

Whitney E. Zahnd, PhD; Allie F. Silverman, MPH, MSW; Stella Self, PhD; Peiyin Hung, PhD; Nabil Natafqi, PhD; Swann Arp Adams, PhD; Melinda A. Merrell, PhD; O. Shaun Owens, PhD; Elizabeth Crouch, PhD; Jan M. Eberth, PhD

The Impact of the COVID-19 Pandemic on Rural Health Clinics' Operations and Cancer Prevention and Control Efforts

- Of the more than 150 Rural Health Clinics (RHCs) surveyed, roughly one in five experienced a temporary closure due to the pandemic.
- More than two-thirds of RHCs surveyed experienced stressors related to finances, changes in clinical operations, provider/staff self-quarantine, and provider/staff burnout.
- The vast majority (92.2%) of RHCs provided telehealth services during the pandemic, a significant rise from 23% pre-pandemic.
- The percentages of RHCs that provided cancer-related prevention and control services dropped pre- vs. peri-pandemic including cancer screening, HPV vaccination, and tobacco cessation services.

INTRODUCTION

Cancer mortality rates have declined more slowly among rural residents than urban residents leading to widening disparities.¹ Further, rural residents have higher rates of incidence of some cancer types with primary and secondary prevention targets (e.g., lung, cervical, and colorectal) and are more likely to be diagnosed at a more advanced stage.^{2,3} Rural communities face disproportionate challenges due to financial distress, limited access to cancer care professionals, hospital closures, and high disease burden among others.⁴⁻⁷ Primary care providers in rural communities can play an important role in cancer care by providing or referring to cancer prevention and screening services such as Human Papillomavirus (HPV) vaccination, colorectal cancer screening, and smoking cessation services.

The intent of the Rural Health Clinic (RHC) program is to increase access to outpatient services in rural communities particularly primary care and preventive health services. Thus, RHCs can play a key role in ensuring their patients receive needed cancer prevention and screening services. RHC services are provided using a team approach (i.e., physicians working with non-physician clinicians) as the RHC must be staffed 50% of the operating hours with nurse practitioners (NPs), certified nurse midwives (CNM), and/or physician's assistants (PAs).⁸ RHC-designation affords enhanced reimbursement rates for both Medicare and Medicaid services. According to the Centers for Medicare & Medicaid Services (CMS), as of October 2022 there were 5,092 RHCs across 45 states (all except Alaska, Rhode Island, Connecticut, Delaware, and New Jersey) in the United States.⁹ In 2014, 13.4% (7.3+ million) of all ambulatory care claims among rural Medicare beneficiaries originated in RHCs.¹⁰

The COVID-19 pandemic has affected both rural health care provision and cancer care delivery. Since March 2020 (i.e., peri-pandemic), rural healthcare providers temporarily suspended elective procedures. Elective and non-emergent services and protocols have been changed to mitigate the spread of the virus and preserve personal protective equipment (PPE).¹¹ Early in the pandemic, hospital systems reported a drastic reduction (>80%) in colorectal, cervical, and breast cancer screening; in addition, rebounds in screening were lower in rural compared to more urban areas for some cancer screenings.^{12,13} Further, modeling studies suggest that delayed screening and treatment related to the pandemic may contribute to small increases in cancer mortality.¹⁴ Although the impacts on mortality may be marginal, reducing pandemic-related delays in screening are important to reduce impacts on quality of life and mortality.

The American Rescue Plan (ARP) and the Paycheck Protection Program and Health Care Enhancement Act (PPHCE) established several programs targeted to RHCs to secure and maintain adequate personnel to carry out COVID-19 testing and mitigation and vaccine confidence including offering hiring bonuses and retention payments; childcare; transportation; and temporary housing. These programs include the Rural Health Clinic COVID-19 Testing Program (PPHCE), Rural Health Clinic COVID-19 Testing and Mitigation Program (ARP), Rural Health Clinic COVID-19 Vaccine Confidence Program (ARP).^{15,16} The public health emergency (PHE) declaration and CMS regulations have granted additional flexibility regarding staffing requirements, supervision of nurse practitioners, telehealth provision, and other policies.¹⁷ For example, further flexibility related to physician supervision requirements for NPs were allowed within the confines of state laws.¹⁷ Additionally, RHCs were allowed to serve as a distant site for telehealth services and can provide audio-only telehealth services during the PHE and receive Medicare reimbursement.

The National Association of Rural Health Clinics has summarized RHC COVID-19 testing patterns and use of federal pandemic funds, but the broader impact of the pandemic on RHC operations has yet to be assessed.¹⁸ Further, the impact of the pandemic on cancer prevention and control activities in rural areas has yet to be assessed. Therefore, our objective was to survey a stratified random sample of RHCs throughout the country to examine how the pandemic has affected their overall operations and their provision of cancer prevention and control services.

FINDINGS

Rural Health Clinic Characteristics

We received survey responses from 153 RHCs (8.0% response rate) across 36 states between April and September 2021. Responses by region largely mirrored the distribution of all RHCs across the country: 41.2% in the South, 41.2% in the Midwest, 13.7% in the West, and 3.9% in the Northeast (Table 1). Most RHCs (60.8%) were provider-based and over a third (39.2%) were independent. Provider-based RHCs are owned and operated by hospitals or other healthcare organizations participating in Medicare, while independent RHCs are owned and operated by a provider or provider entity. The average number of practicing clinicians across RHCs was 2.2 physicians, 2.1 advanced practice nurses, and 1.3 physician assistants. Nearly a third (29.9%) of RHCs were a patient-centered medical home (PCMH), and 43.3% participated in an accountable care organization (ACO).

