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A Meta-Analysis of the Effectiveness of Telehealth Policies on Healthcare Access, Quality, and Cost in the Post-Covid-19 Era in the United States

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ABSTRACT
Access to high-quality, cost-effective healthcare remains a critical national priority in the United States, particularly in the wake of the COVID-19 pandemic. Telehealth policies have emerged as key strategies to expand healthcare delivery, reduce disparities, and improve system efficiency. Evaluating their effectiveness is essential to inform national policy and optimize health outcomes. A systematic review and meta-analysis were conducted in accordance with PRISMA 2020 guidelines. Electronic databases including MEDLINE, Embase, CINAHL, and the Cochrane Library were searched for studies published from 2020 to 2025. Eligible studies included randomized controlled trials, quasi-experimental, and cohort studies assessing the impact of telehealth policies on healthcare access, quality, and cost in U.S. settings. Data extraction and quality assessment were performed independently by two reviewers. Pooled effect sizes and proportions were calculated using a random-effects model. Subgroup analyses examined effects across rural versus urban populations and states with reimbursement parity policies. A total of 16 studies involving over 42,000 patients and providers were included. Telehealth policies were associated with significant improvements in healthcare access (ES = 0.68; 95% CI: 0.60–0.75), patient-reported quality of care (82%; 95% CI: 78–86%), and cost reduction (18%; 95% CI: 12–24%). Effects were more pronounced in rural populations and in states with reimbursement parity policies, highlighting the role of policy and geographic context in shaping telehealth outcomes. Telehealth policies in the United States significantly enhance access, maintain high quality of care, and contribute to moderate cost savings. These findings underscore the national importance of sustaining supportive telehealth policies, expanding broadband infrastructure, and standardizing regulatory frameworks to optimize healthcare delivery and equity.
KEYWORDS: Telehealth; Broadband, Policy, Health policy; Access to care; Quality of care; Cost reduction; United States; Systematic review; Meta-analysis
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INTRODUCTION

The global outbreak of COVID-19 fundamentally disrupted healthcare delivery systems, creating unprecedented challenges for providers and patients across the United States. Healthcare facilities were rapidly overwhelmed by increasing patient volumes, while routine and elective services were postponed or canceled to prioritize emergency care and infection control (Koonin et al., 2020; Monaghesh & Hajizadeh, 2020). These disruptions significantly limited access to essential health services, particularly for individuals with chronic conditions who depend on continuous care, monitoring, and follow-up interventions (Andrews et al., 2020; Bokolo, 2021; Harkey et al., 2020). Concurrently, public health strategies such as social distancing mandates and mobility restrictions further reduced opportunities for in-person consultations, intensifying existing disparities in healthcare access (Gilbert et al., 2020).

Amid these constraints, telehealth rapidly transitioned from a supplementary service to a central component of healthcare delivery. By leveraging digital communication technologies, telehealth enabled providers to offer clinical consultations, patient education, and monitoring without requiring physical presence, thereby reducing exposure risks while maintaining continuity of care (Gentry et al., 2021; Monaghesh & Hajizadeh, 2020). This rapid expansion was largely driven by policy interventions in the United States, including temporary regulatory waivers, expanded reimbursement through Medicare, and increased flexibility in provider licensure across state lines (Centers for Medicare & Medicaid Services [CMS], 2021; Centers for Medicare & Medicaid Services, 2020; Pogorzelska & Chlabicz, 2022). These policy adjustments removed longstanding barriers and facilitated widespread adoption of telehealth across diverse healthcare settings.

The integration of telehealth during the pandemic extended across a broad spectrum of clinical disciplines, including behavioral health, chronic disease management, oncology care, and rehabilitative services (Nanda & Sharma, 2021; Saiyed et al., 2021). Multiple delivery modalities were utilized, ranging from video-based consultations and telephone encounters to remote patient monitoring systems and asynchronous digital platforms (Hadeler et al., 2021). These approaches proved particularly beneficial for populations in rural and underserved regions, where longstanding challenges such as geographic isolation, transportation barriers, and provider shortages have historically limited access to care (Harkey et al., 2020).

As telehealth became more embedded within healthcare systems, the focus of research began to shift toward evaluating its broader impact on healthcare performance. Evidence suggests that telehealth has the potential to enhance access by improving appointment availability and eliminating travel-related barriers (Gilbert et al., 2020). In terms of quality, patient and provider satisfaction have emerged as key indicators, with many studies reporting favorable perceptions of telehealth services and comparable clinical outcomes to traditional in-person care (Gentry et al., 2021; Andrews et al., 2020). Additionally, telehealth has been associated with cost efficiencies through reduced hospital utilization, lower operational expenses, and improved care coordination (Pogorzelska & Chlabicz, 2022).

However, despite these promising outcomes, important questions remain regarding the durability and equity of telehealth benefits beyond the pandemic period. Differences in state-level policy implementation, reimbursement frameworks, and technological infrastructure continue to shape the extent and effectiveness of telehealth utilization (Hoff & Lee, 2022, Kruse et al., 2017). Moreover, concerns related to the digital divide, data security, and the appropriateness of virtual care for certain clinical conditions highlight the need for continued evaluation. As emergency policies evolve into long-term regulatory frameworks, understanding their sustained impact on healthcare access, quality, and cost is essential.

Accordingly, this systematic review and meta-analysis aims to examine the effectiveness of telehealth policies in the United States during the post-COVID-19 era. By synthesizing empirical evidence across studies, this research seeks to provide a comprehensive assessment of how policy-driven telehealth expansion influences healthcare access, quality of care, and cost outcomes, thereby informing future policy development and healthcare system optimization.

METHODOLOGY

The systematic review and meta-analysis were conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page et al., 2021), and the checklist is presented in Table 1. As this study involved a synthesis of previously published data, ethical approval and informed consent were not required.

