A Review of Care Resource Coordination by Community Health Workers through the COVID-19 CHW Program in North Carolina (2020-2022)

Partners In Health (PIH) - United States

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Together, your collective efforts have significantly advanced our response to and understanding of the challenges faced by underserved communities in North Carolina during the COVID-19 pandemic with implications and applications that extend far beyond.

Evaluation Summary

Introduction

The COVID-19 pandemic highlighted the critical need for robust social support programs, especially in marginalized communities. North Carolina played a key role in addressing the escalating short-term food, income, and housing insecurity exacerbated by the pandemic. North Carolina Department of Health and Human Services' (NCDHHS) strategic shift towards integrating whole-person care by addressing social determinants of health (SDOH) and investment in NCCARE360 for electronic care resource coordination coupled with years of developing Community Health Worker (CHW) infrastructure recommendations laid the groundwork for the COVID-19 CHW Program and COVID-19 Support Services Programs (SSP) during the pandemic. These rapidly-mobilized programs aimed to provide targeted support to individuals affected by the pandemic by leveraging CHWs as trusted community members to bridge the gap between clinical and community-based services, paying directly for service delivery in the case of SSP. This evaluation seeks to understand the impact, gaps, successes, and challenges of care resource coordination efforts by CHWs from 2020-2022 to inform future programs focused on addressing health and social needs.

Analysis-to-date

Methods

Data were collected from various sources, including COVID-19 case rate data, socioeconomic data from the U.S. Census Bureau, and social support case data from NCCARE360. Statistical analyses, including visualization techniques, Spearman correlation, and binomial regression assessed social support cases' spatial and temporal distribution and their association with COVID-19 and social vulnerability. Social support case rates and outcomes of referrals (i.e., resolution) were assessed over time, by counties, and by social support service type.

Results & Interpretation

CHWs served 95,569 clients with over 150,500 social support case referrals logged in NCCARE360 from August 2020 through December 2022. Elevated rates of social support cases were observed during the pandemic's peak and during SSP 1.0. Spatial analysis identified variations in case distribution across counties, with higher rates observed in central-eastern and some eastern regions. Food assistance emerged as the most prevalent need, highlighting short- and long-term challenges related to food insecurity. Social support case rates were positively correlated with COVID-19 rates and county-level social vulnerability index scores, indicating that the program met its goal of targeting vulnerable populations and underscoring the interconnectedness of health outcomes and social determinants. Resolution rates varied throughout the program but were generally higher during SSPs. Resolution was highest in some southeastern counties across service types and specifically for food assistance. These findings underscore the importance of targeted interventions in addressing emergent needs during public health crises like the COVID-19 pandemic with likely application to social care programs like the Healthy Opportunities Pilots. While 71% of social support referrals were resolved, disparities persist across regions and service types, highlighting the need for more equitable access to services. Addressing these disparities likely requires ongoing investments in community-driven initiatives and collaborative partnerships.

Limitations

Based on available data, this evaluation relied on documented cases in NCCARE360, which almost certainly underestimate the true extent of social support needs, particularly among marginalized or hard-

to-reach populations. This data also lacked key demographic information, limiting the ability to assess the differential impact of interventions on diverse populations. Additionally, finer geographical resolution than county-level was not possible to detail more localized impact or gaps in referrals or resolution. Deeper understanding is needed from CHWs operating within the programs to provide context around observed outcomes that would enable drawing broader conclusions and developing policy recommendations.

Planned Future Evaluation

To address some of the limitations noted above, we plan to undertake a collaborative qualitative evaluation process engaging CHWs representing diverse vendors/employers and Medicaid regions to interpret the available quantitative data and share insights from their time connecting individuals to social supports during the pandemic. Review of the data and solicitation of qualitative feedback will allow for a more comprehensive evaluation of the program and provide the foundation for further quality improvement and other implementation science findings. Following completion of this evaluation, we recommend dissemination of the results via one or multiple manuscripts co-authored by PIH, ORH, and CHWs. We hope that dissemination of the findings will highlight successes of CHWs in care resource coordination during the pandemic, facilitate learning across the U.S. from insights drawn in NC, and support policy recommendations for CHWs and social care programming.