Table 1: Participating RHC Characteristics (N=153 RHCs)	
	N (%) or mean (Standard Deviation)
Region	
Northeast	6 (3.9%)
South	63 (41.2%)
Midwest	63 (41.2%)
West	21 (13.7%)
RHC Type	
Provider-Based	93 (60.8%)
Independent	60 (39.2%)
Number of practicing clinicians, Mean	
Physicians (MD or DO)	2.2 (1.8)
Advanced Practice Nurses	2.1 (1.5)
Physician's Assistants	1.3 (1.1)
Primary Source of Patient Coverage, Mean Percentage of Patients	
Medicare	28.2 (16.5)
Medicaid	24.2 (17.5)
Dual-eligible	6.6 (9.4)
Private insurance	23.7 (15.2)
Other	3.1 (3.9)
Uninsured/self-pay	6.3 (7.5)
Patient-Centered Medical Home, yes	41 (29.9%)
Accountable Care Organization, yes	51 (43.2%)
Note: Percentages are calculated based upon the number of RHCs responding to a given question which may be fewer than 153 RHCs completing the survey.	

Less than a fourth (23%) of RHCs provided telehealth services prior to March 2020 (pre-pandemic) compared to 92.2% of RHCs providing telehealth services peri-pandemic (since March 2020)(Appendix Table 1). This peri-pandemic telehealth service provision included 69.3% providing both video and phone, 10.5% providing video only, and 12.4% providing phone only with 7.8% providing no telehealth services. The most common uses of telehealth services were for evaluation/management visits (91.5%) and preventative health screenings or wellness visits (39.0%). Nearly all RHCs (98.0%) reported having an electronic health record (EHR) system. The most common uses of EHR services were to view information such as lab results (79.7%) or send messages to the care team (68.9%), while less than half of RHCs reported using EHR services to view bills/make payments, enable the filling out of pre-visit forms, and check prescription refills/requests.

COVID-19 Care Characteristics

The vast majority of RHCs (88.7%) reported providing COVID-19 testing (Table 2). Those that did not have the ability to test primarily referred to the local hospital (83.3%) with a third or less of RHCs without testing capacity referring to a local pharmacy, local public health department, mobile testing center/event, or another primary care provider. With regards to COVID-19

vaccinations, 51% of RHCs reported that greater than 75% of their staff and clinicians were vaccinated. Roughly half of RHCs reported that their clinic and staff experienced ease in getting the vaccine when they became eligible per their state’s eligibility and prioritization criteria. More than half (55.7%) of RHCs reported being signed up with the CDC to be a vaccine administrator.