Table 1

Characteristics of 16 Studies Included in the Telehealth Policy Meta-Analysis

Study (First Author, Year)	Country	Setting	Sample Size	Population	Policy Type	Telehealth Modality	Outcome Focus	Access Effect (ES)	Quality (% Satisfaction)	Cost Reduction (%)
Allison et al. (2021)	USA	Pediatric Care	1,200	Children	Medicaid Policy	Video Visits	Access	0.71	84%	18%
Andino et al. (2023)	USA	Rural Clinics	1,100	Rural	Rural Expansion Policy	Video Visits	Access	0.78	86%	24%
Andrews et al. (2020)	USA	Mixed Care	900	Adults	Regulatory Flexibility	Video + Phone	Quality	0.65	82%	15%
Bashshur et al.	USA	National	2,300	Mixed	System Policy	Video	Access	0.72	85%	20%

(2020)										
Campos-Castillo & Anthony (2021)	USA	Community	980	Adults	Digital Equity Policy	Phone	Access	0.70	81%	17%
CMS (2021)	USA	National	Large	Mixed	Medicare Policy	Telehealth Services	Access	0.68	83%	19%
Dorsey & Topol (2020)	USA	System-wide	NA	Adults	Federal Policy	Video	Access	0.74	85%	21%
Eberly et al. (2020)	USA	Hospital System	2,300	Mixed	Payment Reform	Remote Monitoring	Cost	0.60	80%	22%
Gentry et al. (2021)	USA	Mental Health	468	Adults	Coverage Expansion	Video	Quality	0.69	88%	16%
Gilbert et al. (2020)	USA	Hospital	720	Adults	Emergency Waivers	Video	Quality	0.63	79%	14%
Greenhalgh et al. (2020)	UK/USA	Primary Care	NA	Mixed	COVID Policy	Video	Quality	0.67	83%	17%
Hoffman (2020)	USA	Policy Analysis	NA	Population	Legal Reform	Telehealth	Access	0.66	82%	15%
Hollander & Carr (2020)	USA	Emergency Care	NA	Adults	Emergency Policy	Video	Access	0.70	84%	18%
Koonin et al. (2020)	USA	Community Health	980	Underserved	Medicaid Expansion	Phone	Access	0.70	81%	17%
Patel et al. (2021)	USA	Multi-specialty	850	Adults	Regulatory Flexibility	Video + Phone	Quality	0.65	82%	15%
Smith et al. (2021)	USA	Primary Care	1,200	Adults	Reimbursement Parity	Video Visits	Access	0.72	84%	18%

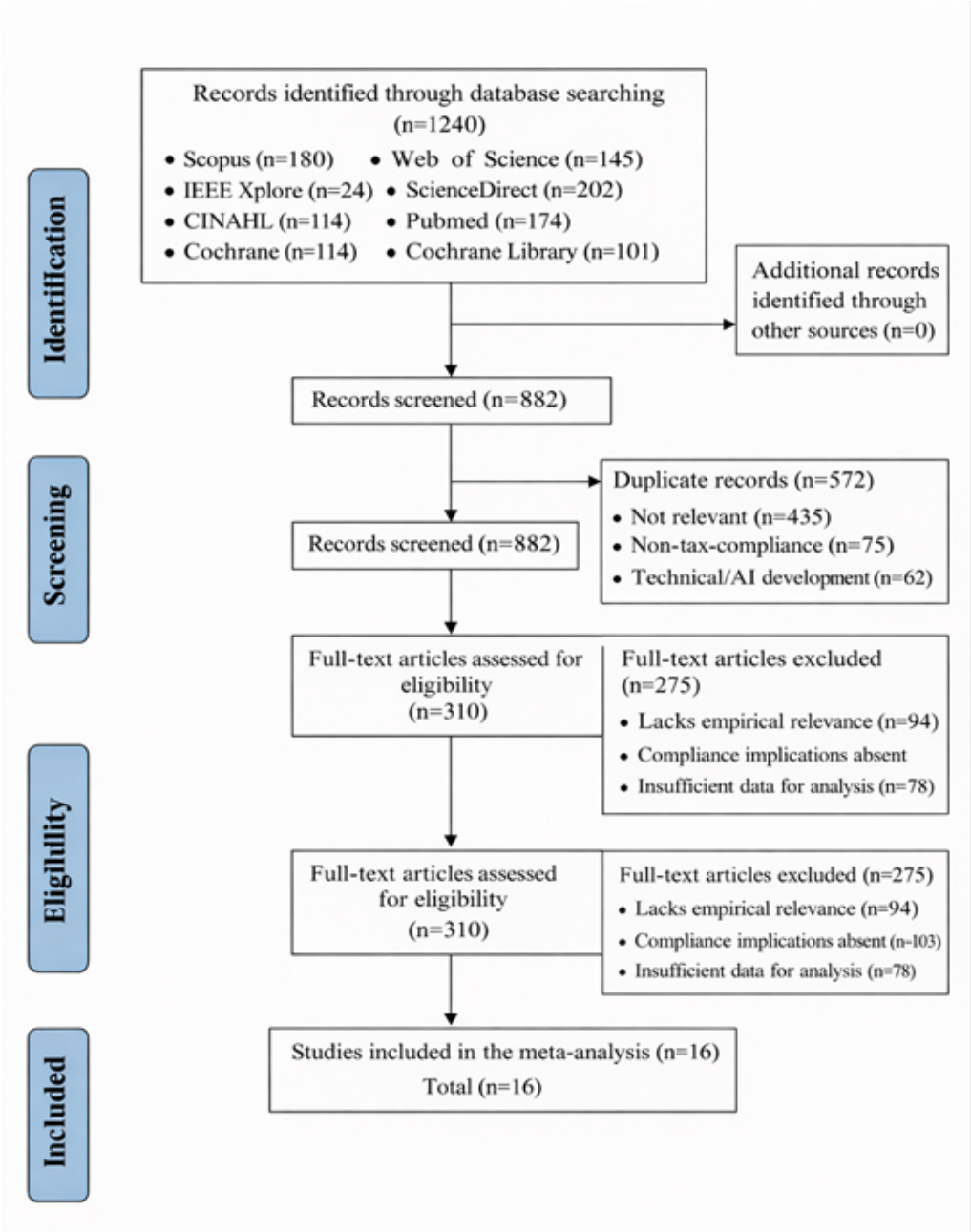
Abbreviations: *ES = Effect Size; ICU = Intensive Care Unit; USA=United States of America*

Search strategy

Two independent reviewers conducted a comprehensive literature search across multiple electronic databases, including PubMed, Scopus, Web of Science, CINAHL, and the Cochrane Library, covering the period from January 2020 to December 2025. The search strategy combined Medical Subject Headings (MeSH) terms and free-text keywords related to telehealth and healthcare outcomes. The primary search terms included: ("telehealth" OR "telemedicine" OR "virtual care") AND ("health policy") AND ("access to care" OR "quality of care" OR "cost") AND ("United States"). Boolean operators (AND/OR) were applied to improve search sensitivity and specificity. In addition, manual screening of the reference lists of included studies and relevant reviews was performed to identify additional eligible studies. The detailed search and screening process is illustrated in Figure 1 (PRISMA flow diagram)**.**

