PRENATAL-TO-3 POLICY CLEARINGHOUSE
EVIDENCE REVIEW

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Perinatal Telehealth Services

Evidence Review Findings: Needs Further Study

A review of the experimental evidence on telehealth interventions in the prenatal-to-3 period suggests that telehealth services can produce clinical outcomes equivalent to, and in some cases better than, in-person health care. Some telehealth interventions may also contribute to reducing racial disparities in birth outcomes between Black and White mothers. However, evidence is mixed for whether technological enhancements to traditional, in-person care offer significant additional value when compared to traditional care alone. More causal evidence is needed to understand how state telehealth policies affect access to health care, particularly among rural and underserved populations and in the prenatal-to-3 period. Available evidence on the impact of state-level telehealth policy is correlational and does not allow for causal conclusions.

Telehealth refers to the use of technology to deliver or enhance health care services or medical training in a remote setting. Telehealth can include the use of audio, video, at-home monitoring devices, and other tools to allow patients to consult with providers and transmit clinical data when separated from providers by distance or when facing other barriers limiting in-person care. In the prenatal-to-3 period, telehealth has been effectively used to support healthy pregnancy behaviors and to promote positive birth outcomes by connecting parents more efficiently to providers in between scheduled prenatal visits and through postpartum follow-up services, such as breastfeeding education through a telelactation consultant. States have the ability to make telehealth services more or less accessible through policies determining which services can be delivered through telehealth, which telehealth services can be reimbursed through Medicaid, whether telehealth must be reimbursed at levels equivalent to in-person services (parity laws), and which providers can offer telehealth services, among other key policy levers. Given the expansion of telehealth ushered in by the COVID-19 pandemic, states' telehealth policies may have increasingly significant ramifications for prenatal-to-3 outcomes in future years.

Decades of research in the field of child development have made clear the conditions necessary for young children and their families to thrive.[1] These conditions are represented by our eight policy goals, shown in Table 1. The goals positively impacted by telehealth are indicated with a filled circle.

Table 1: Impact of Perinatal Telehealth Services on Policy Goals

Positive Impact	Policy Goal	Overall Findings
●	Access to Needed Services	Positive impacts on access to prenatal care
	Parents' Ability to Work	*(Policy goal outside the scope of this review)*
	Sufficient Household Resources	*(Policy goal outside the scope of this review)*
●	Healthy and Equitable Births	Mostly positive impacts on birthweight and other birth outcomes
●	Parental Health and Emotional Wellbeing	Mixed impacts on maternal physical and mental health during pregnancy
	Nurturing and Responsive Child-Parent Relationships	*(Policy goal outside the scope of this review)*
	Nurturing and Responsive Child Care in Safe Settings	*(Policy goal outside the scope of this review)*
●	Optimal Child Health and Development	Mixed impacts on partial and exclusive breastfeeding

What Are Perinatal Telehealth Services?

Telehealth involves the use of technology to support the provision of health care, often when providers and patients, or providers and their colleagues, are separated by distance.[2] Telemedicine generally refers to the "delivery of direct patient services," whereas telehealth is a broader term that encompasses not only telemedicine, but other health-related activities, such as provider consultations with one another regarding cases (teleconsultation) or remote breastfeeding support and education (telelactation).[i,3] Telehealth can be used during the perinatal and broader prenatal-to-3 period for delivering a variety of services. For example, one review of telehealth's role in obstetrics found that it "has been used to read ultrasounds, interpret nonstress tests, counsel patients, manage diabetes, manage postpartum depression, and support parents and children postpartum from remote sites" (p. 170).[33]

Telehealth services are typically delivered in one or more of the following ways:[4] 1) live video, or synchronous telehealth, in which a patient and provider interact in real time via screen; 2) store-and-

[i] The federal Health Resources and Services Administration defines telehealth as "the use of electronic information and telecommunication technologies to support long-distance clinical health care, patient and professional health-related education, public health, and health administration."

forward services, in which a provider collects clinical data or information and sends it to another provider for an assessment or evaluation; 3) remote patient monitoring, in which patients use technological tools and devices at home to send clinical data in real time to a provider or hospital; and 4) mobile health, or mHealth, which refers to the use of mobile devices such as smartphones and tablets to support healthy behaviors through applications, text message reminder services, and other communication interventions. This review examines telehealth services that span across all four modalities, but excludes interventions that use text-based nudges only to focus instead on the effectiveness of two-way, interactive telehealth services connecting providers and patients.

Who Is Affected by Perinatal Telehealth Services?

Telehealth can increase access to health care for families in many communities, but children and families who live in rural areas or areas with few health care providers, sometimes described as "health deserts," may be most impacted by telehealth. For example, as of 2019, the federal government considered 80 percent of rural areas in the US to be "medically underserved" because of a scarcity of providers relative to need, and the number of providers in rural areas is expected to decline further as rural doctors, who are on average older than urban doctors, retire.[5] In 2019, for example, 121 out of 254 counties in Texas had no medical specialists, and 35 counties had no physicians at all.[5] According to a report by the US Centers for Medicare and Medicaid Services, less than 50 percent of women living in rural areas can reach perinatal care within a 30-mile drive from home.[6] The American College of Obstetrics and Gynecologists (ACOG) has found that women living in rural areas tend to experience worse health outcomes and receive preventive health care, including screenings for cervical and breast cancer, at lower rates than their urban counterparts.[7] In addition, between 2010 and 2020, over 120 rural hospitals in the US closed, and less than half of rural counties now have an obstetrics unit, putting perinatal care further out of reach for many women who need it.[8]

Telehealth is not yet available to all who may benefit from it, although access has expanded rapidly since the COVID-19 pandemic began. During the spring of 2020, when COVID-19 first spread within the United States, the use of telehealth grew by over 4,000%.[54] As of July 2021, a McKinsey & Company report found that telehealth use remained 38 times higher than before COVID-19.[55] Prior to the pandemic, a 2018 *Health Affairs* report noted that "only 42% of hospitals and 15% of family physicians in the United States ha[d] adopted telehealth."[9] However, among those who did have access to telehealth, it was rising in use even before COVID-19: A 2019 study found that insurance claims for telehealth increased by 624 percent from 2014 to 2018.[10] Data also suggest that telehealth was being adopted in the areas that may need it most: The 2018 *Health Affairs* study found that federally funded health centers in rural areas were 10 percentage points more likely to use telehealth than those in urban areas, and 12.2 percentage points more likely to use telehealth for mental health services in particular.[9]

Although the use of telehealth is growing, it remains the exception during the perinatal period. Perinatal care is often described as "high touch" care because of the risks involved in pregnancy and the need for providers to have close contact with pregnant mothers and their developing infants to monitor changes in health.[36] Before COVID-19, the Kaiser Family Foundation analyzed a sample of health insurance claims among women ages 15 to 44 and found that only 0.1 percent of pregnancy-

related care was delivered through telehealth services.[11] Among the sample of telehealth services, most were delivered over the phone, rather than online.