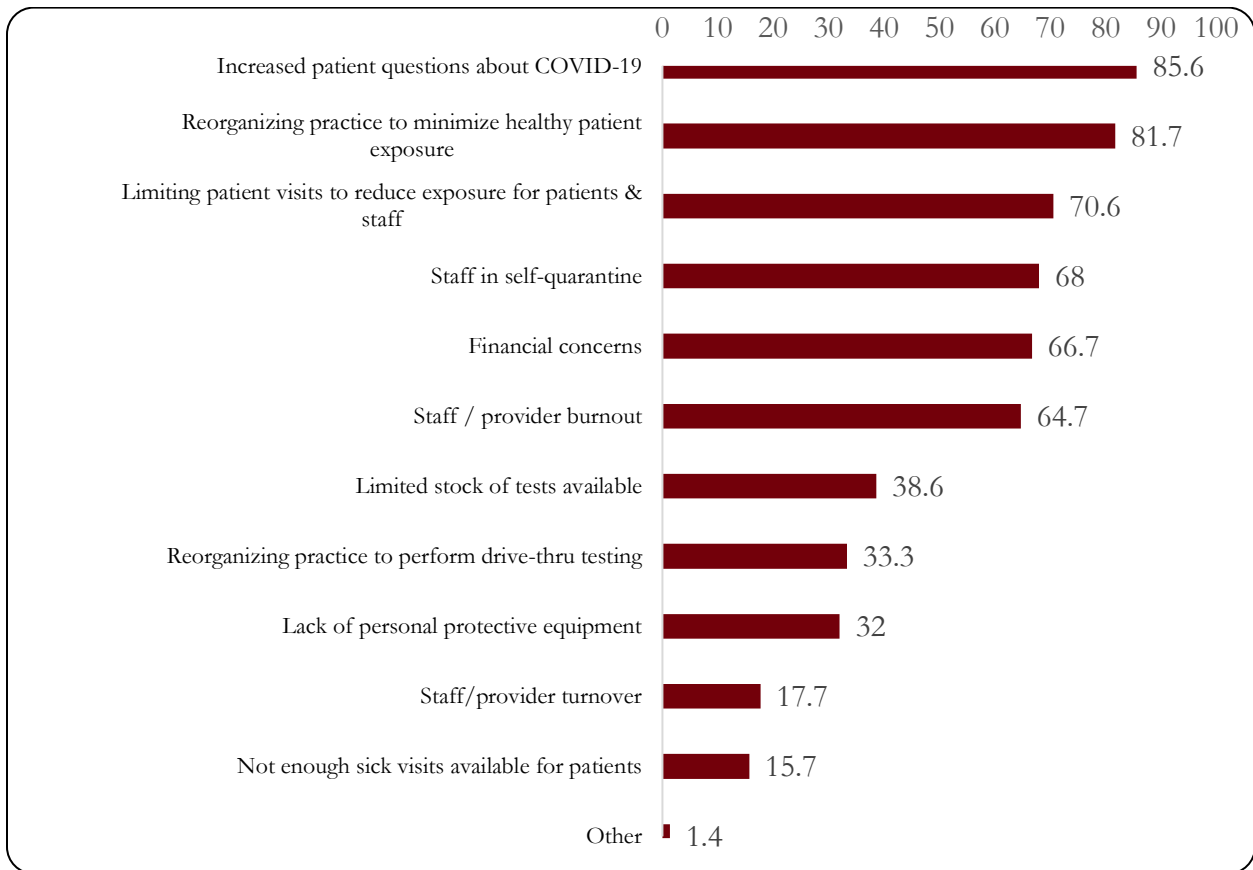
Table 2: COVID-19 Care Characteristics	
	N (%)
Provided COVID-19 testing, yes	133 (88.7%)
If not providing testing, referred to...*	
Local hospital	15 (83.3%)
Local health department	6 (33.3%)
Mobile testing center/event/other	7 (38.9%)
Percent of RHC clinicians and staff vaccinated	
0-25%	17 (11.4%)
26-50%	24 (16.1%)
51-75%	32 (21.5%)
76-99%	59 (39.6%)
100%	17 (11.4%)
Level of difficulty in staff/clinicians obtaining COVID-19 vaccines when eligible per state eligibility and prioritization	
Very difficult	9 (6.1%)
Difficult	23 (15.5%)
Neutral	41 (27.7%)
Easy	48 (32.4%)
Very easy	27 (18.2%)
Signed up with the CDC to be a vaccine administrator, yes	83 (55.7%)
Experienced temporary closure due to the pandemic, yes	29 (19.1%)
If experience temporary closure what were the reasons?*	16 (57.1%)
COVID-19 among clinicians / staff	1 (3.7%)
Staff turnover	11 (42.3%)
Low patient volume	6 (22.2%)
Financial difficulties	8 (29.6%)
Staff Turnover/Other	
Note: Percentages are calculated based upon the number of RHCs responding to a given question, which may be fewer than 153 RHCs; * indicates that RHCs could provide multiple responses; thus, percentages may exceed 100%.	

One in five (19.1%) RHCs reported having their clinic temporarily closed due to the pandemic. The most commonly noted reason was COVID-19 diagnosis among clinicians and staff (57.1%) followed by low patient volume (42.3%), financial difficulties (22.2%), and staff turnover (3.7%). The vast majority of RHCs (88.7%) reported having below average or extremely below average numbers of patient visits during their lowest patient volume period of the pandemic

compared to the same time of year in previous years. COVID-19 was the primary reason for 17.8% of visits since March 2020, while chronic conditions (19.4%), acute conditions (14.2%), well visits/preventive care (10.8%), and mental health (8.8%) were the primary reason for visits since the pandemic began. RHCs reported a myriad of RHC-level stressors related to COVID-19 (Figure 1). Roughly two-thirds or more of RHCs reported the following stressors: increasing patient questions about COVID-19, reorganizing practices to minimize healthy patient exposures, limiting patient visits to reduce exposures, staff in self-quarantine, financial concerns, and staff/provider burnout.

Figure 1: Percentage of RHCs reporting COVID-19-related, Clinic-Level Stressors

Note: RHCs can identify multiple responses.



Through an open-ended survey question, RHCs had the opportunity to share how else the pandemic has affected their clinic. A sampling of responses is noted below:

An independent RHC in the Midwest:

“Federal COVID-19 relief funds were essential, [Paycheck Protection Program] funds were most beneficial, [Personal Protective Equipment] and staff precautions and patients’ cooperation were key to avoiding any shutdown”

A provider-based RHC in the South:

“When we were finally able to get large quantities of the vaccines, most of our population who wanted the vaccine had already traveled outside of our county to get it.”

A provider-based RHC in the West:

“It was very hard to get [Personal Protective Equipment], and we do not have a way of separating sick and well so we had to send sick patients to the ER if they were suspected of having COVID”

An independent RHC in the South:

“I had 9 out of 11 employees had gotten [sic] COVID before Nov 2020”

An independent RHC in the West:

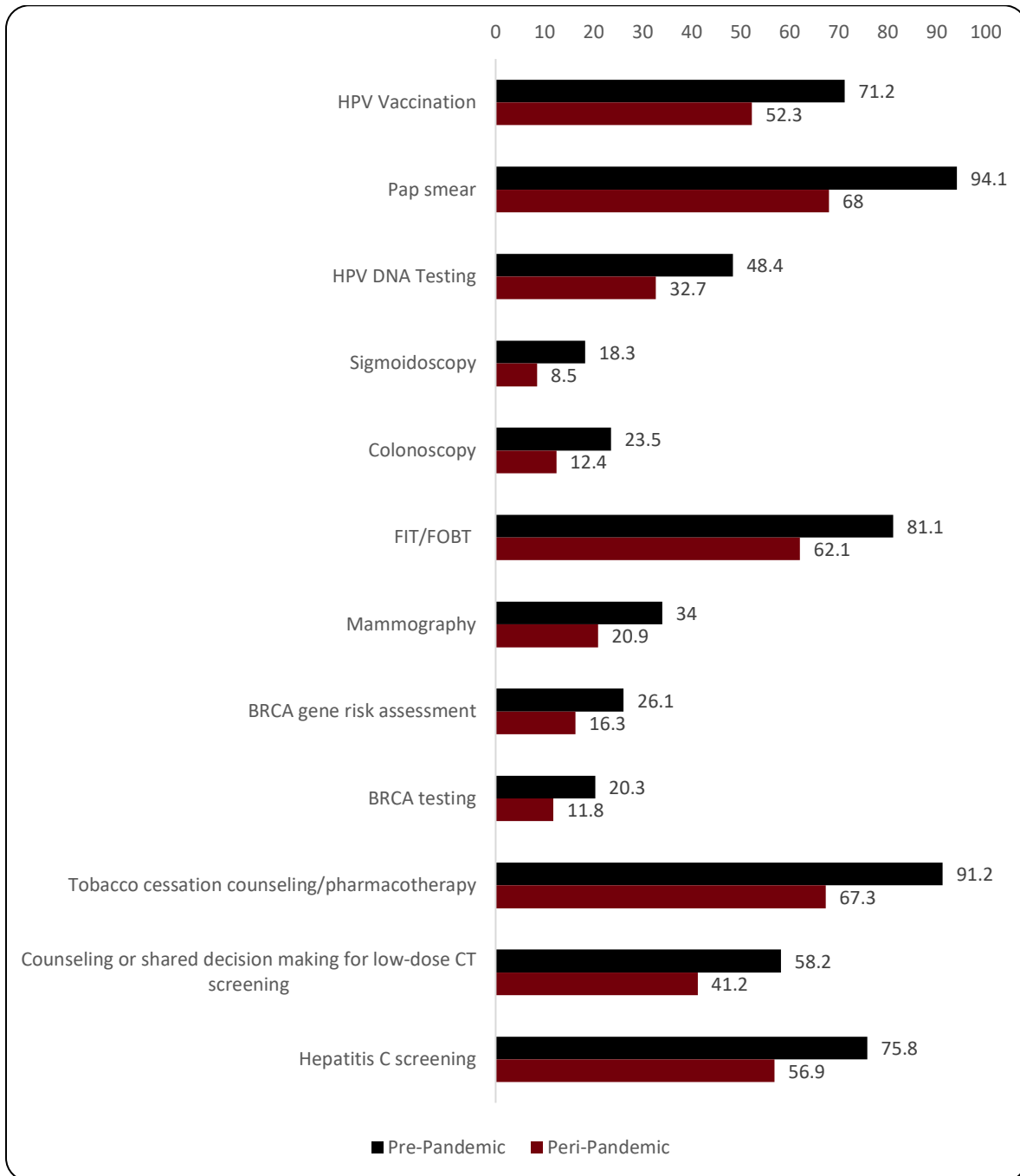
“It has been a very long pandemic, and burnout has been a huge issue.”

COVID-19 Impact on Provision of Cancer Prevention Services

The percentage of RHCs providing cancer prevention services on-site or virtually dropped from pre-pandemic to peri-pandemic times ($p < 0.05$ for all services examined: Figure 2). All colorectal cancer screening services dropped including colonoscopy (23.5% to 12.5%), sigmoidoscopy (18.3% to 8.5%), and FIT/FOBT kit distribution (81.1% to 62.1%). For cervical cancer related services, HPV vaccination dropped from 71.2% pre-pandemic to 52.3% peri-pandemic, pap smear testing dropped from 94.1% to 68%, and HPV DNA testing dropped from 18.3% to 8.5%. For breast cancer-related services, mammography dropped from 34.0% to 20.9% while Breast Cancer Gene (BRCA) risk assessment dropped 26.1% to 16.3% and BRCA gene testing dropped from 20.3 to 11.8%. Tobacco cessation counseling and pharmacotherapy dropped from 91.2% of RHCs pre-pandemic to 67.3% of RHCs peri-pandemic. Counseling or shared decision-making for low-dose CT screening for lung cancer dropped from 58.2% pre-pandemic to 41.2% peri-pandemic. RHCs providing Hepatitis C screening dropped from 75.8 to 56.9%.

While many RHCs provided such services as noted above both pre- and peri-pandemic, others referred cancer prevention services to other providers ranging from 3.4% referring tobacco cessation and pharmacotherapy offsite to 68.6% referring BRCA gene testing offsite (see Appendix Table 2). Appendix Table 2 also details pre- and peri-pandemic changes in skin cancer screening and removal, counseling on aspirin to prevent colorectal cancer, Prostate specific antigen (PSA) counseling/shared decision making, and PSA testing.