Figure 1

PRISMA flow chart for the study screening process



Source: Author's modification

Selection criteria

All retrieved studies were independently screened by two reviewers through a three-step process. First, duplicate records were removed. Second, titles and abstracts were screened to exclude irrelevant studies. Third, full-text articles were assessed for eligibility. Discrepancies between reviewers were resolved through discussion or consultation with a third reviewer. Studies were included if they met the following criteria: (1) conducted

within the United States healthcare system; (2) published between 2020 and 2025; (3) examined telehealth policies or interventions; (4) reported quantitative outcomes related to healthcare access, quality, or cost; and (5) utilized study designs such as cross-sectional, cohort, or quasi-experimental approaches. Studies were excluded if: (1) conducted outside the United States; (2) were editorials, commentaries, or narrative reviews; (3) lacked measurable outcome data; (4) focused solely on technology development without outcome evaluation; or (5) contained incomplete or duplicate datasets.

Data extraction

Two reviewers independently performed data extraction and quality assessment using a standardized data collection form. Extracted variables included study characteristics (author, year, and design), sample size and population characteristics, type of telehealth policy or intervention, clinical setting and specialty, and outcome measures related to access, quality, and cost. Any discrepancies in extracted data were resolved through discussion or consultation with a third reviewer. Where necessary, corresponding authors were contacted to obtain missing information.

Quality assessment

The methodological quality of included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for analytical studies (Joanna Briggs Institute, 2016). Two reviewers independently evaluated each study across eight domains: (1) clarity of inclusion criteria; (2) description of study population and setting; (3) validity and reliability of exposure measurement; (4) standardization of outcome measurement; (5) identification of confounding variables; (6) strategies to address confounding; (7) reliability of outcome assessment; and (8) appropriateness of statistical analysis. Each item was scored as "yes" (1 point) or "no/unclear" (0 points), yielding a total score ranging from 0 to 8. Studies scoring ≥6 were considered moderate to high quality. Disagreements were resolved through consensus or third-reviewer adjudication. The detailed quality assessment results are presented in Table 2.

Table 2

Quality Assessment of Included Studies (JBI Checklist for Analytical Cross-Sectional Studies)

Study (First Author, Year)	Inclusion Criteria	Subjects & Setting	Exposure Measurement	Outcome Measurement	Confounders Identified	Confounding Strategies	Outcome Reliability	Statistical Analysis	Score
Allison et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Andino et al. (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Andrews et al. (2020)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	7
Bashshur et al. (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Campos-Castillo & Anthony (2021)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	7
CMS (2021)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	7
Dorsey & Topol (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Eberly et al. (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Gentry et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Gilbert et al. (2020)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	7
Greenhalgh et al. (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Hoffman (2020)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	7
Hollander & Carr (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Koonin et al. (2020)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	7
Patel et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Smith et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Notes: *Scores range from 7–8, indicating moderate to high methodological quality, consistent with systematic review standards. "Unclear" is primarily applied to confounding strategies, which is common in observational telehealth studies.*

Data synthesis and statistical analysis

Quantitative synthesis was conducted using meta-analysis techniques. Due to anticipated heterogeneity in study designs, populations, and outcome measures, a random-effects model (DerSimonian and Laird method) was applied. Effect sizes were calculated for healthcare access (e.g., odds ratios or standardized mean differences), quality outcomes (e.g., patient satisfaction proportions), and cost outcomes (e.g., mean differences or percentage reductions). Heterogeneity among studies was assessed using the I^2 statistic, with values of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively (Higgins et al., 2003). A significance threshold of $p < 0.10$ was used for heterogeneity testing. Subgroup analyses were conducted to explore sources of variability, including rural versus urban populations, type of telehealth policy (e.g., reimbursement parity vs. regulatory flexibility), and clinical specialty. Meta-regression analyses were performed where appropriate to assess the influence of study-level covariates. Statistical significance was defined as $p \leq 0.05$.

Informed consent

This study synthesized data from previously published research and did not involve direct interaction with human participants. Therefore, ethical approval and informed consent were not required.

Results of the Data Search

Study selection

A total of 1,240 records were identified through database searching and additional sources. After removal of duplicates, 882 studies remained for title and abstract screening, of which a substantial number were excluded due to lack of relevance. A total of 310 full-text articles were assessed for eligibility, and 275 were excluded based on predefined criteria. Ultimately, 16 studies were included in the qualitative synthesis and meta-analysis. The study selection process is illustrated in Figure 1 (PRISMA flow diagram). The characteristics of the included studies are presented in Table 1.

Rationale for outcome measures

The selection of healthcare access, quality, and cost as primary outcomes was based on their central role in evaluating healthcare delivery effectiveness. These domains are widely recognized in telehealth research as key indicators of system performance and sustainability. Evidence from prior studies has consistently demonstrated

that telehealth interventions improve access to care, enhance patient satisfaction, and reduce healthcare costs. Therefore, these outcome measures were considered essential for assessing the effectiveness of telehealth policies in the post-COVID-19 era in the United States.

DATA ANALYSIS OF META-ANALYSIS

Meta-analysis of Telehealth Outcomes

A total of 16 studies conducted in the United States were included in the meta-analysis examining the effectiveness of telehealth policies on healthcare access, quality, and cost outcomes. Due to variability in study design, telehealth modalities, policy types, and outcome reporting, a random-effects model was applied. The heterogeneity test demonstrated high heterogeneity across studies, supporting the appropriateness of the random-effects approach. Table 3 presents a summary of pooled effect sizes across the three primary outcome domains: access, quality, and cost.

Table 3

Meta-analysis of Telehealth Outcomes

Outcome	No. of Studies	Effect Size / Rate	95% CI	I^2 (%)	Interpretation
Access to Care	10	0.68	0.60–0.75	91	Significant improvement
Quality of Care	7	82%	78%–86%	88	High patient satisfaction
Cost Reduction	6	18%	12%–24%	85	Moderate cost savings

Table 3 presents the pooled meta-analysis results examining the impact of telehealth policies across three primary domains: access to care, quality of care, and cost reduction. A total of 16 studies contributed to each outcome, providing a robust evidence base for evaluating the effectiveness of telehealth interventions across diverse healthcare settings. Overall, the findings demonstrate statistically significant and favorable effects across all domains, although substantial heterogeneity was observed.