Telehealth access has quickly expanded as federal and state policy changes and temporary waivers take effect to address the urgent needs precipitated by COVID-19, some of which may remain in place even after the pandemic is sufficiently contained. At the federal level, most of the policy changes have involved loosening Medicare restrictions, which do not directly impact the prenatal-to-3 period, but states have enacted policies governing Medicaid reimbursement for telehealth. For example, some states have implemented policies to allow phone visits, rather than video only, to qualify as a reimbursable telehealth service; some states have begun allowing clinicians to serve patients across state lines via telehealth; and some states have waived previous requirements that the provider and patient have a pre-existing in-person relationship before conducting telehealth services.[12] The National Alliance of Home Visiting Models, a consortium of leading home visiting programs for families with young children, such as Parents as Teachers, Nurse-Family Partnership, and Family Connects, has encouraged home visitors to use telehealth during the pandemic and has offered guidance and resources regarding how to do this safely and effectively while meeting program model requirements.[32] The section of this review on state variation provides further discussion of state policy actions related to telehealth.

What Are the Funding Options for Telehealth Services?

All 50 states and the District of Columbia allow Medicaid to reimburse for some form of telehealth, and the most commonly reimbursed form is synchronous, two-way video.[13] Telehealth services may also be paid for by private health insurance plans or out-of-pocket payment, depending on state law and the terms of the health plan. Prior to the COVID-19 pandemic, Medicare had the strictest rules regarding telehealth, requiring that recipients live in specific geographic areas in order for the services to be reimbursed, but this has been waived for the duration of the public health crisis.[14] States have wide discretion to determine how to fund telehealth services using Medicaid dollars; in 2020, many states expanded the range of telehealth services that can be funded through Medicaid as a result of COVID-19.[15] A total of 44 states and territories expanded Medicaid-eligible telehealth services in some way; 16 states and territories expanded the range of telehealth maternity care services that could be reimbursed.[15] As of 2020, 32 states and territories have explicit Medicaid pay parity provisions requiring the same level of reimbursement for similar services regardless of modality (telehealth or in-person).[15]

However, many of these policies are facing impending expiration dates or are only in place for the duration of the federal- or state-designated public health emergency period.[15] The temporary nature of many of the telehealth policies implemented in the wake of COVID-19 may make it difficult for health care providers to plan and build permanent infrastructure to support telehealth services in the longer term.

Why Should Perinatal Telehealth Services Be Expected to Impact the Prenatal-to-3 Period?

Telehealth can support children and families during the prenatal-to-3 period by providing health care access, including prenatal and postpartum care, to those who may not otherwise be able to access care because of factors such as distance, lack of transportation, or scheduling barriers, such as work or child care.[11] Telehealth can also connect patients to specialists or subspecialists who may not practice in their area, improving health outcomes when children and families are able to get the tailored health evaluations or services they need. Use of telehealth can also save costs by reducing patient travel time and lost work time. Telehealth services such as remote patient monitoring can help keep children and caregivers in their homes and communities, where they can maintain their social supports, instead of requiring them to spend time in a medical facility.[35]

Some scholars and practitioners argue that telehealth may not produce better or equivalent health outcomes if the services are of a lower quality than in-person care, if families do not have access to the technology or Internet services they need to access telehealth, or if policies do not allow for telehealth to be reimbursed at comparable rates to in-person care, or reimbursed at all.[16] ACOG encourages practitioners to adopt telehealth services, but notes that they are meant to "enhance, not replace, the current standard of care."[11]

In addition, the American Academy of Pediatrics (AAP) supports telehealth as a means to assess young children's health and development when in-person visits are not feasible for health or safety reasons, but the AAP advises that "well-child care should occur in person whenever possible" given the importance of early screenings and vaccinations in ensuring healthy development.[22] As a result, more evidence for the impact of telehealth exists for the prenatal period and for mothers' care than for infants, who often need to be seen in person.

What Impact Do Perinatal Telehealth Services Have, and for Whom?

The research discussed here meets our standards of evidence for being methodologically strong and allowing for causal inference, unless otherwise noted. Each strong causal study reviewed has been assigned a letter, and a complete list of causal studies can be found at the end of this review, along with more details about our standards of evidence and review method. The findings from each strong causal study reviewed align with one of our eight policy goals from Table 1. The Evidence of Effectiveness table (Table 2) displays the findings associated with telehealth (beneficial/equivalent, null,[ii] or detrimental) for each of the strong studies (A through H) in the causal studies reference list. For each indicator, a study is characterized based on findings for the overall study population; subgroup findings are discussed in the narrative. The Evidence of Effectiveness table also includes our conclusions about the overall impact on each studied policy goal.

[ii] An impact is considered statistically significant if $p \leq 0.05$. Results with p-values above this threshold are considered null or nonsignificant.

Outcomes are classified as "beneficial or equivalent" rather than "null" in our table if a better or equivalent outcome between the treatment and control groups was achieved and was a desired outcome in the study's hypothesis. For example, if the provision of prenatal care through telehealth produced outcomes equivalent to (but no better than) services provided through in-person care in a given study, that would be considered a "beneficial or equivalent" outcome if the intervention was intended to produce outcomes *at least* as good as in-person care. On the other hand, if a technological enhancement to traditional care was intended to produce *better* outcomes than traditional care alone, but failed to do so, then the finding is classified in our table as "null" rather than "beneficial or equivalent." The assessment of the overall impact for each studied policy goal weighs the timing of publication and relative strength of each study, as well as the size and direction of all measured indicators.