Figure 2: Percentage of RHCs Providing Cancer Prevention and Control Services Pre and Peri-Pandemic



CONCLUSIONS

We surveyed over 150 RHCs to assess the COVID-19 pandemic's impact on their overall operations as well as their cancer prevention and control efforts. Most responding RHCs were provider-based and were overwhelmingly located in either the Midwest or South. Roughly one in five RHCs reported experiencing a temporary closure related to the pandemic with COVID-19 diagnosis among staff and clinicians being the most common reason. While fewer than one in four RHCs provided telehealth service before the pandemic, nearly two-thirds now provide telehealth services with preventive services and wellness visits being the most common telehealth visit type. More than half of all RHCs reported stressors related to staff/clinicians (e.g., COVID-19 self-quarantine and burnout), financial concerns, and changes in clinic operations to address patient questions and reduce exposure. The percentage of RHCs providing USPSTF recommended cancer prevention services dropped from pre- to peri-pandemic times including in HPV vaccination, colorectal cancer screening, lung cancer shared decision making, and tobacco cessation and pharmacotherapy.

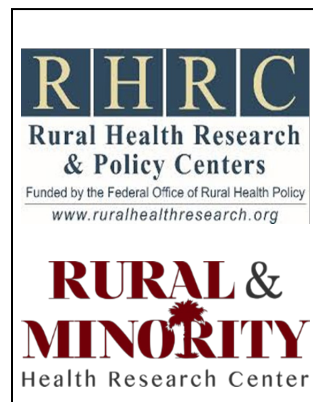
Some RHCs experienced temporary closures, and nearly all RHCs experienced myriad stressors due to the pandemic. The main reason for temporary closures was staff and provider COVID-19 cases; staff/clinician quarantine was a major source of stress. In the early months of the pandemic, urban areas were hit harder than rural.¹⁹ However, since mid-January 2021 the cumulative case rate per 100,000 in rural areas has been equivalent to or exceeded that of urban areas, and as of April 3, 2022, the cumulative case rate is more than 755 cases per 100,000 higher in rural than in urban areas.¹⁹ This has put rural providers at greater risk of exposure, infection, death, and burnout. Further, nearly two-thirds of RHCs indicated financial concerns as a source of stress. This is in-line with the financial stress that has been put on other rural healthcare providers, such as hospitals, who have experienced continued financial burdens due to the pandemic.²⁰ This underscores the importance of federal funding like the Paycheck Protection Program (PPP) and American Rescue Plan to help provide RHCs with financial stability and to enable them to provide needed COVID-19-related and general primary care services to their patients.

During the pandemic, the number of responding RHCs who provide telehealth services nearly doubled. These findings mirror that of rural FQHCs which have also seen a substantial increase in telehealth visits. Such expansion in services may be due in part to the flexibility of Medicare, Medicaid, and private insurer reimbursement for telehealth visits.²¹ This underscores the importance of maintaining telehealth availability and coverage beyond the PHE and the pandemic to provide opportunities for rural patients to access needed primary care and mental health care as reflected by regulatory changes allowing RHC reimbursement for tele-mental health visits beginning January 1, 2022 outside of the context of the PHE.^{8,22} This is especially important as evaluation and management, preventive care, and mental health visits were the most common telehealth visit types.²³ Further, the fact that preventive services were provided via telehealth indicates that telehealth may be an important avenue for cancer-related preventive services that may be delivered virtually such as shared decision making for lung cancer screening and smoking cessation counseling. Despite the expansion of telehealth in rural primary care settings such as RHCs, a smaller percent of rural fee-for-service Medicare patients have sought care using telehealth compared to urban.²³ While flexibility in telehealth reimbursement can help facilitate access to care, rural patients may experience barriers, such as less broadband access, that may prevent them from accessing telehealth services.²⁴

Responding RHCs indicated a statistically significant decrease in the provision of cancer-related prevention and screening services during the COVID-19 pandemic. This corroborates

similar work showing decreases in cancer screening in other settings including FQHCs.²⁵ While private insurance data have indicated that cancer screenings rates have rebounded to near pre-pandemic levels, there is still a critical need to ensure other patients get “caught up” with recommended screenings and preventive services. This is especially important as rural populations have higher rates of HPV-associated, colorectal, and lung cancer which may be prevented or diagnosed at an earlier, more treatable stage with vaccination, smoking cessation counseling, and screening. Both patient and provider reminders are evidence-based strategies for increasing breast, cervical, and colorectal cancer screenings.²⁶ Such reminders may be a feasible strategy for the more than two-thirds of responding RHCs who use their EHRs to communicate with their patients and amongst the RHC staff and clinicians. The nearly one-third of reporting RHCs who identified as a PCMH may also use these or similar tools in their efforts to address their practice performance. Encouraging the collection and reporting quality metrics, such as tobacco cessation counseling, may help improve the provision of such services.

Our survey found that RHCs experienced notable stressors, including temporary closures and financial challenges. Telehealth use increased considerably among RHCs compared to pre-pandemic, but the provision of cancer-related cancer prevention and screening services notably dropped. Continued federal investment in RHCs is needed to provide financial stability. Cancer prevention and screening service offerings have dropped peri-pandemic. RHCs should aim to re-integrate these services as vaccination rates improve, boosters increase, and case counts decrease. Further, RHCs could capitalize on the use of EHRs to communicate with patients and PCMH designation to implement evidence-based strategies for screening. Encouraging collection and reporting of quality metrics could improve the provision of such services.



