The National Center for Excellence in Primary Care Research presents:

Primary Care Practice-Based Research Networks and Publications, 2014–2023: Synthesis Report

Identifying and Supporting the Needs of Primary Care Practice-Based Research Networks

NCEPCR National Center for Excellence in Primary Care Research

DEPARTMENT OF HEALTH & HUMAN SERVICES • USA

AHRQ Agency for Healthcare Research and Quality

Primary Care Practice-Based Research Networks and Publications, 2014–2023: Synthesis Report

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Preface

Primary care Practice-based Research Networks (PBRNs) conduct research to improve the delivery and quality of primary care by investigating questions that are meaningful in community-based practice. AHRQ has supported PBRNs in various ways for more than 30 years, during which time PBRNs have produced a significant body of impactful work.

The mission of the National Center for Excellence in Primary Care Research (NCEPCR) is to support transformative primary care research, tools, methods for implementation, and the next generation of primary care researchers to improve the delivery of primary care. NCEPCR is dedicated to making primary care research, including that conducted by PBRNs, more visible, coordinated, comprehensive, and effective.

I am excited to share this new report showcasing the breadth and depth of the work that PBRNs have generated over the past 10 years. In this report, we catalogue PBRN publications to show the value and impact of PBRN research and how this work contributes to NCEPCR's vision of a future where all patients receive high-quality, whole-person, evidence-based, affordable primary health care from a healthy primary care workforce.

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Executive Summary

This report describes the landscape of primary care Practice-based Research Networks (PBRNs) research and publications over the last 10 years and suggests future opportunities to advance this work. PBRNs are groups of ambulatory care practices conducting community-based research to improve primary care delivery and practice. PBRNs leverage the insights and experiences of practicing clinicians by identifying and addressing pertinent research questions while improving access to innovative, evidence-based primary care.

PBRNs have made notable contributions to research in primary care transformation, clinical practice, and health disparities over the past decade, contributing to more than 900 publications; of these, approximately a quarter were highly cited. The most common funding sources of these publications were the National Institutes of Health and the Agency for Healthcare Research and Quality.

Many publications targeted primary care transformation, including community engagement, health information technology, and organizational culture and patient safety. Less commonly addressed areas of focus were advanced care planning, coordination of care, assessing health policy needs, care management, and access and continuity of care. PBRN research in clinical practice most frequently addressed mental and behavioral health, hypertension, cancer screening, obstetrics and gynecology, and nutrition. Conversely, the least addressed areas were chronic obstructive pulmonary disease, multiple chronic conditions, and obesity. PBRN research on health disparities most frequently targeted pediatric populations, vulnerable groups, social determinants of health (SDoH), and racial/ethnic disparities. Less addressed areas were urban, rural, and geriatric populations. These findings highlight the strengths and areas for improvement in PBRN research, guiding future efforts to enhance primary care practices and health outcomes.

Of the PBRNs that provided their full list of publications, PBRNs with more publications were larger and affiliated with academic institutions. At least half of these PBRNs were established 10 to 20 years ago. This suggests that smaller, younger, and non-academic PBRNs might face limitations in acquiring funding and publishing.

Further research could enable more in-depth understanding of barriers and facilitators faced by PBRNs and might inform more appropriate allocation of future resources. Additionally, several strategies could enhance the collective impact of PBRNs moving forward. Fostering cross-PBRN collaboration through future requests for proposals or by supporting online platforms might encourage collaboration and resource sharing. Clearer guidance on what is considered a PBRN publication and consistent attribution of PBRN affiliations in research publications will increase the visibility and recognition of PBRNs. PBRNs may consider diversifying their funding streams, especially with the national or regional foundations, state, or private sector sponsorships. PBRNs should also consider expanding the scope of PBRN research to address under-researched areas such as chronic conditions or advanced care planning.

1. Introduction and Background

1.1. Brief History of PBRNs

Practice-based Research Networks (PBRNs) are groups of ambulatory care practices "devoted principally to the primary care of patients, and affiliated in their mission to investigate questions related to community-based practice and to improve the quality of primary care" (AHRQ, 2021). PBRNs leverage the insights and experiences of practicing clinicians by identifying and addressing pertinent research questions while improving access to innovative, evidence-based primary care. As such, they facilitate translation of research findings and innovative solutions to practical applications. PBRNs date back to the 1970s, with early initiatives such as the Dartmouth Cooperative Information Project,[1] the Family Medicine Information System in Colorado, and the Ambulatory Sentinel Practice Network (Green et al., 1978; Green et al., 1984; Nelson et al., 1981). Over the past four decades, PBRNs in the United States have grown to more than 100 networks (AHRQ, 2021).

Primary care PBRNs bridge the gap between academic research and real-world clinical practice settings by ensuring that findings are directly applicable to the intended populations and relevant to everyday clinical practice (Dania et al., 2021; Westfall et al., 2019). Primary care PBRNs contributed to quality of primary care services, patient safety, and preventive services (Binienda et al., 2018; Gaglioti et al., 2016). These networks have developed and tested many interventions to improve chronic disease management (Mold et al., 2008), implemented tools to boost preventive care (Fagnan et al., 2011), and validated systems to report medication errors (Hickner et al., 2010). PBRNs have also developed approaches for patient engagement (Arkind et al., 2015) and explored the use of health IT for enhanced patient engagement (Careyva et al., 2016). PBRNs have been uniquely positioned to address disparities in health-related social and medical needs (AHRQ, 2021; Westfall et al., 2019), often involving traditionally underserved populations to ensure practical, sustainable, and generalizable findings.

Primary care PBRNs have faced several challenges that might have negatively impacted their sustainability over the years. Many struggled to maintain the financial resources needed to support their infrastructure and research activities due to limited resources and a "dependence" on grant funding mechanisms (Dania et al., 2021; Gaglioti et al., 2016). PBRNs also faced barriers such as clinician and staff turnover, dedicated time and effort required for research, and limited research skills (Dania et al., 2021).

Over the past 30 years, the Agency for Healthcare Research and Quality (AHRQ) has supported primary care PBRNs through targeted grant and contract programs, a national Resource Center, an annual PBRN conference, web events, an electronic PBRN research repository, a dedicated community extranet, and technical and networking assistance. In 2012, AHRQ provided funding

[1] The Dartmouth Cooperative Information Project is now called the Northern New England CO-OP Practice and Community-Based Research Network.

to support the establishment of collaborative research centers with the goal of encouraging smaller research networks to collaborate and leverage common resources (Hall-Lipsy et al., 2018). The PBRN Resource Center provided technical support to PBRNs in the areas of research design, analytic strategies, organizational development, and health IT (Rockwell et al., 2024). While AHRQ's budget for the PBRN community has decreased in recent years, it has invested in updating and automating the PBRN Registry, creating an online learning series, and identifying PBRN needs through Technical Expert Panel meetings with PBRN leaders and researchers. In addition, this report and other tools and resources have been developed to help support the work and growth of PBRNs.

1.2. Goal of This Report

The goal of this report is to describe the landscape of primary care PBRN research and publications over the past 10 years and demonstrate the impact of primary care PBRNs through publications. Specific questions we sought to answer include the following:

- What primary care research did PBRNs conduct over the past 10 years?
- How many primary care publications, tools, and other resources did PBRNs produce?
- What methodological approaches did PBRNs use?
- What areas of primary care transformation, clinical practice, and health disparities did PBRN research address?
- What are the most cited PBRN publications and how might they have influenced primary care research, practice, or policy?
- What were the characteristics of the most productive PBRNs?

2. Methods

2.1. Identifying PBRN Publications, Tools, and Resources

Publications, tools, and resources included in this environmental scan were limited to those with a primary care focus produced from 2014 through 2023 by or with U.S.-based PBRNs. For the purposes of this report, we used the National Academy of Medicine's definition of primary care (National Academies of Sciences et al., 2021):

> *"High-quality primary care is the provision of whole-person, integrated, accessible, and equitable health care by interprofessional teams that are accountable for addressing the majority of an individual's health and wellness needs across settings and through sustained relationships with patients, families, and communities."*

We defined a "tool" as an instrument (e.g., survey, guideline, or checklist) that can help users accomplish a specific task (e.g., evidence-based recommendation or practice standard) and a "toolkit" as an action-oriented guidance for practitioners or policymakers to apply the research

to their work (AcademyHealth, 2013). We also sought to identify other resources such as training modules, algorithms, or guides. Below we describe our approach for identifying primary care PBRN work.

PBRN Registry Update. The authors of this report (Oneyda Arellano, Masuma Rahman, Jean O'Connor) updated the PBRN Registry by contacting each PBRN listed in the Registry as of January 1, 2024, and asked them to validate their information or provide us with updated information, including whether they were active or inactive, size of PBRN, and other details regarding their PBRN.

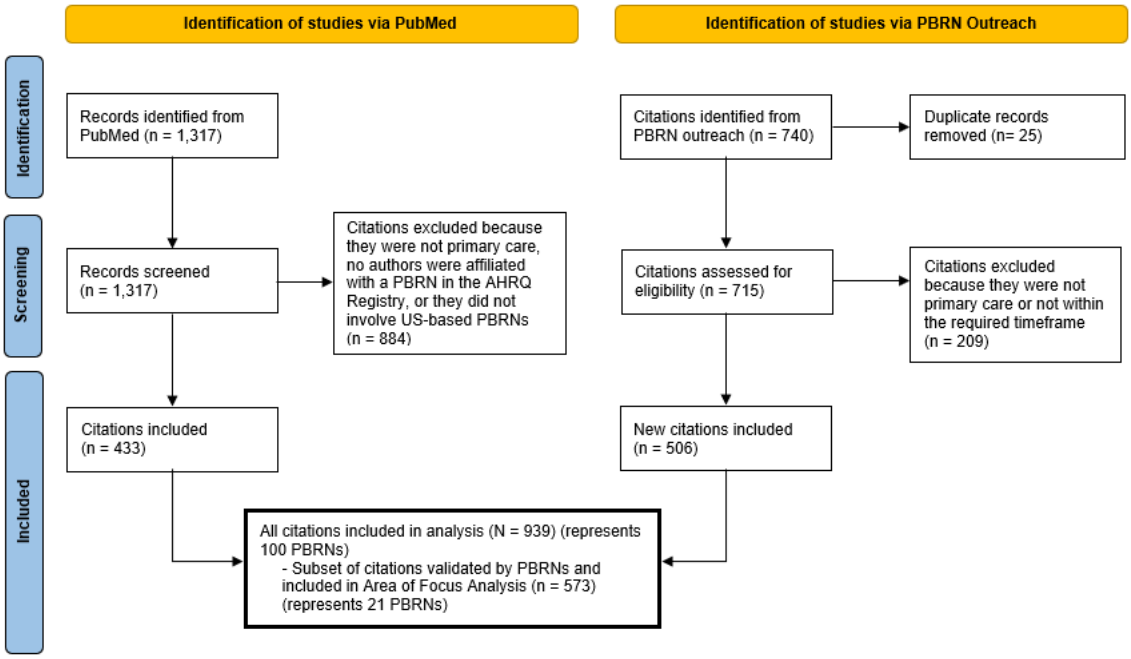
PubMed. We conducted a PubMed search by using the keywords "practice-based research" OR "practice based research" and limiting publication dates to between January 1, 2014, and January 1, 2024. As shown in Exhibit 1, this search resulted in 1,317 publications. The resulting publications were imported into EndNote and manually reviewed for inclusion by members of the research team. We excluded publications for which (1) the lead authors were outside of the United States, (2) no authors were affiliated with a PBRN in the AHRQ Registry, or (3) the publication addressed topics outside of primary care (e.g., dental medicine, sports medicine, chiropractic care). We attributed the authors of each publication to a primary care PBRN as listed in the updated AHRQ Registry. When authors representing multiple primary care PBRNs co-authored a publication, we attributed that publication to the PBRN affiliated with the first author. These steps reduced the list to 433 publications and resulted in the identification of 14 additional PBRNs that were not listed in the Registry.