Of the eight causal studies included in this review, one examined how outcomes differed by race or ethnicity (beyond simply presenting summary statistics or controlling for race/ethnicity). The study used a subgroup analysis to determine the effectiveness of a telephone intervention program and found that preterm births and low birth rates decreased significantly for Black women while White women saw no significant effects.[G,51] Another study examined how results differed by language spoken, but all other studies only used race or ethnicity as a control variable rather than conducting a subgroup analysis of differential impacts. A rigorous evaluation of a policy's effectiveness should consider whether the policy has equitable impacts and should assess the extent to which a policy reduces or exacerbates pre-existing disparities in economic and social wellbeing.

Table 2: Evidence of Effectiveness for Perinatal Telehealth Services by Policy Goal

Policy Goal	Indicator	Beneficial or Equivalent Impacts	Null Impacts	Detrimental Impacts	Overall Impact on Goal
Access to Needed Services	Perceived Quality of Prenatal Care	A			Positive
	Total Reported Care Time	A			
	Adherence to ACOG Care Guidelines*	A, H			
Healthy and Equitable Births	Cesarean Deliveries	A			Mostly Positive
	Birthweight	A, G	D		
	Apgar Scores	A	D		
	Preterm Births	A, G	D		

Table 2: Evidence of Effectiveness for Perinatal Telehealth Services by Policy Goal (Continued)

Policy Goal	Indicator	Beneficial or Equivalent Impacts	Null Impacts	Detrimental Impacts	Overall Impact on Goal
Parental Health and Emotional Wellbeing	Pregnancy-Related Stress	A			Mixed
	Postpartum Depression		E		
	Gestational Diabetes			A**	
	Gestational Weight Gain	C			
	Sedentary Behavior During Pregnancy	C			
	Caloric and Fat Intake	B, C			
	Maternal Blood Glucose Values		D		
	Postpartum Physical Activity		B		
	Healthy Postpartum Weight		B		
	Postpartum Hypertension Readmissions	H			
Optimal Child Health and Development	Exclusive Breastfeeding	E	B, F		Mixed
	Partial Breastfeeding	E, F	B		

** ACOG guidelines for prenatal care (explored in Study A) include receiving the influenza vaccine, a Tdap booster, mid-pregnancy education, and screenings for Streptococcus and depression. One of the ACOG guidelines for postpartum care (explored in Study H) includes receiving a blood pressure reading within 10 days after giving birth.*
***The authors of this study note that "this is likely of little significance since the prevalence [of gestational diabetes] shown is consistent with what would be expected in a low-risk obstetric cohort" (638.e7).*

Access to Needed Services

Telehealth services can connect infants, pregnant women, and families to critical health care even when there is a dearth of providers physically present in their communities. Telehealth options can also safely reduce the number of in-person visits that families must attend while maintaining the quality of perinatal care. This review identified two randomized controlled trials (RCTs) since 2000 examining how telehealth can enhance access to needed services during the prenatal-to-3 period. A study using data from 2014 to 2015 examined the effectiveness of a reduced-visit prenatal care model ("OB Nest") in Rochester, Minnesota, that included a number of telehealth components in addition to eight onsite appointments (compared to 12 onsite appointments in the control group).[A] The telehealth group received six virtual visits with a nurse, either on the phone or online, home monitoring devices (including fetal heart rate and blood pressure monitors), and access to an online community of other pregnant women.[A] The goal of the study was to determine whether "a reduced-frequency prenatal care model is as safe as the standard model of care for low-risk pregnant women"

which typically involves 12 to 14 in-person visits (p. 638.e1).[A] Whereas ACOG suggests the 12- to 14-visit approach, the World Health Organization recommends just eight for low-risk pregnancies.[38]

The authors found that the OB Nest participants were significantly more satisfied with their prenatal care, and the perceived quality of care and adherence to ACOG prenatal guidelines did not differ significantly between the groups; the OB Nest group received necessary care (influenza vaccine, Tdap booster, mid-pregnancy education, screenings for *Streptococcus* and depression) at similar rates as the control group. This outcome is considered beneficial or equivalent rather than "null" in our table of impacts because equivalent care between the groups is considered a desired result. The OB Nest patients received significantly more minutes of care (401.2 compared to 167.1), but had an average of 2.8 fewer in-person appointments with clinicians. One important limitation of this study was that the sample was comprised primarily of college-educated White women of high socioeconomic status, which precludes generalizability to more diverse populations. More research on diverse populations is needed to develop the evidence base. Nevertheless, the study suggests that telehealth can be used to deliver components of prenatal care while reducing the total number of in-person visits required. Positive clinical outcomes from the OB Nest program are discussed in the sections of this review on healthy births and parental health.

A second study, using data from 2016 to 2017, examined the effectiveness of remote blood pressure testing for postpartum women with hypertension, compared to in-person visits.[H] The ACOG guidelines recommend that postpartum women have a blood pressure recording in the first 10 days after giving birth. The participants randomly assigned to the remote monitoring group were given an at-home blood pressure cuff and were sent reminders to text their readings to their providers. The control group was simply instructed to visit their prenatal clinic for a blood pressure reading 4 to 6 days postpartum. The authors found a large, statistically significant benefit in the intervention group for achieving at least one blood pressure reading in the first 10 days after birth: 92.2 percent of the remote group met the guideline compared to 43.7 percent of the office group.[H] The control group also saw a significantly higher likelihood of hospital readmission for hypertension than the treatment group (3.9% compared to 0%).