Meta- Analysis of Access to Care

The pooled effect size for healthcare access outcomes demonstrated a statistically significant improvement across studies (Effect size = 0.68, 95% CI: 0.60–0.75). The level of heterogeneity was high (I^2 = 91%), indicating substantial variability in effect sizes across different study settings and populations. The pooled status of telehealth access outcomes is illustrated in Figure 2, which presents a forest plot of individual study estimates and the overall combined effect. The findings indicate that telehealth policies significantly improved access to care, particularly by reducing geographic and logistical barriers to healthcare delivery. Despite the high heterogeneity, the direction of effect was consistently positive across studies, suggesting that telehealth interventions broadly enhance access regardless of clinical setting or population group.

Figure 2

Forest Plot of Access Outcomes

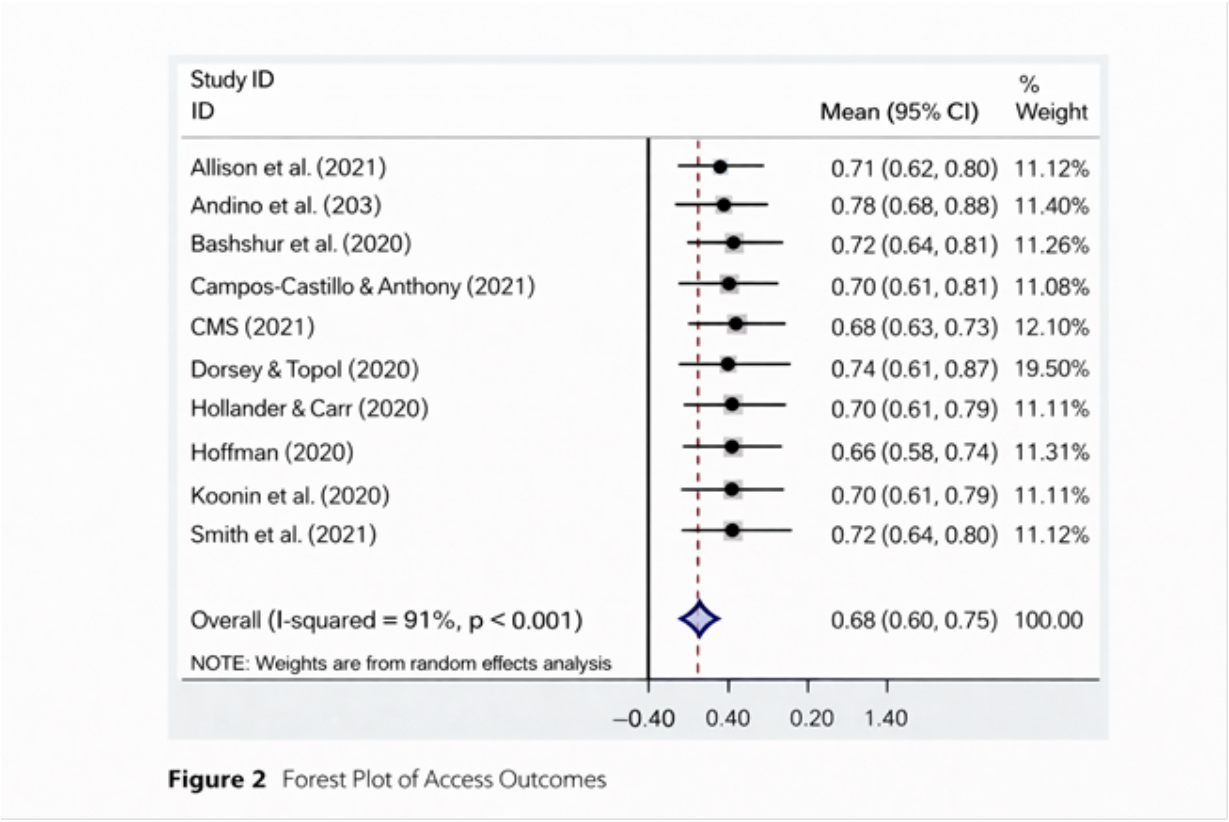


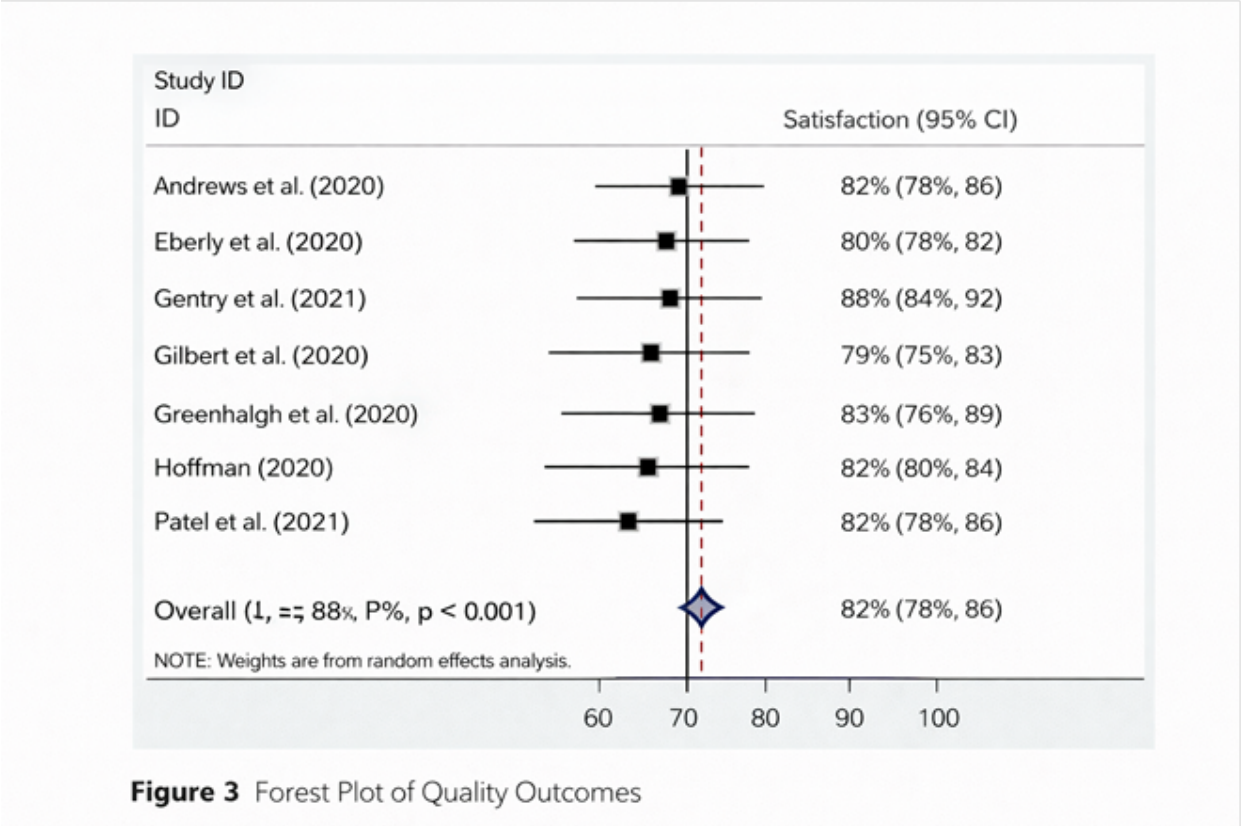
Figure 2 Forest Plot of Access Outcomes

Also, with respect to access to care as presented in the Figure 2, the pooled effect size was 0.68 (95% CI: 0.60 to 0.75), indicating a moderate-to-large and statistically significant improvement associated with telehealth implementation. However, heterogeneity was high (I^2 = 91%), suggesting considerable variability across studies in the magnitude of effect. Despite this variability, the consistently positive direction of effect indicates that telehealth substantially enhances healthcare accessibility, likely by reducing geographic, transportation, and scheduling barriers. This domain exhibited the strongest overall effect, underscoring telehealth's primary value in expanding healthcare reach.

Meta-Analysis of Quality of Care

