinical guidelines of large professional organizations.

The ESP Coordinating Center (ESP CC), located in Portland, Oregon, was created in 2009 to expand the capacity of QUERI/HSR&D and is charged with oversight of national ESP program operations, program development and evaluation, and dissemination efforts. The ESP CC establishes standard operating procedures for the production of evidence synthesis reports; facilitates a national topic nomination, prioritization, and selection process; manages the research portfolio of each Center; facilitates editorial review processes; ensures methodological consistency and quality of products; produces “rapid response evidence briefs” at the request of VHA senior leadership; collaborates with HSR&D Center for Information Dissemination and Education Resources (CIDER) to develop a national dissemination strategy for all ESP products; and interfaces with stakeholders to effectively engage the program.

Comments on this evidence report are welcome and can be sent to Nicole Floyd, ESP CC Program Manager, at [Nicole.Floyd@va.gov](mailto:Nicole.Floyd@va.gov).

**Recommended citation:** Goldstein KM, Gierisch JM, Zullig LL, Alishahi A, Brearly T, Dedert EA, Raitz G, Sata SS, Whited JD, Bosworth HB, McDuffie J, Williams JW Jr. Telehealth Services Designed for Women: An Evidence Map. VA ESP Project #09-010; 2017.

This report is based on research conducted by the Evidence-based Synthesis Program (ESP) Center located at the **Durham VA Medical Center, Durham, NC**, funded by the Department of Veterans Affairs, Veterans Health Administration, Office of Research and Development, Quality Enhancement Research Initiative. The findings and conclusions in this document are those of the author(s) who are responsible for its contents; the findings and conclusions do not necessarily represent the views of the Department of Veterans Affairs or the United States government. Therefore, no statement in this article should be construed as an official position of the Department of Veterans Affairs. No investigators have any affiliations or financial involvement (eg, employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties) that conflict with material presented in the report.

## Stakeholder and Technical Expert Panel

In designing the study questions and methodology at the outset of this report, the ESP consulted several technical and content experts. We sought broad expertise and perspectives. Divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

The list of stakeholders and members of the Technical Expert Panel (TEP) who provided input to this report follows.

### Stakeholders

Kathy Frisbee, PhD

Director

Connected Health Office of Analytics &  
Business Intelligence

VHA

Nancy Maher, PhD

Program Analyst

Office of Patient Care Services, Women's  
Health Services

VHA

Sally Haskell, MD

Deputy Chief Consultant for Clinical

Operations and Director of

Comprehensive Health

Office of Patient Care Services, Women's  
Health Services

VHA

Alan West, PhD

Deputy Director

Office of Rural Health

VHA

### Technical Expert Panel

Lori A. Bastian, MD, MPH

Director, Pain Research, Informatics,

Multimorbidities, and Education Center

VA Connecticut Healthcare System

Jan Lindsay, PhD

Investigator, Center for Innovations in  
Quality, Effectiveness and Safety

Michael E. DeBakey VAMC & South  
Central MIRECC

Alicia Christy, MD

Deputy Director, Reproductive Health,

Patient Care Services, Women's Health  
Services

VHA

Carolyn Turvey, PhD

Core Investigator

Comprehensive Access & Delivery

Research & Evaluation (CADRE)

Iowa City VA Health Care System



## TABLE OF CONTENTS

<b>Preface</b> .....	<b>i</b>
Stakeholder and Technical Expert Panel .....	ii
<b>Abstract</b> .....	<b>6</b>
<b>Introduction</b> .....	<b>8</b>
<b>Methods</b> .....	<b>9</b>
Topic Development.....	9
Search Strategy .....	9
Study Selection .....	10
Data Abstraction .....	12
Quality Assessment.....	12
Data Synthesis.....	13
Peer Review .....	13
<b>Results</b> .....	<b>14</b>
Literature Flow.....	14
Key Question: What are the quantity, distribution, and characteristics of evidence assessing the effectiveness of telehealth services designed specifically for women? .....	15
Description of Included Studies by Focused Area of Research.....	15
Maternal Health .....	15
Key Points.....	15
Synthesis of Findings .....	15
Prevention .....	24
Key Points.....	24
Synthesis of Findings.....	25
Disease Management .....	27
Key Points.....	27
Synthesis of Findings.....	28
Family Planning.....	30
Key Points.....	30
Synthesis of Findings.....	30
High-Risk Breast Cancer Assessment .....	33

Key Points.....	33
Synthesis of Findings.....	33
Mental Health.....	35
Key Points.....	35
Synthesis of Findings.....	35
Intimate Partner Violence.....	36
Key Points.....	36
Synthesis of Findings.....	37
<b>Summary and Discussion.....</b>	<b>39</b>
Implications of findings.....	44
Limitations.....	44
Research Gaps/Future Research.....	45
Conclusions.....	46
<b>References.....</b>	<b>47</b>
<b>Appendix A. Search Strategies.....</b>	<b>64</b>
<b>Appendix B. Peer Review Comments.....</b>	<b>67</b>
<b>Appendix C. Study Characteristics Table.....</b>	<b>76</b>
<b>Appendix D. Primary Outcomes Table.....</b>	<b>85</b>
<b>TABLES</b>	
Table 1. Study Eligibility Criteria.....	10
Table 2. Studies by Focused Area of Research.....	15
<b>FIGURES</b>	
Figure 1. Literature Flow Diagram.....	14
Figure 2. Evidence Map for Maternal Health Area of Research.....	17
Figure 3. Evidence Map for Maternal Health Subcategories (Study Size, Age, Race).....	21
Figure 4. Evidence Map for Maternal Health Subcategories (Modality, Centrality, Dyad).....	22
Figure 5. Evidence Map for Maternal Health Subcategories (Income, Recruitment Location).....	23
Figure 6. Evidence Map for Maternal Health Subcategories (Interventionist, Length of Intervention).....	24
Figure 7. Evidence Map for Prevention Area of Research.....	27
Figure 8. Evidence Map for Disease Management Area of Research.....	29

Figure 9. Evidence Map for Family Planning Area of Research ..... 32

Figure 10. Evidence Map for High-Risk Breast Cancer Assessment Area of Research ..... 34

Figure 11. Evidence Map for Mental Health Area of Research ..... 36

Figure 12. Evidence Map for Intimate Partner Violence Area of Research ..... 38

Figure 13. Study Characteristics by Focused Areas of Research ..... 40

Figure 14. Intervention Components by Focused Areas of Research..... 41

Figure 15. Interventionist and Length of Intervention by Focused Areas of Research ..... 42

Figure 16. Study Setting by Focused Areas of Research..... 43

## ABSTRACT

**Background:** Telehealth encompasses a variety of technologies and approaches to connect individual patients to health care resources with the goal of delivering the right intervention to the right patient at the right time. The Department of Veterans Affairs has been on the forefront of implementing telehealth solutions as a way to extend care to key populations of interest or to overcome barriers to receiving timely and high-quality care. Women Veterans are one such key population who could benefit from the flexibility and access afforded by telehealth because they are geographically dispersed within the Veterans Health Administration and have gender-specific care needs. Thus, the goal of this report was to conduct an evidence map that characterizes the quantity, distribution, and characteristics of evidence which assesses the effectiveness of telehealth services designed specifically for women.

**Methods:** We searched MEDLINE<sup>®</sup> (via PubMed<sup>®</sup>) and Embase<sup>®</sup> to identify relevant articles and systematic reviews (SRs) published between inception and December 29, 2016, for peer-reviewed, English-language, randomized controlled trials (RCTs), nonrandomized controlled studies, controlled before-after studies, interrupted time-series or repeated-measures studies, and relevant SRs or patient-level meta-analyses of telehealth interventions designed for women. We conducted article inclusion screening and abstraction based on predetermined criteria such as type of study design used, population recruited, and intervention tested. Two reviewers independently evaluated titles and abstracts to identify potentially eligible primary studies and SRs for full-text review. Because of the large volume of primary studies, at the full-text screening stage a trained independent reviewer made eligibility decisions, of which at least a random sample of 20% was dual-reviewed. The SRs were examined separately by 2 team members. Disagreements were resolved by consensus between the 2 investigators or by a third investigator. Articles meeting eligibility criteria were included for data abstraction.

**Results:** The literature search identified 5305 unique citations, of which 590 primary studies and 21 SRs were promoted to full-text review. Of these, 209 studies and 2 SRs were retained for data abstraction. From these, 81 primary studies and 1 SR related to maternal care, 56 to prevention, 43 to disease management, 11 to family planning, 7 to identifying and managing women at high risk for breast cancer, 6 to mental health, and 5 studies and 1 SR to intimate partner violence (IPV). When looking across these 7 focused areas of research, the majority of studies identified were relatively small ( $n < 250$ ). For studies that provided race and ethnic study composition, the overwhelming majority of studies included populations that were predominantly white. Age distributions in this literature tracked with population distributions of women potentially affected by the identified health issues. However, we found relatively few studies that focused on health issues of women 60 years of age and older across the reports on prevention, disease management, mental health, and intimate partner violence.

When mapping the setting of telehealth interventions designed for women, the overwhelming majority of studies was conducted in countries categorized as high income by the World Bank. The only exception to this was in the area of family planning, where half the studies were conducted in middle- and low-income countries. When looking across the literature, most studies recruited from outpatient clinics (including specialty outpatient clinics), followed by the community. Across all areas of research, telephone was the dominant telehealth modality to deliver intervention content. Nearly all studies used telehealth technologies to facilitate communication between patients and health care team members. We identified only 1 study that focused on provider-to-provider communication. Very few telehealth interventionists were

physicians or advanced practice providers (*eg*, nurse practitioners, physician assistants). Instead, the interventions were mostly supported by diverse credentialed and noncredentialed positions (*eg*, registered nurses, behavioral health specialists, health educators, peer or lay health workers). The majority of studies were limited in their duration and did not extend beyond 12 weeks. The only exception was among studies focused on prevention; the majority of these were 25 weeks or more. We also mapped the outcomes addressed in each study. Of the studies that reported primary outcomes, most focused on patient-level outcomes. No studies focused on provider-level outcomes, and only 11 studies reported primary outcomes focused on the system level.

**Conclusions:** Telehealth offers a potentially ideal approach to deliver targeted support to women Veterans in a manner that is convenient to the patient and does not require traveling long distances. From a provider and system level, telehealth provides additional tools to aid the facilitation of continuity of care and transitions of care (*eg*, post-acute care) and can be a powerful tool for population health management. The goal of this report was to provide an overview of current evidence for the use of telehealth services designed specifically for women. To our knowledge, this is the first attempt to map this literature base.

A key use of these evidence maps is to inform decisions about where more primary research is needed. The maps in this report serve as a broad visualization of the field of telehealth interventions for women. Beyond maternal health care, we identified a relatively small number of telehealth studies that addressed other gender-specific needs of women Veterans that warrant further exploration, such as family planning, IPV, homelessness, pain management, and high-risk breast cancer assessment. Also, outside of postpartum depression, few studies used telehealth interventions to address the mental health needs of women. Further, mobile health technologies were underrepresented, emphasizing the need to study how best to use evolving technology to address the needs of women. Finally, there is a need for research on the extent to which telehealth improves provider- and system-level outcomes related to provider satisfaction and retention and patient access to care. Only after conducting studies that address these key research gaps can the promise of telehealth for optimizing the well-being of women Veterans be fully assessed. Because the VA is a large, integrated health care system that has demonstrated a commitment to the development and use of telehealth modalities and has been a setting for the successful conduct of multisite studies, the VA health care system is well-positioned to address the gaps in the women's telehealth literature.

# EVIDENCE REPORT

## INTRODUCTION

Telehealth is an important mechanism for delivering patient-centered health care outside the time and location restrictions of a traditional face-to-face medical encounter. According to the US Health Resources & Services Administration, telehealth is defined as “the use of electronic information and telecommunication technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health and health administration.”<sup>1</sup> Telehealth encompasses a variety of technologies and approaches to connect individual patients to health care resources with the goal of improving personalization, efficiency, access to care, and secure sharing of health information. Nationally, telehealth strategies have flourished due to an increased emphasis on the efficiency of health care delivery in recent health policies.<sup>2</sup> Within VA, telehealth and advanced health information technology has long been an area of innovation.<sup>3,4</sup> VA supports the use of telehealth<sup>5,6</sup> and has experience with specific modalities such as mobile health applications (mHealth), clinical videoconferencing between patient and care providers, and asynchronous telehealth methods such as store-and-forward clinical information or home self-monitoring with data transmission via phone lines.<sup>7</sup> Such technology-based strategies are appealing for VA as they accommodate a geographically diverse Veteran population while providing patient-centered care.

One population within the Veterans Health Administration (VHA) that benefits from the flexibility and personalized delivery approach offered by telehealth modalities is women Veterans. Women Veterans are the fastest-growing population receiving care in the VHA, with the total number of women doubling between fiscal years 2003 and 2012.<sup>8</sup> Despite this growth, the absolute number of women at any particular VA health care system or community-based outpatient clinic (CBOC) can be quite small. This lack of density creates challenges to providing high-quality, efficient, and cost-effective gender-specific care for women within the VHA. Further, at least one-quarter of women Veterans reside in rural areas,<sup>8</sup> and women Veterans living in rural areas are more likely to depend on the VA as their primary health care compared to urban-dwelling women.<sup>9</sup> For women living in rural areas, affordability and transportation are significant issues when making health care choices.<sup>9</sup> In particular, women Veterans have expressed a preference for receiving specialty health care services closer to home,<sup>10</sup> which is challenging for those living in rural areas. Even women living in urban areas face barriers to obtaining timely health care, including difficulty obtaining time off from work.<sup>9</sup> Faced with the mandate to provide quality health care to the growing and complex population of women Veterans, the VHA has prioritized improving the quality of health care for women Veterans.<sup>11</sup>

Telehealth may be a good fit for addressing the needs of women Veterans because alternate forms of health care communication are already in use by this population. Compared with men, women Veterans are more likely to contact their health care team by telephone (63% vs 55%) and make a higher number of contacts via phone (4.6 vs 4.2 average encounters by phone).<sup>8</sup> Women use other forms of telehealth (*eg*, video conferencing, home telehealth, and store and forward) at similar rates as men.<sup>8</sup> Examples of gender-specific VA telehealth endeavors include remote consultations for gynecology and telephone-based maternity care coordination.<sup>12,13</sup> By overcoming the challenges of low-density and geographic dispersion, technology-based communication offers innovative ways to deliver high-quality, gender-specific health care to women Veterans in a modality that is well-suited to this population.

This report's objective is to describe the current landscape of telehealth interventions that have been *designed specifically for women*.

## METHODS

### TOPIC DEVELOPMENT

In consultation with our stakeholders, and in keeping with the principles of evidence mapping,<sup>14</sup> our intent was to provide high-level information about a broad question rather than detailed information on a narrow set of questions. Also in keeping with evidence mapping, our intent was to describe the landscape of high-quality literature in the field of telehealth for women that would support effectiveness determinations rather than a focused analysis of the effectiveness of any particular telehealth approach. Thus the key question (KQ) for this report was:

KQ: What are the quantity, distribution, and characteristics of evidence assessing the effectiveness of telehealth services designed specifically for women?

Of note, our inclusion of the language “designed specifically for women” was done purposely and after significant deliberation for the following reasons. This language was put forth by our operations partners as being of particular interest, and in collaboration with our partners we operationalized it to mean *interventions designed for a female-predominant condition or interventions that affected both sexes but are customized for, and assessed among, women*. In a previous ESP project, we conducted an evidence map assessing sex and gender-based analysis in trials of depression, diabetes, and chronic pain.<sup>15</sup> In that evidence map, we found that only 10% of eligible reviews including analyses of sex effects. Thus, we did not expect that the inclusion of telehealth interventions in mixed-gender populations would offer a significant yield of relevant sex-effect subanalyses.

The term *telehealth* can be used to encompass a wide variety of strategies and approaches in the context of health care. For the purposes of this project, we operationalized telehealth broadly based on input from our stakeholders, our technical expert panel, and definitions used in the literature and by government and other organizations. Specifically, we considered telehealth to mean any bidirectional technology or tactic used to synchronously or asynchronously transmit clinical information across a distance between patients and members of the medical/mental health care team or provider-to-provider interactions for the purpose of diagnosis, consultation, treatment, and/or prevention. Examples of telehealth technologies are telephone, short message service (SMS)/text messaging, electronic consultation, video conferencing, and interactive voice response systems. Based on the interests of our stakeholders, we also explicitly included tele-gynecology, tele-colposcopy, tele-mental health, tele-pharmacy, tele-care coordination, tele-primary care, and tele-wellness.

We followed a standard protocol for this review. Each step was pilot-tested to train and calibrate study investigators. The PROSPERO registration number is CRD42017065965.

### SEARCH STRATEGY

In collaboration with an expert reference librarian, we searched MEDLINE<sup>®</sup> (via PubMed<sup>®</sup>) and Embase<sup>®</sup> to identify relevant articles and systematic reviews (SRs) published between inception and December 29, 2016. Because our stakeholders were interested in the literature that assessed the effectiveness of telehealth strategies, our search strategy was informed by the Cochrane

Effective Practice and Organization of Care (EPOC) Group<sup>16</sup> – criteria developed to capture both randomized and nonrandomized study designs with prospective data collection best suited to assess the effects of health system interventions like telehealth. We used a combination of medical subject headings (MeSH), keywords, and selected free-text terms for women’s health and telemedicine (Appendix A). All citations were imported into 2 electronic databases (for referencing, EndNote® Version X7, Thomson Reuters, Philadelphia, PA; for data abstraction, DistillerSR; Evidence Partners Inc., Manotick, ON, Canada).

## STUDY SELECTION

Using prespecified inclusion/exclusion criteria (Table 1), 2 reviewers independently evaluated titles and abstracts to identify potentially eligible primary studies and SRs. Studies then advanced to the full-text review phase. To be eligible at the full-text review stage, studies had to meet all eligibility criteria. If we were unable to assess an eligibility criterion due to missing information, the study was excluded. We chose to restrict eligible studies to those that included at least 100 patient participants (regardless of whether the unit of randomization was at the provider or system level) in order to concentrate our efforts on those studies with sufficient sample sizes to provide useful effectiveness information.

Due to the large volume of primary studies, we assessed the feasibility of a conducting single review at the full-text article stage. To test the feasibility of single review, we conducted a pilot to assess the concordance of reviewers at the full-text review phase. This pilot produced an inter-rater reliability of 87%, which we deemed as an acceptable level to proceed with single full-text review. To assess the rigor of the single full-text review process, we conducted an ongoing evaluation of single review by conducting a random dual screening by another senior investigator (JMG, KMG). An interim examination of the random sample demonstrated acceptable concordance on excluded studies but poor concordance on included studies. Thus all studies categorized as included by single review went through a dual full-text review by senior investigators (KMG, JMG).

The SRs were examined separately by 2 team members. Disagreements were resolved by consensus between the 2 investigators or by a third investigator. Articles meeting all eligibility criteria were included for data abstraction.

**Table 1. Study Eligibility Criteria**

Study Characteristic	Inclusion Criteria	Exclusion Criteria
Population	Adult biological or transgender women only	<ul style="list-style-type: none"> <li>• Children</li> <li>• Men</li> </ul>
Intervention	<p>Eligible telehealth interventions must meet the following 4 criteria:</p> <ol style="list-style-type: none"> <li>1. Intended for any of the following categories of conditions: <ul style="list-style-type: none"> <li>• <u>Women-specific conditions:</u> <ul style="list-style-type: none"> <li>○ Obstetric</li> <li>○ Gynecologic</li> </ul> </li> <li>• <u>Conditions that predominantly affect women:</u> <ul style="list-style-type: none"> <li>○ Migraine</li> <li>○ Fibromyalgia</li> </ul> </li> </ul> </li> </ol>	<ul style="list-style-type: none"> <li>• Static portals without an interactive component</li> <li>• One-way communication (eg, automatic reminder telephone calls)</li> <li>• Use of technologies and tactics (eg, secure messaging, text messaging<sup>a</sup>, e-consultation, video-conferencing, interactive voice response) for data</li> </ul>

Study Characteristic	Inclusion Criteria	Exclusion Criteria
	<ul style="list-style-type: none"> <li>○ Breast cancer (eg, risk assessments like the Gail model and genetic counseling; management decision-making for women at high risk for breast cancer such as counseling for pharmacoprophylactic treatment; behavioral counseling for survivors focused on pain, diet, weight management)</li> <li>○ Intimate partner or sexual violence, military sexual trauma, or domestic violence</li> <li>● <u>Gender nonspecific conditions, but intervention is designed specifically for women</u></li> </ul> <p>2. Use technologies and tactics (eg, secure messaging, text messaging,<sup>a</sup> e-consultation, video-conferencing, interactive voice response) to deliver health care services for the purpose of diagnosis, consultation, treatment, and/or prevention, including tele-gynecology, tele-colposcopy, tele-mental health, tele-pharmacy, tele-care coordination, tele-primary care, tele-wellness</p> <p>3. Involve transmission of clinical information via a telecommunication technology between patients and members of the medical/mental health care team<sup>b</sup> or provider-to-provider interactions who are at a distance</p> <p>4. Include bidirectional synchronous or asynchronous communication</p>	<p>collection or recruitment only</p> <ul style="list-style-type: none"> <li>● Studies promoting breast cancer screening for <i>average risk</i> women will be excluded</li> <li>● Interventions whose only telehealth component promotes a hotline or offers <i>ad hoc</i> calls from the participant without specifically requiring them as part of the intervention protocol</li> </ul>
Comparator	Any (requires an active or inactive control)	No comparator
Outcomes	<ul style="list-style-type: none"> <li>● Patient health outcomes, condition-specific: <ul style="list-style-type: none"> <li>○ Readiness/motivation to change</li> <li>○ Access to care (eg, no-show rates)</li> <li>○ Patient satisfaction</li> <li>○ Treatment adherence</li> <li>○ Patient engagement</li> </ul> </li> <li>● Provider-level outcomes</li> <li>● System-level outcomes</li> </ul>	<ul style="list-style-type: none"> <li>● Outcomes on enhancing data collection only</li> <li>● Outcomes on enhancing recruitment only</li> </ul>
Timing	Any duration of follow-up	None
Setting	<ul style="list-style-type: none"> <li>● Any clinical setting</li> <li>● Any country (assessed country and categorized according to low/middle/high income status)</li> </ul>	None
Study design	<ul style="list-style-type: none"> <li>● EPOC criteria studies that have prospective data collection: <ul style="list-style-type: none"> <li>○ Randomized controlled trials (RCTs)</li> <li>○ Nonrandomized controlled studies</li> <li>○ Controlled before-after studies</li> <li>○ Interrupted time-series or repeated-measures studies</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Self-identified pilot studies</li> <li>● Studies of small sample sizes (n&lt;100 patient participants)</li> <li>● Not a clinical study (eg, editorial, nonsystematic review, letter to the editor)</li> <li>● Uncontrolled clinical study</li> </ul>

Study Characteristic	Inclusion Criteria	Exclusion Criteria
	<ul style="list-style-type: none"> <li>• Relevant systematic reviews or patient-level meta-analyses:               <ul style="list-style-type: none"> <li>○ Must have search strategy, eligibility criteria, and analysis/synthesis plan</li> <li>○ Must be a systematic review of telehealth interventions for women</li> <li>○ Must have at least 50% of the included articles be relevant to the topic (women's telehealth interventions)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Qualitative studies</li> <li>• Prospective and retrospective observational studies</li> <li>• Clinical guidelines</li> <li>• Systematic reviews of telehealth that includes both sexes</li> </ul>
Publication type	<ul style="list-style-type: none"> <li>• English language studies only</li> <li>• Peer-reviewed articles</li> </ul>	<ul style="list-style-type: none"> <li>• Non-English articles</li> <li>• Abstracts only</li> </ul>

<sup>a</sup>Text messaging systems that are interactive based on a predetermined algorithm are included even if there is not real-time human participation on the clinical end of the interaction.

<sup>b</sup>Team member can include those who are without formal medical training (*eg*, health coaches, nonskilled health care workers).

## DATA ABSTRACTION

Data from primary studies were abstracted into a customized DistillerSR database by 1 reviewer, and a random sample of 10% were overread by 1 of 3 senior reviewers. Any disagreements were resolved by consensus between the senior reviewers or arbitrated by the study team. Data from SRs were abstracted into an Excel database and overread by senior reviewers. Disagreements were resolved by consensus between the reviewers.

Data elements included descriptors to characterize the type of study, intervention, comparator, outcomes reported, and study population. Additional elements for abstraction were requested from and provided by the technical expert panel and stakeholders. The telehealth interventions were further categorized by direction (*eg*, provider to patient), primary telehealth modality, and intervention timing (synchronous or asynchronous).

We also evaluated studies based on the centrality of the telehealth portion of the intervention as follows:

- Telehealth as a *central* component: Telehealth technologies (*eg*, text messaging, mobile applications, telephone) were the primary mode of intervention delivery; if the intervention contained multiple components, the non-telehealth components (*eg*, written materials or in-person contact) had to play a minor role relaying intervention content, impacting outcomes, or delivering health care.
- Telehealth as a *non-central* component: Telehealth technologies were ancillary to a suite of other intervention strategies. Most of the health care services and information content were conveyed via non-telehealth technologies (*eg*, face-to-face visits), and telehealth technologies were not a central design feature of the intervention.

## QUALITY ASSESSMENT

Because this was an evidence mapping study, we did not collect data to assess the quality of individual studies. A formal assessment of individual study methodological rigor was beyond the scope of a mapping project.

## DATA SYNTHESIS

We mapped the literature by the focused areas of research that emerged from our search – informed by both the interests of our stakeholders and organization of clinical care. The results are ordered from largest to smallest number of identified studies as follows: (1) maternal health, (2) prevention, (3) disease management, (4) family planning, (5) high-risk breast cancer assessment, (6) mental health, and (7) intimate partner violence (IPV). In some instances, study topics could have been categorized into more than a single area of research (*eg*, mental health care for pregnant women). In such instances, we categorized by the affected population (*eg*, maternal care for any intervention with pregnant women) and not by the target of the intervention (*eg*, improving mental health). Further, we identified 18 studies with more than 1 active telehealth arm.<sup>17-34</sup> For these studies, we collapsed across conditions so that each study is represented only 1 time in graphical depictions of the data. We summarize the data narratively and include tabular and graphical formats to convey key features of the literature. These included demographics; recruitment site; intervention components, interventionist and length of intervention; type of outcomes (*ie*, patient-, provider-, system-level).

## PEER REVIEW

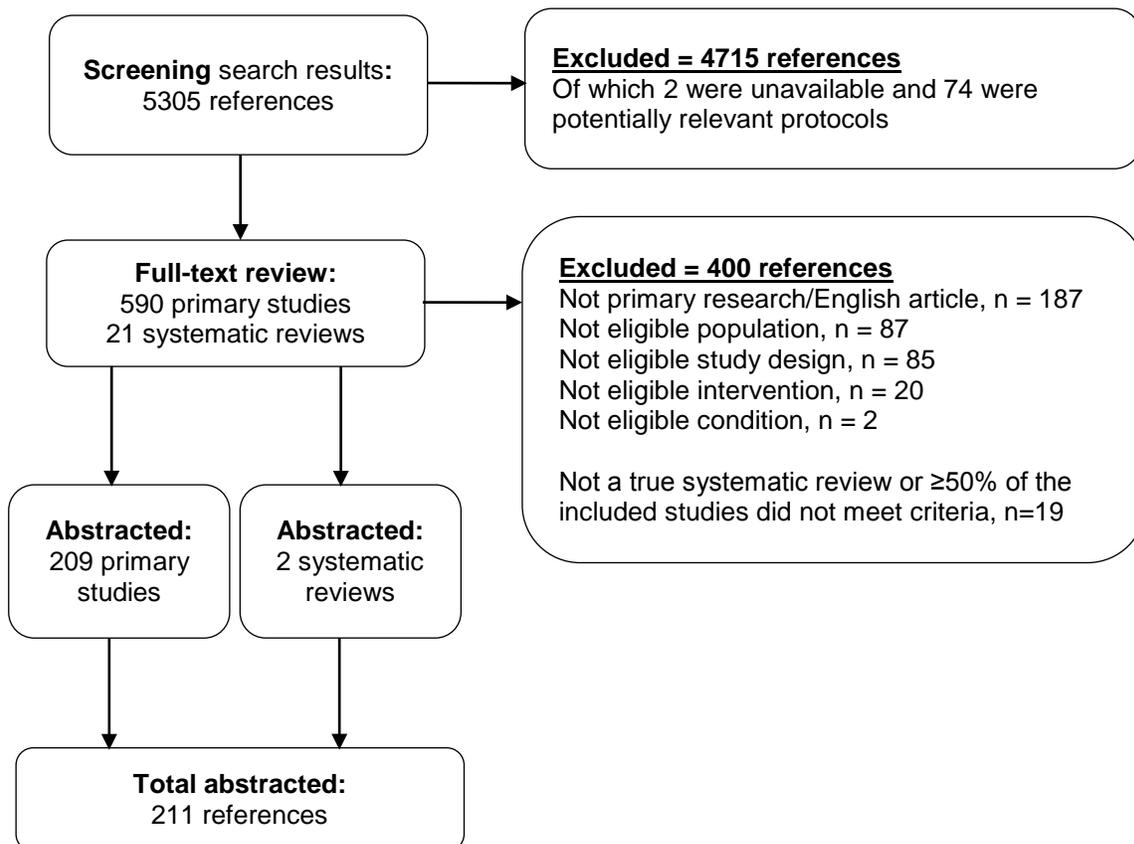
A draft version of this report was reviewed by technical experts and clinical leadership. A transcript of their comments and our responses is in Appendix B.

## RESULTS

### LITERATURE FLOW

Figure 1 shows the flow of articles through the search and review process. The literature search identified 5305 unique citations from a combined search of MEDLINE<sup>®</sup> (via PubMed<sup>®</sup>) and Embase. After applying inclusion and exclusion criteria at the title-and-abstract screening level, 590 primary studies and 21 systematic reviews (SRs) were promoted to full-text review. Of these, 209 studies and 2 SRs were retained for data abstraction (total of 211 references). The oldest study meeting inclusion criteria was published in 1987.

**Figure 1. Literature Flow Diagram**



## Key Question: What are the quantity, distribution, and characteristics of evidence assessing the effectiveness of telehealth services designed specifically for women?

### Description of Included Studies by Focused Area of Research

In the results, we organize the findings for the 211 references by the 7 areas of research shown in Table 2. Please refer to the reference list for full study citations and to Appendix C for study characteristics of all included primary studies. Appendix D lists the primary outcomes by focused area of research.