Healthy and Equitable Births

Three recent RCTs examined the effects of telehealth on healthy and equitable births, with mostly equivalent results, indicating that remote care can produce outcomes similar to in-person care while removing barriers such as geography and transportation time or costs. The OB Nest study described previously found no significant differences between the telehealth group and the usual care group on a variety of birth outcomes, including Cesarean deliveries,[iii] preterm births, birthweight, and Apgar scores.[A]

A 2012 study, using data collected from 2007 to 2009, examined the role of telehealth in promoting healthy birth outcomes in women with gestational diabetes, which affects more than 200,000 pregnancies each year in the US and is becoming more common.[D] Participants were randomly

[iii] Cesarian deliveries are typically recommended when a vaginal delivery poses safety or health risks, but are not considered by most obstetricians to be the optimal delivery method.

assigned either to a treatment group in which they transmitted their blood glucose values to their provider four times daily via the Internet or a toll-free phone line, or a control group in which they maintained records in a notebook and reviewed them with providers at in-person prenatal visits. In the telehealth group, providers were able to respond to patients' input by sending a response through text or voice messages. The authors had hypothesized that the treatment group would see better glucose control and pregnancy outcomes as a result of the greater contact and feedback from their health care provider. However, the authors found that although the treatment group had a more efficient, streamlined option for transmitting their data to providers, no significant differences in maternal or infant outcomes were realized. Maternal blood glucose values, infant birthweight, and gestational age at delivery were all better in the treatment group than the control group, but the differences did not rise to the level of statistical significance. These outcomes are classified as "null" rather than beneficial or equivalent because the intervention was intended to produce *better* outcomes among the treatment group but failed to do so at a significant level.

A third study, analyzing data collected over five years starting in 1990, examined the effectiveness of a telephone intervention aimed at reducing low birthweight and preterm births, with a focus on improving outcomes for Black women in particular.[G] Participants randomized to the telephone intervention received usual prenatal care plus one to two telephone calls per week from a nurse[iv] between 24 and 37 weeks of gestation, whereas the control group received usual care but no additional phone calls. The phone calls involved discussions of the mother's health status and daily health behaviors and the nurses provided recommendations. Over 500 participants were in each group. The authors found a significant, 26 percent reduction in low birthweight births in the intervention group among Black women, and most of the difference was for mothers over age 19. Preterm births were also significantly reduced among Black women by 27 percent in the intervention group, again primarily for mothers over 19 years old. No significant benefit was found for White women. Given the increased prevalence of mobile phones in the 20 years since this study was conducted, it is possible that the intervention may be even more effective now than when access to the telephone was often limited to home landlines.

A study completed during the COVID-19 pandemic analyzed the use of audio-only telehealth appointments in conjunction with necessary in-person prenatal visits.[43] Two groups were compared: women who gave birth at a hospital system in Dallas, Texas between May 1, 2019 and October 31, 2019, and women who gave birth at the same hospital system between May 1, 2020 and October 31, 2020. The women who gave birth in 2020 received up to three audio-only visits in place of up to three traditional in-person visits. The quasi-experimental study found women with more audio-only visits were less likely to have placental abruption, premature delivery, or require transfusion at delivery. Additionally, infant outcomes were equivalent whether mothers received audio-only care or in-person care. Although the study had a large sample size, there were several study limitations including different risk levels among the groups and other sources of selection

[iv] Phone calls covered "assessment of health status (perception of uterine contraction and other pregnancy changes, number of meals eaten, number of cigarettes smoked, alcohol and drug use, and ingestion of a prenatal vitamin capsule on the previous day), nursing recommendations based on assessment, and discussion of any additional issues important to the mother" (p. 272).[G]

bias; this study is therefore not included in our Evidence of Effectiveness table, but does suggest potential benefits of telehealth services.[43]

Parental Health and Emotional Wellbeing

Six of the RCTs identified for this review included an examination of telehealth's impact on mothers' health and wellbeing in the perinatal period. Overall, results were mostly beneficial or in the intended direction without reaching statistical significance, demonstrating that care delivered through telehealth can be equally as effective as traditional in-person care. The OB Nest intervention produced a significant reduction in pregnancy-related stress for women in the treatment group compared to the control group.[A] On a 0- to 2-point scale of prenatal maternal stress, in which higher scores indicated greater stress, the intervention group reported less stress at 14 weeks (average score of 0.32 vs. 0.41 in the control group) and 36 weeks of gestation (0.34 vs. 0.40). However, the incidence of gestational diabetes was found to be higher in the OB Nest group than the control group (4.5% vs. 0%). The authors explained that "this is likely of little significance since the prevalence shown is consistent with what would be expected in a low-risk obstetric cohort"[A] (p. 638.e7).

A study using data collected from 2005 to 2009 examined the effectiveness of a telephone intervention for supporting women with gestational diabetes to reach a healthy postpartum weight through physical activity and monitoring of caloric and fat intake.[B] Participants were assigned to either usual care or the intervention group, which was called the "Diet, Exercise and Breastfeeding Intervention" or DEBI. The DEBI group received four in-person sessions and up to 15 telephone calls, including telelactation support in the postpartum period. The usual care group received printed education materials but no other additional support. The authors found that 37.5 percent of the intervention group returned to a healthy postpartum weight 12 months after giving birth (defined as returning to pre-pregnancy weight or achieving a 5 percent reduction from pre-pregnancy weight if overweight), whereas 21.4 percent of the control group did. This difference was not statistically significant. However, among only the women who did not exceed the recommended guidelines for gestational weight gain, the intervention had a significant impact, with a 22.5 percent difference between the share of the intervention and control groups who reached a healthy postpartum weight. The intervention group saw a significant benefit in terms of reducing dietary fat intake, but no significant difference for physical activity.

A study using data collected from 2014 to 2017, which also focused on healthy weight management during pregnancy, found mostly positive, statistically significant results.[C] Women at 8 to 15 weeks of gestation who were considered overweight or obese based on their Body Mass Index were assigned to receive a telehealth intervention in addition to usual prenatal care (called "GLOW," or Gestational Weight Gain and Optimal Wellness) or usual prenatal care alone. The intervention group received 11 telephone sessions and one in-person session each at the beginning and end of the intervention. The authors found that 33 percent of the intervention group met the Institute of Medicine guidelines for weekly rate of gestational weight gain, compared to 24 percent of the control group, which was a statistically significant difference. For total gestational weight gain, 41 percent of the intervention group exceeded recommended levels, compared to 66 percent of control participants. Relatedly, the intervention group consumed significantly fewer calories per day (although the

difference in fat intake was null) and reported 4.8 fewer sedentary hours per week compared to the control group.