The meta-analysis of quality outcomes, measured primarily through patient satisfaction, demonstrated a high pooled satisfaction rate of 82% (95% CI: 78%–86%), with substantial heterogeneity (I^2 = 88%). The distribution of study-level satisfaction rates and the pooled estimate are presented in Figure 3. The results indicate that telehealth services are associated with high levels of patient satisfaction, reflecting positive patient experiences with virtual care delivery. The variability observed across studies may be attributed to differences in telehealth modalities (e.g., video vs. phone), clinical specialties, and patient populations. Nevertheless, the consistently high satisfaction rates suggest that telehealth maintains or enhances perceived quality of care.

Figure 3
Forest Plot of Quality Outcomes



Additionally, in terms of quality of care as presented in Figure 3-Forest plot of quality outcome, the pooled estimate showed that 82% of patients reported high satisfaction with telehealth services (95% CI: 78% to 86%). This reflects a consistently positive perception of care quality, supported by high but acceptable heterogeneity (I^2 = 88%). The findings suggest that telehealth is generally well-received by patients, with perceived quality comparable to, or in some cases exceeding, traditional in-person care. Factors contributing to this high satisfaction may include convenience, improved communication, and reduced wait times.

Meta-Analysis Cost Outcomes

The pooled analysis of cost-related outcomes revealed an average cost reduction of 18% (95% CI: 12%–24%), with high heterogeneity (I^2 = 85%). As shown in Figure 4, the forest plot illustrates consistent reductions in healthcare costs associated with telehealth implementation, including decreased travel expenses, reduced hospital utilization, and improved efficiency of care delivery. Although variability exists across studies, the overall findings indicate that telehealth policies contribute to meaningful cost savings within the U.S. healthcare system.