Conclusions

Analysis of the impact of CHWs in care resource coordination during the pandemic makes a compelling case for their impact and ongoing investment and integration, while also highlighting gaps in social care network coverage. These findings not only have implications for CHWs in a pandemic setting but are also likely applicable to social care programming including the Healthy Opportunities Pilots. Additional qualitative assessment from the CHW perspective is planned to provide context to outcomes prior to finalizing this evaluation and disseminating the findings.

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Background

The COVID-19 pandemic underscored the imperative for robust social support programming in the United States, emphasizing its disproportionate impact on low-income communities, communities of color, and other historically marginalized populations [1,2]. North Carolina, with a population of 10.5 million, emerged as a key player in mitigating the effects of escalating food, income, and housing insecurity and other social determinants of Health (SDOH) during the pandemic.

In 2017, the North Carolina Department of Health and Human Services (NCDHHS) proactively integrated whole-person care—comprehensive care encompassing non-medical or clinical needs—into its priorities and initiatives [3]. This strategic shift included establishing a statewide infrastructure and introducing incentives to address SDOH via Medicaid transformation and the Healthy Opportunities Pilots. A pivotal development was the launch of NCCARE360, the nation's first electronic statewide coordinated care network. This platform facilitates closed-loop bidirectional referrals between health and human service providers, electronically connecting individuals with unmet needs to community resources [4]. NCCARE360 allows for the reporting of rich care resource coordination data, compiling over 150,000 unique referrals by the end of 2022. NCDHHS, in collaboration with partners, also pioneered a standardized screening approach to identify people with unmet social resource needs across diverse populations [5].

Even before the pandemic, NCDHHS was exploring the role of Community Health Workers (CHWs) in addressing social and health care needs in under-resourced communities [6]. In 2014, NCDHHS formed a CHW Committee, developing a CHW Program Inventory in 2015, and hiring a Statewide CHW Coordinator in 2017. Following the first CHW Initiative stakeholder meeting in 2015, workgroups formed tackling key questions related to CHW roles, core competencies, and certification culminating in a 2018 report and stakeholder recommendations [6]. When COVID-19 hit the state in 2020, the groundwork laid by NCDHHS enabled swift mobilization and investment in the CHW workforce among affected populations. CHWs, as trusted members of their communities, leverage shared experiences and serve as a crucial link between clinical and community-based services and the individuals in greatest need [7].

In August 2020, NCDHHS Office of Rural Health initiated the COVID-19 CHW program, utilizing federal pandemic funding. An initial cohort of 350 CHWs was deployed through contracted vendors in 55 counties with high COVID-19 rates [8]. Subsequently, in September 2020, North Carolina launched the COVID-19 Support Services Program (SSP), comprising an initial phase (SSP 1.0) and a subsequent phase (SSP 2.0, see Figure A1 in the Appendix for the geographic distribution of both programs). Both programs aimed to provide specific social support for individuals in quarantine and isolation due to COVID-19. SSP 1.0, administered in 29 counties with a higher Social Vulnerability Index (SVI) via contracted vendor organizations (ADLA, Inc., Duke University Health System, Piedmont Health Services and Sickle Cell Agency, Quality Comprehensive Health Center), offered various services including nutrition assistance, relief payments, transportation, medication delivery, personal protective equipment, and access to primary health care telehealth services [9]. SSP 1.0 was operational from September 2020 to March 2021. SSP 2.0, operational from August 2021 to February 2022 in 34 counties via the Food Bank of Central and Eastern North Carolina (based on the geographic footprint of that organization), focused exclusively on delivering food boxes to eligible individuals to address short-term food insecurity. Significant investments were made by NCDHHS to ensure initial and ongoing training (related to COVID-19 via NC Area Health Education Centers, NCCARE360 via UniteUs, etc.) and technical assistance to ensure successful implementation of the programs by contracted organizations.