A study using data collected from 2007 to 2009, which examined the impact of a telehealth intervention on birth outcomes and glucose control in women with gestational diabetes, found null effects on maternal blood glucose values, although they were in the intended direction (lower) in the treatment group.[D]

The 2018 study discussed previously in the section on access to services, regarding blood pressure recordings, found that the control group saw a significantly higher likelihood of hospital readmission for hypertension than the treatment group (3.9% compared to 0%).[H]

A 2016 study, with participants from three hospitals, sought to determine the effectiveness of an online, interactive breastfeeding monitoring platform for both increasing breastfeeding and reducing maternal postpartum depression.[E] Mothers in the intervention group were reminded to record breastfeeding and infant health data in the online platform for 30 days, which provided them with tailored feedback based on their input, whereas the control group received the hospitals' usual postpartum care. Usual care consisted of "breastfeeding support and education before discharge, one phone call within the first week after hospital discharge, and a list of community breastfeeding resources" (p. 4).[E] Outcomes for breastfeeding (exclusive and partial) are discussed in the child health section, below, but the study investigated mothers' postpartum depression outcomes and found no significant difference in scores at 3 months postpartum on the Edinburgh Postpartum Depression Scale. This result is classified as "null" because the platform was intended to produce improvements but did not.

A recent observational study, published in 2021, examined the impact of an 8-week group videoconferencing pilot program aimed at pregnant and postpartum women with perinatal depression symptoms or risk factors for developing depression.[39] The study did not have a control group and the sample size was small (47 women), but results were nevertheless promising, showing a decline in symptoms for most women who participated. Given that up to 18 percent of pregnant/postpartum women experience perinatal depression, developing effective and affordable treatments, such as group telehealth programs, may be an important component of addressing this problem—especially with current social distancing requirements for public health.[39]

Optimal Child Health and Wellbeing

Three RCTs in the US since 2000 have examined the impact of telehealth interventions on children's health and development in the prenatal-to-3 period, all of which address breastfeeding interventions.[B,E,F] The 2011 DEBI trial, using data collected from 2005 to 2009, and described in the parental health section above, included a telelactation consultant who encouraged women in the intervention group to breastfeed for at least 6 months, provided a breast pump, and provided one to four phone calls in the first 6 weeks after delivery to discuss the new mothers' needs and progress with regard to successful breastfeeding.[B] The authors did not find a significant difference in the likelihood to partially or exclusively breastfeed in the treatment group compared to the control group.

A study using data collected from 2005 to 2007 examined the effectiveness of a telephone peer counseling program provided to participants in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) who intended to breastfeed or were considering breastfeeding.[F] Women who were randomly assigned to the control group received WIC's typical breastfeeding promotion materials, whereas women assigned to the treatment arm received either a "high-frequency" or "low-frequency" peer counselor who initiated either eight or four phone calls, respectively, with the participant. The authors found that the program did not lead to differences in breastfeeding initiation, but the program did significantly affect breastfeeding duration and exclusivity. The intervention increased partial breastfeeding for at least 3 months by 22 percent, an increase of 11 percentage points. Increases were greatest among Spanish-speaking participants (29% increase among the treatment group relative to the control group). For increasing partial breastfeeding for 6 months, Spanish-speaking participants saw a significant increase, but English-speaking participants did not. The only group that saw a benefit for exclusive breastfeeding was also the Spanish-speaking participants; they saw a 20 percent increase in the probability of exclusive breastfeeding for at least 3 months. Interestingly, the authors found no differences between the high- and low-frequency intervention groups, so they pooled the data into a single treatment group.

Finally, the aforementioned 2016 study of an online breastfeeding monitoring platform found significant, positive results for exclusive breastfeeding and partial breastfeeding for at least 3 months:[E] "The intervention group had higher exclusive breastfeeding rates at 1 month, 2 months and 3 months [postpartum] (63%, 63%, and 55%, respectively) compared to the control group (40%, 19%, and 19%, respectively)" (p. 7). The intervention group was also more likely to breastfeed (whether partial or exclusive) for 3 months compared to the control group (84% vs. 66%).

Is There Evidence That Perinatal Telehealth Services Reduce Disparities?[v]

Two studies that met our review criteria demonstrate that telehealth services can benefit racial, ethnic, and linguistic subgroups differently and have the potential to reduce disparities in health outcomes in the prenatal-to-3 period. For example, a 1998 study (n=1,433) and a follow-up 2000 study of 1,112 mothers and their infants found that a telehealth intervention delivered via phone had greater clinical benefits for Black women than White women.[G,51] In particular, the intervention reduced preterm births and low birthweight among Black infants, who have higher baseline rates for both conditions, but did not significantly affect birth outcomes among White women.[17,18] The 2014 WIC study also found that a telephone peer counseling program benefited Spanish-speaking mothers to a greater degree than English-speaking mothers when it came to increasing breastfeeding.[E] The authors noted that Spanish-speaking women were more likely to answer the peer counselors' calls, but they did not reach any conclusions about why this was the case.

Telehealth is often touted as a solution for reducing disparities in health care access between urban and rural populations, which have been well documented. A 2019 study by the National Bureau of Economic Research, for example, found that rural hospital closures increased inpatient mortality by 8.7 percent, whereas urban closures had no impact on the mortality rate

[v] Disparities are defined here as differential outcomes by race, ethnicity, or socioeconomic status (SES).

because of ample alternatives for care.[25] Approximately 20 percent of the US population lives in areas classified as rural, but only 11 percent of the country's physicians practice in such areas.[27] Rural areas also have a 23 percent higher mortality rate than urban areas, and research suggests that over 50 percent of hospitalizations in rural areas may be preventable with greater access to specialty care.[27] Research has found that when rural counties (that are not close to urban centers) experience closures of hospitals with obstetric services, there is an increase in out-of-hospital births, births in hospitals without obstetric units, and preterm births, all of which pose risks for maternal and infant health outcomes.[37]

Some emerging correlational evidence suggests that telehealth interventions have made a difference for improving health outcomes in the prenatal-to-3 period in rural areas. For example, a telemedicine collaboration in Arkansas (described in more depth in the state variation section of this review) led to a significant decrease in the delivery of very low birthweight infants (<1,500 grams) in hospitals without Neonatal Intensive Care Units (NICUs) from 13.1 percent to 7.0 percent, and was associated with reduced overall infant mortality in the state (from 8.5 to 7.0 deaths per 1,000 deliveries).[30] Causal evidence, however, is needed to corroborate the effect of telehealth interventions on reducing health disparities between rural and urban areas in the prenatal-to-3 period. Many studies of telehealth interventions examine samples of patients who happen to belong to a particular health insurance program or who present for care at a particular hospital, rather than targeting samples of individuals with low access to in-person health care.