Funding: This project was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant number #U1CRH30539, Rural Health Research Grant Program Cooperative Agreement. This information or content and conclusions are those of the authors and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS or the U.S. Government.

For more information about the Rural and Minority Health Research Center, contact Director Dr. Elizabeth L. Crouch (crouchel@mailbox.sc.edu) or Deputy Director Dr. Peiyin Hung, (hungp@mailbox.sc.edu).

Suggested citation: Zahnd WE, Silverman AF, Self S, Hung P, Natafqi N, Adams SA, Merrell MA, Owens OS, Crouch E, Eberth JM. The Impact of the COVID-19 Pandemic on Rural Health Clinic’s Operations and Cancer Prevention and Control Efforts. Rural and Minority Health Research Center Policy Brief. November 2022. [Link to Report](#)

APPENDIX

Methodology

Survey Development

We developed a survey that included questions related to RHC characteristics, COVID-19 care characteristics, the impact of the pandemic on RHC operations and cancer prevention and control efforts, involvement of RHC clinicians' in cancer patients' treatment decisions and survivorship care, evidenced-based strategies used for cancer screening, and federal and organizational recommendations followed for HPV vaccination and cancer screening. This brief includes findings related to only RHC characteristics, COVID-19 care characteristics, and the impact of the pandemic on RHC operations and cancer prevention and control efforts.

Some questions related to RHC characteristics and alignment of cancer-related services with recommendations were adapted from a prior Rural and Minority Health Research Center survey. Health information technology questions of the RHC characteristics section were adapted from a study at Stanford Medicine on physician perceptions of electronic health records.²⁸ To gauge the impact of COVID-19 on RHC operations, questions from the Primary Care Collaborative survey on Primary Care providers and the HRSA Health Center COVID-19 Survey were adapted.^{28,29} To assess the impact of the pandemic on cancer prevention and control efforts, we considered all cancer-related prevention activities that had an "A" or "B" recommendation from the United States Preventive Services Task Force (USPSTF), were recommended by the American Committee on Immunization Practices (ACIP), were screenings that may be likely to be performed despite lack of evidence (e.g., PSA testing), or were other cancer-related procedures that may be performed in a primary care setting (e.g., skin cancer removal).^{30,31} Additional questions related to cancer prevention, screening, treatment, and survivorship services were adapted from the Survey of Physician Attitudes Regarding the Care of Cancer Survivors (SPARCCS) and a National Cancer Institute (NCI) and American Cancer Society (ACS) survey on the role of primary care physicians in cancer care.^{32,33} Additional questions on RHC characteristics, COVID-19 impact, and use of evidence-based screening strategies were developed by the study team.

The research team drafted a survey including questions pulled or adapted from the aforementioned sources or developed by the study team. The project team sent drafts around for review and edits until a consensus draft was developed. We obtained feedback from a staff member of the South Carolina Office of Rural Health and piloted the survey with a South Carolina RHC. After multiple rounds of edits, the survey was finalized for administration in both paper and Qualtrics formats.

Sampling and Recruitment

We obtained a stratified randomized sample of 1,900 RHCs from the list of RHCs downloaded from HRSA's map tool as of November 2, 2020.⁹ We stratified by U.S. Census Region to facilitate a representative regional distribution: 39.7% in the Midwest, 39.4% in the South, 3.5% in the Northeast, 17.4% in the West.

In April 2021, we sent a postcard to the study sample to inform them that the study team would be sending a survey in 1 week. We then sent a hardcopy survey with an informational cover letter that informed the RHC of the opportunity to complete the hardcopy or complete the survey online through a shortlink or a QR code on the cover letter. Participants were offered a \$50 incentive for

completing the survey. A reminder postcard was sent 2 weeks later. We modified our initial protocol to enhance our response rate, re-sending the survey to non-responding RHCs during June 2021 and calling RHCs to remind them to complete the survey and offering alternative methods of administration (e.g., faxing surveys). Surveys were completed between April and September 2021. Ultimately, our response rate was 8.0 %.

Statistical Analysis

We calculated frequencies and percentages for questions with categorical options. For continuous variables we calculated means and standard deviations. To examine differences in the provision of cancer-related prevention and control services pre- and peri-pandemic (defined as prior to or after March 2020 through the time of survey completion), we performed McNemar’s tests.

Appendix Table 1: RHC Characteristics on Telehealth and Electronic Health Record (N=153 RHCs)

	N (%)
Provided telehealth services prior to March 2020, yes	32 (23.0%)
Provide telehealth services currently	
Yes, video and phone	106 (69.3%)
Yes, video only	16 (10.5%)
Yes, phone only	19 (12.4%)
No	12 (7.8%)
Telehealth services provided*	
Evaluation/management visits	129 (91.5%)
Mental health counseling	39 (27.7%)
Substance abuse	13 (9.2%)
Preventive health screening/wellness	55 (39.0%)
Other	13 (9.2%)
Has an electronic health record (EHR) system, yes	149 (98.0%)
Communicate with patients through the EHR, yes	118 (79.2%)
EHR Usage *	
Scheduling appointments online	59 (39.9%)
Viewing bills/ making payments	61 (41.2%)
Filling out pre-visit forms	48 (32.4%)
Updating medical history	52 (35.1%)
Viewing information (e.g., lab results)	118 (79.7%)
Checking prescription refills/requests	67 (45.3%)
Sending messages to care team	102 (68.9%)
Note: Percentages are calculated based upon the number of RHCs responding to a given question which may be fewer than 153 RHCs; * indicates that RHCs could provide multiple responses; thus, percentages may exceed 100%.	