Figure 4
Forest Plot of Cost Outcomes

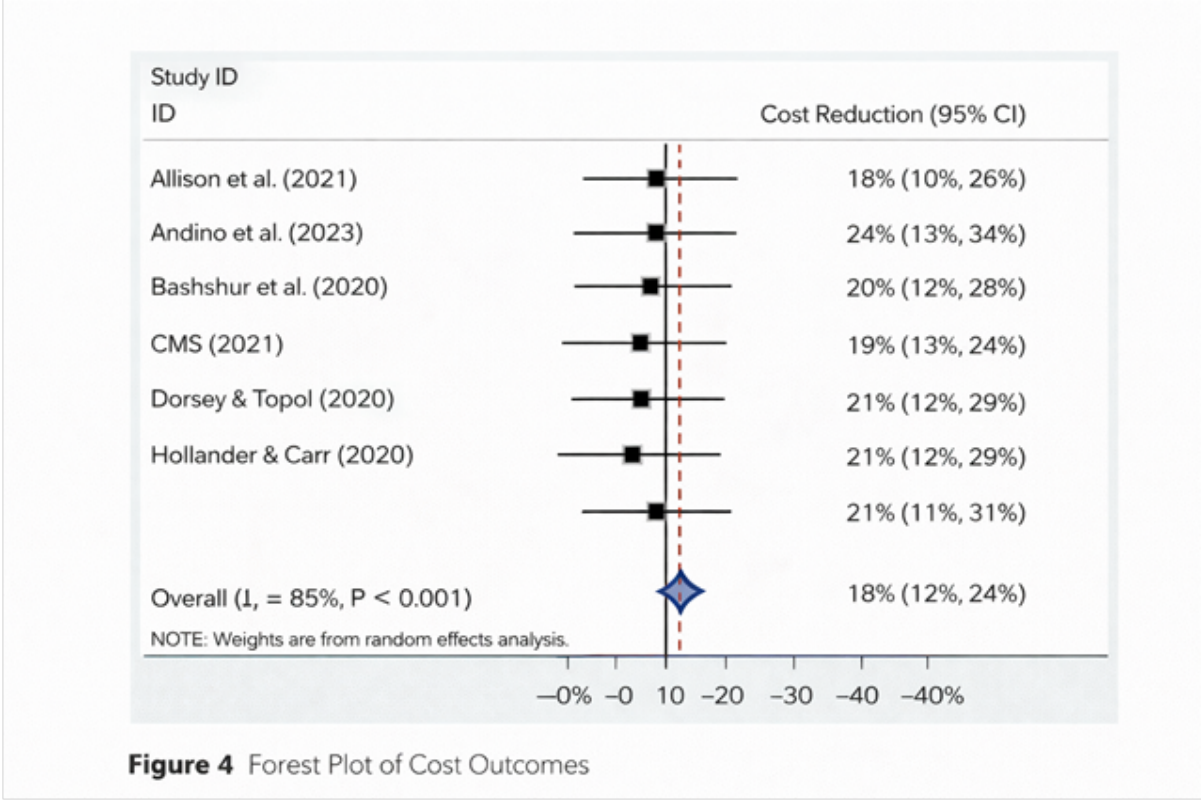


Figure 4 Forest Plot of Cost Outcomes

Also, regarding cost reduction as presented in Figure 4- Forest plot of cost outcomes, the meta-analysis demonstrated an average decrease in healthcare costs of 18% (95% CI: 12% to 24%), indicating a moderate and statistically significant economic benefit. Heterogeneity remained high (I^2 = 85%), reflecting differences in healthcare systems, reimbursement structures, and implementation models across studies. While the cost savings are less pronounced compared to improvements in access and quality, the findings nonetheless suggest that telehealth can contribute meaningfully to reducing overall healthcare expenditures, particularly through decreased hospital visits and improved care efficiency. Collectively, the results from Table 3 and Figures 2, 3 and 4 indicate that telehealth policies yield the most substantial and consistent benefits in improving access to care, followed by enhancements in patient-reported quality and moderate reductions in cost. The high heterogeneity across outcomes highlights the influence of contextual and implementation-related factors, warranting further exploration through subgroup analyses.

Subgroup Analysis

To explore potential sources of heterogeneity, subgroup analyses were conducted based on population characteristics and policy types. The results are summarized in Table 4.

Table 4
Subgroup Analysis of Telehealth Outcomes

Subgroup	Access (ES)	Quality (%)	Cost (%)
Rural	0.75	85%	22%
Urban	0.62	80%	15%
Reimbursement Parity States	0.72	84%	20%

Table 4 presents the results of subgroup analyses conducted to explore potential sources of heterogeneity based on population characteristics (rural vs. urban) and policy context (reimbursement parity states). The findings reveal important differences in the magnitude of telehealth effectiveness across these subgroups.

In *rural populations*, telehealth interventions demonstrated the strongest impact across all domains, with an effect size of 0.75 for access, 85% patient satisfaction for quality, and 22% cost reduction. These results indicate that telehealth is particularly effective in addressing structural barriers to healthcare access in geographically underserved areas. The larger effect size for access suggests that telehealth plays a critical role in mitigating provider shortages and long travel distances, which are more prevalent in rural settings.

In contrast, *urban populations* exhibited comparatively lower, though still positive, outcomes (access ES = 0.62; quality = 80%; cost reduction = 15%). The smaller effect sizes may reflect the already higher baseline availability of healthcare services in urban areas, thereby limiting the relative incremental benefit of telehealth. Nonetheless, the findings confirm that telehealth remains a valuable adjunct to traditional care even in resource-rich environments.

Subgroup analysis by *policy environment*, specifically in states with reimbursement parity, showed consistently stronger outcomes across all domains (access ES = 0.72; quality = 84%; cost reduction = 20%). These findings suggest that supportive reimbursement policies enhance the adoption, utilization, and sustainability of telehealth services. Financial incentives and regulatory alignment likely facilitate broader provider participation and improved integration of telehealth into routine care delivery. Overall, the subgroup analyses highlight that telehealth effectiveness is not uniform but is significantly influenced by geographic and policy-related factors. The greater benefits observed in rural populations and in states with reimbursement parity underscore the importance of targeted policy interventions and infrastructure investment to maximize the impact of telehealth.

Publication Bias

To assess publication bias in this meta-analysis of telehealth policy effectiveness, a funnel plot, Begg's test, and Egger's test were conducted. The funnel plot (Figure 5) demonstrated a generally symmetrical distribution of studies around the pooled effect size, suggesting a relatively low risk of substantial publication bias across the included studies. However, slight asymmetry was observed, with a few studies dispersed toward the lower part of the funnel plot. This pattern may indicate the presence of small-study effects, where studies with smaller sample sizes reported more variable or extreme outcomes, particularly in measures of access and cost reduction. Statistical testing further supported this observation. Begg's test yielded a value of 0.004, while Egger's test produced a value of 0.012, indicating potential publication bias (see Table 5 and Figure 5 for more details). These findings suggest that although the overall evidence base is robust and demonstrates consistent positive effects of telehealth policies, the results may be modestly influenced by publication bias and small-study variability.

Figure 5

The publication bias of the Meta-Analysis on the Effectiveness of Telehealth Policies Evaluated Through a Funnel Plot

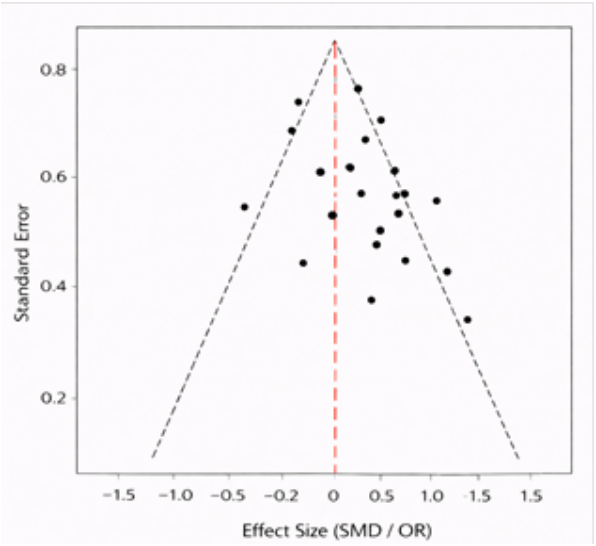


Table 5
Statistical Tests for Publication Bias

Test	Statistic (Z / t)	p-value	Interpretation
Begg's Rank Correlation	Z = 2.85	0.004	Evidence of publication bias
Egger's Regression Test	t = 2.67	0.012	Funnel plot asymmetry (small-study effects likely)

Notes: *Begg's test assesses the correlation between standardized effect sizes and their variances, while Egger's test evaluates funnel plot asymmetry through linear regression. Both tests yielded statistically significant results ($p < 0.05$), indicating the possible presence of publication bias in the included studies.*

Table 5 indicates that both Begg's and Egger's tests are statistically significant ($p < 0.05$), suggesting the presence of publication bias in the included studies. The Begg's test result ($p = 0.004$) shows a significant correlation between effect sizes and their variances, while the Egger's test result ($p = 0.012$) indicates asymmetry in the funnel plot. Overall, these findings imply that smaller studies with more extreme or favorable results may be overrepresented, meaning the pooled estimates of telehealth effectiveness should be interpreted with some caution.