Additional PBRN Outreach. To reconcile the findings between the search results and the existing Registry information, Econometrica conducted another round of outreach to the 100 PBRNs in the Registry via email and listserv announcements. These PBRNs in the Registry either had attributed publications through the PubMed search (n=54) or had a primary contact in the pre-existing AHRQ Registry (n=46). These 100 PBRNs received tailored emails requesting that they verify and share additional list of publications, tools, or resources attributed to their PBRN. We retrieved contact information from data in the AHRQ PBRN Registry and from identified publications for PBRNs not in the Registry. We asked the key contact at each primary care PBRN to validate a list of their attributed publications, which was included as a file attachment on the email outreach. Of the 100 PBRNs included in targeted outreach, 25 PBRNs responded. Four PBRNs (National Dental PBRN, Practitioner Research and Collaboration Initiative, Dental PBRN Japan, and Quebec Practice-based Research Network of Université Laval) were excluded from the analysis because they were either not based in the United States or addressed topics outside of primary care. The remaining 21 PBRNs provided 740 publications. Of these, 506 publications were not part of those identified through PubMed and 67 were validated publications identified through PubMed, totaling 573 publications (see Exhibit 1).

Final Endnote Dataset. The final EndNote dataset included 939 publications, including 9 tools or grey literature publications, representing 100 PBRNs. Of these PBRNs, 86 were in the original Registry, and 14 were not in the Registry but had identified publications from the PubMed search.

The flow diagram in Exhibit 1 lists the number of identified, included, or excluded publications for each of these approaches.

Exhibit 1. Flow Diagram



2.2. Publication Analysis

We exported the final set of 939 publications from EndNote into a Microsoft Excel-based data extraction tool to catalogue, organize, and analyze primary care PBRN publications. The data extraction tool captured PBRN affiliation, key areas of focus, funding sources, and methodological approaches. We developed automated deductive coding formulas in Excel using a predefined set of search terms; applied them to each publication's title, abstract, and keywords; and conducted manual spot-checks to review the accuracy of attribution.

The authors of this report (Asta Sorensen, Amelia Kelly, Peter DiMilia) organized the key areas of focus within three areas: primary care transformation, clinical practice, and health disparity (see Exhibit 2 for a description of the areas of focus within each domain). The full set of 939 publications, representing 100 PBRNs, were included as part of the PBRN Landscape (Section 3.1) and Studies and Publications Over the Past 10 Years (Section 3.2) analyses; only the subset of 573 publications representing 21 PBRNs that were validated by PBRNs were included in the Areas of Focus analysis, however (Section 3.3).

Exhibit 2. Definitions of Primary Care Transformation, Clinical Practice, and Health Disparities Domains

Primary Care Transformation Domains

Domain	Definitions
Access and Continuity	Includes research that seeks to increase beneficiary access to care in terms of affordability, availability, and accessibility. Examples include use of telehealth, 24/7 access to a practitioner with access to an electronic health record (EHR), and/or offering weekend and evening hours.
Planned Care and Population Health	Includes research pertaining to the use of data (e.g., patient registries) to continuously improve patients' health, experience, and quality of care and decrease costs. Examples include use of data and measures to improve population health management, patients' health, and experience and decrease costs.
Care Management	Includes research that seeks to identify patients based on their health risks and needs, including longitudinal and episodic care management. *Longitudinal care (or chronic care)* management involves customized care to help patients manage their conditions effectively. It can include a process of personalized care planning or care plan and risk stratification, which is an algorithm or process that identifies and monitors patients who are at high risk for hospitalizations or other outcomes. *Episodic care management* is the process for identifying patients who have acute or urgent needs using "triggering events" and provides timely follow-up after emergency department (ED) and hospital visits, which helps improve care transitions and adherence to post-discharge care plans.
Patient and Caregiver Engagement	Research that seeks to engage patients and families to guide improvement of the system of care, including shared decision-making, patient activation, patient and family advisory councils, culturally competent care, and health literacy.
Advance Care Planning	Includes research pertaining to planning end-of-life care under circumstances in which the patient can no longer make decisions for themselves. It can include documents such as a living will, durable power of attorney, and healthcare proxy.
Coordination of Care	Research that promotes seamless coordination and bilateral exchange of necessary patient information among various healthcare providers and community-based resources, including a dedicated care coordination staff, collaboration with specialists and referral management, tracking and timely notifications of hospitalizations and ED visits, and practices such as warm handoffs and closed-loop referrals.
Health IT (HIT) and EHR Improvements	Includes activities related to building capacity for practice- and panel-level quality measurement and reporting from the EHR (e.g., PBRN efforts toward EHR interoperability, utilization of the EHR to collect data, telehealth, enhancements to patient portal functionality or access).
Organizational Culture, Teamwork, and Communication	Includes studies such as Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) and culture surveys.

Domain	Definitions
Patient Safety	Refers to the prevention of errors and adverse effects to patients associated with healthcare, including medication safety, medication reconciliation, diagnostic errors, and incident reporting.
Community Engagement	Includes studies that facilitate the engagement of communities of service.
Training Future Primary Care Researchers and Building Practice Analytic Capability	Includes studies and activities related to training healthcare professionals.
Assessing Health Policy Needs	Includes studies that link clinical work with health policy reform efforts.

Clinical Practice Domains

Domain	Definitions
Diabetes	Includes studies related to diabetes treatment, screening, and diagnosis.
Hypertension	Includes studies related to hypertension treatment, screening, and diagnosis.
Chronic Obstructive Pulmonary Disease (COPD)	Includes studies related to COPD treatment, screening, and diagnosis.
Cancer Screening	Includes studies related to cancer screenings.
Mental and Behavioral Health	Includes studies related to mental and behavioral health treatment, screening, and diagnosis.
Cardiovascular Health	Includes studies related to cardiovascular health treatment, screening, and diagnosis.
Obstetrics and Gynecology	Includes studies related to obstetrics and gynecology.
COVID-19 Pandemic Response	Includes studies related to COVID-19.
Obesity	Includes studies related to obesity.
Nutrition	Includes studies related to nutrition.
Multiple Chronic Conditions	Includes studies related to multiple chronic conditions.

Health Disparities Domains

Domain	Definitions
Pediatric	Includes studies that would have impact on, involve, or study infants, children, or adolescents.
Geriatric	Includes studies that would have impact on, involve, or study the elderly (65+ years old).
Rural	Includes studies that would have impact on, involve, or study rural populations.
Urban	Includes studies that would have impact on, involve, or study urban/inner city populations.

Domain	Definitions
Race/Ethnicity	Includes studies that would have impact on, involve, or study Black/African American, Hispanic/Latino, Native American/Alaska Native, Asian, or Pacific Islander populations.
Populations with Health Risk Factors	Includes studies that would have impact on, involve, or study other underserved populations based on sociodemographic factors.
Social Determinants of Health (SDoH)	Includes studies related to SDoH.

Additional publication characteristics, such as journal, methodology, and funding sources, were extracted with Excel formulas based on applicable search terms, Medical Subject Heading (MeSH) terminology, keywords, and other data reported in the appropriate publication fields (e.g., journal name extracted from the Journal Title field, funding sources from Funding Sources field). Publication metrics, such as "times cited" and impact factor of the publishing journal, were identified using Web of Science on October 24, 2024.

We further used Microsoft Copilot to summarize topics within specific domains and the impacts of the most highly cited publications, manually revising and validating the outputs.