**Table 2. Studies by Focused Area of Research**

Focused Area	Primary Studies (n=209)	Systematic Reviews (n=2)
Maternal health	81 studies <sup>17,21,22,33,35-111</sup>	1 SR <sup>112</sup>
Prevention	56 studies <sup>18,29,30,32,113-164</sup>	0
Disease management	43 studies <sup>19,20,23-28,31,34,165-197</sup>	0
Family planning	11 studies <sup>198-208</sup>	0
High-risk breast cancer assessment	7 studies <sup>209-215</sup>	0
Mental health	6 studies <sup>216-221</sup>	0
Intimate partner violence	5 studies <sup>222-226</sup>	1 SR <sup>227</sup>

## MATERNAL HEALTH

### Key Points

- The largest area of focus within the identified women's telehealth literature was maternal health. Among this body of literature, the largest group of studies addressed prenatal health.
- Most maternal health studies had 500 or fewer participants, and the overwhelming majority were conducted in high-income countries.
- Telephone was the most common modality of telehealth used to convey intervention content.
- There was a wide variety of interventionist types among the studies in this focus area, with the most common being registered nurses, midwives, and peer or lay health workers.
- One study examining smoking cessation during pregnancy recruited women from an active military base. No maternal health studies were conducted within the VA.

### Synthesis of Findings

#### *Study Characteristics and Demographics*

Of the 81 studies in the maternal health area of research, 21 focused on prenatal health (*eg*, labor preparation and management and reducing substance use during pregnancy),<sup>22,37,39,41,42,48,55,57,64,70,72,73,76,79,80,85,86,91,106,108,109</sup> 16 on lactation,<sup>21,35,43-45,50,51,56,59,60,67,74,90,102,105,110</sup> 14 on mental health issues related to pregnancy (*eg*, postpartum depression and parenting stress),<sup>52,62,63,65,66,75,77,78,83,84,88,89,104,107</sup> 9 on issues during the postpartum period (*eg*, maternal and infant care and maternal physical activity),<sup>36,40,47,61,68,81,92,100,101</sup> 8 on

smoking cessation during the peripartum period,<sup>33,46,54,69,71,82,87,103</sup> 8 on weight management during or after pregnancy,<sup>38,53,94-99</sup> and 5 on issues related to gestational diabetes.<sup>17,49,58,93,111</sup>

Most studies (n=78) were RCTs. The single SR<sup>112</sup> included 2 RCTs and 2 nonrandomized trials. The greater proportion of maternal health studies included 500 or fewer participants (n=54; 66%); 14 studies (17%) had 501 to 1,000 participants, and 13 studies had more than 1001 participants (16%). Most studies in this focus area included women of a mean age of 20-39 years (n=65); 10 studies reported age without a measure of central tendency (12%), and age was not reported in 6 studies (7%). Just over half of included studies (n=44, 54%) did not report the racial/ethnic make-up of participants. Twenty-one studies were majority white (26%), 6 were majority black (7%), and 10 had another race as the most common (12%) (Figure 2, panel I). Most studies were conducted in World Bank high-income countries (n=66), with 37% (n=30) conducted within the United States specifically; 13 studies were completed in middle-income countries and 2 in low-income countries. Sixty-two studies recruited patients from the outpatient or community setting (77%), while 17 studies recruited from inpatient areas (mostly labor and delivery floors); 2 studies recruited from other settings (*eg*, military base and national database) (Figure 1, panel II). The single study that recruited from a military base was conducted within a hospital for active military addressing smoking cessation during pregnancy.<sup>82</sup>

### *Intervention Details*

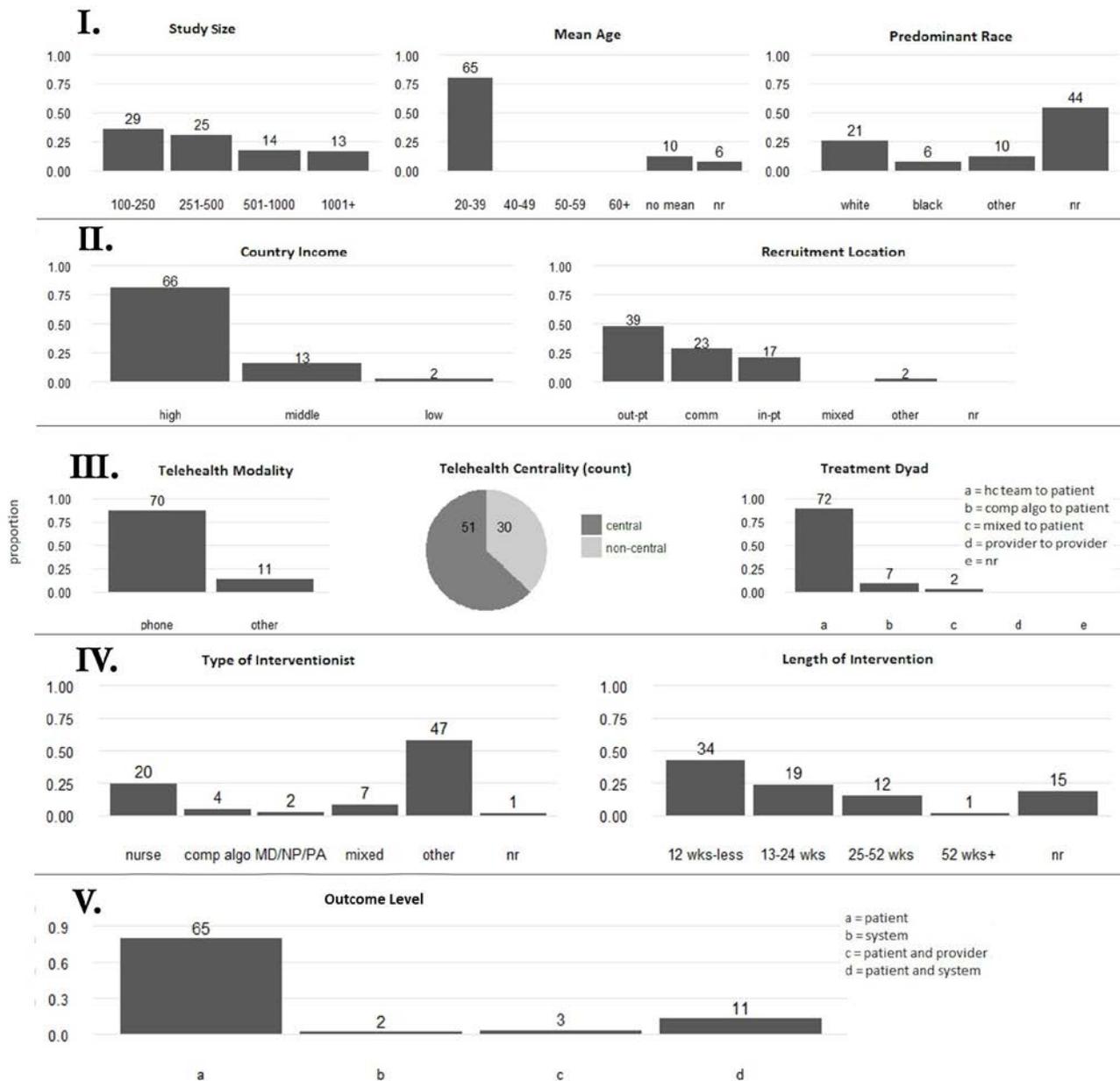
We also categorized studies based on the prominence of the role of telehealth in the study (central or non-central). Most studies employed a telehealth modality as a central feature of the intervention (n=51, 63%); and for most of the studies the telehealth modality chosen was telephone (n=70, 86%) (Figure 2, panel III). Of those studies that did not use telephone as the primary modality, 5 used text messaging or SMS,<sup>74,76,79,87,92</sup> 3 used an interactive website,<sup>35,37,55</sup> and 1 each used Facebook<sup>®</sup>,<sup>90</sup> a mobile application,<sup>106</sup> and videoconferencing.<sup>100</sup> Seven studies reported using a secondary telehealth modality. Five studies added telephone communication as a second modality: 1 combined phone with Facebook<sup>®</sup>,<sup>90</sup> 2 with text messaging,<sup>79,111</sup> 1 with an interactive website use,<sup>37</sup> 1 with videoconferencing,<sup>100</sup> and 1 with computer algorithm-delivered communication.<sup>92</sup> Only 8 studies used asynchronous communication (*eg*, email exchanges and online discussion boards) and the rest were synchronous (*eg*, telephone counseling). Most studies used telehealth modalities to communicate between a health care team member and the patient (n=72, 89%) compared with only 7<sup>35,55,71,74,76,87,92</sup> that used a computer algorithm to tailor communication to individual patients and 2 that used multiple communication strategies (Figure 2, panel III).

There was a wide variety of credentials and expertise among the interventionists in this area of study. The 3 most common types of interventionists were registered nurses (n=20; 25%), midwives (n=13; 16%) and peer or lay health workers (n=12, 15%) (note that midwives and peer/lay workers are included in the “other” category in Figure 2, panel IV). The most common intervention length was 12 weeks or less (n=34; 42%), 31 studies were 13-52 weeks, and only 1 study was longer than 52 weeks and addressed lactation and infant feeding.<sup>74</sup> Fifteen studies did not report the intervention length. Just under half of telehealth studies about pregnancy and maternal health reported adherence to the intervention (n=39, 48%). Twenty studies for this focus area reported using a theoretical framework for their intervention. Of those theories reported, the most common was Social Cognitive Theory<sup>228</sup> (n=6)<sup>33,47,71,85,87,93</sup> and the Transtheoretical Model<sup>229</sup> (n=2).<sup>71,86</sup>

**Outcomes Evaluated**

Sixty-nine studies (85%) designated a primary outcome (Appendix D). No studies reported a primary outcome that was focused on provider issues (eg, provider satisfaction). Common specific primary outcomes at the patient level were breastfeeding (n=13), mental health symptoms (n=14), pregnancy outcomes (n=12), and smoking cessation (n=8). The system-level primary outcomes were utilization, quality-of-care indicators, economic outcomes, and access to care. Of all outcomes measured and reported, the most common type was patient-level outcomes (n=65, 80%) followed by patient- and provider-level outcomes (n=3) (Figure 2, panel V).

**Figure 2. Evidence Map for Maternal Health Area of Research**



## Systematic Review Findings

The single relevant SR that focused on maternal mental health evaluated web-based treatments with interventionist support for perinatal mood disorder.<sup>112</sup> Of the 4 studies included in the SR, 2 RCTs met our inclusion/exclusion criteria (n=1138). Kersting et al (2013; n=228) recruited German participants of mean age 34 years after a loss of pregnancy. Response to a 5-week intervention consisting of ten 45-minute web-based writing assignments (with therapist feedback) led to a significant decreases in grief, depression, and anxiety compared with a waitlist control (with continued improvement in depression scores at 3- and 12-month follow-up). In the second study, O'Mahen et al (2013; n=910) conducted a study in the United Kingdom with postnatal women of mean age 32 years. The 15-week intervention included eleven 40-minute online sessions with homework focused on behavioral activation, and also provided access to weekly text-based synchronous chat with an interventionist. Depressive symptoms decreased for more participants in the treatment group when compared with those receiving treatment as usual.

### Subcategories Within Maternal Health Studies

To further elucidate studies focused on maternal health, we examined the studies by smaller areas of focus within this category. Specifically, we characterized interventions for the following 7 subcategories: prenatal care, lactation, mental health, postpartum, smoking cessation, weight management, and gestational diabetes (Figures 3-6).

#### Prenatal Care

As noted above, the largest subcategory in the maternal health literature was prenatal care (n=21, 26%). Prenatal interventions primarily targeted prevention of pregnancy complications for mother and/or infant (eg, perineal massage to reduce frequency of episiotomy,<sup>106</sup> reducing risk of alcohol<sup>109</sup> or cocaine use,<sup>37</sup> or preterm birth prevention<sup>42</sup>). The study size for prenatal interventions ranged from 100 to 18,186 participants with 8 studies in the 100-250 participant range<sup>37,39,41,55,64,106,108,109</sup> and 8 studies in the 1001 or more range.<sup>42,72,73,76,79,80,85,86</sup> The largest intervention<sup>76</sup> involved a national campaign to promote influenza vaccination among pregnant women already enrolled in a text messaging service. All but 4 studies in this area of the literature were conducted in high-income countries (n=16, 76%). Most of the prenatal interventions employed a telehealth modality as the central feature (n=13, 62%), and for 16 studies the telehealth modality was telephone (76%). Other modalities used for prenatal interventions were a mobile application,<sup>106</sup> SMS/text messaging,<sup>76,79</sup> and interactive website.<sup>37,55</sup> There were no provider-to-provider directed telehealth interventions for prenatal care, and the interventionists in this subcategory were predominantly nurses or midwives (n=14, 67%). Seven prenatal studies were relatively short in duration lasting 12 weeks or less (33%), with none lasting longer than a year. Most primary outcomes were patient level (n=17, 81%), none were provider level, and 3 were system level.<sup>79,80,86</sup> The primary outcome was unclear in 1 study.<sup>57</sup> Examples of patient-level primary outcomes included rate of cesarean delivery,<sup>73</sup> gestation age at delivery,<sup>42</sup> and perceived social support during pregnancy.<sup>64</sup> System-level outcomes for prenatal trials included access to care,<sup>80</sup> quality of care,<sup>79</sup> and economic outcomes.<sup>86</sup>

#### Lactation

This subcategory had 16 trials (20%). The size of studies ranged from 103 to 1885 participants, with 7 studies having 251-500 participants (44%).<sup>43,50,51,56,59,67,105</sup> While 7 studies were conducted in the United States (44%),<sup>43,50,51,56,59,67,105</sup> studies from outside the US were most often from Asian countries (n=5, 31%).<sup>60,67,74,105,110</sup> As with the literature on prenatal

interventions, lactation interventions featured telehealth modalities as a central part of the intervention (n=14, 88%) and were most often telephone-based (n=13, 81%). The most common interventionist type was peer or lay health worker (n=7, 44%).<sup>21,45,50,51,90,102,110</sup> The largest proportion of these studies included interventions lasting 13-24 weeks (n=7, 44%).<sup>44,45,56,67,102,105,110</sup> All trials that clearly reported primary outcomes were at the patient level (n=13, 81%) and focused on duration and exclusivity of breastfeeding.

### *Mental Health*

Fourteen RCTs used telehealth to target mental health conditions among perinatal women (17%). The mental health condition most frequently targeted was postpartum depression (n=8, 57%).<sup>52,65,75,77,78,84,88,104</sup> Overall, study sizes ranged from 100 to 771 participants. The studies were all from middle-income (n=5)<sup>63,65,75,77,84</sup> and high-income (n=9) countries.<sup>52,62,66,78,83,88,89,104,107</sup> Recruitment was mostly outpatient or community-based (n=10; 71%), and only 4 recruited women from inpatient settings.<sup>65,84,88,89</sup> Most of the mental health literature included interventions of shorter duration, with 10 RCTs lasting 12 weeks or less (71%). Half the mental health trials featured telehealth as a central modality of the intervention (n=7, 50%); however, telephone was the only modality used and telehealth communication was health care team-to-patient in all trials; no trials used computer algorithms. All trials evaluating mental health used patient-level primary outcomes that were focused on patient-reported symptomatology.

### *Postpartum*

The postpartum-focused telehealth literature included 9 RCTs (11%). Postpartum issues addressed supporting new mothers in self-care and infant care. Eight trials (11%) were smaller in size ranging from 100 to 388 participants, and 1 study included 1598 participants.<sup>100</sup> This larger study examined videoconferencing for postpartum follow-up compared with traditional in-person evaluations in Catalonia, Spain. All trials on postpartum care were conducted in middle- and high-income countries, and all but 2<sup>68,81</sup> recruited from outpatient clinics or community. While 1 trial did not report intervention duration,<sup>100</sup> of those that did, half were 12 weeks or less (n=4, 44%).<sup>40,61,81,101</sup> Most featured telehealth as a central modality (n=7, 78%), and most used telephone (n=7, 78%). The 2 other modalities were SMS/text messaging<sup>92</sup> and videoconferencing with the patient at home.<sup>100</sup> Three postpartum trials had patient-level outcomes (treatment adherence,<sup>39</sup> pregnancy outcomes,<sup>68</sup> and infant development markers),<sup>47</sup> and 2 had system-level outcomes (utilization<sup>47</sup> and access to care<sup>92</sup>). Two trials did not clearly identify primary outcomes.<sup>61,101</sup>

### *Smoking Cessation*

There were 8 telehealth trials on smoking cessation during and after pregnancy. All but 1 of these included at least 200 participants, and 1 included 105 participants.<sup>54</sup> All were conducted in high-income countries with 5 in the United States.<sup>33,46,54,82,103</sup> All but 1 trial<sup>69</sup> recruited patients from the outpatient or community setting, and 1 specifically recruited women though the Womack Army Medical Center (listed as “other” in the figure).<sup>82</sup> Telehealth was central in most smoking cessation studies (n=6, 75%),<sup>33,46,71,82,87,103</sup> and the majority of these trials were telephone-based with 1 study that used SMS/text messaging<sup>87</sup> through a computer algorithm. Smoking cessation trials most often lasted 12 weeks or less (n=5, 63%).<sup>46,69,71,87,103</sup> One smoking cessation trial did not describe a clear primary outcome,<sup>71</sup> but the other 7 all used a patient-level primary outcome that was centered on cessation or abstinence from smoking.

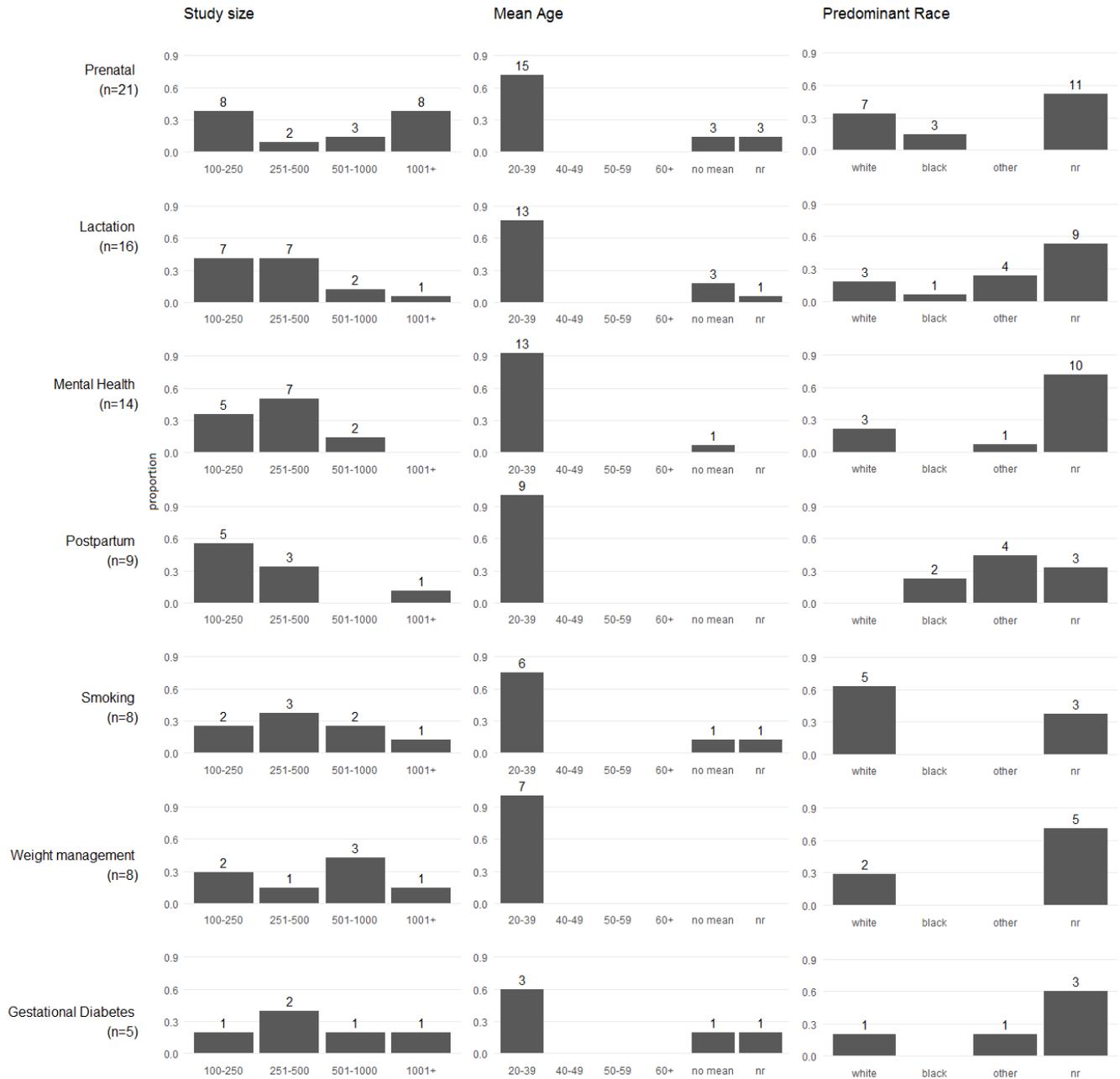
*Weight Management*

Weight management during and after pregnancy was addressed in 8 telehealth interventions (10%). This literature focused on both limiting gestational weight gain and losing weight during the postpartum period. Study size for weight management trials ranged from 119 to 2212 participants and all were conducted in high-income countries. All trials recruited from the outpatient or community setting. While similar to other subcategories within maternal health, trials on weight management only used telephone as the modality, and this literature differed in that most used telehealth modalities as an ancillary component of the intervention (n=6, 75%).<sup>38,53,94-97</sup> All weight management trials featured communication between health care team members and patients, with none using computer algorithms. These trials tended to last longer than trials in the other topic areas, with only 1 study with a duration of 12 weeks or less.<sup>98</sup> Seven of the 8 weight management studies used a patient-level primary outcome, and 1 was unclear.<sup>94</sup> Examples of patient-level primary outcomes included rates of pregnancy complications,<sup>98</sup> postpartum weight retention,<sup>95</sup> and incidence of infants born large for gestation age.<sup>53</sup>

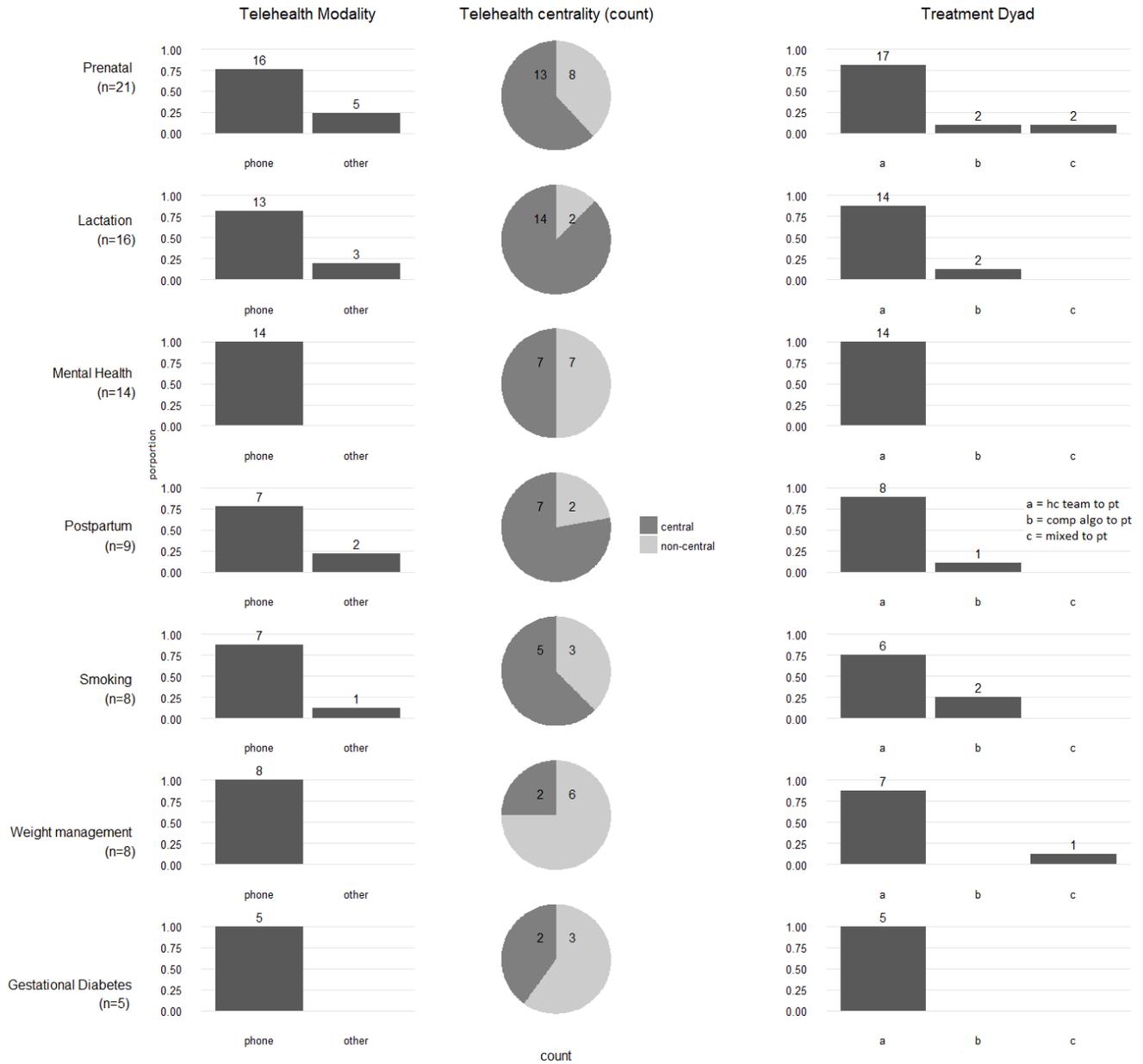
*Gestational Diabetes*

Gestational diabetes was addressed in 5 trials (some trials also included women with type 1 diabetes, and one included women with gestational diabetes or type 2 diabetes).<sup>49,111</sup> Two studies intervened to reduce postpartum consequences for women with gestational diabetes,<sup>58,93</sup> 2 addressed diabetes management during pregnancy,<sup>49,111</sup> and 1 aimed to prevent the development of gestational diabetes among women at risk.<sup>17</sup> Four of these 5 studies were RCTs and 1 was a nonrandomized trial.<sup>49</sup> Study sizes ranged from 100 to 2280 participants, and 2 were conducted in the United States.<sup>58,111</sup> All used telephone as the telehealth modality, and 2 studies used it as a central part of the intervention.<sup>49,111</sup> There was 1 study that used physicians to deliver the intervention,<sup>49</sup> which was relatively unusual across the larger field of women's telehealth literature. Three of the 5 studies lasted 13 to 24 weeks,<sup>17,49,58</sup> and 2 were 12 weeks or less.<sup>93,111</sup> Primary outcomes for gestational diabetes studies were patient-level when reported (n=4)<sup>17,58,93,111</sup> and included weight,<sup>17,58,93</sup> fasting glucose,<sup>17,93</sup> and mean self-monitoring blood glucose compliance rate.<sup>111</sup>

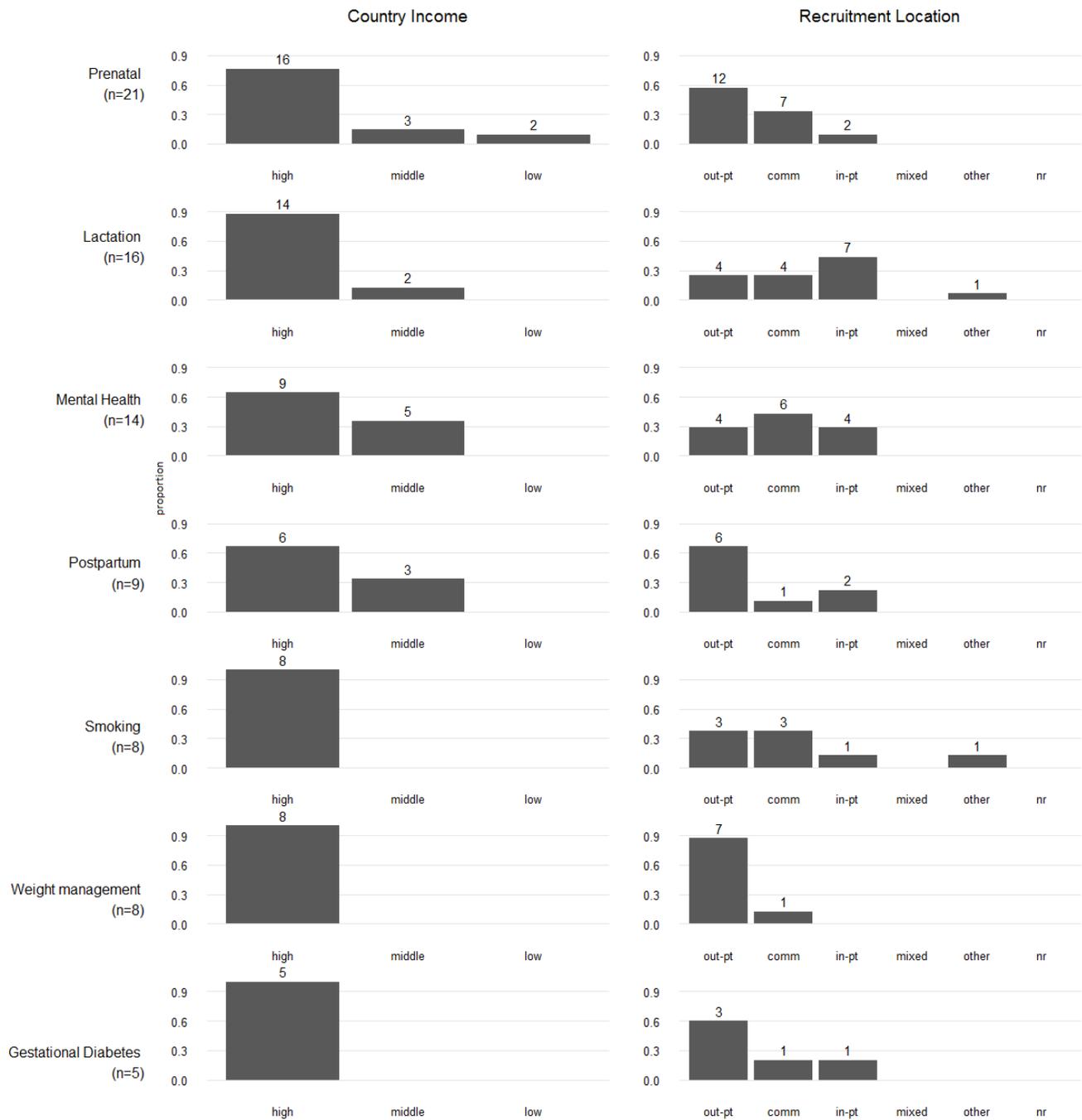
**Figure 3. Evidence Map for Maternal Health Subcategories (Study Size, Age, Race)**



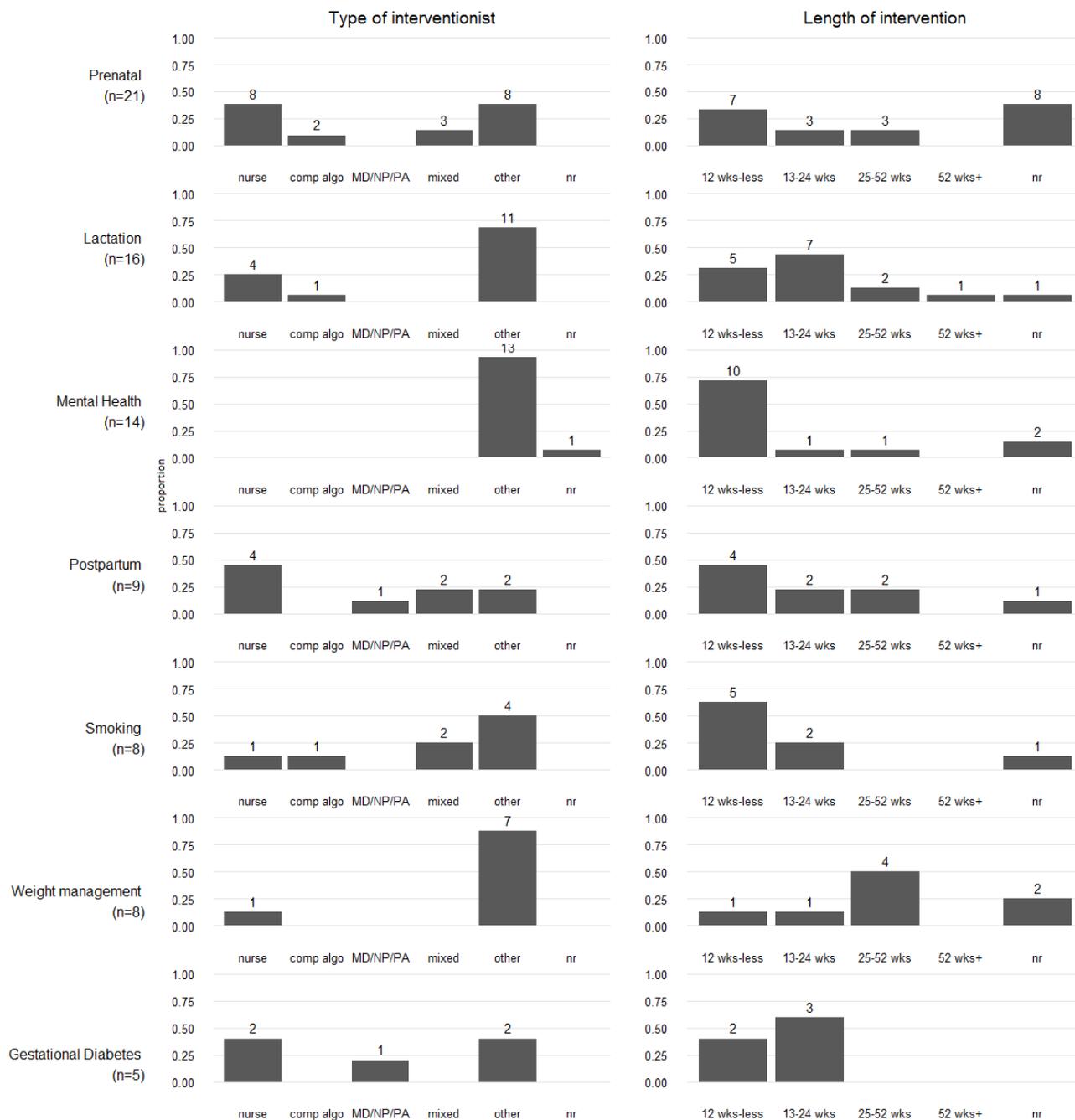
**Figure 4. Evidence Map for Maternal Health Subcategories (Modality, Centrality, Dyad)**



**Figure 5. Evidence Map for Maternal Health Subcategories (Income, Recruitment Location)**



**Figure 6. Evidence Map for Maternal Health Subcategories (Interventionist, Length of Intervention)**



## PREVENTION

### Key Points

- Beyond maternal health, the greatest amount of published literature focused on modifying behaviors associated with prevention; the largest subcategory of prevention-focused studies were devoted to increasing physical activity.