While CHW efforts pivoted substantially towards COVID-19 vaccine outreach, education, and clinic/event support in February 2021, CHWs continued to screen and refer individuals for social support needs through the end of the program in December 2022. By the fall of 2021, 750 CHWs were active across all 100 counties in North Carolina, constituting a substantial outreach effort to support the COVID-19 response. The unique features of these programs, particularly the combination of the CHW Program and SSP 1.0/2.0, warrant an in-depth examination of their impact on addressing the unmet needs of vulnerable communities affected by COVID-19. CHWs were also critical to the initial implementation and improvement of NCCARE360, as primary users of the system during this time.

As North Carolina progresses with Medicaid transformation, expansion, and developing programs like the Healthy Opportunities Pilots (HOP) to address individuals' health and social needs, understanding social care needs and the mechanisms for accessing resources to address them is crucial. This evaluation seeks to quantify the impact of the COVID-19 CHW Program, in conjunction with SSP 1.0/2.0, shedding light on its effectiveness in meeting the needs of communities disproportionately affected by the pandemic.

Methods

Data

COVID-19 & Socioeconomic Data. We compiled publicly accessible COVID-19 case rate data from individual counties in North Carolina as reported to the Johns Hopkins Coronavirus Resource Center from August 1, 2020 to December 31, 2022 [10]. Socioeconomic data were obtained from the U.S. Census Bureau 2016–2020 American Community Survey (ACS) 5-year estimates which summarize data collected from January 1, 2016, to December 31, 2020 [11]. These data were collected for all counties in North Carolina. Variables included median household income (total gross income before taxes during the past 12 months), number of people living below the federal poverty level, SVI, and total population (used to derive poverty, COVID-19, and social support case rates). SVI uses 16 U.S. census variables “to help local officials identify communities that may need support before, during, or after disasters" and is a common metric for assessing vulnerability in the U.S. [12].

COVID-19 CHW Program. We utilized monthly social support case data from eight vendors funded by NCDHHS Office of Rural Health within the COVID-19 CHW Program, sourced from the NCCARE360 (UniteUs, New York, NY) Dashboard from August 2, 2020, to December 31, 2022 [4,13]. During the program, vendors received training on and were required to utilize NCCARE360, though some social support referrals occurred external to NCCARE360. The variables included information about social support cases being made when a client made a request for an SDOH referral to a CHW, the CHW made the case referral to available social support service providers listed in NCCARE360's provider directory, and the client engaged with the service providers to begin addressing the request. Data describing when a service was requested, but the client did not subsequently interact with a service provider was not available. This may have occurred, for example, in situations where no provider was available for the service requested. Note that "social support cases" denote all referrals that CHWs facilitated, and not only ones that occurred during either SSP. As denoted by NCCARE360, there were twenty different service types by which referrals were classified (e.g., food assistance, utilities, etc.). The full list of service types is available in Table 1 with subtypes available in the Appendix.

Three categories of outcomes were defined: “resolved cases” were closed loop cases in which the client's referral was completed and needs were addressed; “unresolved cases” were closed loop cases in which the client was referred to a service provider, but needs were not able to be addressed; and “open

cases" were not closed loop, and the client's needs were unmet. Resolution (i.e., the proportion of referral cases that were resolved) were calculated by county (aggregated over the reporting period) and over the time of the program.

Data Processing

We created an automated data processing pipeline to clean and visualize acquired data from counties across time and service type. We excluded a county for cases if that county was outside of North Carolina. All analyses and visualizations were produced in R v4.2.2 [14] using ggplot2 [15] and tmap [16] packages.