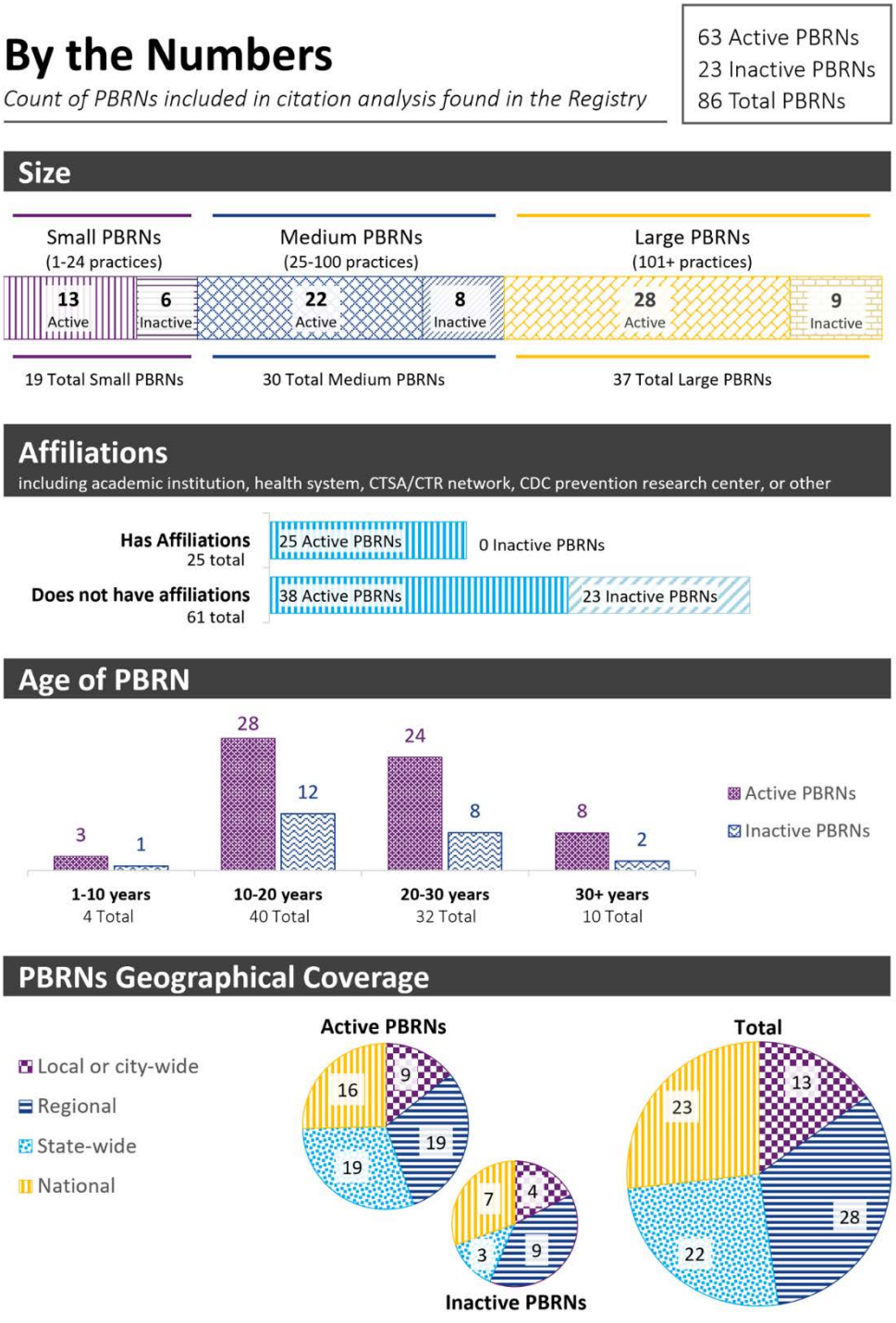
3. Findings

3.1. PBRN Landscape

We identified 939 publications attributable to 100 primary care PBRNs as a result of the PubMed search and PBRN outreach efforts. Of the 100 PBRNs, 86 were part of the pre-existing AHRQ PBRN Registry. The additional 14 were PBRNs that were not on the Registry at the time but that had identified publications. Additional analysis was only able to be conducted on the 86 PBRNs that were in the Registry.

Of the 86 PBRNs that were in the PBRN Registry, 23 were no longer active. Thirty-seven of the PBRNs were large (101 or more practices), 30 were medium (25–100 practices), and 19 were small (1–24 practices). Just under half (n=40) of these PBRNs were established 10 to 20 years ago, with nearly as many (n=32) established 20 to 30 years ago. More than half (n=61) were not affiliated with academic institutions or health systems. Exhibit 3 shows PBRN characteristics by practice size, affiliations, age, and geographical coverage.

Exhibit 3. Characteristics of PBRNs Included in Analysis

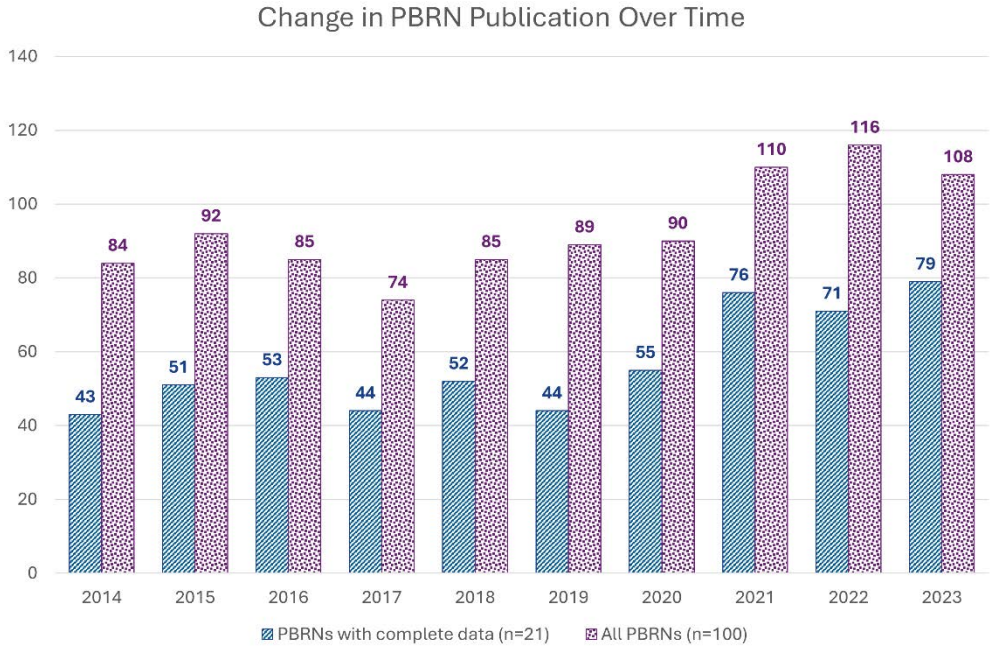


3.2. PBRN Studies and Publications Over the Past 10 Years

3.2.1. Overall Numbers of Publications and Journals

We identified 939 publications attributable to the 100 primary care PBRNs, 86 of which were in the Registry and 14 of which were not in the Registry. The PBRNs were identified as a result of the PubMed search and PBRN outreach efforts. These included 927 journal articles, 9 tools, 2 conference proceedings, and 1 book section. As illustrated in Exhibit 4, publications produced by these 100 PBRNs increased steadily between 2014 and 2023. Approximately 10 percent of the identified publications (91 of 939) were authored by investigators representing more than one primary care PBRN. Many PBRNs published their work in the *Journal of the American Board of Family Medicine* (n=107).[2] Other journals that published PBRN work included the *Annals of Family Medicine* (n=57) and the *Journal of General Internal Medicine* (n=28). The impact factors for the journals that commonly published PBRN research ranged from 8.0 (*Pediatrics*) to 2.0 (*Contemporary Clinical Trials*) (Exhibit 5).[3]

Exhibit 4. Change in PBRN Publications Over Time



More than half (n=573) of the publications were authored by primary care PBRNs that responded to our outreach and validated the list of their recent works (two primary care PBRNs confirmed having no publications). These included 562 journal articles, 8 tools, 2 conference proceedings, and 1 book section. The number of publications produced by these PBRNs increased from 2014

[2] *Journal of the American Board of Family Medicine* also publishes an annual special issue highlighting highly read practice-based research.

[3] The impact factor is a calculated measure of the yearly mean number of citations of articles published in the past 2 years in a given journal. Impact factors can be used compare the relative prestige of journals, with higher impact factors indicating journals that are more commonly cited. The Clarivate Impact Factor. (1994). *Current Contents.* https://clarivate.com/academia-government/essays/impact-factor/.

to 2023, rising from 43 publications in 2014 to 79 in 2023 (Exhibit 4). PBRNs with the most publications were the Clinical Directors Network (n=109), the Oregon Rural Practice-based Research Network (n=91), and the Massachusetts General Primary Care Practice-based Research Network (n=91). These primary care PBRNs published in 250 different journals, most commonly in the *Journal of the American Board of Family Medicine* (n=42), *Annals of Family Medicine* (n=33), and *Pediatrics* (n=22) (see Exhibit 5).

Exhibit 5. Most Common Journals Where PBRNs Published (All PBRNs, n=100)

Journals	Count of Publications	Impact Factor as of March 3, 2025
Journal of the American Board of Family Medicine	107	2.4*
Annals of Family Medicine	57	4.4*
Journal of General Internal Medicine	28	4.3*
Pediatrics	23	8.0*
Journal of Clinical and Translational Science	19	2.6**
Academic Pediatrics	15	3.0**
Contemporary Clinical Trials	13	2.0*
American Journal of Preventive Medicine	12	4.3**
Journal of Family Medicine	12	2.8*
Journal of American Medical Informatics Association	10	4.7*
Journal of Athletic Training	10	2.6**
Journal of Rural Health	10	3.1*

* Impact factors reported by the journals.
** Impact factors obtained from the Web of Science.

3.2.2. Most Cited PBRN Publications

We used the Web of Science to identify the most cited primary care PBRN publications. As of October 24, 2024, Web of Science provided citations for 400 of the 939 identified publications. Of these, 44 publications published between 2014 and 2019 were cited 50 or more times, and 17 publications published between 2020 and 2023 were cited 20 or more times. Appendix C lists the highly cited PBRN publications published over the past 10 years.

The journals that published the most highly cited publications were the *Journal of the American Board of Family Medicine* (n=10), *Annals of Family Medicine* (n=7), *Journal of the American Medical Informatics Association* (n=4), and *Pediatrics* (n=3) (see Exhibit 6). The PBRNs with the most highly cited publications included the Oregon Rural Practice-based Research Network (n=10), the Virginia Ambulatory Care Outcomes Research Network (n=6), the Clinical Directors Network (n=6), the Massachusetts General Primary Care Practice-based Research Network (n=6), and the American Academy of Family Physicians (AAFP) National Research Network (n=5).

Of the 400 publications with available citation data, the highest cited publication between 2014 and 2019 was "Burnout and Health Care Workforce Turnover," authored by the San Francisco Bay Collaborative Research Network (Willard-Grace et al., 2019). This publication was cited more

than 250 times since it was published in the *Annals of Family Medicine* in 2019 and investigated burnout among primary care clinicians/staff and the impact on workforce turnover. The highest cited publication between 2020 and 2023 was the Ochsner Primary Care Research Network's publication "Weight Loss in Underserved Patients — A Cluster-Randomized Trial," which has been cited 71 times since it was published in the *New England Journal of Medicine* in 2020 (Katzmarzyk et al., 2020). This publication discussed findings from a study that tested the effectiveness of a high-intensity, lifestyle-based program for obesity treatment delivered in primary care clinics serving low-income population. It was often cited by other studies exploring weight management strategies and health disparities.

Exhibit 6. Journals That Published the Most Cited PBRN Publications, 2014–2023

Journals	Number of Highly Cited PBRN Publications	Impact Factor as of January 17, 2025
Journal of the American Board of Family Medicine	10	2.4*
Annals of Family Medicine	7	4.4*
Journal of the American Medical Informatics Association	4	4.7*
Pediatrics	3	8.0*
American Journal of Preventive Medicine	2	4.3*
American Journal of Public Health	2	12.7*
Health Affairs	2	8.8*
Journal of Substance Abuse Treatment	2	3.7**

* Impact factors reported by the journals.
** Impact factors obtained from the Web of Science.

3.2.3. Research Approaches Used by PBRNs

We used MeSH terms and keywords to identify research designs and methodologies used by primary care PBRNs. These included study designs (e.g., clinical trial, experimental, observational, randomized control trial) and comparative designs and methodologies (e.g., quantitative, qualitative, mixed methods). Definitions for these MeSH terms are included in Appendix A. As listed in Exhibit 7, the most commonly reported study design among the 939 identified PBRN publications was clinical trials (n=72). Other reported study designs included observational studies (n=25). Of the identified PBRN publications over the past 10 years, only two publications reported an experimental study design. The most commonly reported research method was quantitative methods (n=307), followed by qualitative methods (n=173) and mixed-methods research (n=17) (Exhibit 7).