- The most common intervention length was 25-52 weeks, and telephone was the dominant telehealth modality.
- For the studies that delineated a primary outcome, all were at the patient level. A small minority of studies reported secondary outcomes at the provider and system level.
- One study addressed smoking cessation among active military service members on a Navy base. No prevention studies were conducted in the VA.

## Synthesis of Findings

### *Study Characteristics and Demographics*

The second largest area of telehealth interventions for women focused on prevention (n=56). These included 18 studies on increasing physical activity,<sup>18,30,118,126,127,129,132,133,137,138,140-143,149,150,155,158</sup> 14 on cancer screening,<sup>29,32,115,120,123-125,130,134,135,148,151,157,162</sup> 11 on weight management,<sup>113,114,117,122,128,131,136,139,152,159,163</sup> 10 on smoking cessation,<sup>116,119,121,144,146,147,156,160,161,164</sup> and 3 on diet.<sup>145,153,154</sup> Nearly all of these studies were RCTs, with only 1 nonrandomized trial, a controlled before-and-after study.<sup>159</sup> Most studies had 500 or fewer participants (n=36; 64%), yet 21% had more than 1000 participants. The most common age category for this focus area were women with mean ages from 50 to 59 years (n=21; 36%), with only 4 studies focused on women with a mean age 60 years or older. Eight studies reported age with no measure of central tendency. In nearly half the studies, the recruitment populations were majority white (n=26; 46%), and 8 studies recruited populations that were majority black; 30% did not report race or ethnic data (Figure 7, panel I). Nearly all studies were conducted in countries categorized as high income by the World Bank (n=55), which included 43 from the United States, with only 1 study conducted in middle-income and none conducted in low-income countries. The most common recruitment site was the outpatient setting (n=25; 45%),<sup>29,115,117,121-124,128,129,131,133,134,136,140,144,145,148,150-152,154-156,163</sup> followed by community settings n=23; 41%).<sup>18,30,113,114,118,120,122,125,127,130,132,137-139,141-143,149,153,157,161,162,164</sup> One study recruited from a Navy base and addressed smoking cessation for new recruits<sup>119</sup> (Figure 7, panel II).

### *Intervention Details*

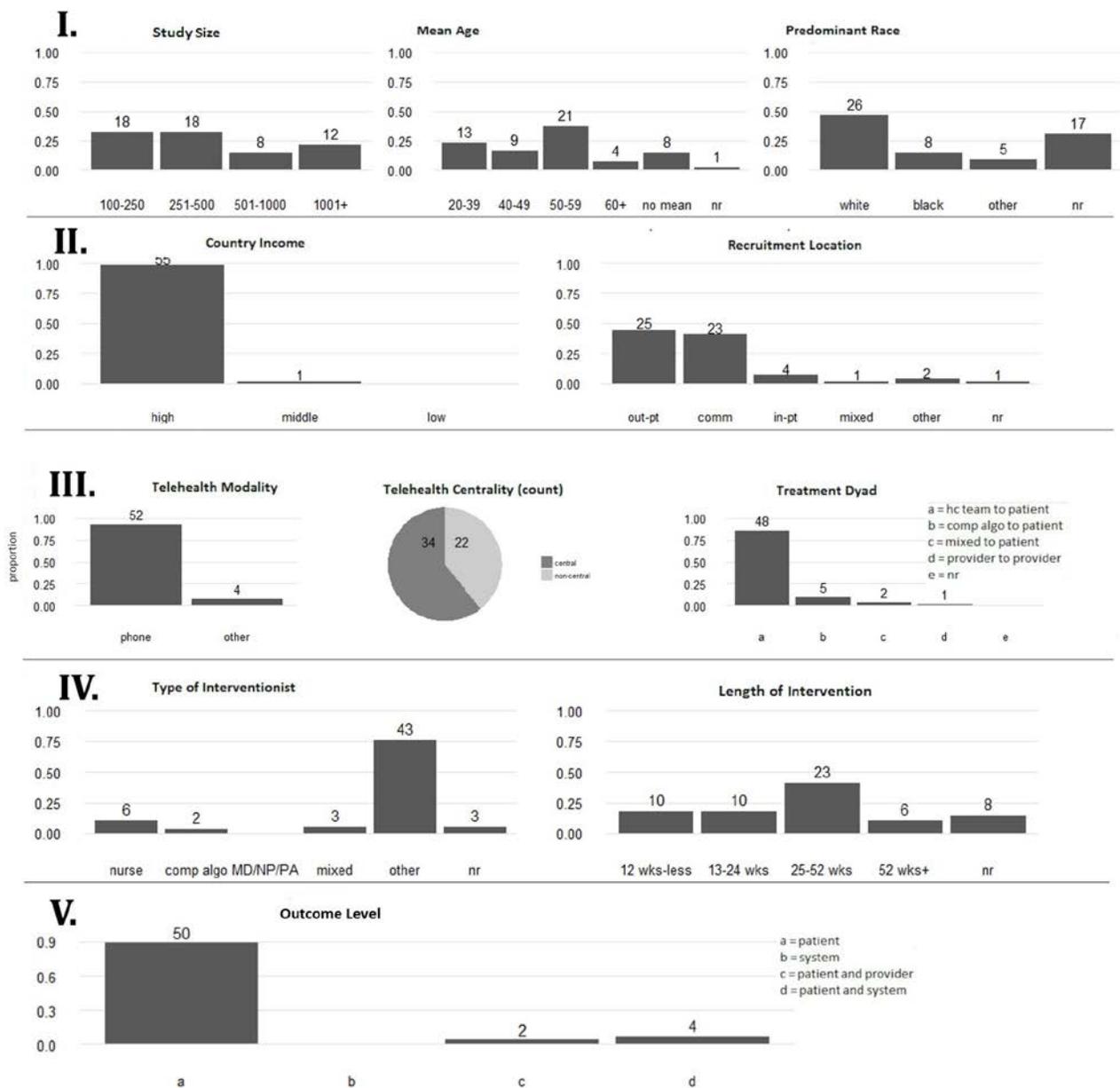
For prevention-focused studies, 61% used telehealth modalities as the central intervention strategy (n=34). The overwhelming majority used synchronous, person-to-person communication via telephone as the primary mode of telehealth delivery (n= 54; 93%). For the 4 studies that did not use telephone as the primary modality, 2 used texting,<sup>127,143</sup> 1 used a mobile application,<sup>164</sup> and 1 used an interactive voice response (IVR) system<sup>163</sup> (Figure 7, panel III). The most common intervention length was 25-52 weeks (n=23; 40%). However, 18% of studies were only 12 weeks or less in duration (n=10). Conversely, 6 studies were 52 weeks or more (Figure 7, panel IV). We also categorized studies based on the participants involved in the telehealth communication (*ie*, the treatment dyad). For studies in this focus area, the majority (n=48; 86%) were focused on health care team member-to-patient communication. Five used telehealth interventions to direct strategies guided by computer algorithms to patients,<sup>121,127,133,135,164</sup> 1 focused on communications from one provider to another provider,<sup>146</sup> and 2 were focused on a mix of provider-to-patient plus IVR communications<sup>163</sup> or provider to patient plus provider to provider communications.<sup>141</sup> Many types of individuals served as interventionists in prevention-focused studies with a wide mix of backgrounds and credentialing. Many studies used nonmedical professionals such as community worker or peer support personnel (n=9), health educators (n=5), health coaches (n=3), and a combination of other nonmedical professionals with

unspecified credentialing or training (*eg*, interventionist trained by study staff) (n=14) (Figure 7, panel IV). There was also a wide variety of other credentialed professionals such as dietitians (n= 6), behavioral health specialists (n=3), and registered nurses (n=6) that served as interventionists. However, no physicians, nurse practitioners, or physician assistants served as interventionist in any of the identified studies. We also assessed if studies provided data on adherence to the intervention; for prevention-focused studies, 53% did not provide this information (n=30). Also the majority of studies did not delineate a theoretical framework (n=33; 59%). Of those that did, the most commonly named models were the Social Cognitive Theory<sup>228</sup> (n=14) and the Transtheoretical Model<sup>229</sup> (n=9).

### *Outcomes Evaluated*

For prevention-focused studies, all primary outcomes were on the patient level (Appendix D). No studies reported provider- or system-level outcomes as a primary outcome. Of those studies designating a primary outcome (n=49, 85%), the most common primary outcomes were cancer screening rates (n=12) and physical activity (n=11), followed by smoking cessation (n=8) and weight (n=7). When looking at secondary outcomes for the prevention-focused studies, there were 6 studies that included additional secondary outcomes at the provider (n=2) or system level (n=4) (Figure 7, panel V).

**Figure 7. Evidence Map for Prevention Area of Research**



## DISEASE MANAGEMENT

### Key Points

- The vast majority of studies that focused on disease management were RCTs and were mainly conducted in countries categorized as high income by the World Bank.
- The largest proportion of studies had fewer than 1000 participants, and most studies were conducted with middle-aged women.
- The most common mode of telehealth delivery was telephone and in a third of studies the interventionist was a nurse.

- The majority of studies focused on patient-level outcomes, the most common of which were quality of life and clinical symptoms.
- No disease management studies were conducted within the VA.

## Synthesis of Findings

### *Study Characteristics and Demographics*

Forty-three (20%) telehealth interventions were focused on disease management. The vast majority were RCTs (n=41; 95%); we identified only 2 nonrandomized studies. The majority of studies had 2 arms (n=26; 60%), with 10 studies having 3 arms and 7 having 4 arms. Sample size ranged from 100 to 6591, with most studies having 1000 or fewer participants (n=38; 88%), and only 5 studies having more than 1000 participants.<sup>19,168,185,186</sup> The mean age ranged from 30 to 80 years. The most common age category was middle-aged women of mean age 40-60 years (n=24), with only 8 studies focused on women with mean age over 60 years (n=9, 20%); 8 studies did not report mean age and/or did not report age at all. Only 23 (53%) studies reported race and ethnicity, and across these studies the most commonly reported category was white (n=18, 41%) (Figure 8, panel I). Except for 1 study, which was conducted in Iran, a middle-income country,<sup>197</sup> all other studies were conducted in countries categorized as high income by the World Bank. Twenty-five studies (58%) were conducted in the United States.<sup>19,20,23,26-28,31,34,167-169,171,174-177,182-186,192-194,196</sup> The most common recruitment site was specialty care settings (n=20, 45%) followed by community settings (n=9, 21%) and inpatient settings (n=3, 7%) (Figure 8, panel II).

### *Intervention Details*

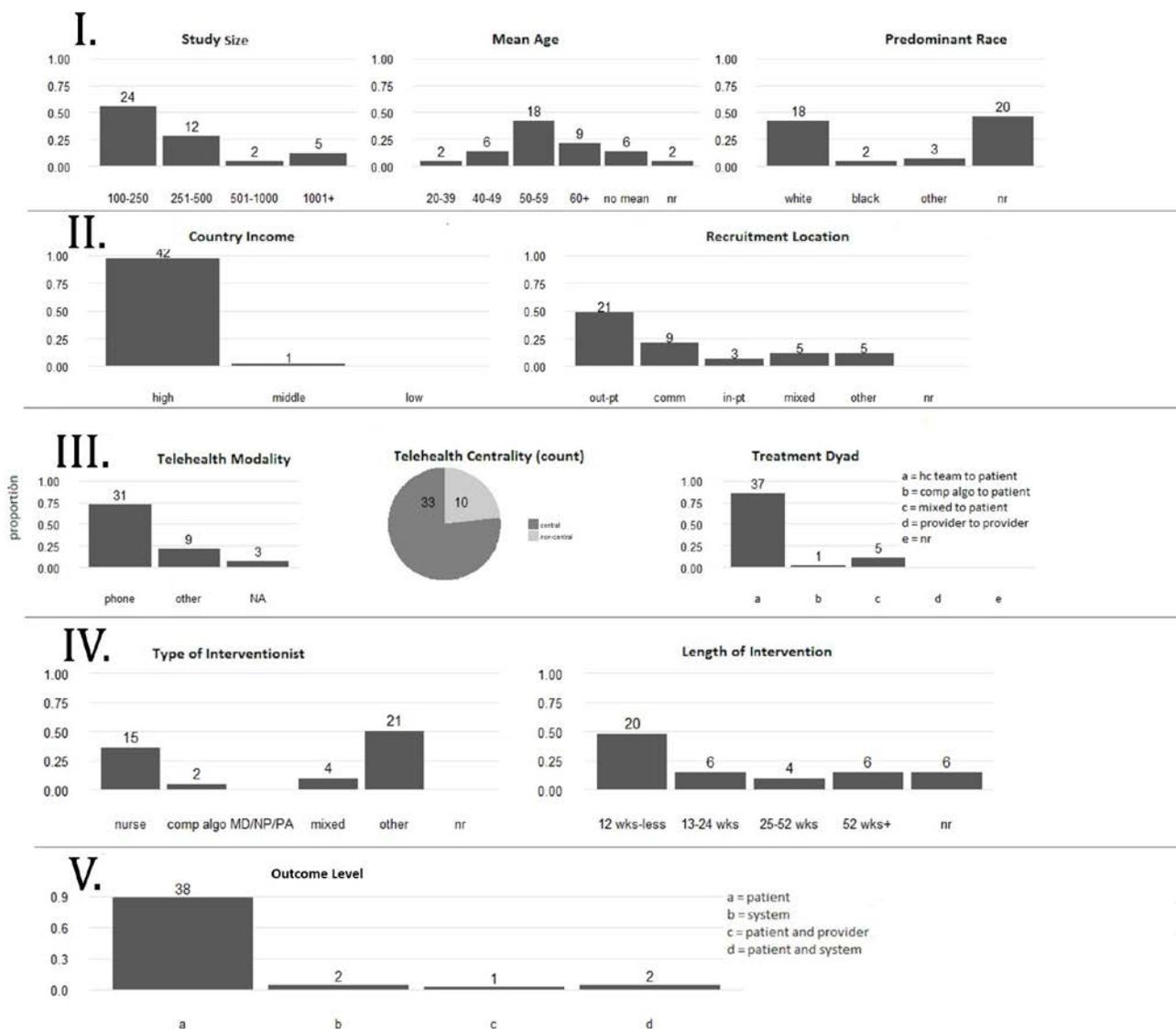
The most common intervention length was 12 weeks or less (n=20, 47%). Six studies were between 13 and 24 weeks,<sup>23,26,34,169,176,193</sup> 4 studies between 24 and 52 weeks<sup>174,177,182,192</sup> and 6 studies were 52 weeks or more.<sup>24,25,31,185,186,195</sup> Six studies did not report intervention length. For disease management studies, 77% used telehealth modalities as the central intervention strategy (n=33). The most common mode of telehealth delivery was telephone (72%; n=31 studies). For the 9 studies that did not use telephone as the primary intervention modality, 7 used interactive website,<sup>23,172,173,177,179,189,191</sup> 1 one used secure email,<sup>190</sup> and 1 used a mobile application.<sup>180</sup> Three studies use more than one modality: 1 added videoconferences to telephone communication as a second modality,<sup>20</sup> and 2 combined telephone with an interactive website<sup>26,34</sup> (Figure 8, panel III). Overall, 84% (n=37) used synchronous communication, while 5 used asynchronous,<sup>179,180,189-191</sup> and 2 used a hybrid approach.<sup>19,172</sup>

We also categorized studies based on the participants involved in the telehealth communication. Telehealth communication was most commonly conducted between a health care team member and a patient (n = 37; 84%), followed by mixed or multiple types of communication with patients (n = 6; 14%).<sup>19,23,26,165,179,189</sup> One study used a computer algorithm in patient communication.<sup>172</sup> The most common type of interventionist was registered nurse (n=15, 35%). Three studies used a mix of interventionist (nurse and/or behavioral health specialist,<sup>31,180</sup> nurse and computer algorithm<sup>173</sup>), and 2 used computer algorithms<sup>34,172</sup> (Figure 8, panel IV). We also assessed if studies provided data on adherence to the intervention; for this focus area, only half the studies provided this information (n=21). Twenty-six studies endorsed using various theoretical frameworks for their intervention, including a health promotion model<sup>230</sup> (n=1<sup>177</sup>), acceptance and commitment therapy<sup>231</sup> (n=1<sup>180</sup>), and social cognitive theory<sup>232</sup> (n=1<sup>179</sup>), among others.

**Outcomes Evaluated**

Of the studies that reported a primary outcome, the majority had a patient-level primary outcome (n=35; 81%), 4 studies focused on system-level outcomes, and 4 studies did not report any specific primary outcome (Appendix D). Studies with a patient-level primary outcome mainly measured quality of life (n=13), clinical symptoms (n=14), and medication or treatment adherence (n=3, 7%).<sup>19,174,195</sup> Studies with a system-level primary outcome measured cost,<sup>189</sup> utilization,<sup>176</sup> quality-of-care indicators,<sup>168</sup> and economic outcomes.<sup>24</sup> When looking across all outcomes reported (eg, primary and secondary outcomes), the majority reported patient-level outcomes only, 2 reported system-level outcomes, 1 reported both patient- and provider-level outcomes, and 2 reported patient- and system-level outcomes (Figure 8, panel V).

**Figure 8. Evidence Map for Disease Management Area of Research**



## FAMILY PLANNING

### Key Points

- Eleven studies used telehealth to address issues related to family planning. Of these, 6 addressed contraception use (eg, adherence, choice of, and co-administration with teratogenic medications), 2 addressed post-abortion care, 2 addressed issues related to assisted reproductive technology, and 1 addressed fertility and pregnancy among cancer survivors.
- Four studies had more than 1,000 participants, and half of those were conducted in high-income countries as defined by the World Bank.
- Most studies used telephone as the telehealth modality, and the role of telehealth was central to the intervention for a majority of studies.
- All but 1 study used telehealth to communicate between the health care team and the patient, but the actual credentials of the interventionist varied across studies.
- There were no VA-based studies.

### Synthesis of Findings

#### *Study Characteristics and Demographics*

Eleven studies focused on telehealth interventions for family planning, addressing issues related to choice of contraception and contraception adherence (n=5, 45%),<sup>198,199,201,206,207</sup> post-abortion care (n=3, 27%),<sup>202,203,205</sup> infertility (n=2, 18%),<sup>200</sup> and fertility and pregnancy among cancer survivors (n=1, 9%).<sup>204</sup> Ten studies were RCTs, and 1 was a nonrandomized trial.<sup>201</sup> Study sizes ranged from 108 to 1,433 participants; 3 of the 4 largest studies, all with over 1,000 patients, addressed contraception choice and contraception adherence.<sup>198,199,201</sup> As expected, the most common age category for this focus area was 20-39 years (n=8, 73%); 2 studies did not report age in a comparable way.<sup>198,205</sup> Of note, 1 study had a mean age range between 51 and 60 years<sup>204</sup> – this was a peer counseling study for African-American women survivors of breast cancer and addressed survivorship concerns across the reproductive spectrum from infertility and pregnancy to menopausal symptoms. Across the 10 studies, race was mostly not reported (n=8, 73%), while 1 study each was majority black,<sup>204</sup> white,<sup>199</sup> and other<sup>198</sup> (Figure 9, panel I). The location in which the family planning studies were conducted was split between high-income (n=6, 55%)<sup>199,200,204,206-208</sup> and middle-income countries (n=4, 36%),<sup>201-203,205</sup> with only 1 study from a low-income country (Uganda).<sup>198</sup> Four studies were conducted in the United States.<sup>199,204,206,208</sup>

#### *Intervention Details*

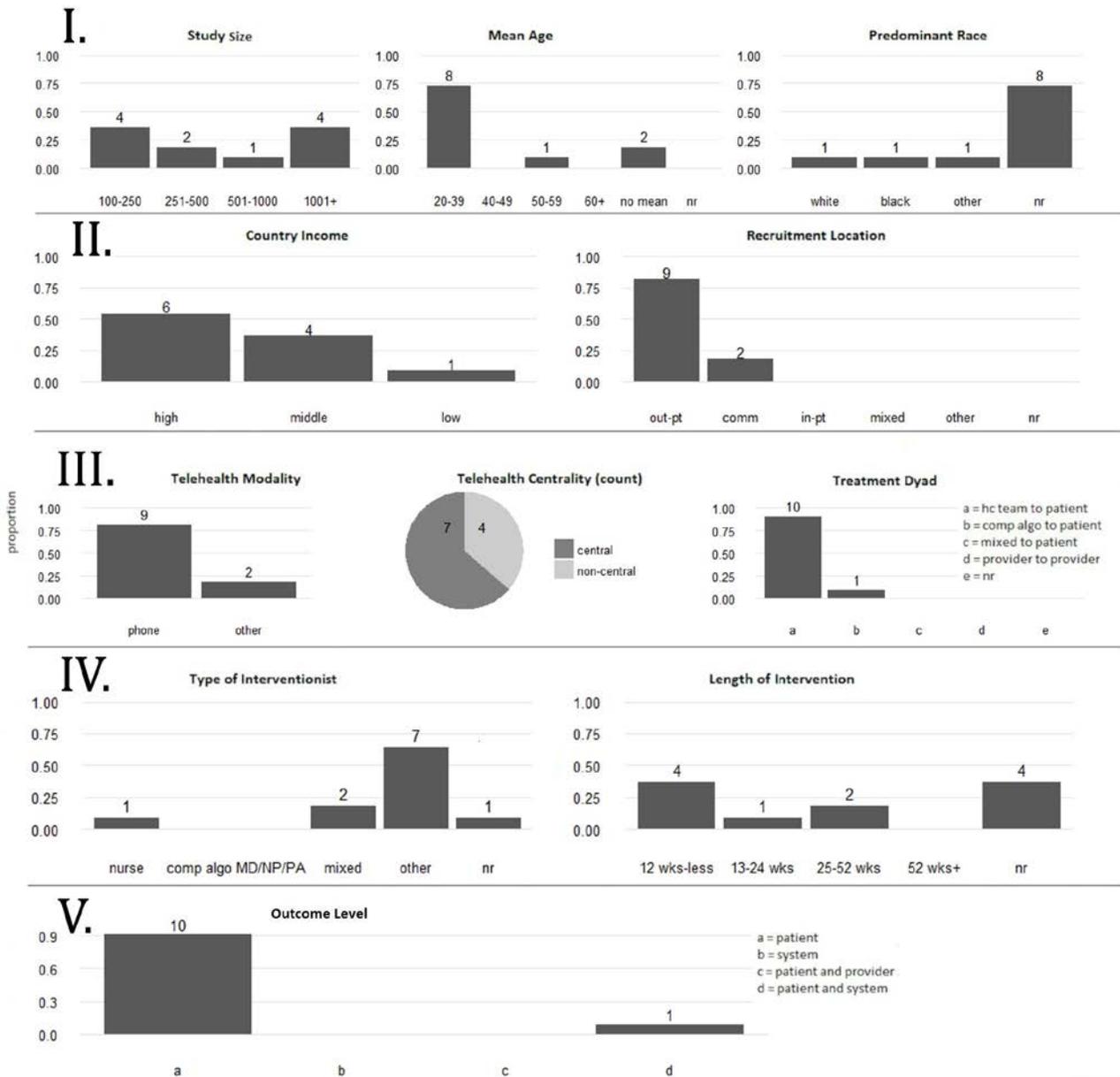
We also examined characteristics of the intervention type. As with other intervention focus areas, most of these studies used telephone as the mode of telehealth delivery (81%, n=9), while 1 used video conference to home,<sup>200</sup> and 1 used an interactive website.<sup>206</sup> Seven of the 11 studies featured a telehealth modality as a central feature of the intervention,<sup>199-201,205-208</sup> while for 3 it was ancillary<sup>198,202,204</sup> and nominal in 1.<sup>203</sup> The majority of family planning studies used telehealth for communication between members of the health care team and patients; only 1 study used a computer algorithm to communicate with patients<sup>206</sup> (Figure 9, panel II). Most studies utilized synchronous communication between involved parties, while 1 used asynchronous communication<sup>200</sup> and 1 used a hybrid approach.<sup>205</sup>

The interventionists varied widely. Two studies used a peer or lay health worker,<sup>198,204</sup> 2 used a health educator,<sup>201,206</sup> 1 used a social worker,<sup>208</sup> and 1 study each used the following interventionist types: unspecified counselor,<sup>205</sup> provider,<sup>200</sup> registered nurse,<sup>202</sup> unspecified nonprofessional,<sup>203</sup> and multiple types of interventionists.<sup>199</sup> The credentials of the interventionist were not reported in 1 study.<sup>207</sup> Of those studies that reported the length of the intervention, the most common length was 12 weeks or less (n = 4),<sup>203,205,207,208</sup> with 2 lasting 25-52 weeks,<sup>201,204</sup> and 1 lasting 13-24 weeks;<sup>199</sup> 4 studies did not report the length of the studied intervention<sup>198,200,202,206</sup> (Figure 9, panel III). Of the studies using telephone as the telehealth modality, only one study reported the length of the telephone calls (30 minutes).<sup>204</sup> Of the telephone-based studies that reported the number of phone contacts, 4 consisted of only 1 phone call,<sup>202-204,207</sup> 1 had 2 phone calls,<sup>208</sup> and 2 had 6 phone calls.<sup>199,205</sup> Most studies did not report adherence to the study protocol (n=7, 64%),<sup>199,200,203-205,207</sup> and only 1 study<sup>199</sup> reported basing the intervention design on an established theory, the Health Belief Model.<sup>233</sup> All recruitment for the family planning studies occurred in either the outpatient or community setting (Figure 9, panel IV). There were no VA-based studies.

### *Outcomes Evaluated*

All family planning studies had a patient-level primary outcome (Appendix D). The most common primary outcome was medication adherence (n=4), followed by physical symptoms (n=2), contraceptive use (n=2), mental symptoms (n = 2), and patient satisfaction (n=1). One study included a system-level outcome as a secondary outcome (Figure 9, panel V).

**Figure 9. Evidence Map for Family Planning Area of Research**



## HIGH-RISK BREAST CANCER ASSESSMENT

### Key Points

- We identified 7 studies that focused on risk assessment for breast cancer; all studies were synchronous, telephone-based, featured telehealth as the central intervention modality, and were designed for information flow from a provider to a patient.
- Most studies on high-risk breast cancer assessment compared telephone-based genetic counseling with in-person counseling, while 1 focused on promoting healthy behaviors including proper risk assessment among sisters of young women with breast cancer. One study provided social support to women known to carry genetic mutations that put them at high risk for breast cancer.
- Studies were conducted among high-income countries such as the United States and Australia. No studies about high-risk breast cancer assessment were conducted within VA.

### Synthesis of Findings

#### *Study Characteristics and Demographics*

We identified 7 telehealth interventions related to identifying and managing women at high risk for breast cancer.<sup>209-215</sup> These included 5 interventions designed to test phone-based versus in-person genetic counseling,<sup>210-214</sup> 1 providing emotional support to women with known BRCA1/BRCA2 mutations,<sup>215</sup> and 1 targeting the sisters of young women with breast cancer to promote appropriate risk assessment, increase knowledge about risk, and reduce worry related to breast cancer risk.<sup>209</sup> All of these studies were individual (n=3)<sup>209,214,215</sup> or cluster RCTs (n=4).<sup>210-213</sup> The size of studies ranged from 100 to 1,012 participants. The most common age category was 40-49 years (n= 4)<sup>209,211,214,215</sup> and 50-59 years (n=3).<sup>210,212,213</sup> Most studies had a predominant racial group that was white (n = 6),<sup>209-214</sup> with 1 study that did not report racial composition<sup>215</sup> (Figure 10, panel I). All breast cancer risk studies were conducted exclusively among high-income countries. Most studies were set in the United States (n=6), while 1 was set in Australia.<sup>215</sup> Participants were recruited from a variety of settings including specialty care (n=3),<sup>211,214,215</sup> primary care (n=1),<sup>210</sup> community-based settings (n=2),<sup>209,213</sup> and a cancer registry<sup>212</sup> (Figure 10, panel II).