Appendix Table 2: Provision of Cancer Prevention and Control Service Pre- and Peri-Pandemic

	Yes, we provided these services on-site and/or remotely BEFORE March 2020 N (%)	Yes, we provided these services on-site and/or remotely AFTER March 2020 N (%)	Referred off-site N (%)	Never provided or referred N (%)
Colonoscopy	36 (23.5%)	19 (12.4%)	109 (71.2%)	<5
Sigmoidoscopy	28 (18.3%)	13 (8.5%)	97 (63.4%)	22 (14.4%)
Fecal Immunochemistry Test (FIT) or Fecal Occult Blood Test (FOBT) kit distribution	124 (81.1%)	95 (62.1%)	23 (15.0%)	<5
Human Papillomavirus (HPV) vaccination	109 (71.2)	80 (52.3%)	34 (22.2%)	17 (11.1%)
Pap smear	144 (94.1%)	104 (68.0%)	9 (5.9%)	<5
HPV testing	74 (48.4%)	50 (32.7%)	56 (36.6%)	17 (11.1%)
Mammography	52 (34.0%)	32 (20.9%)	98 (64.1%)	<5
BRCA risk assessment	40 (26.1%)	32 (20.9%)	90 (58.8%)	15 (10.2 %)
BRCA gene testing	22 (14.4%)	12 (7.8%)	105 (68.6%)	18 (11.8%)
Tobacco cessation counseling and pharmacotherapy	139 (91.2%)	103 (67.3%)	5 (3.4%)	<5
Counseling or shared decision making for low-dose CT screening for lung cancer	89 (59.2%)	63 (41.2%)	56 (36.6%)	<5
Hepatitis C Screening	116 (75.8%)	87 (56.9%)	38 (24.8%)	<5
Counseling on aspirin for cancer prevention	86 (56.2%)	57 (37.3%)	10 (6.5%)	38 (24.8%)
Prostate specific antigen (PSA) testing	124 (81.1%)	92 (60.1%)	18 (11.8%)	<5
Counseling or shared decision making for PSA testing	131 (85.6%)	100 (65.4%)	18 (11.8%)	<5
Skin cancer screening	107 (69.9%)	76 (49.7%)	52 (34.0%)	<5
Skin cancer removal	83 (54.3%)	59 (38.6%)	80 (52.3%)	<5

*Cells with fewer than 5 respondents were suppressed

REFERENCES

1. Curtin S, Spencer MR. Trends in Death Rates in Urban and Rural Areas: United States, 1999–2019. September 2021. doi:10.15620/CDC:109049
2. Zahnd WE, James AS, Jenkins WD, et al. Rural-Urban Differences in Cancer Incidence and Trends in the United States. *Cancer Epidemiol Biomarkers Prev.* 2017;27:1265-1274. doi:10.1158/1055-9965.epi-17-0430
3. Zahnd WE, Fogleman AJ, Jenkins WD. Rural–Urban Disparities in Stage of Diagnosis Among Cancers With Preventive Opportunities. *Am J Prev Med.* 2018;54(5):688-698. doi:10.1016/j.amepre.2018.01.021
4. Zahnd WE, Davis MM, Rotter JS, et al. Rural-urban differences in financial burden among cancer survivors: an analysis of a nationally representative survey. *Support Care Cancer.* 2019;27(12). doi:10.1007/s00520-019-04742-z
5. Hung P, Deng S, Zahnd WE, et al. Geographic disparities in residential proximity to colorectal and cervical cancer care providers. *Cancer.* 2019. doi:10.1002/cncr.32594
6. The Cecil G. Sheps Center for Health Services Research. Rural Hospital Closures . <https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/>. Accessed November 5, 2021.
7. Shaw KM, Theis KA, Self-Brown S, Roblin DW, Barker L. Chronic Disease Disparities by County Economic Status and Metropolitan Classification, Behavioral Risk Factor Surveillance System, 2013. *Prev Chronic Dis.* 2016;13(9):160088. doi:10.5888/pcd13.160088
8. Center for Medicare and Medicaid Services. Rural Health Clinic. <https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/Downloads/RuralHlthClinfctsht.pdf> Accessed April 7, 2022..
9. Health Resource and Services Administration. HRSA Data Explorer. <https://data.hrsa.gov/tools/data-explorer> Accessed 7 October 2022.
10. Schulte AR, Denise Kirk BA, Kristie Thompson MW, George Pink MH. *Facility-Based Ambulatory Care Provided to Rural Medicare Beneficiaries in 2014.*; 2019. https://www.shepscenter.unc.edu/wp-content/uploads/dlm_uploads/2019/03/AmbulatoryCareChartbook.pdf. Accessed March 17, 2020.
11. Temple KM. COVID-19’s Current Impact on Rural Healthcare Delivery: Q&A with Brock Slabach - The Rural Monitor. <https://www.ruralhealthinfo.org/rural-monitor/brock-slabach/>. Accessed June 12, 2020.
12. Robbins R. Routine cancer screenings have plummeted during the pandemic. <https://www.statnews.com/2020/05/04/cancer-screenings-drop-coronavirus-pandemic-epic/>. Accessed June 12, 2020.
13. DeGroff A, Miller J, Sharma K, et al. COVID-19 impact on screening test volume through the National Breast and Cervical Cancer early detection program, January–June 2020, in the United States. *Prev Med (Baltim).* 2021;151:106559. doi:10.1016/J.YPMED.2021.106559
14. Alagoz O, Lowry KP, Kurian AW et al. Impact of the COVID-19 Pandemic on Breast Cancer Mortality in the US: Estimates From Collaborative Simulation Modeling. *JNCI.*
15. HHS Announces Nearly \$1 Billion from American Rescue Plan for Rural COVID-19 Response | HHS.gov. <https://www.hhs.gov/about/news/2021/05/04/hhs-announces-nearly-1-billion-from-american-rescue-plan-for-rural-covid-19-response.html>. Accessed October 16, 2021.
16. Health Resource and Services Administration. Rural Health Clinic COVID-19 Testing and Mitigation (RHCCTM) Program. <https://www.hrsa.gov/coronavirus/rural-health->