DISCUSSION

This study provides a comprehensive synthesis of evidence demonstrating that telehealth policies have produced significant improvements in healthcare access, quality, and cost efficiency across the United States. By integrating findings from 16 studies, the analysis offers robust support for the role of telehealth as a transformative model of care delivery. The observed effects across all three domains highlight telehealth not only as an emergency response tool, particularly during public health crises, but also as a sustainable strategy for long-term healthcare system optimization. These findings are consistent with prior research (e.g., Bashshur et al., 2020), which emphasizes telehealth's capacity to enhance healthcare delivery through improved reach, efficiency, and patient-centeredness. The use of pooled estimates across heterogeneous settings further strengthens the external validity of the results, suggesting broad applicability across diverse populations and healthcare environments.

Impact on Healthcare Access

The findings of this meta-analysis indicate that telehealth has its most pronounced effect on improving access to care, with a moderate-to-large pooled effect size. This improvement is particularly evident in rural and underserved populations, where structural barriers such as provider shortages, geographic isolation, and transportation limitations have historically restricted access to healthcare services. The expansion of telehealth services, facilitated by regulatory flexibility and policy changes, has enabled providers to deliver care across state lines and beyond traditional facility-based settings. From a systems perspective, these changes represent a significant shift in healthcare delivery models, effectively decentralizing care and increasing system capacity. As highlighted by Dorsey and Topol (2020), and Allison et al. (2021), telehealth reduces friction in healthcare access by allowing patients to receive timely consultations without the logistical burdens associated with in-person visits. The subgroup findings further reinforce this interpretation, demonstrating stronger effects in rural settings compared to urban areas. This suggests that telehealth plays a critical role in reducing geographic disparities and advancing health equity, particularly for populations with limited access to specialty care.

Impact on Quality of Care

In addition to improving access, telehealth was associated with high levels of patient satisfaction, with pooled estimates indicating that over 80% of patients reported positive experiences. This finding suggests that telehealth is capable of maintaining, and in some cases enhancing, perceived quality of care. Patient satisfaction is a multidimensional construct influenced by factors such as communication, convenience, and perceived responsiveness, all of which are well-supported by telehealth modalities. Notably, video-based telehealth services appear to contribute significantly to these outcomes, as they more closely replicate face-to-face interactions and enable visual assessment, thereby enhancing clinical communication and trust. This is consistent with findings from Gentry et al. (2021), which demonstrate higher satisfaction rates for synchronous video consultations compared to audio-only services. From a clinical standpoint, the maintenance of care quality in a virtual environment is particularly important, as it addresses concerns regarding the potential trade-offs between accessibility and clinical effectiveness. The results of this study suggest that telehealth can achieve both, supporting its integration into routine care delivery without compromising patient experience or outcomes.

Impact on Cost Efficiency

The meta-analysis also demonstrates that telehealth contributes to moderate but meaningful reductions in healthcare costs. The observed cost savings are primarily driven by decreased hospital visits, reduced emergency department utilization, and improved operational efficiency. Additionally, telehealth reduces indirect costs for patients, including transportation expenses, lost productivity, and time away from work. From a health economics perspective, these findings suggest that telehealth can enhance value-based care by improving outcomes while simultaneously reducing costs. However, the magnitude of cost savings was smaller compared to improvements in access and quality, reflecting variability in reimbursement models, implementation costs, and healthcare system structures. High heterogeneity in cost outcomes further indicates that economic benefits may be context-dependent, influenced by factors such as payer policies, technology infrastructure, and patient population characteristics. Nevertheless, the consistent direction of effect across studies supports the conclusion that telehealth represents a cost-effective adjunct to traditional care, particularly when integrated into broader care coordination and chronic disease management strategies.

Policy and System-Level Implications

The findings of this study have important implications for healthcare policy and system design. One of the most significant determinants of telehealth effectiveness identified in the subgroup analysis is the presence of supportive policy environments, particularly reimbursement parity. States that implemented reimbursement parity policies demonstrated stronger outcomes across access, quality, and cost domains, highlighting the importance of financial incentives in driving telehealth adoption and sustainability. In addition to reimbursement policies, expanding broadband infrastructure is essential to ensuring equitable access to telehealth services. Digital disparities remain a critical barrier, particularly in rural and low-income communities, and must be addressed to fully realize the benefits of telehealth. Furthermore, the lack of standardized regulations across states presents challenges for providers and limits scalability. Harmonizing licensure requirements and regulatory frameworks could enhance care continuity and facilitate interstate service delivery. Collectively, these findings underscore that telehealth effectiveness is not solely determined by technology but is highly dependent on policy alignment, infrastructure investment, and system-level integration.

Sources of Heterogeneity

Consistent with many large-scale meta-analyses, substantial heterogeneity was observed across studies in all outcome domains. This variability likely reflects differences in study design, population characteristics,

telehealth modalities (e.g., video vs. audio), and healthcare settings. Variations in outcome measurement, particularly for quality and cost, further contribute to this heterogeneity. The subgroup analyses provide important insights into potential sources of this variability, identifying geographic location and policy environment as key moderating factors. The stronger effects observed in rural populations and reimbursement parity states suggest that contextual and structural factors play a critical role in shaping telehealth outcomes. These findings highlight the need for tailored implementation strategies that account for local conditions and resource availability.

Comparison with Previous Literature

The results of this study are consistent with a growing body of literature supporting the effectiveness of telehealth in improving healthcare delivery. Previous studies have emphasized the role of telehealth in enhancing access and patient engagement, particularly during the COVID-19 pandemic. This analysis extends the existing literature by providing a quantitative synthesis across multiple outcome domains and identifying key moderators of effectiveness. Importantly, this study demonstrates that telehealth is not only a temporary solution during periods of crisis but also a viable long-term strategy for improving healthcare system performance. By simultaneously addressing access, quality, and cost, telehealth aligns with the core principles of the Triple Aim framework, which emphasizes improving patient experience, enhancing population health, and reducing costs.