Exhibit 7. Research Types Used (All PBRNs, n=100)

Study Design

Research Type	Number of Publications
Clinical Trial*	72
Observational	25
Experimental**	2

* Randomized Control Trial was combined with Clinical Trail.
** Comparative research was renamed under Experimental for this exhibit.

Method

Research Type	Number of Publications
Quantitative	307
Qualitative	173
Mixed	17

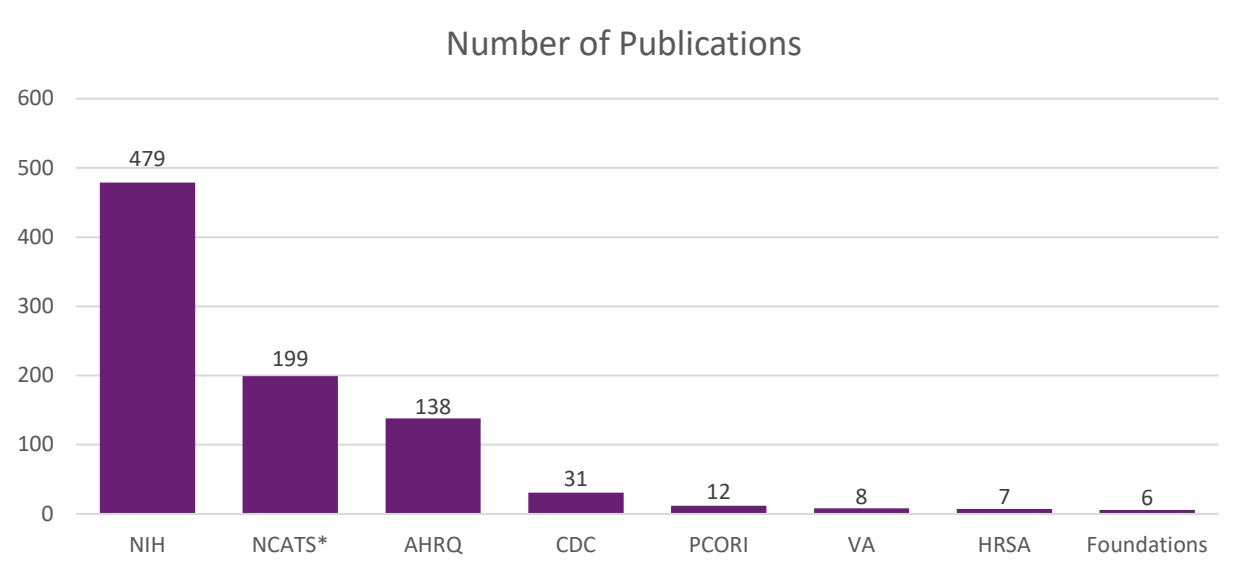
3.2.4. Funding Sources

We used keywords to extract funder organizations reported by PBRNs (Exhibit 8). The funding source was listed for 569 of the 939 publications, with some listing more than one funding organization.

Federal agencies were the most commonly cited funding source. The National Institutes of Health (NIH) was listed in 479 publications. Of these, approximately 42 percent (n=199) were part of the National Center for Advancing Translational Sciences (NCATS) awards. AHRQ was the second most common funding source, attributed in 138 publications. Less common federal agencies cited as funding sources in identified publications were the Centers for Disease Control and Prevention (n=31), the U.S. Department of Veterans Affairs (n=8), and the Health Resources and Services Administration (n=7).

Nonfederal funding organizations included the Patient-Centered Outcomes Research Institute (n=12), and foundations (n=6) such as the Robert Wood Johnson Foundation.

Exhibit 8. Most Cited Funding Sources (All PBRNs, n=100)



* NCATS funding is reported as a subset of NIH funding; that is, the 199 instances of PBRNs supported by NCATS funding are a subset of the 479 instances of NIH support.
Note: Some PBRNs might have received funding from more than one source, so some publications can report more than one funding source.

3.3. Areas of Focus

The following sections summarize primary care PBRN publications addressing primary care transformation, clinical care, and health disparities. As described in Section 2.1, low PBRN response to our outreach (n=21) limited our ability to identify the full research output representing all primary care PBRNs; the subsequent findings are based on the 573 publications that were validated by the 21 PBRNs.

3.3.1. Primary Care Transformation

To capture the landscape of primary care PBRN research, we adapted frameworks from past and current primary care transformation initiatives, such as the Center for Medicare and Medicaid Innovation's Comprehensive Primary Care Plus (CPC+) and Primary Care First models (*CPC+ Care Delivery Requirements Crosswalk, 2019; CPC+ Implementation Guide: Guiding Principles and Reporting, 2017*). Definitions for each Primary Care Transformation domain can be found in Exhibit 2.

Many publications (265 of 573) pertained to one or more Primary Care Transformation domains, as shown in Exhibit 9. The most commonly addressed Primary Care Transformation domain was Community Engagement, with 83 publications. These publications addressed topics such as engaging stakeholders and communities in research and the role of community-academic partnerships and collaborative programs in improving health outcomes. The second most commonly addressed domain in this area was Health IT and EHR Improvements (n=63), focusing on topics such as patient portals and patient engagement, health IT-enabled population health management, and EHR improvements. Other publications within the Primary Care

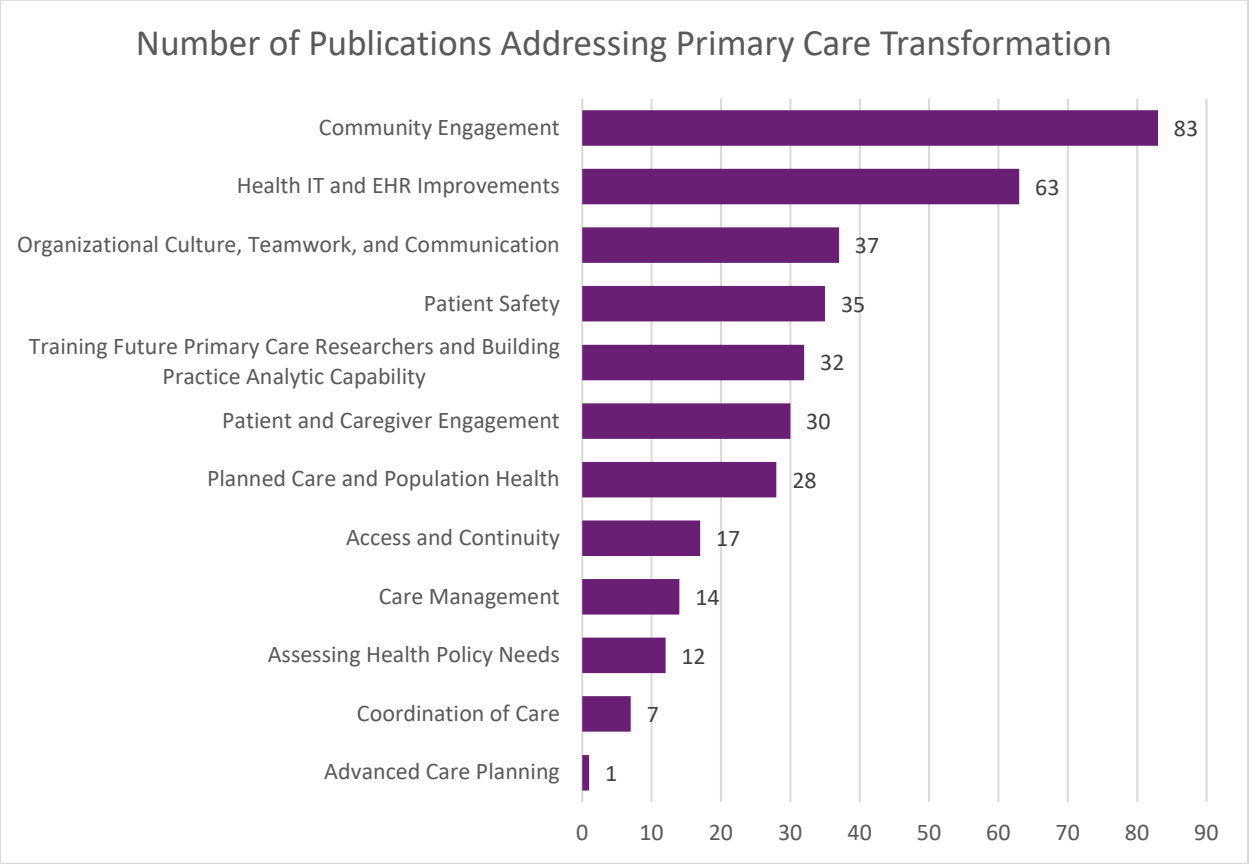
Transformation domain focused on Organizational Culture, Teamwork, and Communication (n=37) and Patient Safety (n=35). Publications pertaining to Organizational Culture, Teamwork, and Communication commonly included topics such as team-based care, while Patient Safety publications included topics such as medication safety.

Less explored Primary Care Transformation domains were Training Future Primary Care Researchers and Building Practice Analytic Capability (n=32), Patient and Caregiver Engagement (n=30), Planned Care and Population Health (n=28), Access and Continuity (n=17), Care Management (n=14), Assessing Health Policy Needs (n=12), Coordination of Care (n=7), and Advanced Care Planning (n=1).

The Virginia Ambulatory Care Outcomes Research Network's highly cited publication "Authentic Engagement of Patients and Communities Can Transform Research, Practice, and Policy" (n=130) focused on Patient and Caregiver Engagement and Planned Care and Population Health (Woolf et al., 2016). This publication emphasized the importance of involving patients and communities as full partners in research and provided examples of how community-engaged research can build trust, encourage participation from underrepresented groups, and improve the applicability and acceptance of research outcomes. The World Health Organization (WHO) cited this article in their consolidated guidelines on sexual and reproductive health and the rights of women living with HIV, highlighting the importance of community-led strategies in improving health outcomes for women living with HIV ("WHO Guidelines Approved by the Guidelines Review Committee," 2017).

Two other examples of highly cited publications by the Virginia Ambulatory Care Outcomes Research Network focused on Health IT and EHR Improvements in primary care: "Electronic Health Record Functionality Needed to Better Support Primary Care" (Krist, Beasley, et al., 2014), which was cited 116 times, and "Engaging Primary Care Patients to Use a Patient-Centered Personal Health Record" (Krist, Woolf, et al., 2014), cited 74 times. "Electronic Health Record Functionality Needed to Better Support Primary Care" highlighted gaps in EHR systems and proposed enhancements that aligned with the Institute of Medicine's primary care attributes and meaningful use objectives. By advocating for improved documentation, patient-partnering activities, support for team-based care, and population-management tools, the article informed EHR development to better support comprehensive, holistic patient care in primary care practice. "Engaging Primary Care Patients to Use a Patient-Centered Personal Health Record" explored the implementation of an interactive preventive health record in primary care practices. This publication provided insights into patient engagement and the integration of health IT in primary care and has been cited by studies examining the factors that influence patient portal use and the impact of patient engagement on health outcomes.