- clinics/testing Accessed 27 December 2021.
17. NARHC-National Association of Rural Health Clinics.COVID-19 Waivers. https://www.narhc.org/narhc/COVID-19_Waivers.asp. Accessed October 16, 2021.
 18. National Association of Rural Health Clinics. Tracking a Pandemic: How Rural Health Clinics Utilized a Historic Investment to Fight COVID-19 <https://www.narhc.org/Document.asp?DocID=10885> Accessed 27 December 2021.
 19. CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#pop-factors_total_cases. Accessed December 27, 2021.
 20. Kadri SS and Simpson SQ. Potential Implications of SARS-CoV-2 Delta Variant Surges for Rural Areas and Hospitals. *JAMA*. 2021;326(11):1003-1004. doi:10.1001/JAMA.2021.13941
 21. Center for Connected Health Policy. State Telehealth Laws & Reimbursement Policies Report. <https://www.cchpca.org/resources/state-telehealth-laws-and-reimbursement-policies-report-fall-2021/>. Accessed November 5, 2021.
 22. Mueller KJ, Rochford H, Coburn AF, et al. The Evolving Landscape of National Telehealth Policies during a Public Health Emergency: Responsiveness to Rural Needs. <https://rupri.org/2020/10/09/report-on-telehealth-policies/> Accessed November 5, 2021.
 23. Sampson LW, Tarazi W, Turrini G, Sheingold S. Medicare Beneficiaries' Use of Telehealth in 2020: Trends by Beneficiary Characteristics and Location. <https://aspe.hhs.gov/sites/default/files/documents/a1d5d810fe3433e18b192be42dbf2351/medicare-telehealth-report.pdf> Accessed 27 December 2021.
 24. Curtis ME, Clingan SE, Guo H, Zhu Y, Mooney LJ, Hser Y-I. Disparities in digital access among American rural and urban households and implications for telemedicine-based services. *J Rural Health*. 2021:1-7. doi:10.1111/JRH.12614
 25. Fedewa SA, Cotter MM, Wehling KA, Wysocki K, Killewald R, Makaroff L. Changes in breast cancer screening rates among 32 community health centers during the COVID-19 pandemic. *Cancer*. 2021;0:2021. doi:10.1002/CNCR.33859
 26. Community Preventive Services Task Force. Cancer. www.thecommunityguide.org/topic/cancer. Accessed October 23, 2021.
 27. Stanford Medicine.EHR White Paper | EHR National Symposium |. <https://med.stanford.edu/ehr/whitepaper>. Accessed November 5, 2021.
 28. Bureau of Primary Health Care.Health Center COVID-19 Survey. <https://bphc.hrsa.gov/emergency-response/coronavirus-health-center-data>. Accessed October 23, 2021.
 29. Primary Care Collaborative. Primary Care & COVID-19 |. <https://www.pcpcc.org/covid>. Accessed October 23, 2021.
 30. United States Preventive Services Taskforce. Search Results. https://uspreventiveservicestaskforce.org/uspstf/topic_search_results?topic_status=P&grades%5B%5D=A&grades%5B%5D=B&category%5B%5D=15&searchterm=. Accessed September 25, 2020.
 31. CDC.ACIP HPV Vaccine Recommendations.. <https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hpv.html#recs>. Accessed September 25, 2020.
 32. Potosky AL, Han PKJ, Rowland J, et al. Differences Between Primary Care Physicians' and Oncologists' Knowledge, Attitudes and Practices Regarding the Care of Cancer Survivors. *J Gen Intern Med*. 2011;26(12):1403. doi:10.1007/S11606-011-1808-4
 33. Klabunde CN, Ambs A, Keating NL, et al. The Role of Primary Care Physicians in Cancer Care. *J Gen Intern Med*. 2009;24(9):1029. doi:10.1007/S11606-009-1058-X