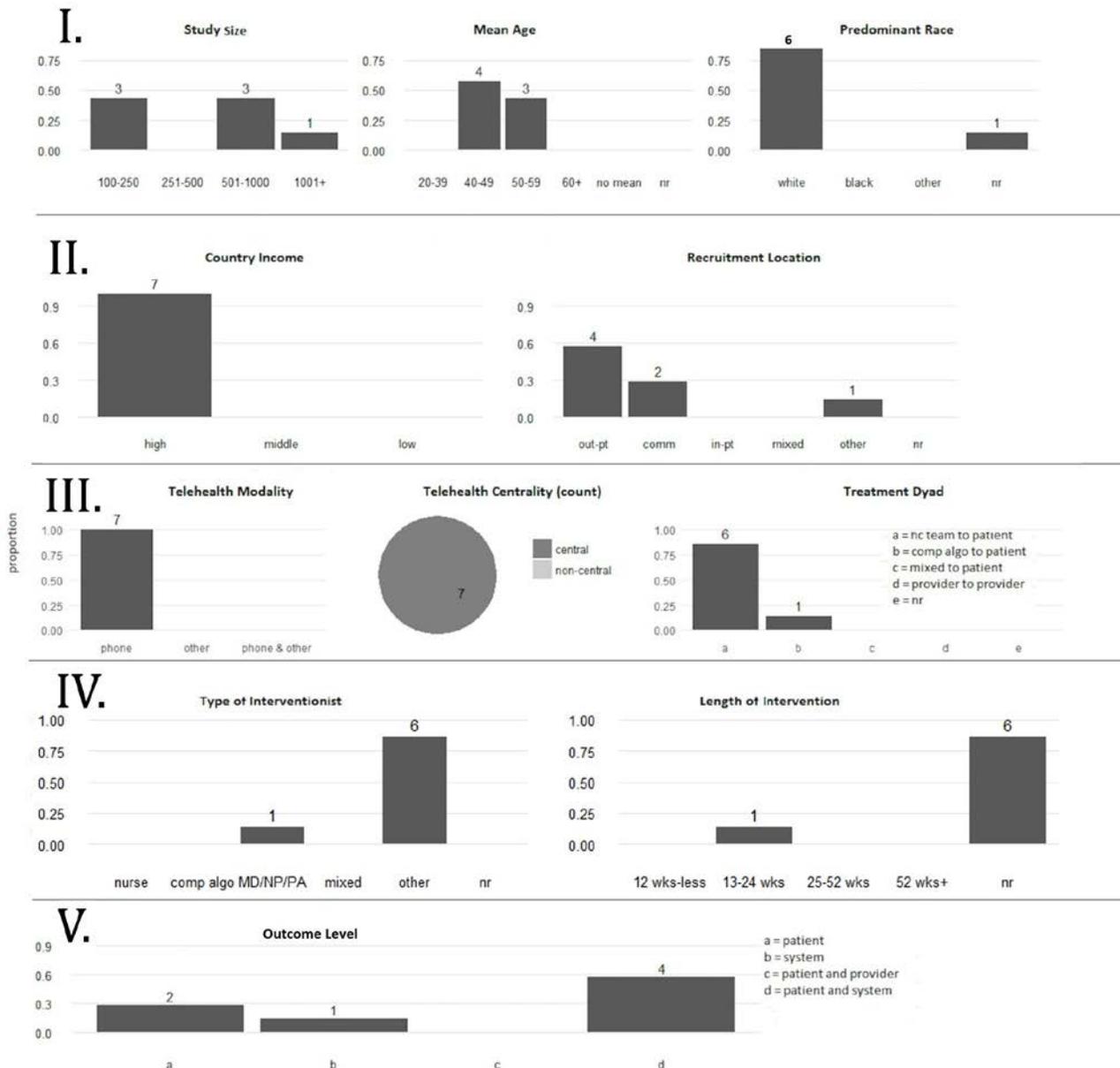
#### *Intervention Details*

All studies were synchronous, telephone-based, and featured telehealth as the central intervention modality. Most studies were designed for information flow from the health care team to a patient, and one study sent information from a computer algorithm to a patient<sup>214</sup> (Figure 10, panel III). The interventionist varied across studies. Providers were most frequently genetic counselors (n=4),<sup>210,212-214</sup> followed by behavioral health specialists,<sup>209</sup> peer or lay health workers,<sup>215</sup> and physician or advanced practice nurse.<sup>211</sup> Only 1 study clearly described the length of the study, which was 13-24 weeks; this intervention provided social support to women with known BRCA1/BRCA2 mutation.<sup>215</sup> Four studies did not specify the length of the intervention but focused on the number of telephone counseling sessions (ranging 1-3 calls),<sup>210-212,214</sup> and 2 studies did not report the number of calls<sup>209,213</sup> (Figure 10, panel IV). Three of the 7 studies reported adherence to the intervention protocol.<sup>210,214,215</sup> We also evaluated whether studies included information about a theoretical framework. Most breast cancer risk studies did not provide a theoretical rationale (n=6); however, 1 study<sup>209</sup> referenced the Health Belief Model,<sup>233</sup> Self-Regulation Theory,<sup>234</sup> and Transtheoretical Model.<sup>229</sup>

*Outcomes Evaluated*

For this focus area, 4 studies had primary outcomes at the patient level including mental health symptom assessments<sup>209,211,215</sup> and patient satisfaction,<sup>214</sup> while 3 studies had system-level primary outcomes including cost<sup>210</sup> and utilization.<sup>212,213</sup> No breast cancer risk studies included provider-level outcomes (Appendix D). However, when accounting for both primary and secondary outcomes together, 2 studies included patient-level outcomes only, 2 had system-level outcomes only, and 4 reported patient- and system-level outcomes (Figure 10, Panel V).

**Figure 10. Evidence Map for High-Risk Breast Cancer Assessment Area of Research**



## MENTAL HEALTH

### Key Points

- In addition to the 14 studies identified in the maternal health section that focused on postpartum depression and parenting anxiety, we identified 6 more studies that focused on mental health generally. All of these included synchronous telephone communication and addressed anxiety, posttraumatic stress disorder, and/or depression.
- One study examining treatment of posttraumatic stress disorder via telemedicine recruited both Veteran and civilian women through a VA and community setting.
- The frequency of telephone contact for mental health studies varied from weekly, to 1-2 calls, or more complex algorithms dictating frequency.

### Synthesis of Findings

#### *Study Characteristics and Demographics*

Six studies focused telehealth interventions on women's mental health outside the postpartum period. All of these studies were 2-armed, individual RCTs. Four studies had between 100 and 250 participants<sup>217,219-221</sup> and 2 had 251-500.<sup>216,218</sup> Of those studies that reported age of participants, 2 studies had a mean age of 20-39 years,<sup>217,220</sup> 1 study 40-49 years,<sup>221</sup> and 1 study 50-59 years.<sup>218</sup> Participants in 3 studies were predominately white,<sup>218,219,221</sup> and 3 studies did not report participants' race<sup>216,217,220</sup> (Figure 11, panel I). Most of the studies were conducted in countries categorized by the World Bank as high income (n=5),<sup>216-219,221</sup> with most of these being in the United States.<sup>218,219,221</sup> One study was conducted in a middle-income country.<sup>220</sup> Further, most studies recruited women from specialty care settings (n=4),<sup>216-219</sup> while 2 studies recruited from the community (Figure 11, panel II).<sup>220,221</sup> One study compared the delivery of cognitive processing therapy via in-person versus video teleconferencing for posttraumatic stress disorder and recruited both Veteran and civilian women through VA and community settings.<sup>221</sup>

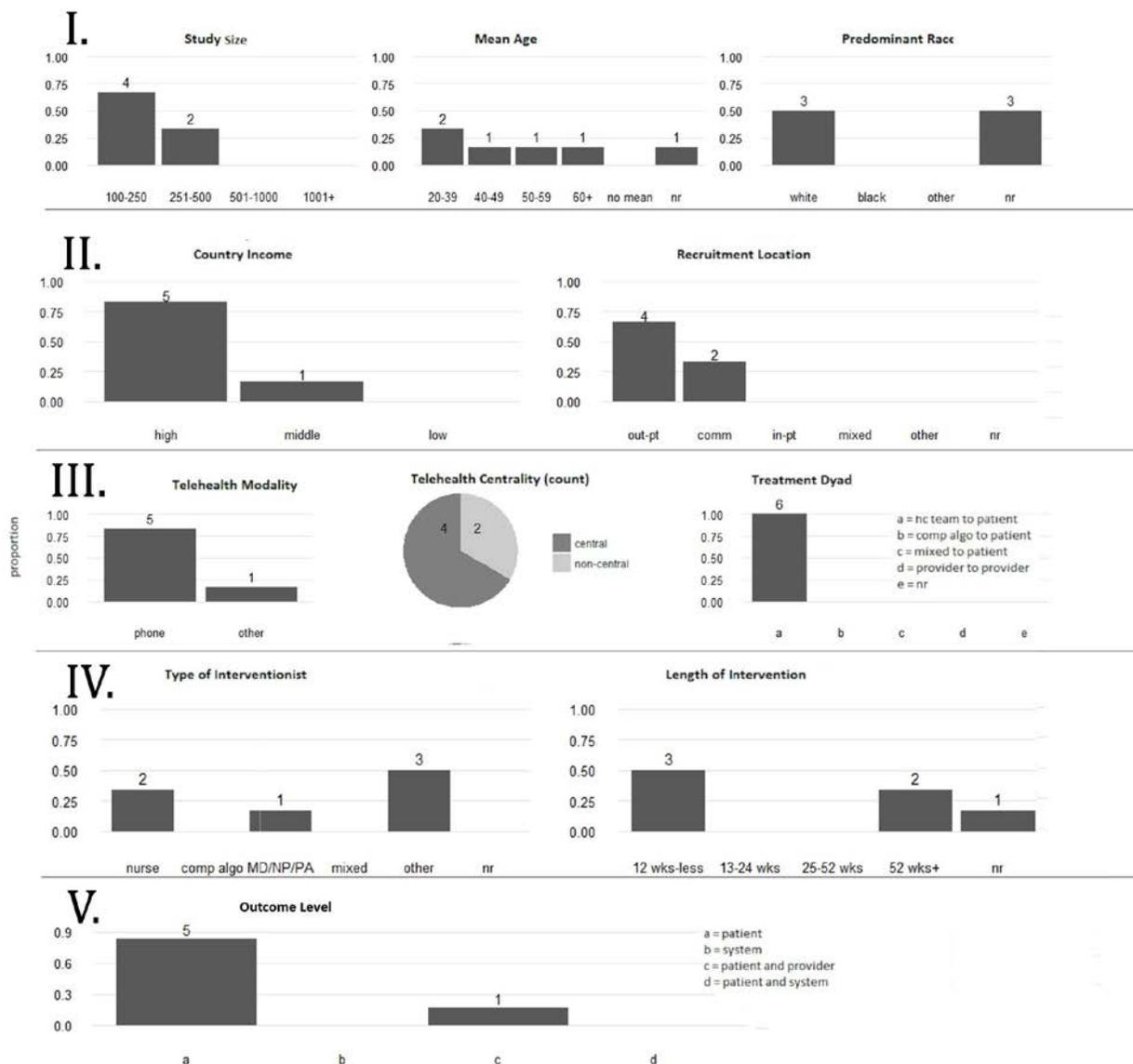
#### *Intervention Details*

Telehealth played a central role in 4 mental health studies.<sup>216-218,221</sup> Further, all studies were synchronous; 5 used telephone as the primary telehealth modality, and 1 used videoconferencing<sup>221</sup> (Figure 11, panel III). For studies in this focus area, all centered on health care team-to-patient communication. For studies using telephone as the intervention modality, most involved repeated telephone calls (n=4), while a few studies reported only 1 or 2 calls (n=2).<sup>217,218</sup> For the 1 study using video teleconferencing, it featured a total of twelve 90-minute sessions.<sup>221</sup> The health care team member who served as interventionist varied and included nurses (n=2),<sup>216,217</sup> peer or lay health workers (n=1),<sup>219</sup> behavioral health specialists (n=1),<sup>221</sup> health educators (n=1),<sup>218</sup> and 1 study with multiple types of interventionists<sup>220</sup> (Figure 11, panel IV). We also assessed whether studies address adherence to the intervention and 4 did.<sup>216,218,220</sup> Intervention length ranged from 1 contact<sup>217</sup> to 2-5 years.<sup>216</sup> Only 1 mental health study<sup>220</sup> described a theoretical framework, specifically Cohen's Social Support.<sup>235</sup>

#### *Outcomes Evaluated*

All primary outcomes were assessed at the patient level (Appendix D). The most common outcomes were depression and anxiety. No secondary outcomes reported were on the provider- or systems-level (Figure 11, panel V).

**Figure 11. Evidence Map for Mental Health Area of Research**



## INTIMATE PARTNER VIOLENCE

### Key Points

- Only 5 studies of telehealth interventions for women focused on IPV. One of these studies was also found in the SR relevant to this research area. Specifically, it was a trial of support provision to women who were recent survivors of rape to promote adherence to HIV post-exposure prophylaxis.
- All were telephone-based studies that targeted reproductive age women and were relatively short in length (all 24 weeks or less).
- All outcomes measured across these 5 studies were patient level with no measures of provider- or system-level outcomes.
- No studies about IPV were conducted within the VA.

## Synthesis of Findings

### *Study Characteristics and Demographics*

We identified 5 studies that focused on IPV.<sup>222-226</sup> All but 1 were conducted among women with a previous history of IPV, with the goal of reducing the risk of future experience of violence through approaches such as promoting safety behaviors,<sup>222</sup> providing social support,<sup>224,225</sup> problem-solving training<sup>224,225</sup> and empowerment<sup>223</sup> through motivational interviewing. The fifth study was a trial of providing support to women who were recent survivors of rape to promote adherence to HIV post-exposure prophylaxis.<sup>226</sup> All studies were RCTs and involved 1189 patients, while individual study sample sizes ranged from 150-307. Studies in this focus area primarily included women of reproductive age, with 3 studies reporting a mean age of 20-39 years (2 studies did not report a measure of central tendency for age).<sup>223,226</sup> The predominant race/ethnicity was white for 2 studies,<sup>223,224</sup> Latina for 1 study,<sup>222</sup> and not reported in 2 studies.<sup>225,226</sup> One study for which race/ethnicity was not reported was conducted in Hong Kong,<sup>225</sup> and the other in South Africa<sup>226</sup> (Figure 12, panel I). Of the 4 trials conducted in high-income countries, 3 were in the United States<sup>222-224</sup> and 1 in Hong Kong.<sup>225</sup> One study was conducted in a middle-income country (South Africa).<sup>226</sup> Two studies recruited from the outpatient setting,<sup>223,226</sup> 1 from a pediatric emergency department,<sup>224</sup> 1 from the community,<sup>225</sup> and 1 from a special family violence unit within a district attorney's office<sup>222</sup> (Figure 12, panel II). None recruited patients from VA settings.

### *Intervention Details*

We also categorized studies based on the prominence of the role of telehealth in the study (central or non-central). Four studies used telehealth modalities as the central intervention strategy.<sup>222,224-226</sup> All studies used telephone as the delivery modality (Figure 12, panel III), and all studies used synchronous communication. We also categorized studies based on the participants involved in the telehealth communication. The interventionist for these studies included 1 study with a nurse,<sup>224</sup> mixed types of interventionists with nurses and a case worker,<sup>222</sup> 2 used unspecified nonprofessionals,<sup>223,226</sup> and 1 did not clearly report the type of interventionist.<sup>225</sup> For studies in this focus area, 4 were focused on health care team to patient communication,<sup>222-224,226</sup> while the fifth study focused on communication from an unspecified individual to a patient.<sup>225</sup> Three studies had an intervention length of 12 weeks or less,<sup>222,225,226</sup> and 2 had interventions lasting 13-24 weeks<sup>223,224</sup> (Figure 12, panel IV). We also assessed if studies provided data on adherence to the intervention, of which 3 of 5 did.<sup>223,224,226</sup> Two studies noted using theoretical frameworks: 1 study<sup>225</sup> named the Dutton Empowerment Model<sup>236</sup> and Cohen's Social Support,<sup>237</sup> and the other study<sup>222</sup> named Walker's 3-Phase Cycle of Violence<sup>238</sup> and Curnow's Open Window Phase.<sup>239</sup>

### *Outcomes Evaluated*

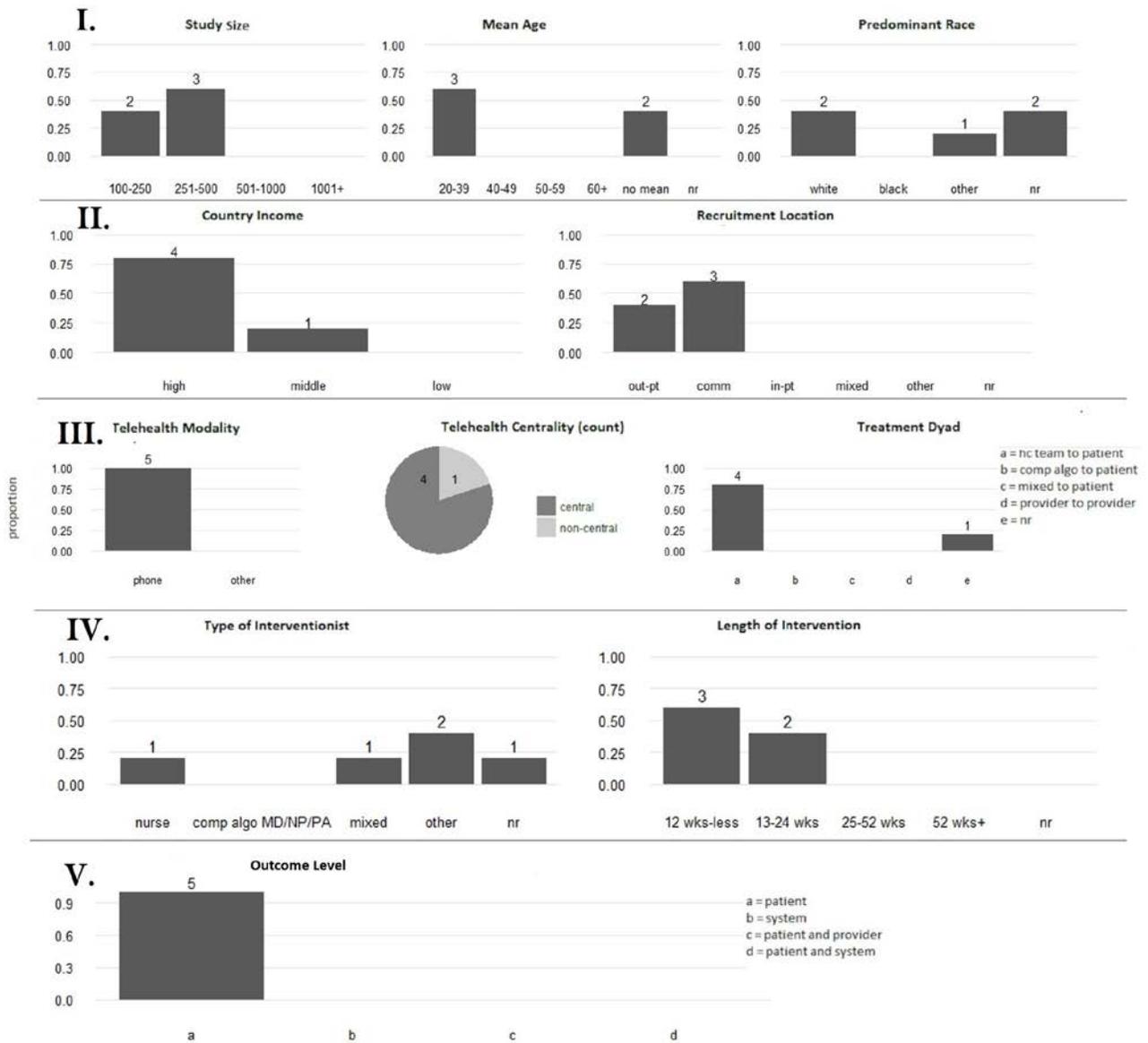
For these studies, all stated primary outcomes were at the patient level (Appendix D). The primary outcome of 2 studies was clinical assessment of mental health,<sup>223,225</sup> 1 used experience of violence,<sup>224</sup> 1 measured adherence to post-exposure prophylaxis,<sup>226</sup> and 1 measured safety-promoting behaviors.<sup>222</sup> All reported outcome measures (including primary and secondary outcomes) across these 5 studies were at patient level. (Figure 12, panel V).

### *Systematic Review Findings*

One trial was identified from an SR that was also found individually. The SR examined telephone interventions for preventing new HIV infection across care settings.<sup>227</sup> The relevant

telehealth study meeting criteria for our evidence map was the RCT<sup>226</sup> mentioned above that included 274 female rape victims who had presented to community clinics in South Africa. Enrolled women were randomized to usual care versus telephone support; support was delivered by a skilled counselor, and the primary outcome was patient level (medication adherence).

**Figure 12. Evidence Map for Intimate Partner Violence Area of Research**



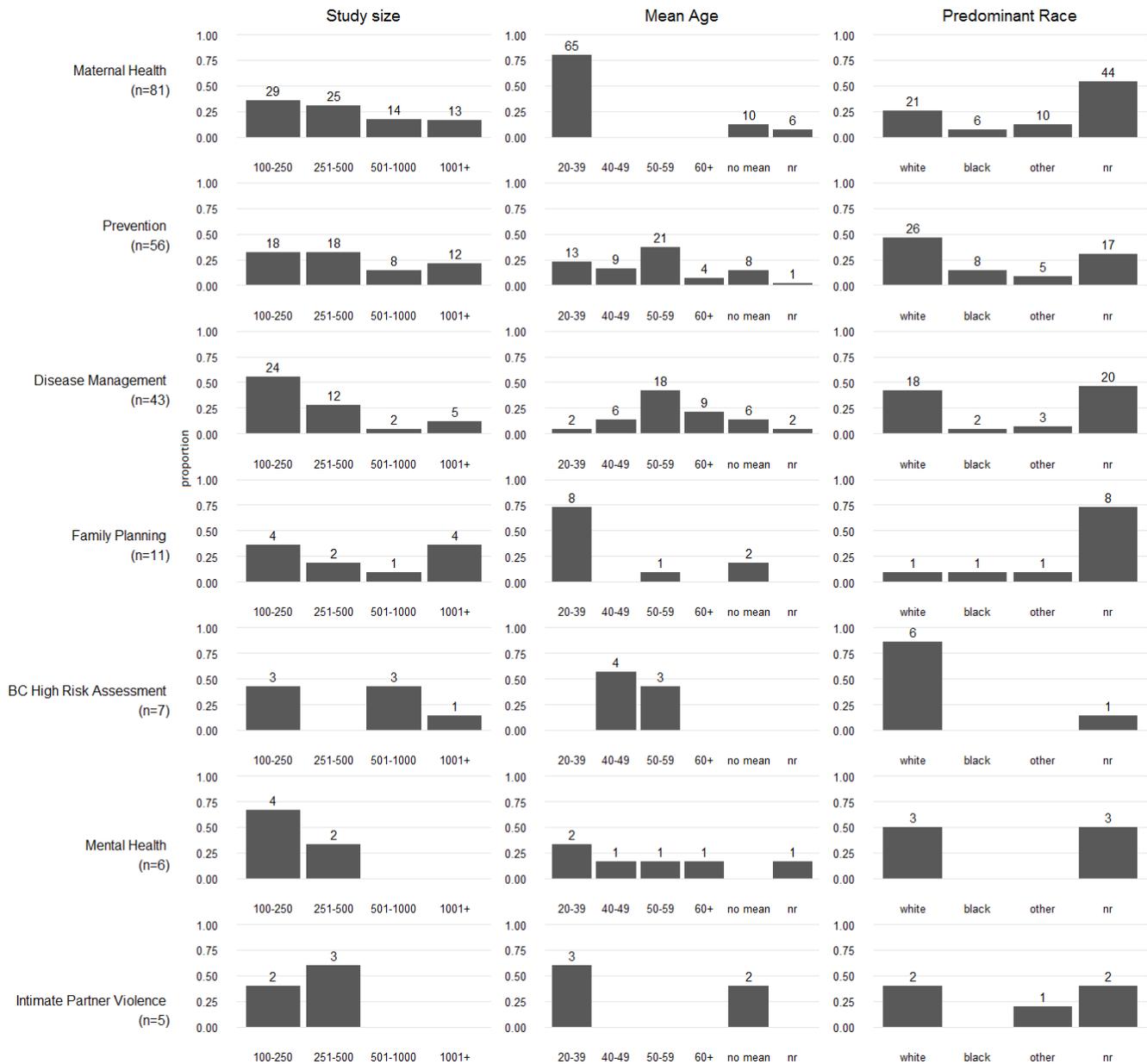
## SUMMARY AND DISCUSSION

Telehealth can be an essential tool to deliver the right intervention to the right patient at the right time by improving access to care and facilitating the secure sharing of health information. VA has been on the forefront of implementing telehealth solutions as a way to extend care to key populations of interest or to overcome barriers to receiving timely and high-quality care.<sup>3,4</sup> Women Veterans are one such key population that could benefit from the flexibility and access afforded by telehealth because they are geographically dispersed within the Veterans Health Administration (VHA) and have gender-specific care needs. Further, women Veterans may be particularly amenable to telehealth as an alternative form of health care because of more frequent interactions with providers compared to their male counterparts and an expressed preference for telephone contacts with their care providers.<sup>8</sup> Given the multiple modalities of telehealth that could be targeted within the VHA to address the care needs of women Veterans, it is imperative to understand the existing literature supporting this approach to care delivery.

The goal of this report was to characterize the quantity, distribution, and characteristics of evidence for the use of telehealth services designed specifically for women. To our knowledge, this is the first attempt to map this literature base. We identified 209 reports of primary studies and 2 systematic reviews. These included 81 primary studies and 1 SR pertaining to maternal care, 56 to prevention, 43 to disease management, 11 to family planning, 7 to assessment of women at high-risk for breast cancer, 6 to mental health, and 5 primary studies and 1 SR to intimate partner violence (IPV). When looking across the 7 focused areas of research, the majority of studies identified recruited 250 or fewer participants (Figure 13 and Appendix C).

Age distributions in the identified literature tracked with population distributions of women potentially impacted with identified health conditions. For example, all studies of breast cancer high-risk management were among women with mean ages in the 40s and 50s, and maternal care studies were focused on women in their 20s and 30s. Yet, there was an overall trend of limited telehealth studies intervening on the health issues of women aged 60 years and older across the identified reports on prevention, disease management, mental health, and IPV. Further, when mapping the race and ethnic composition of included studies, we found that very few studies reported the race and ethnic distribution of women included in these studies. For the studies that did provide data on race distribution, most included populations that were predominantly white (Figure 13).