Statistical Analysis

Sums of cases and case rates (per 10,000 persons) were calculated across the state at a county level and across different social support service types. We examined the distribution of social support cases over time and space. We utilized the Spearman correlation coefficient to assess any association between the referral case rates and the SVI and COVID-19 case rates, which were transformed to rank order as the latter two variables were not normally distributed.

We conducted a binomial regression to assess the predictive power of SSPs on the resolution of cases. Referral cases that occurred during the months when SSP 1.0 or 2.0 were operational were coded as "SSP," while cases that were reported outside of those months were coded as "non-SSP." Outcome data (e.g., "resolved" vs. "not resolved") was regressed upon SSP availability. Outcome data was recoded as a binary variable by assigning both "open" and "unresolved" cases as "not resolved."

Outcome results were also summarized as an interquartile boxplot reporting the median, with each data point referring to county-level aggregates of case data, across social support service types. Outcome results across social support service types were only included in analyses for types with a minimum of 100 referral cases over the reporting period. Resolution by social support type and across counties were also mapped for all types with a minimum of 100 referral cases over the reporting period.

Ethical Considerations

This program evaluation included de-identified data at the county level and publicly available socioeconomic data. Program-specific data were made available to PIH from NCDHHS via a Data Use and Sharing Agreement between the organizations.

Results

Social support cases across geography and time

There were 150,500 social support cases documented in NCCARE360 from 95,569 unique clients from August 2, 2020, to December 31, 2022. Seventy-one percent of identified needs were felt to be sufficiently met, and their cases were marked as resolved. Over 3,200,000 COVID-19 cases were reported during the evaluation period [10,17]; CHWs interacted with approximately 3% of these cases to fill unmet needs.

Social support cases (both gross total and rate per 10,000 population) were elevated between October 2020 and February 2021, with a maximum gross total of 31,412 cases and rate of 33.7 cases per 10,000 population in December 2020 (Figure 1). Following this early peak, cases maintained a steady, but lower rate throughout the reporting period, with a notable increase at the end of 2021. The initial increase corresponded with SSP 1.0, and the secondary, smaller peak corresponded with SSP 2.0. The mean referral rate over the program was 5.89 per month (5,190 cases), though notably the data are not normally distributed. The median monthly referral rate over the program was 2.1 cases per 10,000 population

(1,441 cases). The mean rate during the two SSPs was 10.68 (9,676 cases), and the mean rate outside of the SSPs was 1.41 (1,002 cases). Of the total 150,500 cases, 135,470 (90%) occurred during the two SSP periods. Figure A2 (please see Appendix) provides additional information on the top five referral types, illustrating the number of referrals for each social support type as a proportion of total referrals. The proportion of food assistance cases increased in early 2022, while individual and family Support increased steadily throughout the reporting period, accounting for almost 60% of all cases by the end of 2022 (noting that this service type includes general case management).