Exhibit 9. Number of Publications Addressing Primary Care Transformation



3.3.2. Clinical Practice

Clinical Practice domains sought to identify clinical foci of PBRN research (Exhibit 2). More than half of these publications (364 of 573) pertained to one or more Clinical Practice domains. The most commonly addressed Clinical Practice domain by primary care PBRNs over the past 10 years was Mental and Behavioral Health (n=108). These publications focused on behavioral health assessments and interventions in primary care, substance use disorders, and treatments for depression and anxiety.

Hypertension (n=62) and Cancer Screening (n=62) were also commonly addressed Clinical Practice domains. Publications pertaining to Hypertension included topics such as racial and ethnic disparities in hypertension management and lifestyle interventions. The publications relating to Cancer Screening included topics such as racial and socioeconomic disparities in cancer screening outcomes and interventions to improve cancer screening rates. Another commonly addressed domain was Obstetrics and Gynecology (n=54), with publications discussing topics such as maternal mental health and racial disparities in maternal healthcare. PBRN publications that pertained to Nutrition (n=49) included themes such as food insecurity and the impact on health outcomes and dietary interventions for chronic health conditions. Many recent publications focused on COVID-19 Pandemic Response (n=38). Less commonly addressed Clinical Practice domains included Diabetes (n=48), followed by Cardiovascular Health (n=46) and Obesity

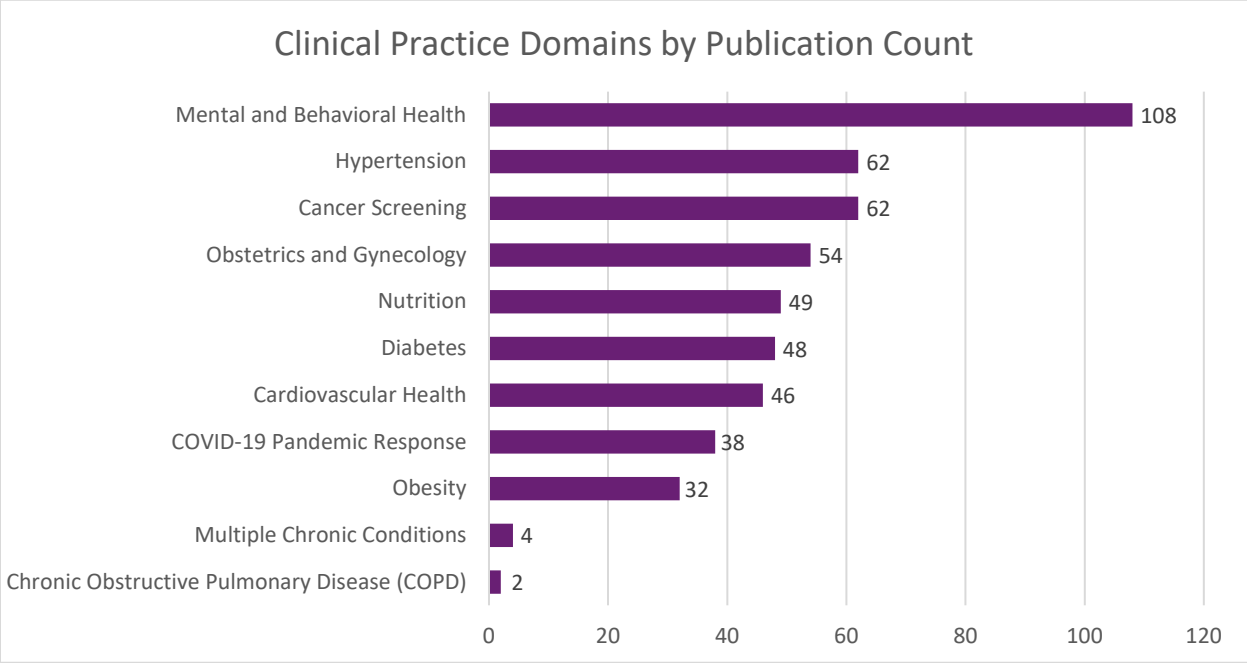
(n=32). The least commonly addressed Clinical Practice domains were Multiple Chronic Conditions (n=4) and Chronic Obstructive Pulmonary Disease (COPD) (n=2).

One example of a highly cited PBRN publication was the Pediatric Research in Office Settings' publication "Motivational Interviewing and Dietary Counseling for Obesity in Primary Care: An RCT" (n=181), which tested the efficacy of motivational interviewing delivered by primary care providers and registered dietitians to parents of overweight children (Resnicow et al., 2015). The American Academy of Pediatrics cited this study and incorporated motivational interviewing in its 2023 Clinical Practice Guidelines for the Evaluation and Treatment of Children and Adolescents with Obesity (Hampl et al., 2023). The National Academy of Medicine also cited this publication as an example of an effective intervention for weight loss among severely obese children in a primary care setting in their discussion paper "Clinical Perspectives on Obesity Treatment: Challenges, Gaps, and Promising Opportunities" (Heymsfield, 2018).

"The Association of Health Literacy and Blood Pressure Reduction in a Cohort of Patients with Hypertension: The Heart Healthy Lenoir Trial" was a highly cited (n=51) Eastern Carolina Association for Research & Education publication (Halladay et al., 2017). Conducted in rural primary care settings, the study evaluated the effectiveness of health literacy-sensitive interventions for hypertensive patients. This PBRN publication has been referenced in subsequent research exploring the relationship between health literacy and chronic disease management. In recent years, several states have implemented initiatives to improve health literacy. For example, in 2024 Michigan's Department of Health and Humans Services expanded access to community health workers who provide health literacy services and other culturally relevant health educational initiatives to Medicaid plan members (Thaxton, 2024).

The University of California, Los Angeles, (UCLA) Primary Care Research Network publication "High Mortality Among Patients with Opioid Use Disorder in a Large Healthcare System" (n=136) was another example of a highly cited PBRN publication (Hser et al., 2017) that addresses Clinical Practice. This study highlighted the urgent need for integrated care models and enhanced screening and treatment strategies for patients with opioid use disorder. It was cited in an update to the regulations implementing to the Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008, which prohibits group health plans and health insurance issuers from placing greater restrictions on access to mental health and substance use disorder benefits as compared to medical/surgical benefits ("Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008," 2008). Authors of the updated rules used the UCLA Primary Care Research Network's publication to highlight the urgent need for comprehensive and equitable access to mental health and substance use disorder treatments, given the high rate of mortality for those struggling with opioid use disorder ("Requirements Related to the Mental Health Parity and Addiction Equity Act," 2024).

Exhibit 10. Number of Publications Addressing Select Clinical Areas



3.3.3. Health Disparities

To assess the extent of PBRN research on improving health disparities and advancing health equity, we sought to identify publications that focused on historically underserved populations (i.e., pediatric, geriatric, rural) and SDoH (definitions in Exhibit 2).

Of the total 573 publications, 325 included one or more domains related to Health Disparities and SDoH. As listed in Exhibit 11, most publications covered pediatric populations (n=143) and included topics such as obesity and weight management and disparities in pediatric health outcomes. Another commonly addressed domain was Populations with Health Risk Factors (n=108), including other underserved populations based on sociodemographic factors. These publications focused on topics such as health literacy and patient engagement. Other common domains included SDoH (n=91), which included topics such as the impact of discrimination on health outcomes, and Race/Ethnicity (n=76), which included topics such as access to care, prenatal care, and chronic disease management. PBRN work over the past 10 years focused less on geriatric (n=49), rural (n=36), and urban (n=18) populations compared to the other Health Disparities domains.

The highly cited publication (n=125) "Cluster Randomized Controlled Trial of Group Prenatal Care: Perinatal Outcomes Among Adolescents in New York City Health Centers" (Ickovics et al., 2016), led by the Clinical Directors Network PBRN, set out to improve prenatal care for young, pregnant women. This publication established the effectiveness of a group prenatal care model compared to traditional, individual prenatal care. Women enrolled in the group prenatal care intervention reported better birth, neonatal, and reproductive outcomes compared to the control group. These findings have encouraged recent developments and support for the Centering Pregnancy prenatal care model, including the push for integration of the model into value-based payment

systems and its recognition by the Prenatal-to-3 Policy Impact Center, further supporting its broader adoption in prenatal care practices. This publication was also cited by the American College of Obstetricians and Gynecologists in their committee opinion on group prenatal care and used as an example of literature that provides evidence of the impact of group prenatal care on pregnancy-related weight management ("ACOG Committee Opinion No. 731: Group Prenatal Care," 2018).

"Evaluating Area-Based Socioeconomic Status Indicators for Monitoring Disparities within Health Care Systems: Results from a Primary Care Network" (Berkowitz et al., 2015), led by the Massachusetts General Primary Care Practice-based Research Network, is another example of a highly cited publication (n=222) addressing Health Disparities. This publication focused on defining area-based socioeconomic indicators for monitoring healthcare disparities, determining that ZIP Code-level median household income and percent poverty were the most effective indicators for detecting differences in health outcomes. Many current state-level efforts (including California's Health Equity Dashboard and New York State's Health Equity Report) rely on these area-based socioeconomic status indicators (Demographic Report on Health and Mental Health Equity in California, 2023).

The Northern New England CO-OP Practice and Community Based Research Network's "Screening for Adverse Childhood Experiences in a Family Medicine Setting: A Feasibility Study" is another highly cited publication (n=105) that addresses Health Disparities (Glowa et al., 2016). This publication facilitated integration of adverse childhood experiences (ACEs) screening into primary care and highlighted the importance of addressing SDoH in clinical settings. It has been cited by subsequent studies examining the impacts of ACEs on health outcomes and the feasibility of routine ACE screening in various healthcare settings. It was also cited in the American Heart Association's statement supporting for universal ACEs screening (American Heart Association, 2019). The National Governors Association's case study of California's ACEs Aware Initiative cited this publication as evidence that primary care screening in childhood for adverse events may help improve outcomes related to healthcare costs, quality of care, and maltreatment (DelFavero et al., 2021). In recent years, several states have implemented polices around ACEs screening, including California's SB 428, the ACEs Equity Act, which mandates insurance coverage for ACEs screening ("Health care coverage: Adverse childhood experiences screenings," 2021).