**Figure 13. Study Characteristics by Focused Areas of Research**

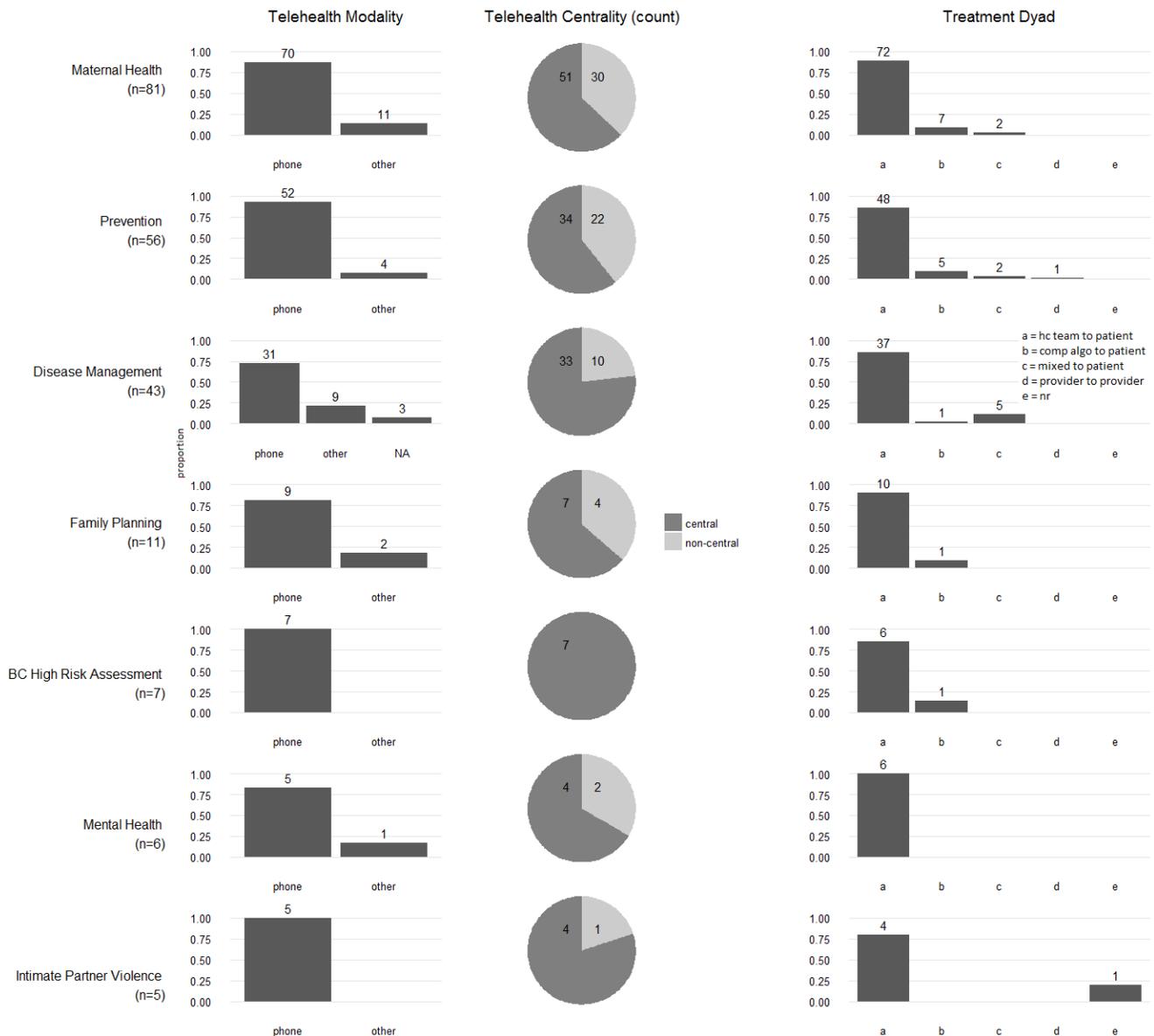


When mapping the evidence on the key characteristics of telehealth centrality, modality, and focus of the treatment dyad, clear patterns emerged (Figure 14). First, among the identified literature, telehealth technologies were rated to be the only or primary (*ie*, central) mode of intervention delivery across the majority of studies. Next, across all areas of research, telephone was the dominant modality to deliver intervention content. Notably, among the literature with the smallest footprint (*ie*, high-risk breast cancer assessment, mental health, IPV), we identified no studies that used telehealth technologies beyond the telephone. While the dominant use of the telephone likely reflects the longevity of experience with care delivery using this modality (*eg*, telephone counseling), there is a lack of evidence on alternative telehealth modalities such as mobile-based apps or SMS/texting. In developing these approaches, VA will be well-suited to contribute to the growing literature around this health care innovation. Last, most studies used telehealth technologies to facilitate communication between patients and health care team



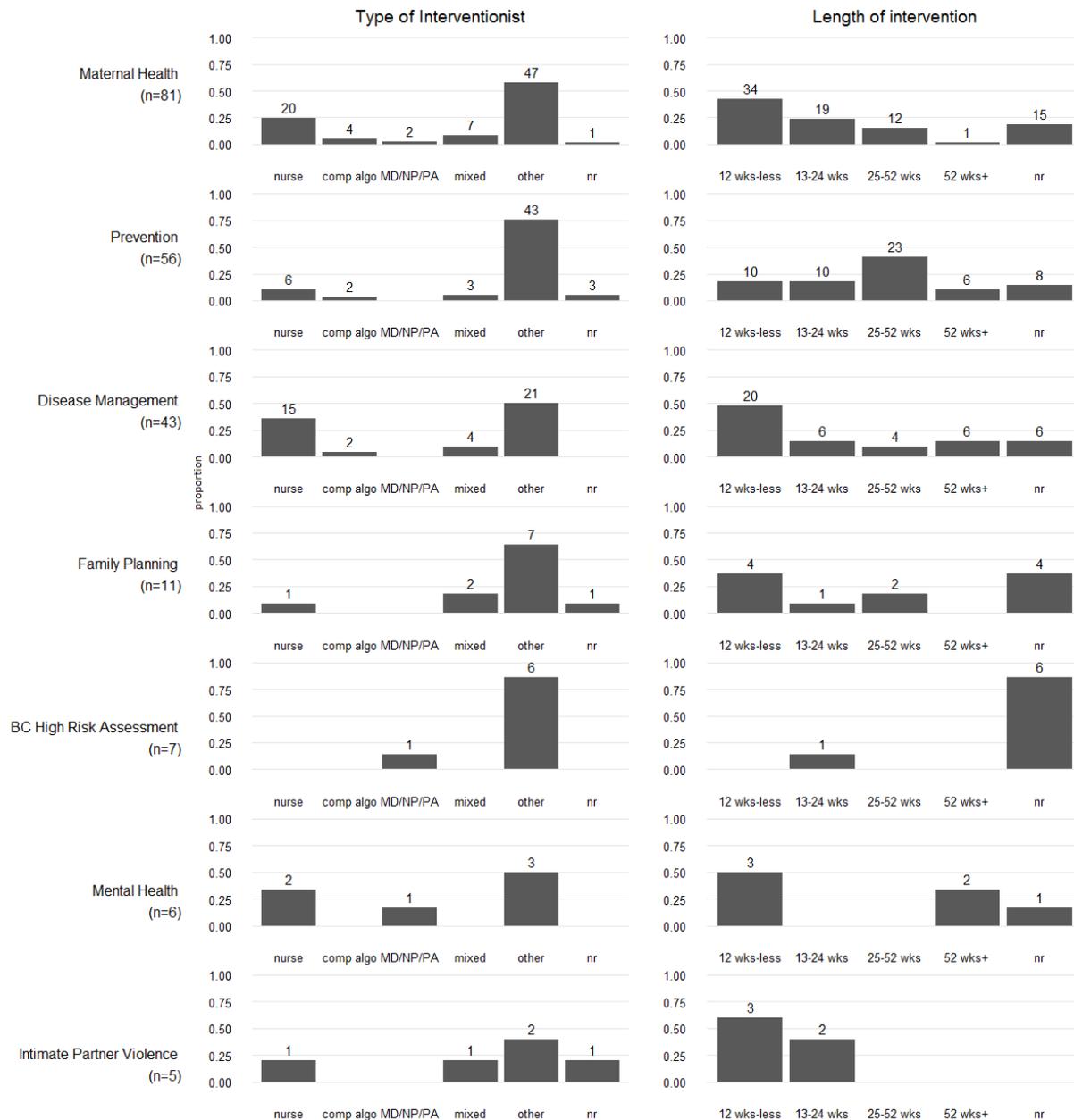
members. Only 1 prevention-focused study used telehealth to communicate from health care provider-to-provider.

**Figure 14. Intervention Components by Focused Areas of Research**



When mapping the type of interventionist used in telehealth approaches for women, very few were physicians or advanced practice providers (eg, nurse practitioners, physician assistants) (Figure 15). Instead, these interventions were mostly supported by a diverse variety of credentialed (eg, registered nurses, behavioral health specialists) and noncredentialed positions (eg, health educators, peer or lay health workers)—thus involving additional health care team members in the delivery of non-face-to-face care and expanding the resources of a traditional care team. The majority of the identified studies were limited in their duration and did not extend beyond 12 weeks. The only exception was among studies focused on prevention; the majority of these were 25 weeks or more.

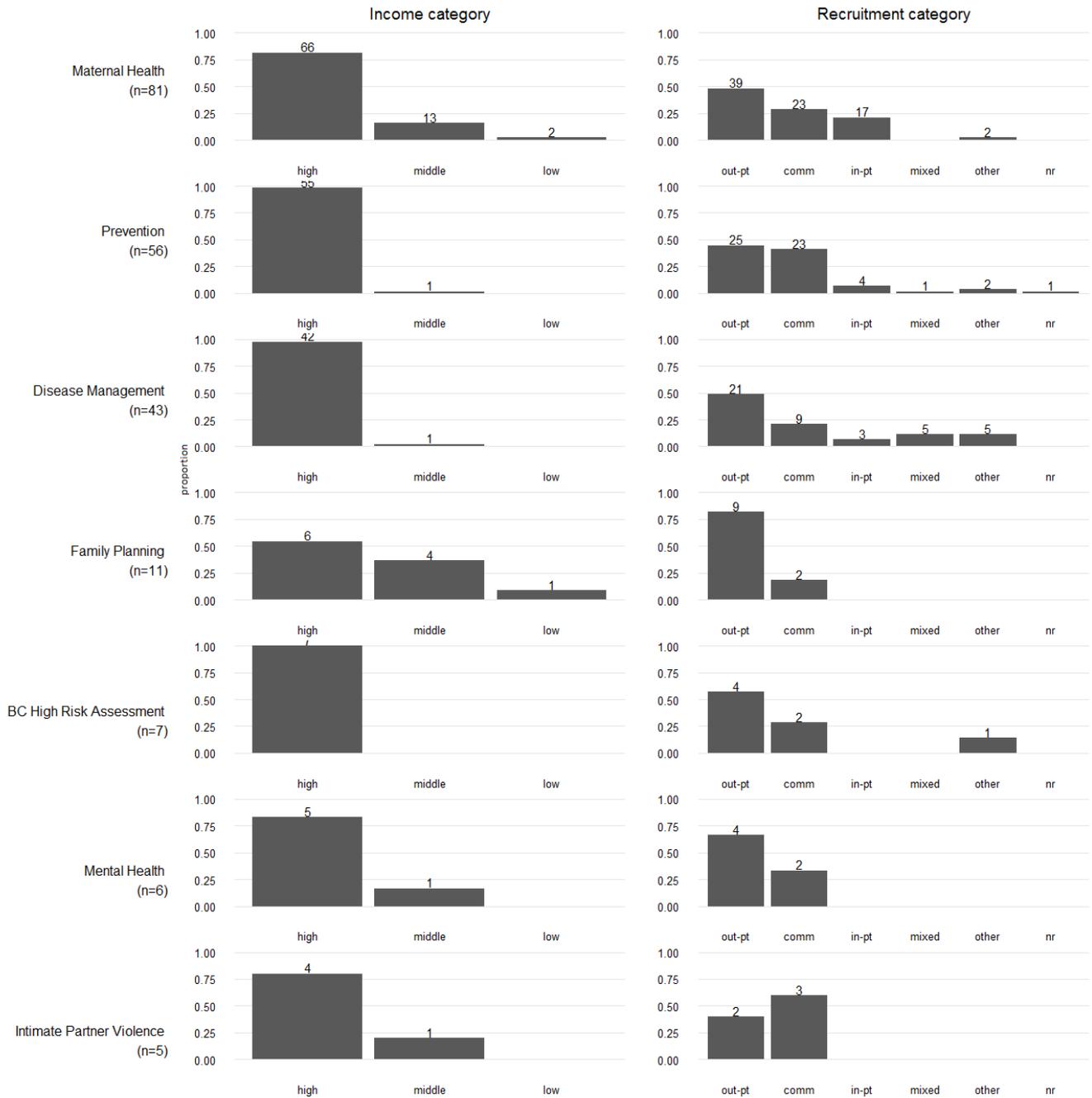
**Figure 15. Interventionist and Length of Intervention by Focused Areas of Research**



When mapping the setting of telehealth interventions designed for women, the overwhelming majority of studies were conducted in countries categorized as high income by the World Bank. The only exception to this was in the area of family planning, where half the studies were conducted in middle- and low-income countries. When looking across the literature, most studies recruited from outpatient clinics (including specialty outpatient clinics), followed by community-based recruiting (Figure 16).



**Figure 16. Study Setting by Focused Areas of Research**



## IMPLICATIONS OF FINDINGS

Women Veterans have multiple personal and structural barriers to seeking care within the VHA. First, women have multiple competing priorities that can make it difficult for them to seek and obtain the health care they need. Further, many VA sites have large catchment areas, and women Veterans may be dispersed across these catchment areas. For example, the growing number of pregnancies within the women Veteran population are geographically dispersed across the country with relatively small numbers at even larger VA sites. While the proportion of women using the VA for health care is growing, women Veterans still comprise a large minority of patients served compared with their male counterparts. Also, women Veterans have a need and preference for gender-specific care that is sensitized to their particular needs as Veterans.<sup>240,241</sup> Recent studies of pregnant Veterans note challenges related to mental health comorbidities and increased risk of complication.<sup>13,242-246</sup> Thus, there are pockets of women Veterans in need of specialized clinical care that lack the population density to support services at individual VA health care centers.

The expansion and optimization of telehealth directly aligns with VHA top priorities. Namely, the VHA is committed to improving the timeliness of health care delivery, and telehealth is seen as a key solution to advance this priority. Telehealth offers a potentially ideal approach to deliver targeted support to women Veterans in a manner that is convenient to the patient and does not require traveling long distances. From a provider and system level, telehealth provides additional tools to aid the facilitation of continuity of care and transitions of care (*eg*, post-acute care) and can be a powerful tool for population health management. In this evidence map, we illustrate the areas in which telehealth for women have been examined. There is a significant literature that has tested telehealth as a strategy to support maternal care, which may be of particular interest to VA as they seek to expand their maternal care coordination efforts<sup>13</sup> due to the growing number of women of childbearing age who are dispersed throughout the VHA.

We also identified significant bodies of literature related to prevention and disease management using telehealth interventions designed specifically for women. Integrating telehealth in these areas, as the VA is currently implementing, can allow for a realignment of health care resources. We identified a wide range of interventionists who delivered care. Thus, telehealth may also be a strategy that allows the integration of additional, nontraditional personnel resources to the health care team. Providing patient access to other health care team members frees up physicians and advanced practice providers to spend more time on high-risk, complex patients. Yet the dearth of provider- and system-level outcomes measured by existing literature limits our ability to explore the feasibility and sustainability of telehealth interventions for women. For interventions that involve providers (*eg*, provider-to-patient or provider-to-provider), it is important to understand how strategies are received by the providers, if providers perceive these strategies as beneficial to optimize the efficiency and quality of clinical decision-making, and if it improves system-level outcomes like access to high-quality care and retention of personnel. Last, as technology evolves and becomes further integrated into clinical practice, it will be important to understand provider perspectives in order to customize strategies to meet the needs of providers and to optimize stakeholder buy-in during future implementation efforts.

## LIMITATIONS

Evidence mapping is an evolving methodology, without well-defined best practices. While we conducted this review with high scientific rigor, our evidence map has limitations. First, identifying and mapping the body of literature on telehealth strategies for women was

challenging. There are multiple definitions of telehealth and each one has implications for searching and identifying the literature base. In collaboration with our stakeholders, we developed an operational definition that was most relevant to the VA care context. Thus, other ways of operationalizing telehealth may produce different results. Similarly, we could have included studies of telehealth that included mixed-gender populations but which conducted sex- or gender-based analysis. While we made this choice intentionally, we acknowledge that we may have missed some relevant findings. Further, in collaboration with our stakeholders and panel of technical experts, we only included study designs set forth by the Cochrane Effective Practice and Organization of Care (EPOC) Group<sup>16</sup>—criteria developed to capture both randomized and nonrandomized study designs best suited to assess the effects of health system interventions like telehealth. Thus, we may have excluded other relevant studies that used observational designs. We chose EPOC designs because our research focus was on mapping the literature that assessed the effectiveness of telehealth strategies for women. In order to focus on studies large enough to provide meaningful findings, we limited our inclusion criteria to those studies that included at least 100 patients. While this would have allowed trials for which the unit of randomization was providers or systems, requiring a minimum number of patients may have excluded studies with relevant findings. Due to the size and scope of this review, we did not conduct dual review or abstraction of all studies. However, we conducted targeted dual review and over-reading and monitored those targeted reviews for acceptable levels of agreement. Further, we classified studies into broad, focused areas of research, potentially limiting interpretation of results. However, we further classified the largest identified literature, maternal health, by subcategories to aid the interpretation of this key body of literature. Also, because this study was an evidence map and the purpose of the study was to characterize and visualize a broad literature base, we did not provide summary estimates of effects. We also did not assess the quality of the literature base. To mitigate this limitation, we only included randomized and nonrandomized study designs of higher methodological rigor as outlined by the EPOC criteria.<sup>16</sup> It is possible that this decision excluded some provider- and system-focused studies that may be more likely to use other designs.

## RESEARCH GAPS/FUTURE RESEARCH

A key use of these maps is to inform decisions about where more primary research is needed. The evidence maps in this report serve as a broad visualization of the field of telehealth interventions for women and a foundation for future research in this area (Appendix C). Beyond maternal health care, we identified a relatively small number of telehealth studies that addressed other gender-specific needs of women Veterans and underscore areas that warrant further exploration such as family planning, IPV, homelessness, pain management, and high-risk breast cancer assessment. Further, beyond postpartum depression, few studies used telehealth interventions to address the mental health needs of women. For example, many pregnant women Veterans have comorbid mental health conditions and may disconnect from their mental health provider during pregnancy as they transition to a community obstetric provider.<sup>247</sup> Assessing telehealth strategies designed for this population may provide an important tool to enhance continuity of care. The wealth of existing literature about telehealth for maternity care could inform the development of future telehealth interventions for this population within VA.

We also found relatively few studies among older women, or studies conducted with racially or ethnically diverse populations. So, there is a need to test telehealth strategies in more diverse patient populations and contexts. We also identified a dearth of studies focused on strategies to enhance provider-to-provider communication for women's health conditions. Such studies are essential to assess the impact of telehealth interventions focused on gender-specific care. Further,

telephone was by far the most commonly studied telehealth modality and newer approaches such as mobile health technologies were underrepresented. This gap underscores the need to study how best to use evolving technology that can address the needs of women. As noted, we identified a relatively small literature base that assesses provider and system outcomes. There is a need for research on the extent to which telehealth improves provider and system outcomes related to provider satisfaction and retention and patient access to care.

The brief duration of many interventions included in this review is a notable limitation of the current state of the evidence on telehealth interventions for women. One of the most promising aspects of telehealth for making large improvements in public health is the potential for such interventions to extend treatment over time by using interventions that have relatively low cost for the health care system. Chronic medical and mental health conditions often require frequent, long-term follow up to address symptom exacerbations and maintain treatment gains. This could be accomplished by utilizing telehealth interventions to increase the durability of treatment over time and reduce the frequency of high-cost clinic visits. There is a need for more research using telehealth to improve long-term health outcomes.

While we found very few telehealth studies based within VA, the nature of VA as a large and diverse health care system that has been a national leader in developing and implementing telehealth modalities creates many opportunities to pursue multisite trials to address some of the gaps in the body of literature described in this report. Of relevance, there have been many multisite VA studies that demonstrate the capacity for this type of research.<sup>248,249</sup> In particular, the VA Women's Health Practice-Based Research Network is an active research and quality improvement infrastructure designed to support multisite studies that seek to recruit sufficient numbers of women to support adequately powered trials.<sup>250,251</sup>

## CONCLUSIONS

Telehealth can be a powerful tool to enhance access, quality, and satisfaction with health care. Due to geographic spread and gender-specific needs, women Veterans are a key population that could benefit from expanding care via telehealth modalities. This review mapped the current landscape of the published literature on telehealth strategies designed to address women and their health care needs. We identified 209 primary reports and 2 systematic reviews addressing telehealth interventions for women. Our findings highlight some notable gaps in the literature, including the need for more exploration in the areas of mental health, pain management, IPV, and family planning. We note the need to explore the testing of alternative telehealth modalities such as texting and videoconferencing and the need to test these strategies in more diverse populations of women. Key to VA, we also note the need to implement studies that assess the impact of telehealth on provider- and system-level outcomes. Only after such studies have been conducted can we assess the full promise of telehealth strategies to optimize the care and well-being of women Veterans across the VA health care system.

## REFERENCES

1. U.S. Department of Health and Human Services. Health Resources & Services Administration: Telehealth Programs. Available at <https://www.hrsa.gov/rural-health/telehealth/index.html>. Accessed November 8, 2017.
2. Weinstein RS, Lopez AM, Joseph BA, et al. Telemedicine, telehealth, and mobile health applications that work: opportunities and barriers. *Am J Med*. 2014;127(3):183-187.
3. Atkins D, Cullen T. The future of health information technology: implications for research. *Med Care*. 2013;51(3 Suppl 1):S1-3.
4. Tuerk PW, Fortney J, Bosworth HB, et al. Toward the development of national telehealth services: the role of Veterans Health Administration and future directions for research. *Telemed J E Health*. 2010;16(1):115-117.
5. Veterans Health Administration. Blueprint for Excellence. September 21, 2014. Available at: [https://www.va.gov/HEALTH/docs/VHA\\_Blueprint\\_for\\_Excellence.pdf](https://www.va.gov/HEALTH/docs/VHA_Blueprint_for_Excellence.pdf). Accessed August 9, 2017.
6. Department of Veterans Affairs. VA Telehealth Services. Available at: <https://www.telehealth.va.gov/>. Accessed August 9, 2017.
7. Department of Veterans Affairs. Connected Care. Website. Available at: <https://connectedcare.va.gov/>. Accessed November 2, 2017.
8. Frayne SM, Mattocks KM. Sourcebook: Women Veterans in the Veterans Health Administration. Volume 2: Sociodemographics and Use of VHA and Non-VA Care (Fee). 2012. Available at: [https://works.bepress.com/kristin\\_mattocks/20/](https://works.bepress.com/kristin_mattocks/20/). Accessed August 8, 2017.
9. Cordasco KM, Mengeling MA, Yano EM, Washington DL. Health and Health Care Access of Rural Women Veterans: Findings From the National Survey of Women Veterans. *J Rural Health*. 2016;32(4):397-406.
10. Washington DL, Bean-Mayberry B, Hamilton AB, Cordasco KM, Yano EM. Women veterans' healthcare delivery preferences and use by military service era: findings from the National Survey of Women Veterans. *J Gen Intern Med*. 2013;28 Suppl 2:S571-576.
11. deKleijn M, Lagro-Janssen AL, Canelo I, Yano EM. Creating a roadmap for delivering gender-sensitive comprehensive care for women Veterans: results of a national expert panel. *Med Care*. 2015;53(4 Suppl 1):S156-164.
12. Cordasco KM, Zuchowski JL, Hamilton AB, et al. Early lessons learned in implementing a women's health educational and virtual consultation program in VA. *Med Care*. 2015;53(4 Suppl 1):S88-92.
13. Mattocks KM, Kuzdeba J, Baldor R, Casares J, Lombardini L, Gerber MR. Implementing and Evaluating a Telephone-Based Centralized Maternity Care Coordination Program for Pregnant Veterans in the Department of Veterans Affairs. *Womens Health Issues*. 2017.
14. Miake-Lye IM, Hempel S, Shanman R, Shekelle PG. What is an evidence map? A systematic review of published evidence maps and their definitions, methods, and products. *Syst Rev*. 2016;5:28.
15. Duan-Porter W, Goldstein KM, McDuffie JR, et al. Reporting of Sex Effects by Systematic Reviews on Interventions for Depression, Diabetes, and Chronic Pain. *Ann Intern Med*. 2016;165(3):184-193.

16. EPOC. Effective Practice and Organisation of Care (EPOC). EPOC Resources for review authors. Oslo: Norwegian Knowledge Centre for the Health Services; 2015. Available at: <http://epoc.cochrane.org/resources/epoc-resources-review-authors>. Accessed November 3, 2017.
17. Simmons D, Devlieger R, van Assche A, et al. Effect of physical activity and/or healthy eating on GDM risk: The DALI Lifestyle Study. *J Clin Endocrinol Metab*. 2016;jc20163455.
18. Wilbur J, Miller AM, Fogg L, et al. Randomized Clinical Trial of the Women's Lifestyle Physical Activity Program for African-American Women: 24- and 48-Week Outcomes. *Am J Health Promot*. 2016;30(5):335-345.
19. Tso LS, Loi D, Mosley DG, et al. Evaluation of a Nationwide Pharmacist-Led Phone Outreach Program to Improve Osteoporosis Management in Older Women with Recently Sustained Fractures. *J Manag Care Spec Pharm*. 2015;21(9):803-810.
20. Freeman LW, White R, Ratcliff CG, et al. A randomized trial comparing live and telemedicine deliveries of an imagery-based behavioral intervention for breast cancer survivors: reducing symptoms and barriers to care. *Psychooncology*. 2015;24(8):910-918.
21. Reeder JA, Joyce T, Sibley K, Arnold D, Altindag O. Telephone peer counseling of breastfeeding among WIC participants: a randomized controlled trial. *Pediatrics*. 2014;134(3):e700-709.
22. Snaith VJ, Hewison J, Steen IN, Robson SC. Antenatal telephone support intervention with and without uterine artery Doppler screening for low risk nulliparous women: a randomised controlled trial. *BMC Pregnancy Childbirth*. 2014;14:121.
23. Baker TB, Hawkins R, Pingree S, et al. Optimizing eHealth breast cancer interventions: which types of eHealth services are effective? *Transl Behav Med*. 2011;1(1):134-145.
24. Kimman ML, Dirksen CD, Voogd AC, et al. Economic evaluation of four follow-up strategies after curative treatment for breast cancer: results of an RCT. *Eur J Cancer*. 2011;47(8):1175-1185.
25. Kimman ML, Dirksen CD, Voogd AC, et al. Nurse-led telephone follow-up and an educational group programme after breast cancer treatment: results of a 2 x 2 randomised controlled trial. *Eur J Cancer*. 2011;47(7):1027-1036.
26. Hawkins RP, Pingree S, Shaw B, et al. Mediating processes of two communication interventions for breast cancer patients. *Patient Educ Couns*. 2010;81 Suppl:S48-53.
27. Sherman DW, Haber J, Hoskins CN, et al. The effects of psychoeducation and telephone counseling on the adjustment of women with early-stage breast cancer. *Appl Nurs Res*. 2012;25(1):3-16.
28. Sandgren AK, McCaul KD. Long-term telephone therapy outcomes for breast cancer patients. *Psychooncology*. 2007;16(1):38-47.
29. Dietrich AJ, Tobin JN, Cassells A, et al. Telephone care management to improve cancer screening among low-income women: a randomized, controlled trial. *Ann Intern Med*. 2006;144(8):563-571.
30. Conn VS, Burks KJ, Minor MA, Mehr DR. Randomized trial of 2 interventions to increase older women's exercise. *Am J Health Behav*. 2003;27(4):380-388.
31. Samarel N, Tulman L, Fawcett J. Effects of two types of social support and education on adaptation to early-stage breast cancer. *Res Nurs Health*. 2002;25(6):459-470.

32. Valanis BG, Glasgow RE, Mullooly J, et al. Screening HMO women overdue for both mammograms and pap tests. *Prev Med.* 2002;34(1):40-50.
33. Ershoff DH, Quinn VP, Boyd NR, Stern J, Gregory M, Wirtschafter D. The Kaiser Permanente prenatal smoking-cessation trial: when more isn't better, what is enough? *Am J Prev Med.* 1999;17(3):161-168.
34. Hawkins RP, Pingree S, Baker TB, et al. Integrating eHealth with human services for breast cancer patients. *Transl Behav Med.* 2011;1(1):146-154.
35. Ahmed AH, Roumani AM, Szucs K, Zhang L, King D. The Effect of Interactive Web-Based Monitoring on Breastfeeding Exclusivity, Intensity, and Duration in Healthy, Term Infants After Hospital Discharge. *J Obstet Gynecol Neonatal Nurs.* 2016;45(2):143-154.
36. Albright CL, Steffen AD, Wilkens LR, et al. Effectiveness of a 12-month randomized clinical trial to increase physical activity in multiethnic postpartum women: results from Hawaii's Na Mikimiki Project. *Prev Med.* 2014;69:214-223.
37. Alemi F, Stephens RC, Javalghi RG, Dyches H, Butts J, Ghadiri A. A randomized trial of a telecommunications network for pregnant women who use cocaine. *Med Care.* 1996;34(10 Suppl):Os10-20.
38. Althuisen E, van der Wijden CL, van Mechelen W, Seidell JC, van Poppel MN. The effect of a counselling intervention on weight changes during and after pregnancy: a randomised trial. *BJOG.* 2013;120(1):92-99.
39. Amiri P, Hamzavi-Zarghani N, Nazeri P, et al. Can an educational intervention improve iodine nutrition status in pregnant women? A randomized controlled trial. *Thyroid.* 2016.
40. Bagherinia M, Mirghafourvand M, Shafaie FS. The effect of educational package on functional status and maternal self-confidence of primiparous women in postpartum period: a randomized controlled clinical trial. *J Matern Fetal Neonatal Med.* 2016:1-22.
41. Brooten D, Youngblut JM, Brown L, Finkler SA, Neff DF, Madigan E. A randomized trial of nurse specialist home care for women with high-risk pregnancies: outcomes and costs. *Am J Manag Care.* 2001;7(8):793-803.
42. Bryce RL, Stanley FJ, Garner JB. Randomized controlled trial of antenatal social support to prevent preterm birth. *Br J Obstet Gynaecol.* 1991;98(10):1001-1008.
43. Bunik M, Shobe P, O'Connor ME, et al. Are 2 weeks of daily breastfeeding support insufficient to overcome the influences of formula? *Acad Pediatr.* 2010;10(1):21-28.
44. Carlsen EM, Kyhnaeb A, Renault KM, Cortes D, Michaelsen KF, Pryds O. Telephone-based support prolongs breastfeeding duration in obese women: a randomized trial. *Am J Clin Nutr.* 2013;98(5):1226-1232.
45. Chapman DJ, Damio G, Young S, Perez-Escamilla R. Effectiveness of breastfeeding peer counseling in a low-income, predominantly Latina population: a randomized controlled trial. *Arch Pediatr Adolesc Med.* 2004;158(9):897-902.
46. Cummins SE, Tedeschi GJ, Anderson CM, Zhu SH. Telephone Intervention for Pregnant Smokers: A Randomized Controlled Trial. *Am J Prev Med.* 2016;51(3):318-326.
47. Cupples ME, Stewart MC, Percy A, Hepper P, Murphy C, Halliday HL. A RCT of peer-mentoring for first-time mothers in socially disadvantaged areas (the MOMENTS Study). *Arch Dis Child.* 2011;96(3):252-258.

48. Curry MA, Durham L, Bullock L, Bloom T, Davis J. Nurse case management for pregnant women experiencing or at risk for abuse. *J Obstet Gynecol Neonatal Nurs.* 2006;35(2):181-192.
49. Dalfra MG, Nicolucci A, Lapolla A. The effect of telemedicine on outcome and quality of life in pregnant women with diabetes. *J Telemed Telecare.* 2009;15(5):238-242.
50. Dennis CL. Breastfeeding peer support: maternal and volunteer perceptions from a randomized controlled trial. *Birth.* 2002;29(3):169-176.
51. Dennis CL, Hodnett E, Gallop R, Chalmers B. The effect of peer support on breast-feeding duration among primiparous women: a randomized controlled trial. *CMAJ.* 2002;166(1):21-28.
52. Dennis CL, Hodnett E, Kenton L, et al. Effect of peer support on prevention of postnatal depression among high risk women: multisite randomised controlled trial. *BMJ.* 2009;338:a3064.
53. Dodd JM, Turnbull D, McPhee AJ, et al. Antenatal lifestyle advice for women who are overweight or obese: LIMIT randomised trial. *BMJ.* 2014;348:g1285.
54. Dornelas EA, Magnavita J, Beazoglou T, et al. Efficacy and cost-effectiveness of a clinic-based counseling intervention tested in an ethnically diverse sample of pregnant smokers. *Patient Educ Couns.* 2006;64(1-3):342-349.
55. Eden KB, Perrin NA, Vesco KK, Guise JM. A randomized comparative trial of two decision tools for pregnant women with prior cesareans. *J Obstet Gynecol Neonatal Nurs.* 2014;43(5):568-579.
56. Efrat MW, Esparza S, Mendelson SG, Lane CJ. The effect of lactation educators implementing a telephone-based intervention among low-income Hispanics: A randomised trial. *Health Educ J.* 2015;74(4):424-441.
57. Fenwick J, Toohill J, Gamble J, et al. Effects of a midwife psycho-education intervention to reduce childbirth fear on women's birth outcomes and postpartum psychological wellbeing. *BMC Pregnancy Childbirth.* 2015;15:284.
58. Ferrara A, Hedderson MM, Brown SD, et al. The Comparative Effectiveness of Diabetes Prevention Strategies to Reduce Postpartum Weight Retention in Women With Gestational Diabetes Mellitus: The Gestational Diabetes' Effects on Moms (GEM) Cluster Randomized Controlled Trial. *Diabetes Care.* 2016;39(1):65-74.
59. Frank DA, Wirtz SJ, Sorenson JR, Heeren T. Commercial discharge packs and breast-feeding counseling: effects on infant-feeding practices in a randomized trial. *Pediatrics.* 1987;80(6):845-854.
60. Fu IC, Fong DY, Heys M, Lee IL, Sham A, Tarrant M. Professional breastfeeding support for first-time mothers: a multicentre cluster randomised controlled trial. *BJOG.* 2014;121(13):1673-1683.
61. Gagnon AJ, Edgar L, Kramer MS, Papageorgiou A, Waghorn K, Klein MC. A randomized trial of a program of early postpartum discharge with nurse visitation. *Am J Obstet Gynecol.* 1997;176(1 Pt 1):205-211.
62. Gamble J, Creedy D, Moyle W, Webster J, McAllister M, Dickson P. Effectiveness of a counseling intervention after a traumatic childbirth: a randomized controlled trial. *Birth.* 2005;32(1):11-19.