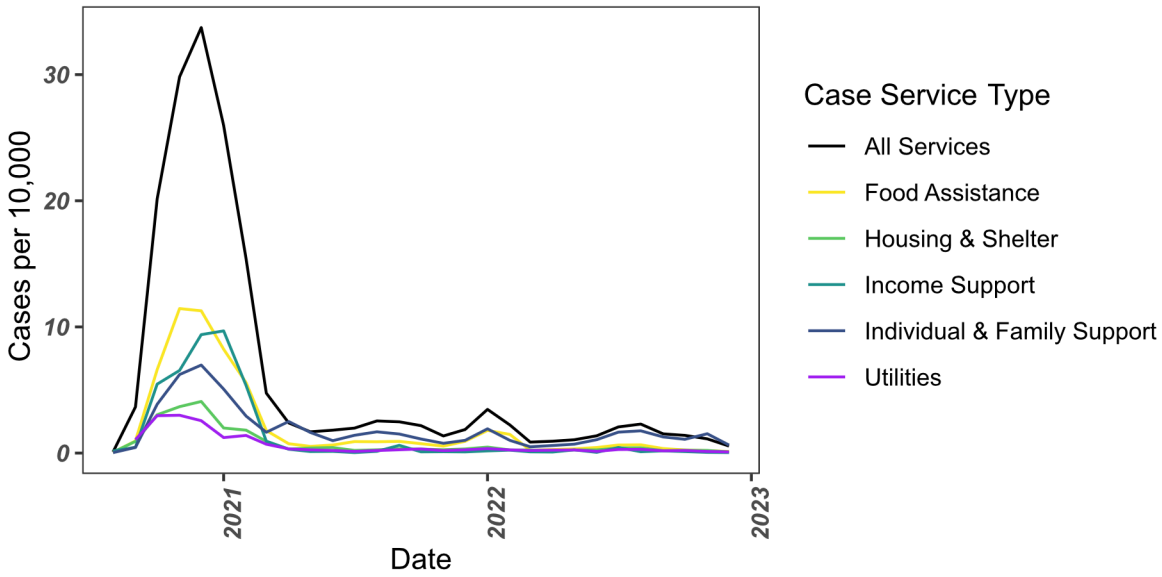

Figure 1: Social support cases over time. Social support case rates per 10,000 population over time as total of all case rates and disaggregated by top five most frequent service types: food assistance, housing and shelter, income support, individual and family support, and utilities. Case rates are expressed for each month from August 2020 to December 2022. Data extracted from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations.

Social support cases were reported in 98 of the state's 100 counties over the program period. Ashe and Alleghany Counties, located in the northwest corner of the state, did not report any cases. Cases were highest in the central-eastern band of counties (Figure 2). The highest social support case rate over a single month was recorded in Vance County in November 2020, with 331 referrals per 10,000 population. Vance County also reported the highest case rate over the entire program, at 1,112 referrals per 10,000 population; Vance was followed by Wilson, Wayne, Greene, and Durham counties. These five counties were included in the original 55 counties of the COVID-19 CHW program prior to statewide expansion and were covered by SSP 1.0/2.0. The county with the highest gross number of cases (i.e., not adjusted for population) was Mecklenburg County, in which the large metropolitan city of Charlotte is located; it was followed by Durham, Wake, Wayne, and Gaston counties. Mecklenburg also reported the largest gross number of cases over one month, with 7,209 cases in December 2020. Social support cases throughout the state began to decline after December 2020. Case rates were lower after 2020 but remained higher in central-eastern and some eastern counties as compared to the rest of the state in early 2021 (Figure A3). Case rates throughout the state noticeably dropped when SSPs were not operational but maintained a steady rate. Higher case rates in months outside of SSPs were generally seen in eastern counties.