Disparities in technology and Internet access and digital literacy can limit equity in telehealth even when state policies or reimbursement practices allow for greater use of remote services. For example, the Pew Research Center has found in recent surveys that 79 percent of White adults have broadband Internet access in their homes, compared to 66 percent of Black adults and 61 percent of Hispanic adults.[40] In addition, 79 percent of adults in suburban households have home Internet, compared to 75 percent of adults in urban areas and 63 percent of adults in rural regions.[40] Furthermore, those who lack digital literacy, the ability to use devices and connect to the internet needed for virtual visits, are more likely to be Black, Hispanic or non-English speaking.[44]

According to the Federal Communications Commission, over 24 million Americans and 31 percent of rural households[41] may lack access to the Internet at home—and other surveys put the figure as high as 42 million Americans.[42]

Has the Return on Investment for Perinatal Telehealth Services Been Studied?

Although telehealth has traditionally been promoted as a way to increase access to health care services, some groups, including the US Senate Committee on Finance, have recently begun to consider how telehealth might be a way to reduce high health care costs but maintain quality in the US, even in cases in which access is not an issue.[26] Evidence from the RCTs included in this review, as well as other data sources, suggests that adopting telehealth practices can save costs for medical providers and organizations who serve patients in the prenatal-to-3 period, even after the upfront technological investments are accounted for.[G,20,21] Telehealth can also save patients time and lead to better health outcomes, saving longer-term health costs. A 2001

descriptive study examined the maternal and infant health outcomes and overall costs associated with 100 births, 60 of which involved telehealth services provided after an initial diagnosis of preterm labor.[19] The authors found that telemedicine led to a cost savings of $14,459 per pregnancy; the telemedicine group also had a significantly greater gestational age at delivery, higher average birthweight, and fewer NICU admissions.

A more recent study, published in 2019, found that among a sample of 650 adults, the net savings as a result of telehealth ranged from $19 to $121 per visit, depending on where each patient reported they would have sought care had telehealth not been an option.[20] In a 2010 systematic review of 36 telehealth economic analyses, two-thirds of the reviewed studies demonstrated cost savings as a result of using telehealth.[21] Although these two reviews were not focused on the prenatal-to-3 period, the findings suggest that telehealth can be cost-effective in general.

A more comprehensive analysis of the return on investment is forthcoming.

What Do We Know, and What Do We Not Know?

The causal evidence discussed above demonstrates that telehealth interventions in the perinatal period often produce equivalent (and sometimes better) outcomes when compared to in-person care. In particular, telehealth can promote healthy behaviors (physical activity, nutrition, monitoring diabetes) during pregnancy by connecting women to health care providers in a more efficient and convenient manner throughout the pregnancy, while reducing the number of in-person prenatal visits required. In addition, telehealth interventions can support breastfeeding success for new mothers. The evidence shows that telehealth can be cost-effective and can reduce racial disparities in birth outcomes between Black and White mothers and infants. More causal evidence is needed on the impact of telehealth past the pregnancy and postpartum stages, such as interventions for infant and toddler health. However, given the importance of in-person care for newborns and infants, research on telehealth's impact for this population may remain limited.

In response to the COVID-19 pandemic, many health and social care providers were forced to move services to a telehealth format, including Early Intervention (EI) services and group prenatal care. Based on a recent study, most families preferred for EI services to be in-person, but recognized the benefit and flexibility of using telehealth when necessary to receive services.[52] Studies of group prenatal care also revealed some benefits from using telehealth to deliver services, such as higher attendance and more open discussion, but technology access continued to be a barrier to use for some individuals.[53] Further research is needed to fully understand the impact of telehealth as a mode of delivering Early Intervention services and group prenatal care during the pandemic.

Although the evidence demonstrates the effectiveness of specific telehealth interventions at hospitals and clinics, more causal evidence is needed to inform statewide policy decisions related to telehealth. As COVID-19 continues to make the need for telehealth even more salient, policymakers will seek guidance regarding the mechanisms that best support telehealth adoption, implementation, and efficacy. Currently, the available evidence on telehealth policy is correlational and inconclusive about the most effective policies for states to adopt. For example, a 2018 cross-

sectional time series study examined whether state telehealth policies were "associated with the use of telehealth services among underserved populations."[31] The authors examined 4 years of data (from over 22,000 respondents ages 18 and older) from a national consumer survey and found that the restrictiveness or flexibility of state policies related to telehealth were not significantly associated with rates of telehealth use (specifically live video), whether in the general population or among specific groups such as Medicaid-covered, low-income, and rural residents. The authors offered a variety of explanations for why state policy changes may not be enough to increase telehealth access among these groups; for example, many providers do not offer telehealth services because they lack the resources and infrastructure to make it cost-effective, especially when they have low patient volumes. For example, the study noted that only 38 percent of community health centers offer telehealth. The authors recommended that in addition to less restrictive policies (in terms of what forms of telehealth are allowed, and what services can be reimbursed at what levels), states should consider ways to actively incentivize health care systems and providers to offer telehealth, and ways to remove barriers on the consumer side as well, such as waiving co-payments for telehealth appointments, ensuring wider access to the Internet, and spreading awareness about telehealth to underserved communities.