63. Gao LL, Chan SW, Li X, Chen S, Hao Y. Evaluation of an interpersonal-psychotherapy-oriented childbirth education programme for Chinese first-time childbearing women: a randomised controlled trial. *Int J Nurs Stud.* 2010;47(10):1208-1216.
64. Gao LL, Chan SW, Sun K. Effects of an interpersonal-psychotherapy-oriented childbirth education programme for Chinese first-time childbearing women at 3-month follow up: randomised controlled trial. *Int J Nurs Stud.* 2012;49(3):274-281.
65. Gao LL, Xie W, Yang X, Chan SW. Effects of an interpersonal-psychotherapy-oriented postnatal programme for Chinese first-time mothers: a randomized controlled trial. *Int J Nurs Stud.* 2015;52(1):22-29.
66. Giallo R, Cooklin A, Dunning M, Seymour M. The efficacy of an intervention for the management of postpartum fatigue. *J Obstet Gynecol Neonatal Nurs.* 2014;43(5):598-613.
67. Gu Y, Zhu Y, Zhang Z, Wan H. Effectiveness of a theory-based breastfeeding promotion intervention on exclusive breastfeeding in China: A randomised controlled trial. *Midwifery.* 2016;42:93-99.
68. Hannan J, Brooten D, Page T, Galindo A, Torres M. Low-Income First-Time Mothers: Effects of APN Follow-up Using Mobile Technology on Maternal and Infant Outcomes. *Glob Pediatr Health.* 2016;3:2333794x16660234.
69. Hannover W, Thyrian JR, Roske K, et al. Smoking cessation and relapse prevention for postpartum women: results from a randomized controlled trial at 6, 12, 18 and 24 months. *Addict Behav.* 2009;34(1):1-8.
70. Hillesund ER, Bere E, Sagedal LR, Vistad I, Overby NC. Effect of a diet intervention during pregnancy on dietary behavior in the randomized controlled Norwegian Fit for Delivery study. *J Dev Orig Health Dis.* 2016;7(5):538-547.
71. Huang CM, Wu HL, Huang SH, Chien LY, Guo JL. Transtheoretical model-based passive smoking prevention programme among pregnant women and mothers of young children. *Eur J Public Health.* 2013;23(5):777-782.
72. Janssen PA, Desmarais SL. Women's experience with early labour management at home vs. in hospital: a randomised controlled trial. *Midwifery.* 2013;29(3):190-194.
73. Janssen PA, Still DK, Klein MC, et al. Early labor assessment and support at home versus telephone triage: a randomized controlled trial. *Obstet Gynecol.* 2006;108(6):1463-1469.
74. Jiang H, Li M, Wen LM, et al. Effect of short message service on infant feeding practice: findings from a community-based study in Shanghai, China. *JAMA Pediatr.* 2014;168(5):471-478.
75. Jiang L, Wang ZZ, Qiu LR, Wan GB, Lin Y, Wei Z. Psychological intervention for postpartum depression. *J Huazhong Univ Sci Technolog Med Sci.* 2014;34(3):437-442.
76. Jordan ET, Bushar JA, Kendrick JS, Johnson P, Wang J. Encouraging Influenza Vaccination Among Text4baby Pregnant Women and Mothers. *Am J Prev Med.* 2015;49(4):563-572.
77. Kamalifard M, Yavarikia P, Babapour Kheiroddin J, Salehi Pourmehr H, Iraj Iranagh R. The effect of peers support on postpartum depression: a single-blind randomized clinical trial. *J Caring Sci.* 2013;2(3):237-244.

78. Lewis BA, Gjerdingen DK, Avery MD, et al. A randomized trial examining a physical activity intervention for the prevention of postpartum depression: The healthy mom trial. *Mental Health and Physical Activity*. 2014;7(1):42-49.
79. Lund S, Hemed M, Nielsen BB, et al. Mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar: a cluster-randomised controlled trial. *BJOG*. 2012;119(10):1256-1264.
80. Mangwi Ayiasi R, Kolsteren P, Batwala V, Criel B, Orach CG. Effect of Village Health Team Home Visits and Mobile Phone Consultations on Maternal and Newborn Care Practices in Masindi and Kiryandongo, Uganda: A Community-Intervention Trial. *PLoS One*. 2016;11(4):e0153051.
81. Maslowsky J, Frost S, Hendrick CE, Trujillo Cruz FO, Merajver SD. Effects of postpartum mobile phone-based education on maternal and infant health in Ecuador. *Int J Gynaecol Obstet*. 2016;134(1):93-98.
82. McBride CM, Baucom DH, Peterson BL, et al. Prenatal and postpartum smoking abstinence a partner-assisted approach. *Am J Prev Med*. 2004;27(3):232-238.
83. Milgrom J, Schembri C, Ericksen J, Ross J, Gemmill AW. Towards parenthood: an antenatal intervention to reduce depression, anxiety and parenting difficulties. *J Affect Disord*. 2011;130(3):385-394.
84. Mohammad-Alizadeh-Charandabi S, Malakoti J, Sohrabi F, Shokranian N. The effect of telephone support on postpartum depression: a randomized controlled trial. *J Caring Sci*. 2013;2(2):147-155.
85. Moore ML, Meis PJ, Ernest JM, Wells HB, Zaccaro DJ, Terrell T. A randomized trial of nurse intervention to reduce preterm and low birth weight births. *Obstet Gynecol*. 1998;91(5 Pt 1):656-661.
86. Muender MM, Moore ML, Chen GJ, Sevick MA. Cost-benefit of a nursing telephone intervention to reduce preterm and low-birthweight births in an African American clinic population. *Prev Med*. 2000;30(4):271-276.
87. Naughton F, Prevost AT, Gilbert H, Sutton S. Randomized controlled trial evaluation of a tailored leaflet and SMS text message self-help intervention for pregnant smokers (MiQuit). *Nicotine Tob Res*. 2012;14(5):569-577.
88. Ngai FW, Wong PW, Leung KY, Chau PH, Chung KF. The Effect of Telephone-Based Cognitive-Behavioral Therapy on Postnatal Depression: A Randomized Controlled Trial. *Psychother Psychosom*. 2015;84(5):294-303.
89. Ngai FW, Wong PWC, Chung KF, et al. The effect of telephone-based cognitive-behavioural therapy on parenting stress: A randomised controlled trial. *J Psychosom Res*. 2016;86:34-38.
90. Niela-Vilen H, Axelin A, Melender HL, Loyttyniemi E, Salanterä S. Breastfeeding preterm infants - a randomized controlled trial of the effectiveness of an Internet-based peer-support group. *J Adv Nurs*. 2016;72(10):2495-2507.
91. Oakley A, Rajan L, Grant A. Social support and pregnancy outcome. *Br J Obstet Gynaecol*. 1990;97(2):155-162.
92. Odeny TA, Bukusi EA, Cohen CR, Yuhás K, Camlin CS, McClelland RS. Texting improves testing: a randomized trial of two-way SMS to increase postpartum prevention of mother-to-child transmission retention and infant HIV testing. *Aids*. 2014;28(15):2307-2312.

93. O'Reilly SL, Dunbar JA, Versace V, et al. Mothers after Gestational Diabetes in Australia (MAGDA): A Randomised Controlled Trial of a Postnatal Diabetes Prevention Program. *PLoS Med.* 2016;13(7):e1002092.
94. Ostbye T, Krause KM, Lovelady CA, et al. Active Mothers Postpartum: a randomized controlled weight-loss intervention trial. *Am J Prev Med.* 2009;37(3):173-180.
95. Phelan S, Phipps MG, Abrams B, et al. Does behavioral intervention in pregnancy reduce postpartum weight retention? Twelve-month outcomes of the Fit for Delivery randomized trial. *Am J Clin Nutr.* 2014;99(2):302-311.
96. Phelan S, Phipps MG, Abrams B, Darroch F, Schaffner A, Wing RR. Randomized trial of a behavioral intervention to prevent excessive gestational weight gain: the Fit for Delivery Study. *Am J Clin Nutr.* 2011;93(4):772-779.
97. Sagedal LR, Overby NC, Bere E, et al. Lifestyle intervention to limit gestational weight gain: the Norwegian Fit for Delivery randomised controlled trial. *BJOG.* 2017;124(1):97-109.
98. Sagedal LR, Øverby NC, Bere E, et al. Lifestyle intervention to limit gestational weight gain: The Norwegian Fit for Delivery randomised controlled trial. *BJOG.* 2016.
99. Sagedal LR, Sanda B, Overby NC, et al. The effect of prenatal lifestyle intervention on weight retention 12 months postpartum: results of the Norwegian Fit for Delivery randomised controlled trial. *BJOG.* 2017;124(1):111-121.
100. Seguranyes G, Costa D, Fuentelsaz-Gallego C, et al. Efficacy of a videoconferencing intervention compared with standard postnatal care at primary care health centres in Catalonia. *Midwifery.* 2014;30(6):764-771.
101. Serwint JR, Wilson MH, Duggan AK, Mellits ED, Baumgardner RA, DeAngelis C. Do postpartum nursery visits by the primary care provider make a difference? *Pediatrics.* 1991;88(3):444-449.
102. Srinivas GL, Benson M, Worley S, Schulte E. A clinic-based breastfeeding peer counselor intervention in an urban, low-income population: interaction with breastfeeding attitude. *J Hum Lact.* 2015;31(1):120-128.
103. Stotts AL, Diclemente CC, Dolan-Mullen P. One-to-one: a motivational intervention for resistant pregnant smokers. *Addict Behav.* 2002;27(2):275-292.
104. Surkan PJ, Gottlieb BR, McCormick MC, Hunt A, Peterson KE. Impact of a health promotion intervention on maternal depressive symptoms at 15 months postpartum. *Matern Child Health J.* 2012;16(1):139-148.
105. Tahir NM, Al-Sadat N. Does telephone lactation counselling improve breastfeeding practices? A randomised controlled trial. *Int J Nurs Stud.* 2013;50(1):16-25.
106. Takeuchi S, Horiuchi S. Randomised controlled trial using smartphone website vs leaflet to support antenatal perineal massage practice for pregnant women. *Women Birth.* 2016;29(5):430-435.
107. Toohill J, Fenwick J, Gamble J, et al. A randomized controlled trial of a psycho-education intervention by midwives in reducing childbirth fear in pregnant women. *Birth.* 2014;41(4):384-394.
108. Wang X, Li GY, Deng ML, et al. Pelvic floor muscle training as a persistent nursing intervention: Effect on delivery outcome and pelvic floor myodynamia. *International Journal of Nursing Sciences.* 2014;1(1):48-52.

109. Wilton G, Moberg DP, Van Stelle KR, Dold LL, Obmascher K, Goodrich J. A randomized trial comparing telephone versus in-person brief intervention to reduce the risk of an alcohol-exposed pregnancy. *J Subst Abuse Treat.* 2013;45(5):389-394.
110. Wong EH, Nelson E, Choi KC, Wong KP, Ip C, Ho LC. Evaluation of a peer counselling programme to sustain breastfeeding practice in Hong Kong. *Int Breastfeed J.* 2007;2:12.
111. Bartholomew LM, Soules K, Church K, et al. Managing diabetes in pregnancy using cell phone/internet technology. *Clinical Diabetes.* 2015;33(4):169-174.
112. Lee EW, Denison FC, Hor K, Reynolds RM. Web-based interventions for prevention and treatment of perinatal mood disorders: a systematic review. *BMC Pregnancy Childbirth.* 2016;16:38.
113. Annesi JJ. Mediation of the relationship of behavioural treatment type and changes in psychological predictors of healthy eating by body satisfaction changes in women with obesity. *Obes Res Clin Pract.* 2016.
114. Befort CA, Klemp JR, Sullivan DK, et al. Weight loss maintenance strategies among rural breast cancer survivors: The rural women connecting for better health trial. *Obesity (Silver Spring).* 2016;24(10):2070-2077.
115. Bloom JR, Stewart SL, Hancock SL. Breast cancer screening in women surviving Hodgkin disease. *Am J Clin Oncol.* 2006;29(3):258-266.
116. Bullock L, Everett KD, Mullen PD, Geden E, Longo DR, Madsen R. Baby BEEP: A randomized controlled trial of nurses' individualized social support for poor rural pregnant smokers. *Matern Child Health J.* 2009;13(3):395-406.
117. Cadmus-Bertram L, Nelson SH, Hartman S, Patterson RE, Parker BA, Pierce JP. Randomized trial of a phone- and web-based weight loss program for women at elevated breast cancer risk: the HELP study. *J Behav Med.* 2016;39(4):551-559.
118. Chen AH, Sallis JF, Castro CM, et al. A home-based behavioral intervention to promote walking in sedentary ethnic minority women: project WALK. *Womens Health.* 1998;4(1):19-39.
119. Conway TL, Woodruff SI, Edwards CC, Elder JP, Hurtado SL, Hervig LK. Operation Stay Quit: evaluation of two smoking relapse prevention strategies for women after involuntary cessation during US Navy recruit training. *Mil Med.* 2004;169(3):236-242.
120. Corkrey R, Parkinson L, Bates L. Pressing the key pad: trial of a novel approach to health promotion advice. *Prev Med.* 2005;41(2):657-666.
121. Curry SJ, Ludman EJ, Graham E, Stout J, Grothaus L, Lozano P. Pediatric-based smoking cessation intervention for low-income women: a randomized trial. *Arch Pediatr Adolesc Med.* 2003;157(3):295-302.
122. Demark-Wahnefried W, Colditz GA, Rock CL, et al. Quality of life outcomes from the Exercise and Nutrition Enhance Recovery and Good Health for You (ENERGY)-randomized weight loss trial among breast cancer survivors. *Breast Cancer Res Treat.* 2015;154(2):329-337.
123. Dietrich AJ, Tobin JN, Cassells A, et al. Translation of an efficacious cancer-screening intervention to women enrolled in a Medicaid managed care organization. *Ann Fam Med.* 2007;5(4):320-327.
124. Dietrich AJ, Tobin JN, Robinson CM, et al. Telephone outreach to increase colon cancer screening in medicaid managed care organizations: a randomized controlled trial. *Ann Fam Med.* 2013;11(4):335-343.

125. Eaker S, Adami HO, Granath F, Wilander E, Sparen P. A large population-based randomized controlled trial to increase attendance at screening for cervical cancer. *Cancer Epidemiol Biomarkers Prev.* 2004;13(3):346-354.
126. Eakin EG, Lawler SP, Winkler EA, Hayes SC. A randomized trial of a telephone-delivered exercise intervention for non-urban dwelling women newly diagnosed with breast cancer: exercise for health. *Ann Behav Med.* 2012;43(2):229-238.
127. Fjeldsoe BS, Miller YD, Graves N, Barnett AG, Marshall AL. Randomized Controlled Trial of an Improved Version of MobileMums, an Intervention for Increasing Physical Activity in Women with Young Children. *Ann Behav Med.* 2015;49(4):487-499.
128. Goodwin PJ, Segal RJ, Vallis M, et al. Randomized trial of a telephone-based weight loss intervention in postmenopausal women with breast cancer receiving letrozole: the LISA trial. *J Clin Oncol.* 2014;32(21):2231-2239.
129. Gordon LG, DiSipio T, Battistutta D, et al. Cost-effectiveness of a pragmatic exercise intervention for women with breast cancer: results from a randomized controlled trial. *Psychooncology.* 2016.
130. Han HR, Song Y, Kim M, et al. Breast and Cervical Cancer Screening Literacy Among Korean American Women: A Community Health Worker-Led Intervention. *Am J Public Health.* 2017;107(1):159-165.
131. Harrigan M, Cartmel B, Loftfield E, et al. Randomized Trial Comparing Telephone Versus In-Person Weight Loss Counseling on Body Composition and Circulating Biomarkers in Women Treated for Breast Cancer: The Lifestyle, Exercise, and Nutrition (LEAN) Study. *J Clin Oncol.* 2016;34(7):669-676.
132. Hayes S, Rye S, Battistutta D, et al. Design and implementation of the Exercise for Health trial -- a pragmatic exercise intervention for women with breast cancer. *Contemp Clin Trials.* 2011;32(4):577-585.
133. Hayes SC, Rye S, Disipio T, et al. Exercise for health: a randomized, controlled trial evaluating the impact of a pragmatic, translational exercise intervention on the quality of life, function and treatment-related side effects following breast cancer. *Breast Cancer Res Treat.* 2013;137(1):175-186.
134. Helmes AW, Culver JO, Bowen DJ. Results of a randomized study of telephone versus in-person breast cancer risk counseling. *Patient Educ Couns.* 2006;64(1-3):96-103.
135. Hou SI. Stage of adoption and impact of direct-mail communications with and without phone intervention on Chinese women's cervical smear screening behavior. *Prev Med.* 2005;41(3-4):749-756.
136. Kerr J, Patrick K, Norman G, et al. Randomized control trial of a behavioral intervention for overweight women: impact on depressive symptoms. *Depress Anxiety.* 2008;25(7):555-558.
137. Keyserling TC, Samuel Hodge CD, Jilcott SB, et al. Randomized trial of a clinic-based, community-supported, lifestyle intervention to improve physical activity and diet: the North Carolina enhanced WISEWOMAN project. *Prev Med.* 2008;46(6):499-510.
138. Keyserling TC, Samuel-Hodge CD, Ammerman AS, et al. A randomized trial of an intervention to improve self-care behaviors of African-American women with type 2 diabetes: impact on physical activity. *Diabetes Care.* 2002;25(9):1576-1583.
139. Koniak-Griffin D, Brecht ML, Takayanagi S, Villegas J, Melendrez M, Balcazar H. A community health worker-led lifestyle behavior intervention for Latina (Hispanic)

- women: feasibility and outcomes of a randomized controlled trial. *Int J Nurs Stud*. 2015;52(1):75-87.
140. Lawton BA, Rose SB, Elley CR, Dowell AC, Fenton A, Moyes SA. Exercise on prescription for women aged 40-74 recruited through primary care: two year randomised controlled trial. *BMJ*. 2008;337:a2509.
  141. Lawton BA, Rose SB, Elley CR, et al. Exercise on prescription for women aged 40-74 recruited through primary care: Two year randomised controlled trial. *BMJ*. 2009;(2009) 338(7686):88-91.
  142. Lee RE, Goldberg JH, Sallis JF, Hickmann SA, Castro CM, Chen AH. A prospective analysis of the relationship between walking and mood in sedentary ethnic minority women. *Women Health*. 2001;32(4):1-15.
  143. Lopez-Torres Hidalgo J, Sanchez Ortiz MP, Rabanales Sotos J, Simarro Herraes MJ, Lopez-Torres Lopez J, Campos Rosa M. Effectiveness of three interventions in improving adherence to cervical cancer screening. *Eur J Cancer Prev*. 2016;25(5):423-429.
  144. Manfredi C, Crittenden KS, Cho YI, Gao S. Long-term effects (up to 18 months) of a smoking cessation program among women smokers in public health clinics. *Prev Med*. 2004;38(1):10-19.
  145. Maskarinec G, Robbins C, Riola B, Kane-Sample L, Franke AA, Murphy S. Three measures show high compliance in a soy intervention among premenopausal women. *J Am Diet Assoc*. 2003;103(7):861-866.
  146. McBride CM, Scholes D, Grothaus LC, Curry SJ, Ludman E, Albright J. Evaluation of a minimal self-help smoking cessation intervention following cervical cancer screening. *Prev Med*. 1999;29(2):133-138.
  147. McClure JB, Westbrook E, Curry SJ, Wetter DW. Proactive, motivationally enhanced smoking cessation counseling among women with elevated cervical cancer risk. *Nicotine Tob Res*. 2005;7(6):881-889.
  148. Miller SM, Siejak KK, Schroeder CM, Lerman C, Hernandez E, Helm CW. Enhancing adherence following abnormal Pap smears among low-income minority women: a preventive telephone counseling strategy. *J Natl Cancer Inst*. 1997;89(10):703-708.
  149. Nies MA, Chruscial HL, Hepworth JT. An intervention to promote walking in sedentary women in the community. *Am J Health Behav*. 2003;27(5):524-535.
  150. Parra-Medina D, Wilcox S, Salinas J, et al. Results of the Heart Healthy and Ethnically Relevant Lifestyle trial: a cardiovascular risk reduction intervention for African American women attending community health centers. *Am J Public Health*. 2011;101(10):1914-1921.
  151. Paskett ED, McLaughlin JM, Lehman AM, Katz ML, Tatum CM, Oliveri JM. Evaluating the efficacy of lay health advisors for increasing risk-appropriate Pap test screening: a randomized controlled trial among Ohio Appalachian women. *Cancer Epidemiol Biomarkers Prev*. 2011;20(5):835-843.
  152. Peshkin BN, Kelly S, Nusbaum RH, et al. Patient Perceptions of Telephone vs. In-Person BRCA1/BRCA2 Genetic Counseling. *J Genet Couns*. 2016;25(3):472-482.
  153. Pierce JP, Natarajan L, Sun S, et al. Increases in plasma carotenoid concentrations in response to a major dietary change in the women's healthy eating and living study. *Cancer Epidemiol Biomarkers Prev*. 2006;15(10):1886-1892.

154. Pierce JP, Newman VA, Flatt SW, et al. Telephone counseling intervention increases intakes of micronutrient- and phytochemical-rich vegetables, fruit and fiber in breast cancer survivors. *J Nutr.* 2004;134(2):452-458.
155. Pinto BM, Papandonatos GD, Goldstein MG. A randomized trial to promote physical activity among breast cancer patients. *Health Psychol.* 2013;32(6):616-626.
156. Rigotti NA, Park ER, Regan S, et al. Efficacy of telephone counseling for pregnant smokers: a randomized controlled trial. *Obstet Gynecol.* 2006;108(1):83-92.
157. Rimer BK, Conaway M, Lyna P, et al. The impact of tailored interventions on a community health center population. *Patient Educ Couns.* 1999;37(2):125-140.
158. Rock CL, Flatt SW, Byers TE, et al. Results of the Exercise and Nutrition to Enhance Recovery and Good Health for You (ENERGY) Trial: A Behavioral Weight Loss Intervention in Overweight or Obese Breast Cancer Survivors. *J Clin Oncol.* 2015;33(28):3169-3176.
159. Rock CL, Flatt SW, Sherwood NE, Karanja N, Pakiz B, Thomson CA. Effect of a free prepared meal and incentivized weight loss program on weight loss and weight loss maintenance in obese and overweight women: a randomized controlled trial. *Jama.* 2010;304(16):1803-1810.
160. Sivarajan Froelicher ES, Miller NH, Christopherson DJ, et al. High rates of sustained smoking cessation in women hospitalized with cardiovascular disease: the Women's Initiative for Nonsmoking (WINS). *Circulation.* 2004;109(5):587-593.
161. Solomon LJ, Marcy TW, Howe KD, Skelly JM, Reinier K, Flynn BS. Does extended proactive telephone support increase smoking cessation among low-income women using nicotine patches? *Prev Med.* 2005;40(3):306-313.
162. Stein K, Lewendon G, Jenkins R, Davis C. Improving uptake of cervical cancer screening in women with prolonged history of non-attendance for screening: a randomized trial of enhanced invitation methods. *J Med Screen.* 2005;12(4):185-189.
163. Steinberg DM, Levine EL, Lane I, et al. Adherence to self-monitoring via interactive voice response technology in an eHealth intervention targeting weight gain prevention among Black women: randomized controlled trial. *J Med Internet Res.* 2014;16(4):e114.
164. Wetter DW, McClure JB, Cofta-Woerpel L, et al. A randomized clinical trial of a palmtop computer-delivered treatment for smoking relapse prevention among women. *Psychol Addict Behav.* 2011;25(2):365-371.
165. Allard NC. Day surgery for breast cancer: effects of a psychoeducational telephone intervention on functional status and emotional distress. *Oncol Nurs Forum.* 2007;34(1):133-141.
166. Aranda S, Schofield P, Weih L, Milne D, Yates P, Faulkner R. Meeting the support and information needs of women with advanced breast cancer: a randomised controlled trial. *Br J Cancer.* 2006;95(6):667-673.
167. Ashing K, Rosales M. A telephonic-based trial to reduce depressive symptoms among Latina breast cancer survivors. *Psychooncology.* 2014;23(5):507-515.
168. Bastani R, Mojica CM, Berman BA, Ganz PA. Low-income women with abnormal breast findings: results of a randomized trial to increase rates of diagnostic resolution. *Cancer Epidemiol Biomarkers Prev.* 2010;19(8):1927-1936.

169. Budin WC, Hoskins CN, Haber J, et al. Breast cancer: education, counseling, and adjustment among patients and partners: a randomized clinical trial. *Nurs Res*. 2008;57(3):199-213.
170. Caljouw MA, Hogendorf-Burgers ME. GYNOTEL: telephone advice to gynaecological surgical patients after discharge. *J Clin Nurs*. 2010;19(23-24):3301-3306.
171. Crane-Okada R, Freeman E, Kiger H, et al. Senior peer counseling by telephone for psychosocial support after breast cancer surgery: effects at six months. *Oncol Nurs Forum*. 2012;39(1):78-89.
172. Damholdt MF, Mehlsen M, O'Toole MS, Andreasen RK, Pedersen AD, Zachariae R. Web-based cognitive training for breast cancer survivors with cognitive complaints-a randomized controlled trial. *Psychooncology*. 2016;25(11):1293-1300.
173. Davison BJ, Degner LF. Feasibility of using a computer-assisted intervention to enhance the way women with breast cancer communicate with their physicians. *Cancer Nurs*. 2002;25(6):417-424.
174. Ell K, Vourlekis B, Xie B, et al. Cancer treatment adherence among low-income women with breast or gynecologic cancer: a randomized controlled trial of patient navigation. *Cancer*. 2009;115(19):4606-4615.
175. Gallagher R, McKinley S, Dracup K. Effects of a telephone counseling intervention on psychosocial adjustment in women following a cardiac event. *Heart Lung*. 2003;32(2):79-87.
176. Gustafson DH, McTavish FM, Stengle W, et al. Use and Impact of eHealth System by Low-income Women With Breast Cancer. *J Health Commun*. 2005;10 Suppl 1:195-218.
177. Hageman PA, Pullen CH, Hertzog M, Boeckner LS. Effectiveness of tailored lifestyle interventions, using web-based and print-mail, for reducing blood pressure among rural women with prehypertension: main results of the Wellness for Women: DASHing towards Health clinical trial. *Int J Behav Nutr Phys Act*. 2014;11:148.
178. Hoyer BB, Toft GV, Debess J, Ramlau-Hansen CH. A nurse-led telephone session and quality of life after radiotherapy among women with breast cancer: a randomized trial. *Open Nurs J*. 2011;5:31-37.
179. Kleiboer A, Sorbi M, van Silfhout M, et al. Short-term effectiveness of an online behavioral training in migraine self-management: A randomized controlled trial. *Behav Res Ther*. 2014;61:61-69.
180. Kristjansdottir OB, Fors EA, Eide E, et al. A smartphone-based intervention with diaries and therapist feedback to reduce catastrophizing and increase functioning in women with chronic widespread pain. part 2: 11-month follow-up results of a randomized trial. *J Med Internet Res*. 2013;15(3):e72.
181. Lin CH, Chiang SL, Heitkemper MM, et al. Effects of telephone-based motivational interviewing in lifestyle modification program on reducing metabolic risks in middle-aged and older women with metabolic syndrome: A randomized controlled trial. *Int J Nurs Stud*. 2016;60:12-23.
182. Marcus AC, Garrett KM, Cella D, et al. Can telephone counseling post-treatment improve psychosocial outcomes among early stage breast cancer survivors? *Psychooncology*. 2010;19(9):923-932.

183. Miller SM, Hui SK, Wen KY, et al. Tailored telephone counseling to improve adherence to follow-up regimens after an abnormal pap smear among minority, underserved women. *Patient Educ Couns*. 2013;93(3):488-495.
184. Mishel MH, Germino BB, Gil KM, et al. Benefits from an uncertainty management intervention for African-American and Caucasian older long-term breast cancer survivors. *Psychooncology*. 2005;14(11):962-978.
185. Pierce JP, Natarajan L, Caan BJ, et al. Influence of a diet very high in vegetables, fruit, and fiber and low in fat on prognosis following treatment for breast cancer: the Women's Healthy Eating and Living (WHEL) randomized trial. *Jama*. 2007;298(3):289-298.
186. Pierce JP, Newman VA, Natarajan L, et al. Telephone counseling helps maintain long-term adherence to a high-vegetable dietary pattern. *J Nutr*. 2007;137(10):2291-2296.
187. Salonen P, Kellokumpu-Lehtinen PL, Tarkka MT, Koivisto AM, Kaunonen M. Changes in quality of life in patients with breast cancer. *J Clin Nurs*. 2011;20(1-2):255-266.
188. Salonen P, Tarkka MT, Kellokumpu-Lehtinen PL, Astedt-Kurki P, Luukkaala T, Kaunonen M. Telephone intervention and quality of life in patients with breast cancer. *Cancer Nurs*. 2009;32(3):177-190; quiz 191-172.
189. Sjostrom M, Umefjord G, Lindholm L, Samuelsson E. Cost-effectiveness of an Internet-based treatment program for stress urinary incontinence. *Neurourol Urodyn*. 2015;34(3):244-250.
190. Sjostrom M, Umefjord G, Stenlund H, Carlbring P, Andersson G, Samuelsson E. Internet-based treatment of stress urinary incontinence: 1- and 2-year results of a randomized controlled trial with a focus on pelvic floor muscle training. *BJU Int*. 2015;116(6):955-964.
191. Sjöström M, Umefjord G, Stenlund H, et al. Internet-based treatment of stress urinary incontinence: 1- and 2-year results of a randomized controlled trial with a focus on pelvic floor muscle training. *BJU Int*. 2015;116(6):955-964.
192. Skelly AH, Carlson J, Leeman J, Soward A, Burns D. Controlled trial of nursing interventions to improve health outcomes of older African American women with type 2 diabetes. *Nurs Res*. 2009;58(6):410-418.
193. Stuifbergen AK, Blozis SA, Becker H, et al. A randomized controlled trial of a wellness intervention for women with fibromyalgia syndrome. *Clin Rehabil*. 2010;24(4):305-318.
194. Wenzel L, Osann K, Hsieh S, Tucker JA, Monk BJ, Nelson EL. Psychosocial telephone counseling for survivors of cervical cancer: results of a randomized biobehavioral trial. *J Clin Oncol*. 2015;33(10):1171-1179.
195. Ziller V, Kyvernitakis I, Knoll D, Storch A, Hars O, Hadji P. Influence of a patient information program on adherence and persistence with an aromatase inhibitor in breast cancer treatment--the COMPAS study. *BMC Cancer*. 2013;13:407.
196. Rock CL, Thomson C, Caan BJ, et al. Reduction in fat intake is not associated with weight loss in most women after breast cancer diagnosis: evidence from a randomized controlled trial. *Cancer*. 2001;91(1):25-34.
197. Parsapure R, Rahimiforushani A, Majlessi F, et al. Impact of health-promoting educational intervention on lifestyle (Nutrition behaviors, physical activity and mental health) related to vaginal health among reproductive-aged women with vaginitis. *Iranian Red Crescent Medical Journal*. 2016;18:10 Article Number: e37698.