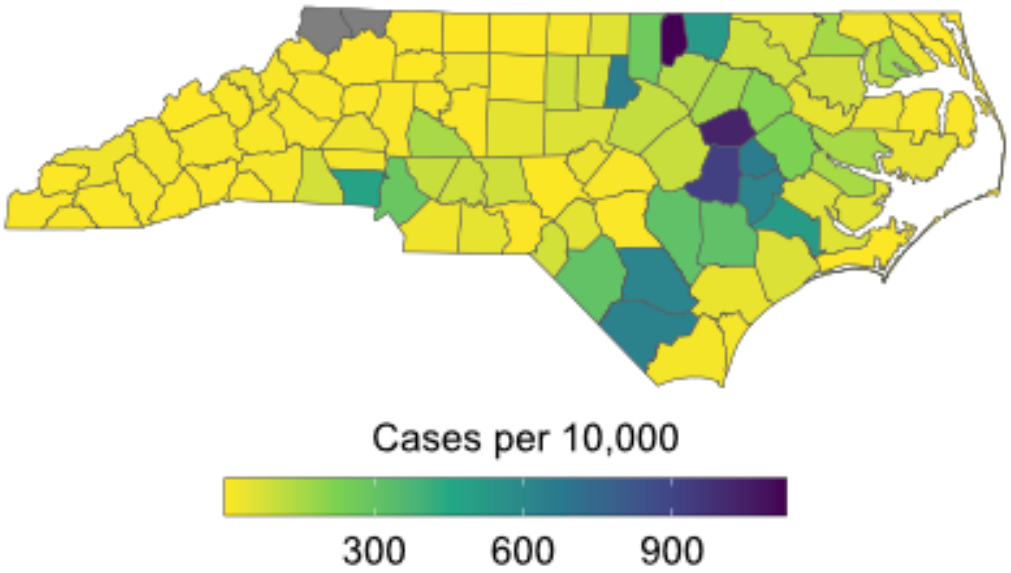

Figure 2: Social support cases by county. Social support case rates are shown for each county, aggregated across the entire program period (August 2020 to December 2022). Rates are expressed per 10,000 persons. No referral cases were reported in Ashe and Alleghany counties (gray). Data extracted from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations.

Service Type

The top five service types across time and counties were food assistance, individual and family support, income support, housing and shelter, and utilities (Table 1). Food assistance was the most common type, with 46,684 cases making up 31% of total cases over the entire program (Table 1). The next most common case service types were individual and family support (31,227; 21%), income support (30,714; 20%), housing and shelter (16,507; 11%), and utilities (12,377; 8%). Eight of the twenty service types were associated with fewer than one hundred cases, representing 0.14% of total cases. Food assistance and utilities case rates peaked in November 2020, individual and family support and housing in December 2020, and income support in January 2021 (Figure 1). After March 2021, individual and family support was the most common social support reported, except for a small increase in food assistance cases in early 2022. Individual and family support cases as a percentage of total cases increased steadily throughout the program, though these cases also included general case management. Food assistance cases as a percentage of total cases increased in early 2022. Case rates (alongside resolution) by service type and across counties can be found in Figures A4 – A15.

Table 1: Social support cases by service type. Number and percentage of social support cases provided by service type. Percent refers to the proportion of referral cases from each respective service type to total cases (150,500). Service types are presented in descending order of frequency. Data extracted from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022). Additional information about what services were categorized within each service type can be found in the Appendix.

Service Type	Cases (n)	Percent (%)
Food Assistance	46,684	31.02
Individual & Family Support	31,227	20.75
Income Support	30,714	20.41
Housing & Shelter	16,507	10.97
Utilities	12,377	8.22
Clothing & Household Goods	5,277	3.51
Employment	3,352	2.23
Physical Health	1,856	1.23
Transportation	1,303	0.87
Benefits Navigation	521	0.35
Education	296	0.2
Mental/Behavioral Health	172	0.11
Legal	63	0.04
Spiritual Enrichment	58	0.04
Wellness	26	0.02
Entrepreneurship	20	0.01
Money Management	20	0.01
Social Enrichment	18	0.01
Sports & Recreation	8	0.01
Substance Use	1	0
Total	**150,500**	**100**

Association of Social Support Cases with COVID-19 and SVI

The Spearman correlation coefficient for county-level data between COVID-19 cases (cumulative, January 2020 – December 2022) and social support cases (cumulative, August 2020 – December 2022) was 0.278 ($p<0.05$), showing a weak positive correlation. Many of the counties that reported a COVID-19 case rate over 3,000 (per 10,000 population) also reported a relatively high social support case rate. The Spearman correlation coefficient for county-level data between SVI and social support cases was 0.504 ($p<0.05$), showing a moderate to strong positive correlation. Counties in the upper quintile of SVI (more socially vulnerable) reported a relatively higher social support case rate (Figure 3).