Another more recent PBRN publication authored by the Northern New England CO-OP Practice and Community-based Research Network focused on improving well water testing rates among rural-dwelling families with young children using private wells (Murray et al., 2020). This publication, titled "Private Well Water Testing Promotion in Pediatric Preventive Care: A Randomized Intervention Study," found that systematic drinking water source screening in pediatric care, combined with clinician involvement and structured follow-up, significantly increased well water test completion rates. These findings have influenced recent policy developments and recommendations, such as the recent inclusion of well water testing recommendations in the American Academy of Pediatrics guidelines (Woolf et al., 2023).

Exhibit 11. Number of Publications Addressing Health Disparities

Health Disparities Domains	Publication Count
Pediatric	143
Populations with Health Risk Factors	108
Social Determinants of Health	91
Race/Ethnicity	76
Geriatric	49
Rural	36
Urban	18

4. Discussion and Implications

4.1. Summary of Findings

Over the past decade, PBRNs have made a notable contribution to research in primary care transformation, clinical practice, and health disparities by contributing to more than 900 publications. Approximately 23.5 percent of PBRN publications were highly cited. The most commonly addressed areas in primary care transformation were community engagement, health IT, and organizational culture and patient safety. Less addressed areas of focus were advanced care planning, coordination of care, assessment of health policy needs, care management, and access and continuity of care.

PBRN research focusing on clinical topics most frequently addressed mental and behavioral health, hypertension, cancer screening, obstetrics and gynecology, and nutrition. The least addressed areas were COPD, multiple chronic conditions, and obesity. PBRN research on health disparities most frequently targeted pediatric populations, individuals with health risk factors, SDoH, and racial/ethnic disparities. Less addressed areas were urban, rural, and geriatric populations (see Appendix B for definitions).

These findings highlight the areas of past focus on which to build and gap areas for potential future attention in PBRN research, and can help guide future research efforts to enhance primary care practices and health outcomes.

4.2. Implications

This synthesis report is intended to comprehensively capture primary care PBRN publications in the United States. The sheer number of articles published in the past 10 years demonstrates not only the productivity of PBRNs but also the unique value of PBRNs despite the challenges they face, including limited funding to support their infrastructure.

Of the PBRNs that provided a full list of publications, those that had more publications were larger and affiliated with academic institutions. At least half of these PBRNs were established 10 to 20 years ago, which suggests that smaller, non-academic PBRNs might have more limitations in their ability or resources to identify and pursue funding opportunities for publishing.

While PBRNs continued their research in many clinical areas that advance medical practice, there might be untapped opportunities to influence health policy by broadening focus in the areas of health transformation, such as advanced care planning, access to care, and care coordination. Likewise, opportunities might exist to further the focus of research on underserved urban, rural, and geriatric populations. Expanding research in these areas might position PBRNs for broader health policy impacts at the state and national levels.

PBRNs continued to publish in well-known primary care and family medicine journals. However, publications that had the most impact were not limited to those journals, suggesting an opportunity to pursue higher-impact journals that are not limited to primary care.

4.3. Limitations

This environmental scan has several limitations. Primary care PBRN authors did not consistently attribute their publications, tools, and other resources to their PBRNs, which limited our ability to identify PBRN-affiliated work using PubMed. When authors listed their work's PBRN affiliation, they did so in varying fields, such as author affiliation, methods, acknowledgements, funding sources, or in the abstract. Many did not list such an affiliation at all. Funding sources were listed in 569 of the 939 publications; several publications listed more than one funding organization.

Primary care PBRNs and their collaborators might also vary in their definitions and interpretation of what constitutes PBRN-affiliated work. While some primary care PBRNs might have provided guidance to its researchers to consistently list the name of the network for PBRN-affiliated research studies and publications, others might not have provided such guidance and left it to the decision-making of individual authors. What constitutes a "PBRN publication" also varied, with some attributing publications to PBRN-affiliated investigators and others to investigators in their larger academic communities who might have used PBRN data in their research but might not have had an active role in the PBRN itself.

The small number of PBRNs (n=21) responding to our outreach further limited our ability to identify and study the research output representing primary care PBRNs. Efforts to update the AHRQ PBRN Registry in 2024 suggest that approximately 74 of the 197 PBRNs in the Registry may be inactive. It is also not clear whether the 46 PBRNs with no identified citations did not produce any publications or did not have capacity to respond to our request.

Last, we would like to note the inconsistencies we observed between PubMed and Web of Science. Web of Science has publication information for 400 out of 937 publications, limiting our ability to identify all highly cited publications.

5. Future Opportunities

5.1. Opportunities for AHRQ

To facilitate future PBRN research, AHRQ might consider the following strategies to further enhance the collective impact of PBRNs:

Continue to work with a Technical Expert Panel or group of PBRNs to understand and address evolving PBRN needs. As a part of the overall project for which this analysis was conducted, AHRQ engaged a Technical Expert Panel over five meetings. This panel provided invaluable context and information regarding the findings in this report and the development of other materials that are housed on the AHRQ website. Future PBRN work will benefit from a continued effort to engage with and understand the barriers and facilitators that PBRNs face in a rapidly evolving healthcare and research funding environment. It will be particularly important to address the barriers and facilitators that uniquely affect smaller, non-academic, and more recently established PBRNs, as well as how to more appropriately allocate future resources to ensure that those with less infrastructure and resources have similar opportunities. Assessing the changing needs and challenges that PBRNs face will ensure that the supports offered by AHRQ (including online resources) meet PBRN needs and optimize their success. For example, research outputs produced over the past 10 years suggest that PBRNs might no longer need as much support and training in design or analytic strategies. Instead, PBRNs might benefit from timely sharing of best practices through posting of information on the AHRQ website or a self-managed and sustained learning network on shared platforms such as LinkedIn.

Position PBRNs for opportunities to address emerging healthcare needs and impact health policy. AHRQ might consider identifying emerging health policy needs and positioning PBRNs to address those emerging needs, maximizing their role and ability to impact health policy. Such activities can take place through timely sharing of federal priorities through a newsletter, podcasts, or targeted communications via social media groups such as LinkedIn.

Foster opportunities for cross-PBRN collaboration, especially between academic and non-academic PBRNs. AHRQ might encourage cross-PBRN collaboration through future requests for proposals. Additionally, it can foster such collaboration by supporting online platforms for sharing best practices, research findings, and innovative solutions, allowing PBRNs to connect, share resources, and collaborate on joint projects. Resources to support such platforms could be minimal, should AHRQ promote participation and generation of knowledge by PBRNs themselves in real time (e.g., closed LinkedIn groups where PBRNs have autonomy to generate uncured content any time and others have an opportunity to respond or use that content in real time).

Promote PBRN visibility and recognition. AHRQ can help increase the visibility of PBRNs by providing clear guidance on what is and is not considered a PBRN publication and encourage consistent attribution of PBRN affiliations in research publications. AHRQ can encourage PBRNs to submit or upload their most recent publications to maintain a timely and ongoing depository

of research outputs, including predefined categories to allow easy retrieval of information by PBRNs. These activities will facilitate better tracking of research outputs and support assessment of PBRN research impacts.

5.2. Recommendations for PBRNs

Our findings suggest several strategies that might be helpful for PBRNs in terms of sustainability, impact, and visibility of their research:

- **Diversifying funding streams**. Past PBRN research heavily relied on AHRQ and NIH funding. PBRNs might benefit from broadening the pool of future funding opportunities, especially national or regional foundations and state or private sector sponsorships. Collaborating with other PBRNs or applying known community engagement strategies might be helpful for identifying and obtaining such funding (Gaglioti et al., 2016).
- **Contributing to health policy reforms.** While PBRNs made notable contributions to improving primary care practice, they might have additional opportunities to influence or inform ongoing policy reforms (e.g., Centers for Medicare & Medicaid Services primary care initiatives).
- **Addressing under-researched areas.** Addressing under-researched areas in primary care and expanding the scope of PBRN research could lead to more comprehensive and impactful findings. This includes focusing on chronic conditions, advanced care planning, and health disparities in diverse populations.
- **Attributing PBRN research in publications**. Consistent attribution to PBRNs in publications can improve the visibility of PBRN-affiliated research and increase recognition of PBRN contributions. For example, researchers should list the name of their PBRN in author affiliations to enhance the visibility of the PBRN's contributions.
- **Continuing to foster cross-network collaboration.** PBRNs should continue to collaborate and share resources to enhance success in obtaining research funding, research execution and translation to practice, and coauthoring of publications to offset resource limitations and maximize research impacts.

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Appendix A. MeSH Terms to Identify Study Design and Type of Research

Study Design

MeSH Term	Search Terms	Definition
Clinical Trial	clinical trial	A work that reports on the results of a clinical study in which participants are assigned to receive one or more interventions so that researchers can evaluate the interventions on biomedical or health-related outcomes.
Observational	observational study, card study	A work that reports on the results of a clinical study in which participants may receive diagnostic, therapeutic, or other types of interventions, but the investigator does not assign participants to specific interventions.
Randomized Control Trial	randomized control trial	A work that reports on a clinical trial that involves at least one test treatment and one control treatment, concurrent enrollment, and follow-up of the test- and control-treated groups, and in which the treatments to be administered are selected by a random process, such as the use of a random-numbers table.
Comparative	comparative study	Comparison of outcomes, results, responses, etc., for different techniques, therapeutic approaches, or other inputs.

Methods

MeSH Term	Search Terms	Definition
Mixed Methods*	mixed methods	Mixed-methods research is a research methodology that employs rigorous quantitative research and qualitative research. This methodology utilizes multiple methods (e.g., intervention trials and in-depth interviews), intentionally integrating or combining these methods to draw on the strengths of each (Creswell, 2011).
Qualitative Methods	interview, focus group, qualitative methods	Any type of research that employs nonnumeric information to explore individual or group characteristics, producing findings not arrived at by statistical procedures or other quantitative means.
Quantitative Methods*	quantitative methods, survey, statistical	Any type of research involving the use of numerical measurement and data analysis based on statistical methods (Frechtling, 2002).

* MeSH term not available.