198. Ayiasi RM, Muhumuza C, Bukonya J, Orach CG. The effect of prenatal counselling on postpartum family planning use among early postpartum women in Masindi and Kiryandongo districts, Uganda. *Pan Afr Med J*. 2015;21:138.
199. Berenson AB, Rahman M. A randomized controlled study of two educational interventions on adherence with oral contraceptives and condoms. *Contraception*. 2012;86(6):716-724.
200. Gerris J, Delvigne A, Dhont N, et al. Self-operated endovaginal telemonitoring versus traditional monitoring of ovarian stimulation in assisted reproduction: an RCT. *Hum Reprod*. 2014;29(9):1941-1948.
201. Hameed W, Azmat SK, Ali M, et al. Comparing Effectiveness of Active and Passive Client Follow-Up Approaches in Sustaining the Continued Use of Long Acting Reversible Contraceptives (LARC) in Rural Punjab: A Multicentre, Non-Inferiority Trial. *PLoS One*. 2016;11(9):e0160683.
202. Ngoc NT, Bracken H, Blum J, et al. Acceptability and feasibility of phone follow-up after early medical abortion in Vietnam: a randomized controlled trial. *Obstet Gynecol*. 2014;123(1):88-95.
203. Paul M, Iyengar K, Essén B, et al. Acceptability of home-assessment post medical abortion and medical abortion in a low-resource setting in Rajasthan, India. Secondary outcome analysis of a non-inferiority randomized controlled trial. *PLoS ONE*. 2015;10:9 Article Number: e0133354.
204. Schover LR, Rhodes MM, Baum G, et al. Sisters Peer Counseling in Reproductive Issues After Treatment (SPIRIT): a peer counseling program to improve reproductive health among African American breast cancer survivors. *Cancer*. 2011;117(21):4983-4992.
205. Smith C, Ngo TD, Gold J, et al. Effect of a mobile phone-based intervention on post-abortion contraception: a randomized controlled trial in Cambodia. *Bull World Health Organ*. 2015;93(12):842-850a.
206. Sridhar A, Chen A, Forbes ER, Glik D. Mobile application for information on reversible contraception: a randomized controlled trial. *Am J Obstet Gynecol*. 2015;212(6):774.e771-777.
207. Tsur L, Kozer E, Berkovitch M. The effect of drug consultation center guidance on contraceptive use among women using isotretinoin: a randomized, controlled study. *J Womens Health (Larchmt)*. 2008;17(4):579-584.
208. Skiadas CC, Terry K, De Pari M, et al. Does emotional support during the luteal phase decrease the stress of in vitro fertilization? *Fertil Steril*. 2011;96(6):1467-1472.
209. Bloom JR, Stewart SL, Chang S, You M. Effects of a telephone counseling intervention on sisters of young women with breast cancer. *Prev Med*. 2006;43(5):379-384.
210. Chang Y, Near AM, Butler KM, et al. Economic Evaluation Alongside a Clinical Trial of Telephone Versus In-Person Genetic Counseling for BRCA1/2 Mutations in Geographically Underserved Areas. *J Oncol Pract*. 2016;12(1):59, e51-13.
211. Jenkins J, Calzone KA, Dimond E, et al. Randomized comparison of phone versus in-person BRCA1/2 predisposition genetic test result disclosure counseling. *Genet Med*. 2007;9(8):487-495.
212. Kinney AY, Butler KM, Schwartz MD, et al. Expanding access to BRCA1/2 genetic counseling with telephone delivery: a cluster randomized trial. *J Natl Cancer Inst*. 2014;106(12).

213. Kinney AY, Steffen LE, Brumbach BH, et al. Randomized Noninferiority Trial of Telephone Delivery of BRCA1/2 Genetic Counseling Compared With In-Person Counseling: 1-Year Follow-Up. *J Clin Oncol*. 2016;34(24):2914-2924.
214. Schwartz MD, Valdimarsdottir HB, Peshkin BN, et al. Randomized noninferiority trial of telephone versus in-person genetic counseling for hereditary breast and ovarian cancer. *J Clin Oncol*. 2014;32(7):618-626.
215. White VM, Young MA, Farrelly A, et al. Randomized controlled trial of a telephone-based peer-support program for women carrying a BRCA1 or BRCA2 mutation: impact on psychological distress. *J Clin Oncol*. 2014;32(36):4073-4080.
216. Beaver K, Tysver-Robinson D, Campbell M, et al. Comparing hospital and telephone follow-up after treatment for breast cancer: randomised equivalence trial. *BMJ*. 2009;338:a3147.
217. de Bie RP, Massuger LF, Lenselink CH, Derksen YH, Prins JB, Bekkers RL. The role of individually targeted information to reduce anxiety before colposcopy: a randomised controlled trial. *BJOG*. 2011;118(8):945-950.
218. Gotay CC, Moinpour CM, Unger JM, et al. Impact of a peer-delivered telephone intervention for women experiencing a breast cancer recurrence. *J Clin Oncol*. 2007;25(15):2093-2099.
219. Ireys HT, Chernoff R, DeVet KA, Kim Y. Maternal outcomes of a randomized controlled trial of a community-based support program for families of children with chronic illnesses. *Arch Pediatr Adolesc Med*. 2001;155(7):771-777.
220. Tiwari A, Fong DY, Yuen KH, et al. Effect of an advocacy intervention on mental health in Chinese women survivors of intimate partner violence: a randomized controlled trial. *Jama*. 2010;304(5):536-543.
221. Morland LA, Mackintosh MA, Rosen CS, et al. Telemedicine versus In-Person Delivery of Cognitive Processing Therapy for Women with Posttraumatic Stress Disorder: A Randomized Noninferiority Trial. *Depress Anxiety*. 2015;32(11):811-820.
222. McFarlane J, Malecha A, Gist J, et al. Increasing the safety-promoting behaviors of abused women. *Am J Nurs*. 2004;104(3):40-50; quiz 50-41.
223. Saftlas AF, Harland KK, Wallis AB, Cavanaugh J, Dickey P, Peek-Asa C. Motivational interviewing and intimate partner violence: a randomized trial. *Ann Epidemiol*. 2014;24(2):144-150.
224. Stevens J, Scribano PV, Marshall J, Nadkarni R, Hayes J, Kelleher KJ. A Trial of Telephone Support Services to Prevent Further Intimate Partner Violence. *Violence Against Women*. 2015;21(12):1528-1547.
225. Tiwari A, Yuk H, Pang P, et al. Telephone intervention to improve the mental health of community-dwelling women abused by their intimate partners: a randomised controlled trial. *Hong Kong Med J*. 2012;18 Suppl 6:14-17.
226. Abrahams N, Jewkes R, Lombard C, Mathews S, Campbell J, Meel B. Impact of telephonic psycho-social support on adherence to post-exposure prophylaxis (PEP) after rape. *AIDS Care*. 2010;22(10):1173-1181.
227. van-Velthoven MH, Tudor Car L, Gentry S, Car J. Telephone delivered interventions for preventing HIV infection in HIV-negative persons. *Cochrane Database Syst Rev*. 2013(5):Cd009190.
228. Bandura A. *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall; 1977.

229. Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol*. 1983;51(3):390-395.
230. Pender NJ, Murdaugh CL, Parsons MA. *Health Promotion in Nursing Practice* (7th Edition). Pearson Education Inc, 2015.
231. Dahl J, Wilson KG, Luciano C, Hayes SC. *Acceptance and Commitment Therapy for Chronic Pain*. Reno, NV: Context Press, 2005.
232. Bandura A. Health promotion by social cognitive means. *Health Educ Behav*. 2004;31(2):143-164.
233. Rosenstock IM. Historical Origins of the Health Belief Model. *Health Educ Monogr*. 1974;2(4):328-335.
234. Leventhal H, Cameron L. *Behavioral theories and the problem of compliance*. Vol 101987.
235. Cohen S, Mermelstein R, Kamarck T, Hoberman H. *Social Support: Theory, Research and Applications* 1985.
236. Dutton M. *Empowering and healing the battered women: a model for assessment and intervention*. New York: Springer Publishing Co; 1992.
237. Cohen S. Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychol*. 1988;7(3):269-297.
238. Walker L. *The Battered Woman*. 1st ed: Harper & Rowe; 1979.
239. Curnow SA. The Open Window Phase: helpseeking and reality behaviors by battered women. *Appl Nurs Res*. 1997;10(3):128-135.
240. Bean-Mayberry BA, Chang CC, McNeil MA, Scholle SH. Ensuring high-quality primary care for women: predictors of success. *Womens Health Issues*. 2006;16(1):22-29.
241. Kimerling R, Bastian LA, Bean-Mayberry BA, et al. Patient-centered mental health care for female veterans. *Psychiatr Serv*. 2015;66(2):155-162.
242. Misra DP, Giurgescu C. Effects of Post-traumatic Stress Disorder on Pregnancy among US Military Veterans: Lessons for Research on Stress and Racial Disparities. *Paediatr Perinat Epidemiol*. 2017;31(3):195-197.
243. Shivakumar G, Anderson EH, Suris AM. Managing posttraumatic stress disorder and major depression in women veterans during the perinatal period. *J Womens Health (Larchmt)*. 2015;24(1):18-22.
244. Shaw JG, Asch SM, Kimerling R, Frayne SM, Shaw KA, Phibbs CS. Posttraumatic stress disorder and risk of spontaneous preterm birth. *Obstet Gynecol*. 2014;124(6):1111-1119.
245. Shaw JG, Asch SM, Katon JG, et al. Post-traumatic Stress Disorder and Antepartum Complications: a Novel Risk Factor for Gestational Diabetes and Preeclampsia. *Paediatr Perinat Epidemiol*. 2017;31(3):185-194.
246. Katon JG, Lewis L, Hercinovic S, McNab A, Fortney J, Rose SM. Improving Perinatal Mental Health Care for Women Veterans: Description of a Quality Improvement Program. *Matern Child Health J*. 2017;21(8):1598-1605.
247. U.S. Department of Veterans Affairs. Examining Patterns of Mental Health Utilization Among Pregnant and Postpartum Veterans. Video presented by Kristin Mattocks, PhD, MPH. Available at: [https://www.hsrd.research.va.gov/meetings/2017/streamed\\_sessions/Pregnant\\_postpartum.cfm](https://www.hsrd.research.va.gov/meetings/2017/streamed_sessions/Pregnant_postpartum.cfm). Accessed November 8, 2017.

248. Yano EM. A partnered research initiative to accelerate implementation of comprehensive care for women veterans: the VA women's health CREATE. *Med Care*. 2015;53(4 Suppl 1):S10-14.
249. Fox AB, Hamilton AB, Frayne SM, et al. Effectiveness of an Evidence-Based Quality Improvement Approach to Cultural Competence Training: The Veterans Affairs' "Caring for Women Veterans" Program. *J Contin Educ Health Prof*. 2016;36(2):96-103.
250. Frayne SM, Carney DV, Bastian L, et al. The VA Women's Health Practice-Based Research Network: amplifying women veterans' voices in VA research. *J Gen Intern Med*. 2013;28 Suppl 2:S504-509.
251. Goldstein KM, Vogt D, Hamilton A, et al. Practice-based research networks add value to evidence-based quality improvement. *Healthc (Amst)*. 2017.

## APPENDIX A. SEARCH STRATEGIES

PubMed search date: December 29, 2016

Set	Terms	Results
#1	("Cell Phones"[Mesh] OR "Text Messaging"[Mesh] OR "Computers, Handheld"[Mesh] OR "Telemedicine"[Mesh] OR "Mobile Applications"[Mesh] OR "mobile applications"[tiab] OR "mobile application"[tiab] OR cellphone[tiab] OR cellphones[tiab] OR ((mobile[tiab] OR cellular[tiab] OR cell[tiab]) AND (phone[tiab] OR phones[tiab] OR device[tiab] OR devices[tiab] OR app[tiab] OR apps[tiab])) OR mobiles[tiab] OR smartphone[tiab] OR smartphones[tiab] OR telephone[tiab] OR telephones[tiab] OR phone[tiab] OR phones[tiab] OR e-health[tiab] OR ehealth[tiab] OR m-health [tiab] OR mhealth[tiab] OR telehealth[tiab] OR telemedicine[tiab] OR video-conference[tiab] OR videoconference[tiab] OR video-conferencing[tiab] OR videoconferencing[tiab] OR "automated telephone"[tiab] OR IVR[tiab] OR "interactive voice response"[tiab] OR sms[tiab] OR skype[tiab] OR (text[tiab] AND (message[tiab] OR messages[tiab]))) OR texts[tiab] OR mms[tiab] OR blackberry[tiab] OR ipad[tiab] OR ipads[tiab] OR android[tiab] OR laptop[tiab] OR laptops[tiab] OR ((tablet[tiab] OR tablets[tiab]) AND (computer[tiab] OR computers[tiab] OR device[tiab] OR devices[tiab])))	144064
#2	women[mesh] OR "Reproductive Health Services"[Mesh] OR "Women's Health"[Mesh] OR "Women's Health Services"[Mesh] OR "Gynecologic Surgical Procedures"[Mesh] OR "Pregnancy"[Mesh] OR "Pregnancy Complications"[Mesh] OR "Pregnant Women"[Mesh] OR "Mammography"[Mesh] OR "Gynecological Examination"[Mesh] OR "Female Urogenital Diseases"[Mesh] OR "Breast Diseases"[Mesh] OR "Breast Feeding"[Mesh] OR "Lactation"[Mesh] OR "Contraception"[Mesh] OR "Contraceptives, Oral"[Mesh] OR "Depression, Postpartum"[Mesh] OR "Uterine Cervical Neoplasms"[Mesh] OR "Papanicolaou Test"[Mesh] OR "Breast Neoplasms"[Mesh] OR "Sex Offenses"[Mesh] OR "Domestic Violence"[Mesh] OR "Intimate Partner Violence"[Mesh] OR "Migraine Disorders"[Mesh] OR "Genetic Counseling"[Mesh] OR "Fibromyalgia"[Mesh] OR women[ti] OR colposcopy[tiab] OR pregnancy[tiab] OR pregnant[tiab] OR breastfeeding[tiab] OR "breast feeding"[tiab] OR lactation[tiab] OR "breast health"[tiab] OR prenatal[tiab] OR "reproductive health"[tiab] OR "family planning"[tiab] OR contraception[tiab] OR contraceptive[tiab] OR contraceptives[tiab] OR "postpartum depression"[tiab] OR "gestational diabetes"[tiab] OR preeclampsia[tiab] OR "pre-eclampsia"[tiab] OR preconception[tiab] OR "pre-conception"[tiab] OR perinatal[tiab] OR maternal[tiab] OR "cervical cancer"[tiab] OR "Papanicolaou Test"[tiab] OR "pap test"[tiab] OR "Breast cancer"[tiab] OR "intimate partner violence"[tiab] OR rape[tiab] OR (sexual[tiab] AND (violence[tiab] OR trauma[tiab])) OR migraine[tiab] OR migraines[tiab] OR "genetic counseling"[tiab] OR fibromyalgia[tiab]	2641700
#3	#1 AND #2	13936
#4	telecolposcopy[tiab] OR "tele-colposcopy"[tiab] OR telegynecology[tiab] OR "telegynecology"[tiab] OR "telemental health"[tiab] OR "tele mental health"[tiab] OR telepharmacy[tiab] OR "tele-pharmacy"[tiab] OR "teleprimary care"[tiab] OR "tele primary care"[tiab] OR "telewellness"[tiab] OR "tele wellness"[tiab] OR "telecare coordination"[tiab] OR "tele care coordination"[tiab]	200
#5	#3 OR #4	14119
#6	(systematic[subset] OR "meta-analysis"[Publication Type] OR "meta-analysis as topic"[MeSH Terms] OR "meta-analysis"[tiab] OR "meta-analyses"[tiab] OR randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR randomised[tiab] OR randomization[tiab] OR randomisation[tiab] OR randomly[tiab] OR trial[tiab] OR groups[tiab] OR "Comparative Study"[Publication Type] OR "Controlled Clinical Trial"[Publication Type] OR Nonrandom[tiab] OR non-random[tiab] OR nonrandomized[tiab] OR non-randomized[tiab] OR nonrandomized[tiab] OR non-randomised[tiab] OR quasi-experiment*[tiab] OR quasiexperiment*[tiab] OR quasirandom*[tiab] OR quasi-random*[tiab] OR quasi-	3258507



Set	Terms	Results
	control*[tiab] OR quasicontrol*[tiab] OR (controlled[tiab] AND (trial[tiab] OR study[tiab])) NOT (animals[mh] NOT humans[mh]) NOT (Editorial[ptyp] OR Letter[ptyp] OR Case Reports[ptyp] OR Comment[ptyp])	
#7	#5 AND #6	5038
#8	#7 NOT (("Adolescent"[Mesh] OR "Child"[Mesh] OR "Infant"[Mesh]) NOT "Adult"[Mesh]) AND English[la]	4486

**Embase search date: December 29, 2016**

Set	Terms	Results
#1	'mobile phone'/exp OR 'text messaging'/exp OR 'personal digital assistant'/exp OR 'telemedicine'/exp OR 'mobile application'/exp OR 'mobile applications':ab,ti OR 'mobile application':ab,ti OR cellphone:ab,ti OR cellphones:ab,ti OR ((mobile:ab,ti OR cellular:ab,ti OR cell:ab,ti) AND (phone:ab,ti OR phones:ab,ti OR device:ab,ti OR devices:ab,ti OR app:ab,ti OR apps:ab,ti)) OR mobiles:ab,ti OR smartphone:ab,ti OR smartphones:ab,ti OR telephone:ab,ti OR telephones:ab,ti OR phone:ab,ti OR phones:ab,ti OR 'e health':ab,ti OR ehealth:ab,ti OR 'm-health':ab,ti OR mhealth:ab,ti OR telehealth:ab,ti OR telemedicine:ab,ti OR 'video conference':ab,ti OR videoconference:ab,ti OR 'video conferencing':ab,ti OR videoconferencing:ab,ti OR 'automated telephone':ab,ti OR IVR:ab,ti OR 'interactive voice response':ab,ti OR sms:ab,ti OR skype:ab,ti OR (text:ab,ti AND (message:ab,ti OR messages:ab,ti)) OR texts:ab,ti OR mms:ab,ti OR blackberry:ab,ti OR ipad:ab,ti OR ipads:ab,ti OR android:ab,ti OR laptop:ab,ti OR laptops:ab,ti OR ((tablet:ab,ti OR tablets:ab,ti) AND (computer:ab,ti OR computers:ab,ti OR device:ab,ti OR devices:ab,ti))	186383
#2	'female'/mj OR 'maternal health service'/exp OR 'birth control'/exp OR 'women`s health'/exp OR 'prepregnancy care'/exp OR 'prenatal care'/exp OR 'pregnancy'/exp OR 'gynecologic surgery'/exp OR 'pregnancy disorder'/exp OR 'gynecological examination'/exp OR 'mammography'/exp OR 'urogenital tract disease'/exp OR 'breast disease'/exp OR 'breast feeding'/exp OR 'breast feeding education'/exp OR 'lactation'/exp OR 'lactation disorder'/exp OR 'oral contraceptive agent'/exp OR 'puerperal depression'/exp OR 'uterine cervix cancer'/exp OR 'Papanicolaou test'/exp OR 'breast cancer'/exp OR 'sexual crime'/exp OR 'domestic violence'/exp OR 'migraine'/exp OR 'genetic counseling'/exp OR 'fibromyalgia'/exp OR women:ti OR colposcopy:ab,ti OR pregnancy:ab,ti OR pregnant:ab,ti OR breastfeeding:ab,ti OR 'breast feeding':ab,ti OR lactation:ab,ti OR 'breast health':ab,ti OR prenatal:ab,ti OR 'reproductive health':ab,ti OR 'family planning':ab,ti OR contraception:ab,ti OR contraceptive:ab,ti OR contraceptives:ab,ti OR 'postpartum depression':ab,ti OR 'gestational diabetes':ab,ti OR preeclampsia:ab,ti OR 'pre eclampsia':ab,ti OR preconception:ab,ti OR 'pre conception':ab,ti OR perinatal:ab,ti OR maternal:ab,ti OR 'cervical cancer':ab,ti OR 'Papanicolaou Test':ab,ti OR 'pap test':ab,ti OR 'Breast cancer':ab,ti OR 'intimate partner violence':ab,ti OR rape:ab,ti OR (sexual:ab,ti AND (violence:ab,ti OR trauma:ab,ti)) OR migraine:ab,ti OR migraines:ab,ti OR 'genetic counseling':ab,ti OR fibromyalgia:ab,ti	4111241
#3	#1 AND #2	23689
#4	telecolposcopy:ab,ti OR 'tele colposcopy':ab,ti OR telegynecology:ab,ti OR 'tele gynecology':ab,ti OR 'telemental health':ab,ti OR 'tele mental health':ab,ti OR telepharmacy:ab,ti OR 'tele pharmacy':ab,ti OR 'teleprimary care':ab,ti OR 'tele primary care':ab,ti OR 'telewellness':ab,ti OR 'tele wellness':ab,ti OR 'telecare coordination':ab,ti OR 'tele care coordination':ab,ti	250
#5	#3 OR #4	24079
#6	'evidence based medicine'/exp OR 'systematic review':ab,ti OR 'meta-analysis':ab,ti OR 'meta-analyses':ab,ti OR 'crossover procedure'/exp OR 'double blind procedure'/exp OR 'single blind procedure'/exp OR random*:ab,ti OR factorial*:ab,ti OR crossover*:ab,ti OR (cross NEAR/1 over*):ab,ti OR placebo*:ab,ti OR (doubl* NEAR/1 blind*):ab,ti OR (singl* NEAR/1 blind*):ab,ti OR assign*:ab,ti OR allocat*:ab,ti OR volunteer*:ab,ti OR 'clinical study'/exp OR 'clinical trial':ti,ab OR	5462927

Set	Terms	Results
	'clinical trials':ti,ab OR 'controlled study'/exp OR 'comparative study'/exp OR Nonrandom:ab,ti OR non-random:ab,ti OR nonrandomized:ab,ti OR non-randomized:ab,ti OR nonrandomized:ab,ti OR non-randomised:ab,ti OR quasi-experiment*:ab,ti OR quasiexperiment*:ab,ti OR quasirandom*:ab,ti OR quasirandom*:ab,ti OR quasi-control*:ab,ti OR quasicontrol*:ab,ti OR (controlled:ab,ti AND (trial:ab,ti OR study:ab,ti)) AND [humans]/lim AND [english]/lim NOT ('case report'/exp OR 'case study'/exp OR 'editorial'/exp OR 'letter'/exp OR 'note'/exp OR [conference abstract]/lim)	
<b>#7</b>	#5 AND #6	<b>10238</b>
<b>#8</b>	#7 AND ([young adult]/lim OR [adult]/lim OR [middle aged]/lim OR [aged]/lim OR [very elderly]/lim)	<b>7190</b>
<b>#9</b>	#8 AND [embase]/lim NOT [medline]/lim	<b>1110</b>

## APPENDIX B. PEER REVIEW COMMENTS

Question Text	Reviewer Number	Comment	Response
Are the objectives, scope, and methods for this review clearly described?	1	Yes	Acknowledged
	3	Yes	Acknowledged
	4	Yes	Acknowledged
	5	No - The inclusions/exclusions criteria for study design are quite rigorous so that few non-RCTs were included. The objectives and scope should be modified to more accurately reflect this very focused review. The study selection and data abstraction sections are likely to be confusing to some readers.	Thank you for this point and the need for clarification. For this evidence map, we used EPOC criteria* to identify study designs that provide higher quality information to inform the guiding question. Of note, EPOC does allow non-RCTs, though admittedly we did not identify many.  *Effective Practice and Organisation of Care (EPOC). EPOC Resources for review authors. Oslo: Norwegian Knowledge Centre for the Health Services; 2015. Available at: <a href="http://epoc.cochrane.org/epoc-specific-resources-review-authors2015">http://epoc.cochrane.org/epoc-specific-resources-review-authors2015</a> .
	6	Yes	Acknowledged
	8	Yes	Acknowledged
Is there any indication of bias in our synthesis of the evidence?	1	No	Acknowledged
	3	No	Acknowledged
	4	No	Acknowledged
	5	No	Acknowledged
	6	No	Acknowledged
	8	No	Acknowledged
Are there any <u>published</u> or <u>unpublished</u> studies that we may have overlooked?	1	Yes - The report clearly states that the objective is "to describe the current landscape of telehealth interventions that have been designed specifically for women". However, does it make sense to acknowledge (and perhaps also list/review) the telehealth trials/research that included both men and women veterans? While some health areas in the report are clearly female sex specific, whereas mental health, for example, is not. Some of the extant studies report sex differences in outcomes, which are germane for informing programs and improvements in treatment	This reviewer brings up a key distinction that we gave a significant amount of thought to in the design of this map. There were a couple of reasons that we did not include gender-neutral studies that may have included sex-based analyses. First, this project was developed in response to a question from our operational partners that specifically asked about telehealth interventions "designed specifically for women." If an intervention included both men and women—but was not designed specifically for women or for a female-predominant condition—then we considered it not to be designed for



Question Text	Reviewer Number	Comment	Response
		<p>delivery for both women and men. A rationale for why NOT to include studies with both sexes may be helpful or at least acknowledgement of this limitation.</p>	<p>women in particular. Second, in a previous ESP project, we conducted an evidence map assessing sex and gender-based analysis in trials of depression, diabetes and chronic pain.* In that evidence map, we found that only 10% of eligible reviews including analyses of sex effects. We agree that adding this rationale to the report is important and have done so in the methods section under “topic development” and in the limitations.</p> <p>*Duan-Porter W, et al. Reporting of Sex Effects by Systematic Reviews on Interventions for Depression, Diabetes, and Chronic Pain. <i>Ann Intern Med.</i> 2016 Aug 2;165(3):184-93. doi: 10.7326/M15-2877. Epub 2016 Apr 26. PubMed PMID: 27111355.</p>
	3	No	Acknowledged
	4	No	Acknowledged
	5	<p>Yes - The criteria were strict in terms of study design so that few non-RCTs were included. Care should be taken in stating the objectives and summary to state the effect of these strict criteria on the body of literature included. For example, RCTs are much easier to conduct with randomized patient groups rather than provider or system groups, thus it is not surprising that the findings overwhelmingly include patient groups and not provider or system groups. Likewise RCTs are easier to implement with short-duration interventions and telephone interventions. Thus, the interpretation of the existing literature is likely biased by adhering to this strict criteria. And the studies selected clearly do not reflect the entire literature. I suggest that the authors be a little clearer in stating the conclusions but also the objective of the evidence map - it is a selected evidence map reflecting the most rigorous study designs. This does not lessen its importance, but its strict focus must be made clear and the conclusions should be interpreted in this light.</p>	<p>As noted above, we focused on the inclusion of studies meeting EPOC criteria, which allows for inclusion of non-RCT designs (nonrandomized controlled trials, controlled before-after CBA, interrupted time series, and repeated measures studies). We allowed provider- and system-focused trial designs, but did not find many meeting the EPOC standards. We agree there may be more provider- and system-focused trials that were observational or other designs without a comparator group that we did not include and that much could be learned from this literature. However, as our operational partners were interested in understanding the scope of existing literature that could contribute to our understanding of the effectiveness of telehealth interventions, we limited those studies we included to those that could potentially provide this information. We have added this caveat in the limitations as suggested.</p>
	6	No	Acknowledged



Question Text	Reviewer Number	Comment	Response
	8	No	Acknowledged
Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.	1	Please define "virtual visits". This term has several possible meaning these days, including web-based services, virtual reality, and others.	We agree that terms such as "virtual visit" can have many different interpretations. We have replaced this term in the introduction for specific examples of the types of telehealth that the VA supports.
		This is an excellent report. Thank you.	Thank you.
	3		
	4	<p>This was an excellent report. I just had a few minor comments:</p> <p>1) I am not sure how much the length of the intervention matters, it seems like this would depend on the condition/population being targeted so in aggregate isn't too informative. Is there a way to look instead at intensity of the intervention (number of contacts, number of potential contacts, or similar)?</p> <p>2) In the intro you provide a sentence for an overview of telehealth, but it might be helpful to have a more</p>	<p>1) We agree that understanding the dose or intensity of a telehealth intervention might be more informative than the length of the intervention. However, we did not collect this information for a couple of reasons. First, based on prior work on a health coaching systematic review,* we found collecting this kind of information to be tremendously challenging. Interventions often do not report this information consistently or at all and because different interventions may use entirely different modalities (eg, fax vs telephone vs SMS/text messaging) it is not clear how to compare this across modality. Further, we know that publications about interventions rarely describe the dose of an intervention.** In the case of this evidence map, we found that intervention intensity as planned per protocol and adherence to the planned intervention was not commonly reported.</p> <p>* Gierisch JM, et al. The Effectiveness of Health Coaching. VA ESP Project #09-009; 2016                  **King H., BOSWORTH (2015). Treatment Fidelity in Health Services Research. In Sanetti L (ed.) Treatment Integrity: Conceptual, Methodological, and Applied Considerations for Practitioners. Washington DC, American Psychological Association. Pp. 15-34.</p> <p>2) Thank you. We have further delineated what telehealth is in the Introduction. We have added the</p>



Question Text	Reviewer Number	Comment	Response
		<p>formal definition and references (inclusion and exclusion criteria do provide this indirectly, but having 1-2 sentences would be helpful.</p> <p>3) on page 44 there is mention made of the challenges for pregnant veterans related to mental health. I think that the references you want are:                      Shaw, J. G., et al. (2014). "Posttraumatic stress disorder and risk of spontaneous preterm birth." <i>Obstet Gynecol</i> 124(6): 1111-1119.                      Shaw, J. G., et al. (2017). "Post-traumatic Stress Disorder and Antepartum Complications: a Novel Risk Factor for Gestational Diabetes and Preeclampsia." <i>Paediatr Perinat Epidemiol</i> 31(3): 185-194.                      and possibly:                      Katon, J. G., et al. (2017). "Improving Perinatal Mental Health Care for Women Veterans: Description of a Quality Improvement Program." <i>Matern Child Health J</i> 21(8): 1598-1605.                      Mattocks, K. M., et al. (2017). "Implementing and Evaluating a Telephone-Based Centralized Maternity Care Coordination Program for Pregnant Veterans in the Department of Veterans Affairs." <i>Womens Health Issues</i>.</p> <p>Otherwise there were a few minor typos, but it was an excellent report.</p>	<p>following from HRSA "According to Health Resources and Service Administration (HRSA),* telehealth is defined as "the use of electronic information and telecommunication technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health and health administration."</p> <p><a href="https://www.hrsa.gov/rural-health/telehealth/index.html">*https://www.hrsa.gov/rural-health/telehealth/index.html</a></p> <p>3) Thank you for these references, we have added them as suggested in the report.</p>
	5	<p>1) Overall, this is a very well conducted evidence map and report. My comments are largely suggestions to clarify some of the text for the reader.</p> <p>2) Abstract, page 1, line 26 – It would help the reader if a little bit of information is given on what the</p>	<p>1) Thank you</p> <p>2) We appreciate this suggestion and have added content at this location to clarify the criteria used.</p>