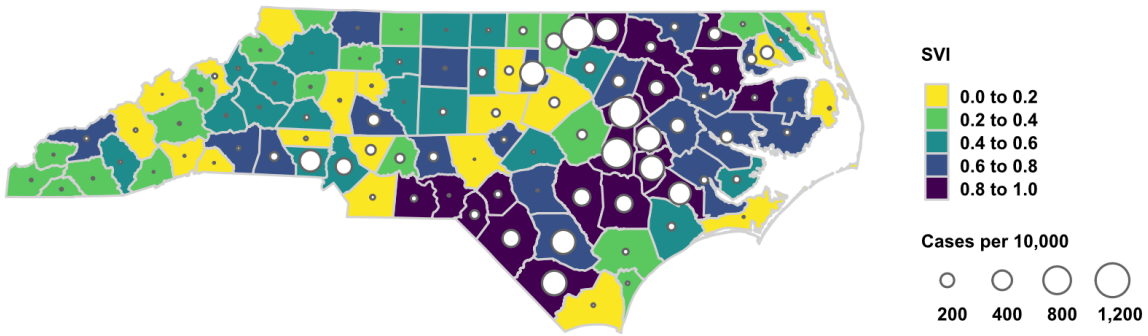

Figure 3: SVI & social support cases by county. Social Vulnerability Index (SVI) by county are shown in color as grouped by quintile, with case rates for each county overlaid as bubbles. Larger bubbles indicate a higher referral case rate. SVI data obtained from census Bureau 2016–2020 American Community Survey (ACS) 5-year estimates, social support cases from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

Resolution

Of 150,500 cases, 106,863 were marked as "resolved," representing a resolution percentage of 71%. Resolution increased toward the end of 2020 and declined after the beginning of 2021, in alignment with both the case rate (see Figure 1) and timing of SSP 1.0 (Figure 4). The next increase coincided with SSP 2.0, with the proportion of resolved referrals increasing around August 2021 and dropping around February 2022. Resolution then followed a general upward trend through the end of 2022. The highest proportion of resolved cases occurred in December 2022, with over 80% resolved referrals. However, there were only 339 cases across the state during that month. The next highest resolution, when the referral case rate was at approximately 26 cases per 10,000 population, occurred in January 2021 during SSP 1.0 and a COVID-19 surge, when the resolved percentage was nearly 78%.

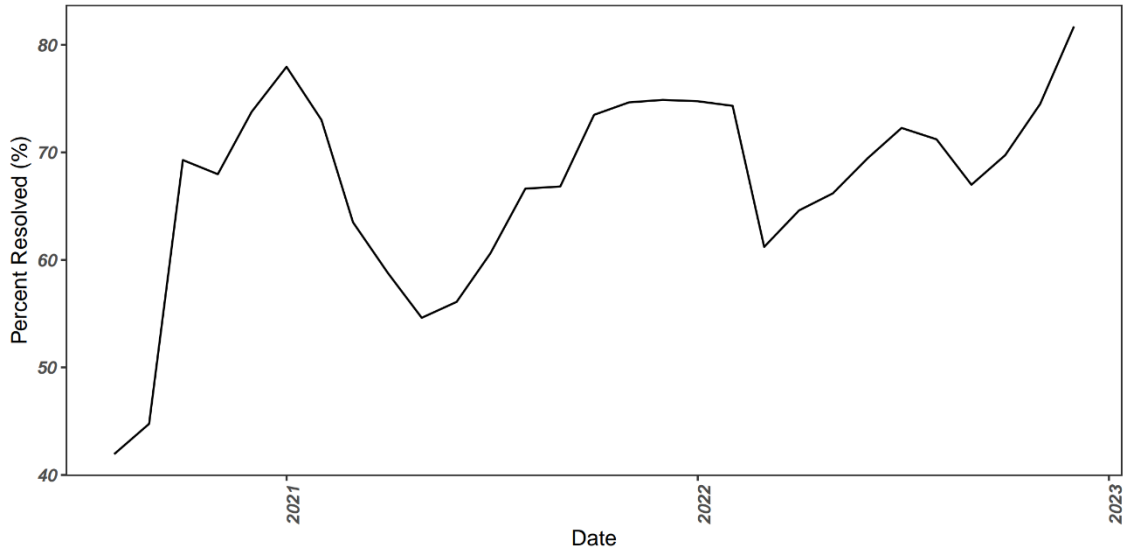

Figure 4: Resolution over time. The proportion of resolved social support cases is shown by month over the entire COVID-19 CHW Program reporting period. Data extracted from NCCARE360 North Carolina

Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

Binomial regression of resolution outcome on SSP availability demonstrated that the operation of SSPs were positively associated with resolution of cases (Table 2). The operation of either SSP is associated with a 28.6% increase in resolution of cases in comparison to resolution during time periods where no SSP was operational ($p<0.05$).