Appendix B. Keywords to Identify Primary Care Transformation, Clinical Practice, and Health Disparities

Primary Care Transformation Domains

Domain	Search Terms
Access and Continuity	access to care, continuity, same day appointment, 24/7, extended hours, weekend appointments, evening hours
Planned Care and Population Health	population health, patient panel, patient registries, patient registry, quality of care
Care Management	episodic care management, longitudinal care management, care management, care manager, risk stratification, personalized care plan, follow-up after ED, case manager, care coordinator, case coordinator, case management
Patient and Caregiver Engagement	caregiver engagement, patient and family, patient and family advisory council, patient engagement, patient and family advisory committee, shared decision-making, patient activation, culturally competent care, health literacy
Advance Care Planning	advanced care planning, POLST, advanced directive, 5 wishes, living will, durable power of attorney, health care proxy, MOLST, COLST, advance care planning
Coordination of Care	coordination of care, care coordination, continuity of care, referral management, warm handoff, closed-loop referral
Health Information Technology (HIT) and Electronic Health Record (EHR) Improvements	EHR, HIT, Health information technology, electronic health record, EPIC, information exchange, portal
Organizational Culture, Teamwork, and Communication	organizational culture, teamwork, communication, TeamSTEPPS, culture survey
Patient Safety	safety, medication safety, patient fall, diagnostic error, medication error, medication reconciliation, incident reporting, patient safety
Community Engagement	community engagement, community, community based
Training Future Primary Care Researchers and Building Practice Analytic Capability	training
Assessing Health Policy Needs	health policy, CPC, CMS

Clinical Practice Domains

Domain	Search Terms
Diabetes	diabetes, blood sugar, A1C, diabetic, glucose monitoring
Hypertension	hypertension, blood pressure, statin
Chronic Obstructive Pulmonary Disease (COPD)	chronic obstructive pulmonary disease, COPD
Cancer Screening	cancer screening, cancer

Domain	Search Terms
Mental and Behavioral Health	behavioral health, BH, emotional well-being, psychological health, depression, anxiety, substance, psychologist, counseling, PHQ-9, alcohol, addiction, opioid, PTSD, mental health
Cardiovascular Health	cardiovascular, cardio, cardiac, atrial fibrillation
Obstetrics and Gynecology	obstetrics, gynecology, obgyn, pregnant, newborn, infant, maternal, prenatal, postnatal
COVID-19 Pandemic Response	covid, covid-19, pandemic, sars-cov-2
Obesity	obesity
Nutrition	nutrition, diet, food
Multiple Chronic Conditions	multiple chronic conditions, multimorbidity

Health Disparities Domains

Domain	Search Terms
Pediatric	pediatric, child, children, adolescent, young adult, teen, teens
Geriatric	geriatric, elderly, geriatr*, older adult, older adults, 65+, senior, seniors, Medicare
Rural	rural
Urban	urban, inner city
Race/Ethnicity	Black, African American, Hispanic, Latino, LatinX, Native American, Indigenous, Alaskan Native, Asian, Pacific Islander, racial disparities, racial disparity, black, Ethnic and Racial Minorities
Populations with Health Risk Factors	low income, socioeconomic, FQHC, underserved, disability, disabilities, English as a second language, ESL, Spanish-speaking, literacy, translation services, translator, specialized services, chronic conditions, LGBTQI+, LGBT, transexual, gender discordant, Medicaid, uninsured, refugee, migrant, immigrant, disadvantaged
Social Determinants of Health	Social Determinants of Health, Health Related Social Needs, Health-Related Social Needs, SDoH, HRSN, Food insecurity, housing insecurity, financial strain, poverty, poor, low-income

Appendix C. List of Highly Cited PBRN Publications, 2014–2023

PBRN Publications Published 2014–2019 Cited 50 or More Times

PBRN	Title	Times Cited as of October 24, 2024
SF Bay CRN	Willard-Grace, R., Knox, M., Huang, B., Hammer, H., Kivlahan, C., & Grumbach, K. (2019). Burnout and health care workforce turnover.	265
MGPC-PBRN	Berkowitz, S. A., Traore, C. Y., Singer, D. E., & Atlas, S. J. (2015). Evaluating area-based socioeconomic status indicators for monitoring disparities within health care systems: Results from a primary care network.	222
PROS	Resnicow, K., McMaster, F., Bocian, A., Harris, D., Zhou, Y., Snetselaar, L., Schwartz, R., Myers, E., Gotlieb, J., Foster, J., Hollinger, D., Smith, K., Woolford, S., Mueller, D., & Wasserman, R. C. (2015). Motivational interviewing and dietary counseling for obesity in primary care: An RCT.	181
UCLA PCRN	Hser, Y. I., Mooney, L. J., Saxon, A. J., Miotto, K., Bell, D. S., & Huang, D. (2017). Chronic pain among patients with opioid use disorder: Results from electronic health records data.	143
RRNet	Young, R. A., Burge, S. K., Kumar, K. A., Wilson, J. M., & Ortiz, D. F. (2018). A time-motion study of primary care physicians' work in the electronic health record era.	137
UCLA PCRN	Hser, Y. I., Mooney, L. J., Saxon, A. J., Miotto, K., Bell, D. S., Zhu, Y., Liang, D., & Huang, D. (2017). High mortality among patients with opioid use disorder in a large healthcare system.	136
ACORN	Woolf, S. H., Zimmerman, E., Haley, A., & Krist, A. H. (2016). Authentic engagement of patients and communities can transform research, practice, and policy.	130
CDN	Ickovics, J. R., Earnshaw, V., Lewis, J. B., Kershaw, T. S., Magriples, U., Stasko, E., Rising, S. S., Cassells, A., Cunningham, S., Bernstein, P., & Tobin, J. N. (2016). Cluster randomized controlled trial of group prenatal care: Perinatal outcomes among adolescents in New York City health centers.	125
ACORN	Krist, A. H., Beasley, J. W., Crosson, J. C., Kibbe, D. C., Klinkman, M. S., Lehmann, C. U., Fox, C. H., Mitchell, J. M., Mold, J. W., Pace, W. D., Peterson, K. A., Phillips, R. L., Post, R., Puro, J., Raddock, M., Simkus, R., & Waldren, S. E. (2014). Electronic health record functionality needed to better support primary care.	116
SF Bay CRN	Willard-Grace, R., Chen, E. H., Hessler, D., DeVore, D., Prado, C., Bodenheimer, T., & Thom, D. H. (2015). Health coaching by medical assistants to improve control of diabetes, hypertension, and hyperlipidemia in low-income patients: A randomized controlled trial.	114

PBRN	Title	Times Cited as of October 24, 2024
ACORN	Tong, S. T., Liaw, W. R., Kashiri, P. L., Pecsok, J., Rozman, J., Bazemore, A. W., & Krist, A. H. (2018). Clinician experiences with screening for social needs in primary care.	111
BIGHORN	Cifuentes, M., Davis, M., Fernald, D., Gunn, R., Dickinson, P., & Cohen, D. J. (2015). Electronic health record challenges, workarounds, and solutions observed in practices integrating behavioral health and primary care.	111
MGPC-PBRN	Berkowitz, S. A., Hulberg, A. C., Hong, C., Stowell, B. J., Tirozzi, K. J., Traore, C. Y., & Atlas, S. J. (2016). Addressing basic resource needs to improve primary care quality: A community collaboration programme.	105
NNE CO-OP PCBRN	Glowa, P. T., Olson, A. L., & Johnson, D. J. (2016). Screening for adverse childhood experiences in a family medicine setting: A feasibility study.	105
ORPRN	Ramanadhan, S., Davis, M. M., Armstrong, R., Baquero, B., Ko, L. K., Leng, J. C., Salloum, R. G., Vaughn, N. A., & Brownson, R. C. (2018). Participatory implementation science to increase the impact of evidence-based cancer prevention and control.	100
ORPRN	Hall, J., Cohen, D. J., Davis, M., Gunn, R., Blount, A., Pollack, D. A., Miller, W. L., Smith, C., Valentine, N., & Miller, B. F. (2015). Preparing the workforce for behavioral health and primary care integration.	99
PROS	Lee, J. M., Wasserman, R., Kaciroti, N., Gebremariam, A., Steffes, J., Dowshen, S., Harris, D., Serwint, J., Abney, D., Smitherman, L., Reiter, E., & Herman-Giddens, M. E. (2016). Timing of puberty in overweight versus obese boys.	96
ORPRN	Davis, M. M., Renfro, S., Pham, R., Hassmiller Lich, K., Shannon, J., Coronado, G. D., & Wheeler, S. B. (2017). Geographic and population-level disparities in colorectal cancer testing: A multilevel analysis of Medicaid and commercial claims data.	90
OCHIN PBRN	Wallace, L. S., Angier, H., Huguet, N., Gaudino, J. A., Krist, A., Dearing, M., Killerby, M., Marino, M., & DeVoe, J. E. (2016). Patterns of electronic portal use among vulnerable patients in a nationwide practice-based research network: From the OCHIN Practice-based Research Network (PBRN).	79
ORPRN	Davis, M. M., Freeman, M., Shannon, J., Coronado, G. D., Stange, K. C., Guise, J. M., Wheeler, S. B., & Buckley, D. I. (2018). A systematic review of clinic and community intervention to increase fecal testing for colorectal cancer in rural and low-income populations in the United States: How, what, and when?	77
ORPRN	Cohen, D. J., Davis, M., Balasubramanian, B. A., Gunn, R., Hall, J., deGruy, F. V., 3rd, Peek, C. J., Green, L. A., Stange, K. C., Pallares, C., Levy, S., Pollack, D., & Miller, B. F. (2015). Integrating behavioral health and primary care: Consulting, coordinating, and collaborating among professionals.	77

PBRN	Title	Times Cited as of October 24, 2024
ACORN	Krist, A. H., Woolf, S. H., Bello, G. A., Sabo, R. T., Longo, D. R., Kashiri, P., Etz, R. S., Loomis, J., Rothemich, S. F., Peele, J. E., & Cohn, J. (2014). Engaging primary care patients to use a patient-centered personal health record.	74
AAFP NRN	Brega, A. G., Freedman, M. A., LeBlanc, W. G., Barnard, J., Mabachi, N. M., Cifuentes, M., Albright, K., Weiss, B. D., Brach, C., & West, D. R. (2015). Using the health literacy universal precautions toolkit to improve the quality of patient materials.	74
ACORN	Mullen, R. A., Tong, S., Sabo, R. T., Liaw, W. R., Marshall, J., Nease, D. E., Jr., Krist, A. H., & Frey, J. J., 3rd. (2019). Loneliness in primary care patients: A prevalence study.	74
PROS	Daymont, C., Ross, M. E., Russell Localio, A., Fiks, A. G., Wasserman, R. C., & Grundmeier, R. W. (2017). Automated identification of implausible values in growth data from pediatric electronic health records.	73
AAFP NRN	Anderson, H. D., Pace, W. D., Brandt, E., Nielsen, R. D., Allen, R. R., Libby, A. M., West, D. R., & Valuck, R. J. (2015). Monitoring suicidal patients in primary care using electronic health records.	72
Ochsner-PCRN	Price-Haywood, E. G., Harden-Barrios, J., Ulep, R., & Luo, Q. (2017). eHealth literacy: Patient engagement in identifying strategies to encourage use of patient portals among older adults.	71
CDN	Kaushal, R., Hripcsak, G., Ascheim, D. D., Bloom, T., Campion, T. R., Jr., Caplan, A. L., Currie, B. P., Check, T., Deland, E. L., Gourevitch, M. N., Hart, R., Horowitz, C. R., Kastenbaum, I., Levin, A. A., Low, A. F., Meissner, P., Mirhaji, P., Pincus, H. A., Scaglione, C., . . . Tobin, J. N. (2014). Changing the research landscape: The New York City Clinical Data Research Network.	69
OKPRN	Beatty Moody, D. L., Waldstein, S. R., Tobin, J. N., Cassells, A., Schwartz, J. C., & Brondolo, E. (2016). Lifetime racial/ethnic discrimination and ambulatory blood pressure: The moderating effect of age.	68
SNOCAP	Dickinson, W. P., Dickinson, L. M., Nutting, P. A., Emsermann, C. B., Tutt, B., Crabtree, B. F., Fisher, L., Harbrecht, M., Gottsman, A., & West, D. R. (2014). Practice facilitation to improve diabetes care in primary care: A report from the EPIC randomized clinical trial.	68
AAFP NRN	Loskutova, N. Y., Tsai, A. G., Fisher, E. B., LaCruz, D. M., Cherrington, A. L., Harrington, T. M., Turner, T. J., & Pace, W. D. (2016). Patient navigators connecting patients to community resources to improve diabetes outcomes.	67
ORPRN	Zahnd, W. E., Davis, M. M., Rotter, J. S., Vanderpool, R. C., Perry, C. K., Shannon, J., Ko, L. K., Wheeler, S. B., Odahowski, C. L., Farris, P. E., & Eberth, J. M. (2019). Rural-urban differences in financial burden among cancer survivors: An analysis of a nationally representative survey.	67