Question Text	Reviewer Number	Comment	Response
		<p>predetermined criteria are, since these criteria have a major impact on the evidence map.</p> <p>3) Abstract, page 2, line 33 and elsewhere – IPV should be spelled out since it is not an obvious abbreviation to all readers.</p> <p>4) Study Selection, page 4 – This paragraph is a little confusing. For example, the sentence beginning on line 38 is not clear whether the inter-rater reliability was computed at the title/abstract stage or at an early stage of full-text screening. And it is not clear whether the dual-review process specifically involved the single trained reviewer plus the second review on 20% or something else. Also, it becomes obvious later on that all inclusion criteria needed to be met but this should be explicitly stated and whether missing information on criteria was or was not a reason for exclusion.</p> <p>5) Table 1 is very clear.</p> <p>6) Data Abstraction, page 6 line 36 – Reaching consensus on only 10% of cases does not help with any discrepancies that might have arisen on the remaining 90% had they been reviewed. I completely understand the work involved in this type of undertaking, but the study selection and data abstraction processes largely involved a single person, which could have led to missed literature and/or misstated data and this should be clearly stated as a limitation.</p> <p>7) Results, page 8 and 9 – Figure 1 is clear. The presentation of findings is clearly organized and will be particularly helpful to the reader. Table 2 is a useful summary of the classification of studies.</p> <p>8) Key Question, page 9 line 4 – Since the inclusion</p>	<p>3) This suggestion is appreciated and we have made the recommended changes.</p> <p>4) We understand this section being confusing and have clarified it as suggested. If we could not confirm that a particular study met our inclusion criteria due to missing information, we excluded it. We have added this to the methods description.</p> <p>5) Thank you.</p> <p>6) We have added this as a limitation.</p> <p>7) Thank you. We are glad the reviewer found this helpful.</p> <p>8) We have added this to the limitations. Further, we</p>

Question Text	Reviewer Number	Comment	Response
		<p>criteria were quite rigorous in terms of study sample size and research design, which led to very few non RCTs being included, the findings are really limited to large RCTs. Thus, the Key Question should be modified to reflect that the evidence summarized was the most rigorous of studies.</p> <p>9) Figure 2, page 11 – It will help the reader if all figures of this type are enlarged. I suggest moving Panel IV to follow Panel I. Panel IV includes two items that are more reflective of the sample characteristics and thus will nicely follow Panel I. I suggest that Panel V be labeled “Outcome Level” to be clearer to the reader. Note that Figures 5 and 6 are in the opposite order of Panels III and IV.</p> <p>10) Systematic Review Findings, page 12 – Specific references and findings are provided here but nowhere else, and since this comes early in the report it will likely confuse the reader. I suggest deleting this level of detail. I also suggest moving the systematic review findings section for maternal health to come at the end of this section as you have done in the Intimate Partner Violence section.</p> <p>11) Limitations, page 39, line 8 – This last sentence is very important and should appear in the objectives and be reflected in the Key Question.</p> <p>12) Research Gaps/Future Research, page 39, line 37 – Here is an example of the implication of only including “studies of higher methodological rigor such as RCTs”. RCTs are difficult to conduct and randomizing patients is much easier than randomizing providers or systems.</p>	<p>have clarified that our original intent was to map the literature assessing the effectiveness of telehealth strategies for women in our key question, abstract, and Methods. Thus, inclusion of EPOC studies is most relevant.</p> <p>9) We appreciate these suggestions to improve the usefulness and clarity of our figures and have made the adjustments as noted.</p> <p>10) We appreciate that the reviewer identified this difference in detail for the systematic review sections. We elected to keep this additional detail in these areas as we hoped it would provide a small amount of information about efficacy which was limited by the nature of this evidence map.</p> <p>11) As noted above, we agree that this caveat needs to be acknowledged and have added it to the limitations section. Further, we have clarified our original intent and added language about mapping the literature assessing the effectiveness of interventions approaches to the abstract, Methods and key question.</p> <p>12) As noted, we have added detail in the objectives about the rationale for included studies of higher methodologic rigor, including nonrandomized designs as recommended by EPOC to assess system-level interventions.</p>

Question Text	Reviewer Number	Comment	Response
		<p>13) Also, only including studies with over 100 participants, means that the participants are likely to be patients rather than providers or systems. Also, the fact that the interventions tended to be by phone and of brief duration is likely a result of the studies being RCTs. This results in a chicken-and-egg situation where the inclusion/exclusion criteria were so strict that they drove the type of literature that was included. A reader might interpret the Research Gaps/Future Research section as suggesting that only a small literature on other outcomes and on non-telephone interventions exists, which could be a faulty conclusion. I am not suggesting that this report lacks merit – it is well done and a definite contribution – I am only suggesting that a few statements in the Key Question and Discussion section be qualified more clearly.</p> <p>14) Appendix C was clearly a lot of work – I did not see it discussed anywhere.</p>	<p>13) We acknowledge that this is a valid concern. For clarification, we note that the inclusion criteria was operationalized to mean that studies had to include at least 100 patients participants even if the unit of randomization or study was providers or systems. However, you are right that the unit of analysis was the patient. We have added clarification about the rationale for our approach and strengthened the discussion of this limitation.</p> <p>14) Thank you. The results of this table are discussed in the context of the finding of the focused areas of research. We also direct readers to this table at the beginning of the results section so they can see the individual studies, and some key characteristics, associated with each focused area of research.</p>
	6	<p>1) Regarding potential for overlooked studies, it seems they did a comprehensive search, but I am not sure when I say no to item above on "any published or unpublished studies.</p> <p>2) A more definitive set of suggestions for specific VA sponsored research would be a useful addition perhaps considering the potential power of the VA for multi-institutional trials leveraging the quite ubiquitous telemedicine applications and what levels of participation or design to address the identified gaps</p>	<p>1) Thank you. We sought to do a thorough mapping of this literature.</p> <p>2) We appreciate this suggestion and agree that this would be a useful addition to the report. Thus, we have added content to suggest that given the nature of the large and diverse VA care system and the extent to which the VA has invested in telehealth modalities, there are many opportunities to pursue multi-site trials.</p>

Question Text	Reviewer Number	Comment	Response
		<p>might be considered.</p> <p>3) Also useful would be the age of the publications - what is the spectrum of currency of the literature reviewed?</p>	<p>We cite prior studies that have utilized multi-site approaches to study approaches to care provision as examples that could be considered in developing women's telehealth specific studies.* Specifically we point to infrastructures such as the WH-PBRN as a possible resource for pursuing a multisite trial of telehealth services for women.</p> <p>*Goldstein KM, et al. Practice-based research networks add value to evidence-based quality improvement. Healthc (Amst). 2017.</p> <p>3) As noted in the methods section, our search strategy was limited by the inception date of the databases used. Of those studies found meeting inclusion criteria, the earliest study was published in 1987 and the search is current through December 2016. The publication dates of included studies are listed in Table 2.</p>
	8	<p>1) The topic is very timely and important to the VA, for reasons discussed in the review.</p> <p>2) The review would have benefited from a clear definition (and differentiation) of the various virtual care technologies (e.g., telemedicine, telehealth, eHealth, mHealth) and to use this definition to describe the studies.</p> <p>3) In addition, it would have been helpful to see specific search terms.</p> <p>4) Looking forward, a limitation of the literature (and thus the review) is that 86% of the studies focused on telephone as the telemedicine technology. Thus, relatively little can be concluded about more innovative forms of telemedicine, beyond the telephone</p>	<p>1) Thank you.</p> <p>2) We agree that the term telehealth can be used a number of different ways and clarifying this aspect of our project is key. We have added a clear definition to the topic development section that pulls together the inclusion criteria we used and identifies the terminology that we use throughout the rest of the report.</p> <p>3) Exact search terms are in Appendix A.</p> <p>4) We agree that this is a significant gap in the literature and have added emphasis to this point in the section on "research gaps/future research."</p>

Question Text	Reviewer Number	Comment	Response
		<p>5) Only thrice (page 22 – disease management; page 28 – mental health; page 31 IPV) did the review mention what % of studies were VA studies. Moreover, the location of this information was not consistent. I suggest adding a bullet to each key point stating % of studies conducted with Veterans or VA enrollees.</p> <p>6) The biggest weakness of the review is that while the outcomes measured were reported, no actual intervention effects were reviewed. Where the primary outcomes improved? What was the effect size? Did the secondary outcomes improve and what was the effect size? This is listed as a limitation by the authors, but the justification for not reporting outcomes seemed weak/non-existent. Given that the studies were categorized into fairly homogenous groups, outcomes could have been examined.</p> <p>7) Figures 13-16 seemed redundant with the figures presented earlier.</p>	<p>5) We agree that this is an important point, and have added a bullet in the key points about the number of studies for each section that was conducted in the Veteran population.</p> <p>6) We appreciate and understand the interest in an exploration and meta-analysis of actual intervention effects. However, given the nature of this project as an evidence map rather than a systematic review, this level of analysis was beyond the scope of what was requested by our operations partners. The purpose of an evidence map* is not to provide the summary estimates of effects but to conduct “a systematic search of a broad field to identify gaps in knowledge and/or future research needs that presents results in a user-friendly format, often a visual figure or graph, or a searchable database.” We have added clarification about this intent in the “topic development” section to clarify this approach for readers.</p> <p>* Miake-Lye IM, et al. What is an evidence map? A systematic review of published evidence maps and their definitions, methods, and products. Syst Rev. 2016;5:28.</p> <p>7) Figures 13-16 do provide previously presented information, however organized into a different way to facilitate additional comparisons. In the body of the results, we present study characteristics by focused research area (eg, maternal health, prevention). For the summary, we chose to reorganize this information to allow for synthesis across all the areas of research within women’s telehealth by key study characteristics to offer a user-friendly way to compare across focused areas of research.</p>

## APPENDIX C. STUDY CHARACTERISTICS TABLE

This table shows characteristics for the 209 primary studies by the 7 focused areas of research. For full study citations, please refer to the report's main reference list.

Study	Study N	Primary Telehealth Modality	Outcome Level(s)	Setting(s)
<b>Maternal Health (n=81)</b>				
Ahmed, 2016 <sup>35</sup>	141	Interactive website	Patient	Inpatient
Albright, 2014 <sup>36</sup>	311	Phone	Patient	Community
Alemi, 1996 <sup>37</sup>	178	Interactive website	Patient	Outpatient
Althuizen, 2013 <sup>38</sup>	119	Phone	Patient	Outpatient
Amiri, 2016 <sup>39</sup>	100	Phone	Patient	Outpatient
Bagherinia, 2016 <sup>40</sup>	136	Phone	Patient	Outpatient
Bartholomew, 2015 <sup>111</sup>	100	Phone	Patient	Inpatient
Brooten, 2001 <sup>41</sup>	173	Phone	Patient, system	Inpatient
Bryce, 1991 <sup>42</sup>	1970	Phone	Patient	Outpatient
Bunik, 2010 <sup>43</sup>	341	Phone	Patient	Outpatient
Carlsen, 2013 <sup>44</sup>	226	Phone	Patient, system	Inpatient
Chapman, 2004 <sup>45</sup>	219	Phone	Patient	Outpatient
Cummins, 2016 <sup>46</sup>	1173	Phone	Patient	Community
Cupples, 2011 <sup>47</sup>	343	Phone	Patient	Outpatient
Curry, 2006 <sup>48</sup>	489	Phone	Patient	Outpatient
Dalfra, 2009 <sup>49</sup>	276	Phone	Patient	Outpatient
Dennis, 2002 <sup>50</sup>	256	Phone	Patient, provider	Community
Dennis, 2002 <sup>51</sup>	256	Phone	Patient	Inpatient
Dennis, 2009 <sup>52</sup>	701	Phone	Patient	Community
Dodd, 2014 <sup>53</sup>	2212	Phone	Patient	Outpatient
Dornelas, 2006 <sup>54</sup>	105	Phone	Patient, system	Outpatient
Eden, 2014 <sup>55</sup>	131	Interactive website	Patient	Community

Study	Study N	Primary Telehealth Modality	Outcome Level(s)	Setting(s)
Efrat, 2015 <sup>56</sup>	289	Phone	Patient	Community
Ershoff, 1999 <sup>33</sup>	390	Phone	Patient	Outpatient
Fenwick, 2015 <sup>57</sup>	339	Phone	Patient	Outpatient
Ferrara, 2016 <sup>58</sup>	2280	Phone	Patient, system	Outpatient
Frank, 1987 <sup>59</sup>	343	Phone	Patient	Outpatient
Fu, 2014 <sup>60</sup>	722	Phone	Patient	Inpatient
Gao, 2015 <sup>65</sup>	180	Phone	Patient	Inpatient
Gao, 2012 <sup>64</sup>	194	Phone	Patient	Outpatient
Gao, 2010 <sup>63</sup>	194	Phone	Patient	Outpatient
Gagnon, 1997 <sup>61</sup>	183	Phone	Patient	Outpatient
Gamble, 2005 <sup>62</sup>	103	Phone	Patient	Outpatient
Giallo, 2014 <sup>66</sup>	202	Phone	Patient	Community
Gu, 2016 <sup>67</sup>	352	Phone	Patient	Inpatient
Hannan, 2016 <sup>68</sup>	129	Phone	Patient, system	Inpatient
Hannover, 2009 <sup>69</sup>	871	Phone	Patient	Inpatient
Hillesund, 2016 <sup>70</sup>	606	Phone	Patient	Outpatient
Huang, 2013 <sup>71</sup>	355	Phone	Patient	Outpatient
Janssen, 2006 <sup>73</sup>	1459	Phone	Patient	Outpatient
Janssen, 2013 <sup>72</sup>	1459	Phone	Patient	Outpatient
Jiang, 2014 <sup>74</sup>	582	SMS/text messaging	Patient	Community
Jiang, 2014 <sup>75</sup>	771	Phone	Patient	Community
Jordan, 2015 <sup>76</sup>	18,186	SMS/text messaging	Patient	Community
Kamalifard, 2013 <sup>77</sup>	100	Phone	Patient	Community
Lewis, 2014 <sup>78</sup>	130	Phone	Patient	Community
Lund, 2012 <sup>79</sup>	2550	SMS/text messaging	System	Outpatient
Mangwi Ayiasi, 2016 <sup>80</sup>	1385	Phone	Patient, system	Community
Maslowsky, 2016 <sup>81</sup>	178	Phone	Patient	Inpatient
McBride, 2004 <sup>82</sup>	583	Phone	Patient	Other

<b>Study</b>	<b>Study N</b>	<b>Primary Telehealth Modality</b>	<b>Outcome Level(s)</b>	<b>Setting(s)</b>
Milgrom, 2011 <sup>83</sup>	143	Phone	Patient	Outpatient
Mohammad-Alizadeh-Charandabi, 2013 <sup>84</sup>	366	Phone	Patient	Inpatient
Moore, 1998 <sup>85</sup>	1544	Phone	Patient, system	Community
Muender, 2000 <sup>86</sup>	1544	Phone	Patient, system	Community
Naughton, 2012 <sup>87</sup>	207	SMS/text messaging	Patient	Community
Ngai, 2016 <sup>89</sup>	397	Phone	Patient	Inpatient
Ngai, 2015 <sup>88</sup>	397	Phone	Patient	Inpatient
Niela-Vilen, 2016 <sup>90</sup>	124	Facebook	Patient	Other
Oakley, 1990 <sup>91</sup>	509	Phone	Patient	Outpatient
Odeny, 2014 <sup>92</sup>	388	SMS/text messaging	System	Outpatient
O'Reilly, 2016 <sup>93</sup>	573	Phone	Patient	Community
Ostbye, 2009 <sup>94</sup>	450	Phone	Patient	Outpatient
Phelan, 2014 <sup>95</sup>	401	Phone	Patient	Outpatient
Phelan, 2011 <sup>96</sup>	401	Phone	Patient	Outpatient
Reeder, 2014 <sup>21</sup>	1885	Phone	Patient	Community
Sagedal, 2017 <sup>99</sup>	606	Phone	Patient	Outpatient
Sagedal, 2016 <sup>98</sup>	606	Phone	Patient	Outpatient
Sagedal, 2017 <sup>97</sup>	606	Phone	Patient	Community
Seguranyes, 2014 <sup>100</sup>	1598	Video conference to home	Patient, system	Outpatient
Serwint, 1991 <sup>101</sup>	251	Phone	Patient	Outpatient
Simmons, 2016 <sup>17</sup>	436	Phone	Patient	Outpatient
Snaith, 2014 <sup>22</sup>	840	Phone	Patient, provider	Community
Srinivas, 2015 <sup>102</sup>	103	Phone	Patient	Outpatient
Stotts, 2002 <sup>103</sup>	269	Phone	Patient, system	Community
Surkan, 2012 <sup>104</sup>	679	Phone	Patient	Community
Tahir, 2013 <sup>105</sup>	357	Phone	Patient	Inpatient
Takeuchi, 2016 <sup>106</sup>	161	Mobile application	Patient	Inpatient

Study	Study N	Primary Telehealth Modality	Outcome Level(s)	Setting(s)
Toohill, 2014 <sup>107</sup>	339	Phone	Patient	Outpatient
Wang, 2014 <sup>108</sup>	106	Phone	Patient	Outpatient
Wilton, 2013 <sup>109</sup>	132	Phone	Patient, system	Community
Wong, 2007 <sup>110</sup>	200	Phone	Patient, provider	Inpatient
<b>Prevention (n=56)</b>				
Annesi, 2016 <sup>113</sup>	107	Phone	Patient	Community
Befort, 2016 <sup>114</sup>	172	Phone	Patient, system	Community
Bloom, 2006 <sup>115</sup>	157	Phone	Patient	Outpatient
Bullock, 2009 <sup>116</sup>	695	Phone	Patient	Community
Cadmus-Bertram, 2016 <sup>117</sup>	105	Phone	Patient	Outpatient
Chen, 1998 <sup>118</sup>	125	Phone	Patient	Community
Conn, 2003 <sup>30</sup>	190	Phone	Patient	Community
Conway, 2004 <sup>119</sup>	2781	Phone	Patient	Other
Corkrey, 2005 <sup>120</sup>	17,008	Phone	Patient	Community
Curry, 2003 <sup>121</sup>	303	Phone	Patient	Outpatient
Demark-Wahnefried, 2015 <sup>122</sup>	692	Phone	Patient	Outpatient
Dietrich, 2006 <sup>29</sup>	1413	Phone	Patient	Outpatient
Dietrich, 2007 <sup>123</sup>	1316	Phone	Patient	Outpatient
Dietrich, 2013 <sup>124</sup>	2240	Phone	Patient	Outpatient
Eaker, 2004 <sup>125</sup>	12,240	Phone	Patient	Community
Eakin, 2012 <sup>126</sup>	143	Phone	Patient	Inpatient
Fjeldsoe, 2015 <sup>127</sup>	263	SMS/text messaging	Patient	Community
Goodwin, 2014 <sup>128</sup>	338	Phone	Patient	Outpatient
Gordon, 2016 <sup>129</sup>	194	Phone	Patient, system	Outpatient
Han, 2017 <sup>130</sup>	560	Phone	Patient	Community
Harrigan, 2016 <sup>131</sup>	100	Phone	Patient	Outpatient

<b>Study</b>	<b>Study N</b>	<b>Primary Telehealth Modality</b>	<b>Outcome Level(s)</b>	<b>Setting(s)</b>
Hayes, 2011 <sup>132</sup>	194	Phone	Patient	Community
Hayes, 2013 <sup>133</sup>	194	Phone	Patient	Outpatient
Helmes, 2006 <sup>134</sup>	340	Phone	Patient	Outpatient
Hou, 2005 <sup>135</sup>	424	Phone	Patient	Inpatient
Kerr, 2008 <sup>136</sup>	401	Phone	Patient	Outpatient
Keyserling, 2002 <sup>138</sup>	200	Phone	Patient, provider	Community
Keyserling, 2008 <sup>137</sup>	236	Phone	Patient	Outpatient, community
Koniak-Griffin, 2015 <sup>139</sup>	223	Phone	Patient	Community
Lawton, 2008 <sup>140</sup>	1089	Phone	Patient	Outpatient
Lawton, 2009 <sup>141</sup>	1089	Phone	Patient, system	Community
Lee, 2001 <sup>142</sup>	102	Phone	Patient	Community
Lopez-Torres Hidalgo, 2016 <sup>143</sup>	263	SMS/text messaging	Patient, provider	Community
Manfredi, 2004 <sup>144</sup>	1068	Phone	Patient	Outpatient
Maskarinec, 2003 <sup>145</sup>	220	Phone	Patient	Outpatient
McBride, 1999 <sup>146</sup>	580	Phone	Patient	Outpatient
McClure, 2005 <sup>147</sup>	275	Phone	Patient	Other
Miller, 1997 <sup>148</sup>	395	Phone	Patient	Outpatient
Nies, 2003 <sup>149</sup>	197	Phone	Patient	Community
Parra-Medina, 2011 <sup>150</sup>	266	Phone	Patient	Outpatient
Paskett, 2011 <sup>151</sup>	286	Phone	Patient	Outpatient
Peshkin, 2016 <sup>152</sup>	554	Phone	Patient	Outpatient
Pierce, 2004 <sup>154</sup>	2970	Phone	Patient	Outpatient
Pierce, 2006 <sup>153</sup>	2922	Phone	Patient	Community
Pinto, 2013 <sup>155</sup>	192	Phone	Patient	Outpatient
Rimer, 1999 <sup>157</sup>	889	Phone	Patient	Community
Rigotti, 2006 <sup>156</sup>	442	Phone	Patient	Outpatient

Study	Study N	Primary Telehealth Modality	Outcome Level(s)	Setting(s)
Rock, 2010 <sup>159</sup>	446	Phone	Patient	Inpatient
Rock, 2015 <sup>158</sup>	692	Phone	Patient	NR
Sivarajan Froelicher, 2004 <sup>160</sup>	277	Phone	Patient	Inpatient
Solomon, 2005 <sup>161</sup>	330	Phone	Patient	Community
Stein, 2005 <sup>162</sup>	1140	Phone	Patient, system	Community
Steinberg, 2014 <sup>163</sup>	194	IVR, brief tailored feedback	Patient	Outpatient
Valanis, 2002 <sup>32</sup>	510	Phone	Patient	Community
Wetter, 2011 <sup>164</sup>	302	Mobile application	Patient	Community
Wilbur, 2016 <sup>18</sup>	288	Phone	Patient	Community
<b><i>Disease Management (n=43)</i></b>				
Allard, 2007 <sup>165</sup>	117	Phone	Patient	Outpatient
Aranda, 2006 <sup>166</sup>	105	Phone	Patient	Outpatient
Ashing, 2014 <sup>167</sup>	221	Phone	Patient	Community
Baker, 2011 <sup>23</sup>	450	Interactive website	Patient, provider	Outpatient
Bastani, 2010 <sup>168</sup>	1708	Phone	System	Outpatient
Budin, 2008 <sup>169</sup>	249	Phone	Patient	Other
Caljouw, 2010 <sup>170</sup>	499	Phone	Patient	Outpatient
Crane-Okada, 2012 <sup>171</sup>	139	Phone	Patient	Outpatient
Damholdt, 2016 <sup>172</sup>	157	Interactive website	Patient	Community
Davison, 2002 <sup>173</sup>	749	Interactive website	Patient	Outpatient
Ell, 2009 <sup>174</sup>	487	Phone	Patient	Outpatient
Freeman, 2015 <sup>20</sup>	118	Phone, video conference to home	Patient	Community
Gallagher, 2003 <sup>175</sup>	196	Phone	Patient	Inpatient
Gustafson, 2005 <sup>176</sup>	231	Phone	Patient, system	Outpatient, inpatient
Hageman, 2014 <sup>177</sup>	289	Interactive website	Patient	Community
Hawkins, 2010 <sup>26</sup>	434	Phone control, e-health web-	Patient	Outpatient

Study	Study N	Primary Telehealth Modality	Outcome Level(s)	Setting(s)
		based CHES, interactive website		
Hawkins, 2011 <sup>34</sup>	434	Phone, interactive website	Patient	Outpatient
Hoyer, 2011 <sup>178</sup>	100	Phone	Patient	Outpatient
Kimman, 2011 <sup>24</sup>	320	Phone	System	Outpatient
Kimman, 2011 <sup>25</sup>	299	Phone	Patient	Outpatient
Kleiboer, 2014 <sup>179</sup>	368	Interactive website	Patient	Outpatient
Kristjansdottir, 2013 <sup>180</sup>	140	Mobile application	Patient	Inpatient
Lin, 2016 <sup>181</sup>	115	Phone	Patient	Community
Marcus, 2010 <sup>182</sup>	304	Phone	Patient	Outpatient, inpatient
Miller, 2013 <sup>183</sup>	210	Phone	Patient	Outpatient
Mishel, 2005 <sup>184</sup>	509	Phone	Patient	Outpatient, inpatient, community
Parsapure, 2016 <sup>197</sup>	350	Phone	Patient	Outpatient
Pierce, 2007 <sup>186</sup>	3082	Phone	Patient	Other
Pierce, 2007 <sup>185</sup>	3107	Phone	Patient	Outpatient
Rock, 2001 <sup>196</sup>	1010	Phone	Patient	Community
Salonen, 2009 <sup>188</sup>	250	Phone	Patient	Outpatient
Salonen, 2011 <sup>187</sup>	164	Phone	Patient	Inpatient
Samarel, 2002 <sup>31</sup>	125	Phone	Patient	Outpatient, inpatient
Sandgren, 2007 <sup>28</sup>	218	Phone	Patient	Outpatient
Sherman, 2012 <sup>27</sup>	249	Phone	Patient	Outpatient
Sjostrom, 2015 <sup>190</sup>	250	Email/secure message	Patient	Community
Sjostrom, 2015 <sup>189</sup>	250	Interactive website	Patient, system	Community
Sjöström, 2015 <sup>191</sup>	250	Interactive website	Patient	Other
Skelly, 2009 <sup>192</sup>	180	Phone	Patient	Outpatient, community

Study	Study N	Primary Telehealth Modality	Outcome Level(s)	Setting(s)
Stuifbergen, 2010 <sup>193</sup>	187	Phone	Patient	Community
Tso, 2015 <sup>19</sup>	6591	Phone	Patient	Other
Wenzel, 2015 <sup>194</sup>	204	Phone	Patient	Other
Ziller, 2013 <sup>195</sup>	181	Phone	Patient	Outpatient
<b>Family Planning (n=11)</b>				
Ayiasi, 2015 <sup>198</sup>	1385	Phone	Patient	Outpatient
Berenson, 2012 <sup>199</sup>	1155	Phone	Patient	Outpatient
Gerris, 2014 <sup>200</sup>	123	Patient-generated images	Patient, system	Outpatient
Hameed, 2016 <sup>201</sup>	1246	Phone	Patient	Outpatient
Ngoc, 2014 <sup>202</sup>	1433	Phone	Patient	Outpatient
Paul, 2015 <sup>203</sup>	731	Phone	Patient	Outpatient
Schover, 2011 <sup>204</sup>	300	Phone	Patient	Community
Skiadas, 2011 <sup>208</sup>	131	Phone	Patient	Outpatient
Smith, 2015 <sup>205</sup>	500	Phone	Patient	Outpatient
Sridhar, 2015 <sup>206</sup>	120	Interactive website	Patient	Outpatient
Tsur, 2008 <sup>207</sup>	108	Phone	Patient	Community
<b>High-risk Breast Cancer Assessment (n=7)</b>				
Bloom, 2006 <sup>209</sup>	163	Phone	Patient	Community
Chang, 2016 <sup>210</sup>	901	Phone	System	Outpatient
Jenkins, 2007 <sup>211</sup>	111	Phone	Patient	Other
Kinney, 2014 <sup>212</sup>	1012	Phone	Patient, system	Other
Kinney, 2016 <sup>213</sup>	988	Phone	Patient, system	Community
Schwartz, 2014 <sup>214</sup>	669	Phone	Patient, system	Outpatient
White, 2014 <sup>215</sup>	207	Phone	Patient	Outpatient
<b>Mental Health (n=6)</b>				
Beaver, 2009 <sup>216</sup>	374	Phone	Patient, provider	Outpatient

Study	Study N	Primary Telehealth Modality	Outcome Level(s)	Setting(s)
de Bie, 2011 <sup>217</sup>	169	Phone	Patient	Outpatient
Gotay, 2007 <sup>218</sup>	305	Phone	Patient	Outpatient
Ireys, 2001 <sup>219</sup>	139 <sup>a</sup>	Phone	Patient	Outpatient
Morland, 2015 <sup>221</sup>	126	Video conference to other clinic(s)	Patient	Community
Tiwari, 2010 <sup>220</sup>	200	Phone	Patient	Community
<b><i>Intimate Partner Violence (n=5)</i></b>				
Abrahams, 2010 <sup>226</sup>	279	Phone	Patient	Community
McFarlane, 2004 <sup>222</sup>	150	Phone	Patient	Community
Stevens, 2015 <sup>224</sup>	253	Phone	Patient	Outpatient
Saftlas, 2014 <sup>223</sup>	307	Phone	Patient	Outpatient
Tiwari, 2012 <sup>225</sup>	200	Phone	Patient	Community

<sup>a</sup> 139 mothers analyzed of 161 enrolled.

Abbreviations: CHESS=Comprehensive Health Enhancement Support System; IVR=interactive voice response; SMS=short message system

## APPENDIX D. PRIMARY OUTCOMES TABLE

Primary outcome	Maternal health (n=81)	Prevention (n=56)	Disease management (n=43)	Family planning (n=11)	High-risk breast cancer assessment (n=7)	Mental health (n=6)	Intimate partner violence (n=5)
<b><i>Patient-level Outcomes</i></b>							
Breast feeding	13						
Cancer screening		12	1				
Psychological and mental health assessment	14	3	4	2	3	6	2
Physical health assessment	1	0	9	2			
Cognitive function			1				
Contraceptive use				2			
Dietary change	1	3	1				
Immunization	1						
Infant development	1						
Intimate partner violence							2
Medication adherence			1	4			1
Patient knowledge			1				
Patient satisfaction		1		1	1		
Physical activity		10					
Pregnancy outcomes	12						
Quality of life		3	13				
Shared decision making	1		1				
Smoking cessation	7	9					

Primary outcome	Maternal health (n=81)	Prevention (n=56)	Disease management (n=43)	Family planning (n=11)	High-risk breast cancer assessment (n=7)	Mental health (n=6)	Intimate partner violence (n=5)
Social support	1	1					
Substance use	2						
Treatment adherence	4	1	2				
Weight management	6	6	1				
<b>Provider-level Outcomes (none)</b>							
<b>System-level Outcomes</b>							
Access to care	2						
Cost			1		1		
Economic outcomes	1		1				
Quality of care indicators	1		1				
Utilization	1		1		2		
<b>No Clear Primary Outcome</b>	12	7	4				