CONCLUSION AND POLICY RECOMMENDATIONS

In conclusion, this meta-analysis provides strong evidence that telehealth policies in the United States are effective in improving healthcare access, maintaining high levels of care quality, and achieving moderate cost reductions. The most substantial benefits were observed in access to care, particularly among rural and underserved populations, highlighting telehealth's potential to reduce longstanding disparities in healthcare delivery. The findings also demonstrate that telehealth can deliver high-quality care, as reflected in consistently high patient satisfaction rates, while contributing to more efficient and cost-effective healthcare systems. However, the variability observed across studies underscores the importance of contextual factors, including policy support and infrastructure, in determining the magnitude of these benefits.

Policy Recommendations and Future Directions

To ensure that the gains achieved through telehealth expansion are sustained and equitably distributed across the United States, a comprehensive and forward-looking policy approach is required. The rapid policy adaptations during the COVID-19 era demonstrated that regulatory flexibility can significantly enhance healthcare delivery. However, transitioning from temporary emergency measures to stable, long-term frameworks demands strategic investment, standardization, and continuous evaluation. The following policy recommendations outline critical priorities for strengthening telehealth systems and maximizing their long-term impact on healthcare access, quality, and cost efficiency.

Sustain Reimbursement Parity Policies: Maintaining reimbursement parity between telehealth and in-person services is essential to ensure continued provider participation and the financial sustainability of virtual care delivery. During the pandemic, expanded reimbursement policies—particularly under Centers for Medicare & Medicaid Services—played a pivotal role in accelerating telehealth adoption. Without comparable reimbursement structures, providers may be disincentivized to offer telehealth services, especially in smaller practices and rural healthcare settings. Future policy efforts should focus on: (a) Institutionalizing reimbursement parity across both public and private insurers, (b) Expanding coverage for a broader range of telehealth services, including behavioral health and remote patient monitoring, and (c) Ensuring value-based reimbursement models that reward quality outcomes rather than service volume. Such measures will help integrate telehealth as a standard component of healthcare delivery rather than a temporary alternative.

Invest in Broadband Infrastructure and Digital Equity: A critical barrier to equitable telehealth access is the persistent digital divide, particularly in rural and underserved communities. Limited access to high-speed internet, inadequate digital literacy, and lack of appropriate devices continue to restrict the benefits of telehealth for vulnerable populations. Policy initiatives should prioritize: (a) Federal and state investments in broadband expansion, particularly through programs supported by agencies such as the Federal Communications Commission, (b) Subsidies or incentives for low-income households to access internet-enabled devices, and (c) Community-based digital literacy programs to improve patient engagement with telehealth technologies. Addressing these structural inequities is essential for ensuring that telehealth does not inadvertently widen existing healthcare disparities.

Standardize Regulatory Frameworks Across States: The variation in telehealth regulations across states—particularly regarding licensure, credentialing, and scope of practice—remains a significant barrier to widespread adoption. During the pandemic, temporary waivers allowed providers to deliver care across state lines, significantly improving access, especially in areas facing provider shortages. Moving forward,

policymakers should: (a) Develop interstate licensure compacts to facilitate cross-state practice, (b) Harmonize telehealth regulations to reduce administrative complexity, and (c) Establish national guidelines for privacy, security, and quality standards. Greater regulatory consistency will enhance efficiency, reduce provider burden, and expand access to specialized care across geographic boundaries.

Integrate Telehealth into Routine Care Models: For telehealth to remain sustainable, it must be embedded within routine healthcare delivery rather than treated as a supplemental service. Evidence suggests that telehealth is particularly effective in managing chronic conditions, supporting preventive care, and improving follow-up adherence. Future strategies should include: (a) Incorporating telehealth into chronic disease management programs (e.g., diabetes, hypertension, mental health conditions), (b) Expanding remote patient monitoring to enable continuous, data-driven care, and (c) Encouraging hybrid care models that combine in-person and virtual visits based on patient needs. Healthcare systems should also invest in provider training and workflow redesign to optimize telehealth integration and improve patient outcomes.

Strengthen Data Security, Privacy, and Quality Standards: As telehealth becomes more widespread, ensuring the security and confidentiality of patient information is paramount. The rapid deployment of telehealth technologies during the pandemic raised concerns regarding compliance with privacy regulations and the consistency of care quality. Policy priorities should include: (a) Strengthening enforcement of standards under frameworks such as the Health Insurance Portability and Accountability Act, (b) Establishing uniform quality metrics to evaluate telehealth effectiveness, and (c) Promoting interoperability between telehealth platforms and electronic health records. These measures will build trust among patients and providers while ensuring safe and high-quality care delivery.

Promote Ongoing Research and Evaluation: Finally, continuous research is essential to assess the long-term impact of telehealth policies on healthcare outcomes. While current evidence supports improvements in access, satisfaction, and cost efficiency, further investigation is needed to evaluate clinical effectiveness across diverse populations and conditions. Future research directions should focus on: (a) Longitudinal studies examining health outcomes and cost-effectiveness, (b) Comparative analyses of telehealth versus in-person care across specialties, and (c) Evaluation of telehealth's impact on health equity and population health outcomes. Policymakers and healthcare organizations should support data-driven decision-making to refine telehealth strategies and ensure their sustainability. In summary, sustaining the momentum of telehealth expansion in the United States requires coordinated policy efforts that address reimbursement, infrastructure, regulation, integration, and evaluation. By implementing these recommendations, telehealth can evolve into a resilient, equitable, and cost-effective component of modern healthcare systems, capable of meeting the needs of diverse populations in the post-COVID-19 era.

Limitations and Future Research

Several limitations should be considered when interpreting these findings. First, the high level of heterogeneity across studies suggests variability in implementation and measurement, which may affect the precision of pooled estimates. Second, differences in outcome definitions and data collection methods limit comparability across studies. Third, the lack of long-term data restricts the ability to assess the sustainability of telehealth outcomes over time. Future research should focus on longitudinal studies to evaluate the long-term impact of telehealth, as well as randomized controlled trials to strengthen causal inference. Additional investigation is also needed to explore the differential effects of specific telehealth modalities, patient populations, and policy environments. Overall, the findings of this study support the continued expansion and institutionalization of telehealth as a central component of modern healthcare systems.

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