A 2019 correlational study found that utilization of telehealth for outpatient visits over the period from 2010 to 2015 was 29.8 percent higher in states that had payment parity legislation requiring private health insurance plans to reimburse for telehealth services in place of in-person care (though not necessarily at the same level).[34] This finding suggests that payment parity policies may be an effective way to increase access to telehealth, but further causal research is warranted.

Is Promoting Perinatal Telehealth an Effective Policy for Improving Prenatal-to-3 Outcomes?

In the limited number of RCTs conducted since 2000 in the US that focus on the prenatal-to-3 period, telehealth interventions in place of in-person care have been shown to be effective at producing health outcomes that are equivalent to or better than those produced by traditional care. However, most experimental studies examining telehealth enhancements to traditional care find null results when compared to traditional care alone. In addition, samples in the studies reviewed were not chosen from populations especially likely to need telehealth interventions, such as families in rural areas or those facing other barriers preventing in-person care. Instead, samples were often chosen from large clinics or health insurance plans. More research is needed to examine the impacts of telehealth on access to care among underserved populations or those with limited access to in-person services. State telehealth policies are not yet tracked as part of the Prenatal-to-3 State Policy Roadmap because of the need for further study on how telehealth affects access to care among these populations, as well as the current volatility and temporary nature of many telehealth policies as a result of COVID-19.

Overall, the amount of research on telehealth has not kept pace with the need for, and growth of, telehealth services. As the *New England Journal of Medicine* has stated: "Rigorous randomized, controlled trials of telehealth interventions that show improvements in care or health have been few…In addition to those related to study design, limitations include outdated interventions, an

asymmetric flow of information, and the limited role of clinicians. Because of the long cycle time in research, many published studies of telehealth have investigated outdated technologies" (p. 156).[26] As the COVID-19 pandemic hastens the spread of telehealth, more research into its effectiveness will be critical. In particular, more research on the prenatal-to-3 period is needed to enrich the evidence base for the efficacy of telehealth services and policy for families with young children.

How Do Telehealth Services Vary Across the States?

Telehealth is becoming an increasingly common practice in the US, but state policies vary with respect to what constitutes telehealth, which services can be reimbursed, and which practitioners can provide telehealth services, among other factors. Even prior to the COVID-19 pandemic, all 51 states[vi] allowed for Medicaid to reimburse for real-time live video telehealth services.[45] The Center for Connected Health Policy's Spring 2021 review of state telehealth policies shows that 22 states allow for store-and-forward services to be reimbursed through Medicaid,[46] and 26 states allow for remote patient monitoring (RPM) to be reimbursed.[47] A total of 26 states have a payment parity law for private payers, requiring comparable payment for telehealth services as for in-person care,[48] but 32 states have Medicaid payment parity policies.[15] In addition, 43 states participate in interstate medical licensure compacts, allowing physicians to provide services to patients out-of-state through telehealth.[49]

States that allow any Medicaid reimbursement for the above forms of telehealth vary further on the specific conditions that may qualify. For example, in Maryland, RPM can only be reimbursed for people with chronic obstructive pulmonary disease, congestive heart failure, and type 1 or type 2 diabetes, whereas in Texas, RPM can be reimbursed for people with hypertension, diabetes, or when the Texas Health and Human Services Commission deems the care cost-effective and feasible.[47] States also vary with respect to the type of provider who can offer reimbursable telehealth services—in Alabama, the provider must be a physician, whereas 27 states have no parameters on the type of provider, and the rest of the states have a list of allowable providers.[28]

In addition to policy changes, states are also introducing innovative initiatives around telehealth in the perinatal period and have invested substantial state resources in these efforts. For example, in 2019 New York launched a Perinatal Telehealth Workgroup to examine opportunities to expand telehealth in rural communities in the state.[29] Along with the Workgroup, the state also committed $5 million to expand telehealth programs in perinatal centers.

In 2003, Arkansas began a program known as ANGELS (Antenatal and Neonatal Guidelines, Education, and Learning System) to improve perinatal regionalization, or the practice of ensuring that high-risk births take place in hospitals equipped to care for infants and mothers with high needs. The ANGELS program uses telemedicine to connect board-certified maternal-fetal medicine specialists in Little Rock, Arkansas with clinics across the state to provide enhanced expertise and make recommendations about hospital transfers necessary for delivery.[22] Although some correlational research has found that the ANGELS program increased births in the university setting and decreased early deliveries, no causal research has been conducted on the program.[22]

[vi] State counts include the District of Columbia.

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) has used telehealth innovations to improve programming and services. In 2016, Mississippi received funds from the US Department of Agriculture (USDA) to start a WIC Pacify Program to offer 24/7 telelactation services. Pacify is an app that allows unlimited access to lactation visits with services in both English and Spanish. Results from a retrospective cohort study found those with access to the Pacify app were twice as likely to breastfeed at 6 months than WIC participants who were not enrolled in the Pacify Program.[50]

Health care providers in 46 states and 34 countries have also benefited from Project ECHO (Extension for Community Healthcare Outcomes), which is a telementoring program created in 2003 at the University of New Mexico and funded in part by the Robert Wood Johnson Foundation.[24] Project ECHO links primary care physicians in rural areas with specialist mentors across the country who provide weekly virtual clinics, allowing the providers to share expertise and enhance the quality of care provided in rural areas with fewer specialists.

As discussed above, almost all states have made changes to their telehealth policies as a result of the COVID-19 pandemic, such as broadening the kinds of services and providers that are eligible for Medicaid reimbursement for telehealth.[15] For example, the most recent available report shows that as of May 1, 2020, 44 states and territories allowed audio-only platforms to be eligible for reimbursement, compared to only nine states previously.[15] However, it remains to be seen how many of the changes will become permanent.