PBRN	Title	Times Cited as of October 24, 2024
ACORN	Wolf, E. R., Hochheimer, C. J., Sabo, R. T., DeVoe, J., Wasserman, R., Geissal, E., Opel, D. J., Warren, N., Puro, J., O'Neil, J., Pecsok, J., & Krist, A. H. (2018). Gaps in well-child care attendance among primary care clinics serving low-income families.	64
MGPC-PBRN	Forcino, R. C., Barr, P. J., O'Malley, A. J., Arend, R., Castaldo, M. G., Ozanne, E. M., Percac-Lima, S., Stults, C. D., Tai-Seale, M., Thompson, R., & Elwyn, G. (2018). Using CollaboRATE, a brief patient-reported measure of shared decision making: Results from three clinical settings in the United States.	61
AAFP NRN	Kessler, R., Miller, B. F., Kelly, M., Graham, D., Kennedy, A., Littenberg, B., MacLean, C. D., van Eeghen, C., Scholle, S. H., Tirodkar, M., Morton, S., & Pace, W. D. (2014). Mental health, substance abuse, and health behavior services in patient-centered medical homes.	57
CDN	Rosenthal, L., Earnshaw, V. A., Lewis, T. T., Reid, A. E., Lewis, J. B., Stasko, E. C., Tobin, J. N., & Ickovics, J. R. (2015). Changes in experiences with discrimination across pregnancy and postpartum: Age differences and consequences for mental health.	56
CDN	Magriples, U., Boynton, M. H., Kershaw, T. S., Lewis, J., Rising, S. S., Tobin, J. N., Epel, E., & Ickovics, J. R. (2015). The impact of group prenatal care on pregnancy and postpartum weight trajectories.	56
RAP	Goodwin, M. A., Stange, K. C., Zyzanski, S. J., Crabtree, B. F., Borawski, E. A., & Flocke, S. A. (2017). The Hawthorne effect in direct observation research with physicians and patients.	56
CDN	Rabin, B. A., Lewis, C. C., Norton, W. E., Neta, G., Chambers, D., Tobin, J. N., Brownson, R. C., & Glasgow, R. E. (2016). Measurement resources for dissemination and implementation research in health.	56
OKPRN	Mold, J. W., Fox, C., Wisniewski, A., Lipman, P. D., Krauss, M. R., Harris, D. R., Aspy, C., Cohen, R. A., Elward, K., Frame, P., Yawn, B. P., Solberg, L. I., & Gonin, R. (2014). Implementing asthma guidelines using practice facilitation and local learning collaboratives: A randomized controlled trial.	54
MGPC-PBRN	Percac-Lima, S., Ashburner, J. M., Rigotti, N. A., Park, E. R., Chang, Y., Kuchukhidze, S., & Atlas, S. J. (2018). Patient navigation for lung cancer screening among current smokers in community health centers: A randomized controlled trial.	54
ORPRN	Gunn, R., Davis, M. M., Hall, J., Heintzman, J., Muench, J., Smeds, B., Miller, B. F., Miller, W. L., Gilchrist, E., Brown Levey, S., Brown, J., Wise Romero, P., & Cohen, D. J. (2015). Designing clinical space for the delivery of integrated behavioral health and primary care.	53
MGPC-PBRN	Percac-Lima, S., López, L., Ashburner, J. M., Green, A. R., & Atlas, S. J. (2014). The longitudinal impact of patient navigation on equity in colorectal cancer screening in a large primary care network.	52

PBRN	Title	Times Cited as of October 24, 2024
E-CARE	Halladay, J. R., Donahue, K. E., Cené, C. W., Li, Q., Cummings, D. M., Hinderliter, A. L., Miller, C. L., Garcia, B. A., Little, E., Rachide, M., Tillman, J., Ammerman, A. S., & DeWalt, D. (2017). The association of health literacy and blood pressure reduction in a cohort of patients with hypertension: The Heart Healthy Lenoir Trial.	51

PBRN Publications Published 2020–2023 Cited 20 or More Times

PBRN	Title	Times Cites as of October 24, 2024
Ochsner-PCRN	Katzmarzyk, P. T., Martin, C. K., Newton, R. L., Jr., Apolzan, J. W., Arnold, C. L., Davis, T. C., Price-Haywood, E. G., Denstel, K. D., Mire, E. F., Thethi, T. K., Brantley, P. J., Johnson, W. D., Fonseca, V., Gugel, J., Kennedy, K. B., Lavie, C. J., Sarpong, D. F., & Springgate, B. (2020). Weight loss in underserved patients: A cluster-randomized trial.	71
HamesNet	Moore, J. X., Gilbert, K. L., Lively, K. L., Laurent, C., Chawla, R., Li, C., Johnson, R., Petcu, R., Mehra, M., Spooner, A., Kolhe, R., & Ledford, C. J. W. (2021). Correlates of COVID-19 vaccine hesitancy among a community sample of African Americans living in the southern United States.	48
CDN	Talal, A. H., Sofikitou, E. M., Jaanimägi, U., Zeremski, M., Tobin, J. N., & Markatou, M. (2020). A framework for patient-centered telemedicine: Application and lessons learned from vulnerable populations.	44
WINS PBRN	Furness, B. W., Goldhammer, H., Montalvo, W., Gagnon, K., Bifulco, L., Lentine, D., & Anderson, D. (2020). Transforming primary care for lesbian, gay, bisexual, and transgender people: A collaborative quality improvement initiative.	40
WPRN	Hallgren, K. A., Witwer, E., West, I., Baldwin, L. M., Donovan, D., Stuvek, B., Keppel, G. A., Mollis, B., & Stephens, K. A. (2020). Prevalence of documented alcohol and opioid use disorder diagnoses and treatments in a regional primary care practice-based research network.	39
PROS	Szilagyi, P. G., Humiston, S. G., Stephens-Shields, A. J., Localio, R., Breck, A., Kelly, M. K., Wright, M., Grundmeier, R. W., Albertin, C., Shone, L. P., Steffes, J., Rand, C. M., Hannan, C., Abney, D. E., McFarland, G., Kominski, G. F., Seixas, B. V., & Fiks, A. G. (2021). Effect of training pediatric clinicians in human papillomavirus communication strategies on human papillomavirus vaccination rates: A cluster randomized clinical trial.	36
ORPRN	Calancie, L., Frerichs, L., Davis, M. M., Sullivan, E., White, A. M., Cilenti, D., Corbie-Smith, G., & Hassmiller Lich, K. (2021). Consolidated framework for collaboration research derived from a systematic review of theories, models, frameworks, and principles for cross-sector collaboration.	33

PBRN	Title	Times Cites as of October 24, 2024
RRNet	Schneider, F. D., Loveland Cook, C. A., Salas, J., Scherrer, J., Cleveland, I. N., & Burge, S. K. (2020). Childhood trauma, social networks, and the mental health of adult survivors.	31
AAFP NRN	Fiscella, K., Sanders, M. R., & Carroll, J. K. (2021). Transforming health care to address value and equity: National vital signs to guide vital reforms.	28
UCLA PCRN	Klann, J. G., Estiri, H., Weber, G. M., Moal, B., Avillach, P., Hong, C., Tan, A. L. M., Beaulieu-Jones, B. K., Castro, V., Maulhardt, T., Geva, A., Malovini, A., South, A. M., Visweswaran, S., Morris, M., Samayamuthu, M. J., Omenn, G. S., Ngiam, K. Y., Mandl, K. D., . . . Murphy, S. N. (2021). Validation of an internationally derived patient severity phenotype to support COVID-19 analytics from electronic health record data.	25
ORPRN	McConnell, K. J., Charlesworth, C. J., Zhu, J. M., Meath, T. H. A., George, R. M., Davis, M. M., Saha, S., & Kim, H. (2020). Access to primary, mental health, and specialty care: A comparison of Medicaid and commercially insured populations in Oregon.	24
NNE CO-OP PCBRN	Schlosser, J., Kollisch, D., Johnson, D., Perkins, T., & Olson, A. (2020). VA-community dual care: Veteran and clinician perspectives.	23
OCHIN PBRN	Larson, A. E., Zahnd, W. E., Davis, M. M., Stange, K. C., Yoon, J., Heintzman, J. D., & Harvey, S. M. (2022). Before and during pandemic telemedicine use: An analysis of rural and urban safety-net clinics.	22
MGPC-PBRN	Spencer, J. C., Kim, J. J., Tiro, J. A., Feldman, S. J., Kobrin, S. C., Skinner, C. S., Wang, L., McCarthy, A. M., Atlas, S. J., Pruitt, S. L., Silver, M. I., & Haas, J. S. (2023). Racial and ethnic disparities in cervical cancer screening from three U.S. healthcare settings.	22
ORPRN	Petchel, S., Gelmon, S., & Goldberg, B. (2020). The organizational risks of cross-sector partnerships: A comparison of health and human services perspectives.	21
PCRC	Joseph, J., Pajewski, N. M., Dolor, R. J., Sellers, M. A., Perdue, L. H., Peeples, S. R., Henrie, A. M., Woolard, N., Jones, W. S., Benziger, C. P., Orkaby, A. R., Mixon, A. S., VanWormer, J. J., Shapiro, M. D., Kistler, C. E., Polonsky, T. S., Chatterjee, R., Chamberlain, A. M., Forman, D. E., Alexander, K. P. (2023). Pragmatic evaluation of events and benefits of lipid lowering in older adults (PREVENTABLE): Trial design and rationale.	20
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