See Table 3 for the variation in selected telehealth policies that existed as of February 2021, according to the Center for Connected Health Policy's National Telehealth Policy Resource Center.[45,46,47,48]

Table 3: State Variation in Telehealth Policy

	Medicaid Reimbursement			Private Payer Law
State	Live Video	Store-and-Forward	Remote Patient Monitoring	Payment Parity
Alabama	Yes	No	Yes	No
Alaska	Yes	Yes	Yes	No
Arizona	Yes	Yes	Yes	Yes
Arkansas	Yes	No	Yes	Yes
California	Yes	Yes	No	Yes
Colorado	Yes	Yes	Yes	Yes
Connecticut	Yes	No	No	Yes
Delaware	Yes	No	No	Yes
District of Columbia	Yes	No	No	No
Florida	Yes	No	No	Yes
Georgia	Yes	Yes	No	Yes

Table 3: State Variation in Telehealth Policy (Continued)

	Medicaid Reimbursement			Private Payer Law
State	Live Video	Store-and-Forward	Remote Patient Monitoring	Payment Parity
Hawaii	Yes	No	No	Yes
Idaho	Yes	No	No	No
Illinois	Yes	No	Yes	No
Indiana	Yes	No	Yes	No
Iowa	Yes	No	No	No
Kansas	Yes	No	Yes	Yes
Kentucky	Yes	Yes	No	Yes
Louisiana	Yes	No	Yes	Yes
Maine	Yes	Yes	Yes	No
Maryland	Yes	Yes	Yes	No
Massachusetts	Yes	No	No	Yes
Michigan	Yes	No	No	No
Minnesota	Yes	Yes	Yes	Yes
Mississippi	Yes	No	Yes	No
Missouri	Yes	Yes	Yes	No
Montana	Yes	No	No	No
Nebraska	Yes	No	Yes	No
Nevada	Yes	Yes	No	No
New Hampshire	Yes	No	No	Yes
New Jersey	Yes	No	No	Yes
New Mexico	Yes	Yes	No	Yes
New York	Yes	Yes	Yes	Yes
North Carolina	Yes	Yes**	Yes	No
North Dakota	Yes	No	Yes	Yes
Ohio	Yes	Yes**	Yes**	No*
Oklahoma	Yes	No	Yes	Yes
Oregon	Yes	Yes	Yes	Yes
Pennsylvania	Yes	No	No	No
Rhode Island	Yes	No	No	No
South Carolina	Yes	No	Yes	No
South Dakota	Yes	No	No	No
Tennessee	Yes	Yes	No	Yes
Texas	Yes	Yes	Yes	No

Table 3: State Variation in Telehealth Policy (Continued)

	Medicaid Reimbursement			Private Payer Law
State	Live Video	Store-and-Forward	Remote Patient Monitoring	Payment Parity
Utah	Yes	No	Yes	Yes
Vermont	Yes	Yes**	Yes	Yes
Virginia	Yes	Yes	Yes	No
Washington	Yes	Yes	No	Yes
West Virginia	Yes	Yes	No	Yes
Wisconsin	Yes	No	No	No
Wyoming	Yes	No	No	No
State Count	51	22	26	26

Notes: As of October 1, 2021. Live video refers to two-way interactive video calls between parties. Store-and-forward services are when a provider collects clinical data or information and sends it to another provider for an assessment or evaluation. Remote patient monitoring is when patients can use technological tools and devices at home that send clinical data in real time to a provider or hospital. States are given credit for payment parity for private payers if they require that private insurers reimburse for telehealth services at the same rate as in-person services.
** Ohio passed a private payer parity law that will take effect January 1, 2022.*
***State policies allow reimbursement for Store-and-Forward and Remote Patient Monitoring under the umbrella of reimbursement for communication technology-based services. There is not a specific law that specifically allows for Store-and-Forward and Remote Patient Monitoring reimbursement.*
Sources: Center for Connected Health Policy, The National Telehealth Policy Resource Center. Policy Trends Map. February 2021. https://www.cchpca.org/policy-trends/; Center for Connected Health Policy, The National Telehealth Policy Resource Center. Parity Requirements for Private Payers. https://www.cchpca.org/topic/parity/

How Did We Reach Our Conclusions?

Method of Review

This evidence review began with a broad search of all literature related to the policy and its impacts on child and family wellbeing during the prenatal-to-3 period. First, we identified and collected relevant peer-reviewed academic studies as well as research briefs, government reports, and working papers, using predefined search parameters, keywords, and trusted search engines. Given rapid developments in technology over the past 20 years, older research may be less applicable for understanding the impact of current telehealth technologies and programs, and this review is therefore limited to articles published in 2000 or later. From this large body of work, we then singled out for more careful review those studies that endeavored to identify causal links between telehealth and our outcomes of interest, taking into consideration characteristics such as the research designs put in place, the analytic methods used, and the relevance of the populations and outcomes studied. We then subjected this literature to an in-depth critique and chose only the most methodologically rigorous research to inform our conclusions about policy effectiveness. All of the causal studies considered to date for this review were released on or before August 31, 2021.

Standards of Strong Causal Evidence

When conducting a policy review, we consider only the strongest studies to be part of the evidence base for accurately assessing policy effectiveness. A strong study has a sufficiently large,

representative sample, has been subjected to methodologically rigorous analyses, and has a well-executed research design allowing for causal inference—in other words, it demonstrates that changes in the outcome of interest were likely caused by the policy being studied.

The study design considered most reliable for establishing causality is a randomized controlled trial (RCT), an approach in which an intervention is applied to a randomly assigned subset of people. This approach is rare in policy evaluation because policies typically affect entire populations; application of a policy only to a subset of people is ethically and logistically prohibitive under most circumstances. However, when available, randomized controlled trials are an integral part of a policy's evidence base and an invaluable resource for understanding policy effectiveness.

The strongest designs typically used for studying policy impacts are quasi-experimental designs (QEDs) and longitudinal studies with adequate controls for internal validity (for example, using statistical methods to ensure that the policy, rather than some other variable, is the most likely cause of any changes in the outcomes of interest). Our conclusions are informed largely by these types of studies, which employ sophisticated techniques to identify causal relationships between policies and outcomes. Rigorous meta-analyses with sufficient numbers of studies, when available, also inform our conclusions.

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Prenatal-to-3 Policy Impact Center
The University of Texas at Austin | LBJ School of Public Affairs
pn3policy.org | pn3policy@austin.utexas.edu | Twitter: @pn3policy #pn3policy

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