Table 2: Binomial regression results. Binomial regression of social support case resolution ("resolved" vs "not-resolved") on the presence of SSP. Referral cases occurring during months when SSP 1.0 or 2.0 were operational coded as "SSP" with cases outside of those months "non-SSP." Data extracted from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

Coefficient	Estimate	Standard Error	z value	p value
Intercept	0.639	0.017	37.27	<0.05
SSP	0.286	0.018	15.74	<0.05

The highest proportion of resolved referrals over the entire program period (aggregated August 2020 to December 2022) were a group of southeastern counties, including Robeson, Sampson, Bladen, and Columbus, as well as Madison in the west (which had a much lower social support case rate, Figure 5). The lowest resolution proportions were in the northeast counties, including Camden and Tyrrell, where there were also relatively few referrals. These counties were only included in the COVID-19 CHW Program following statewide expansion and were outside of either SSP 1.0 or 2.0 coverage.

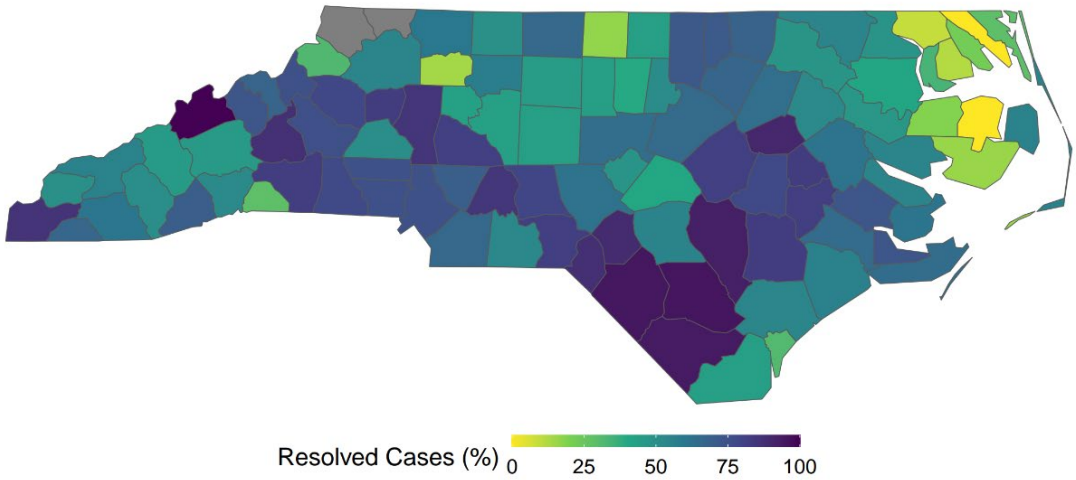

Figure 5: Resolution by county. The proportion of resolved cases is presented in each county over the total reporting period. Resolution was highest in certain southeastern counties. Social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

Figure 6 demonstrates resolution among service types with over 100 total referrals, ordered left to right and down by greatest to least number of total cases (i.e., food assistance with the highest number of referrals on the upper left, and mental and behavioral health with the lowest number of referrals on the

lower right). Resolution was highest among food assistance and income support, followed closely by individual and family support. Referrals were more likely to be resolved than unresolved or open across service types, except for education and mental and behavioral health referrals. Resolution (alongside case rates) by service type and across counties can be found in Figures A4 – A15.

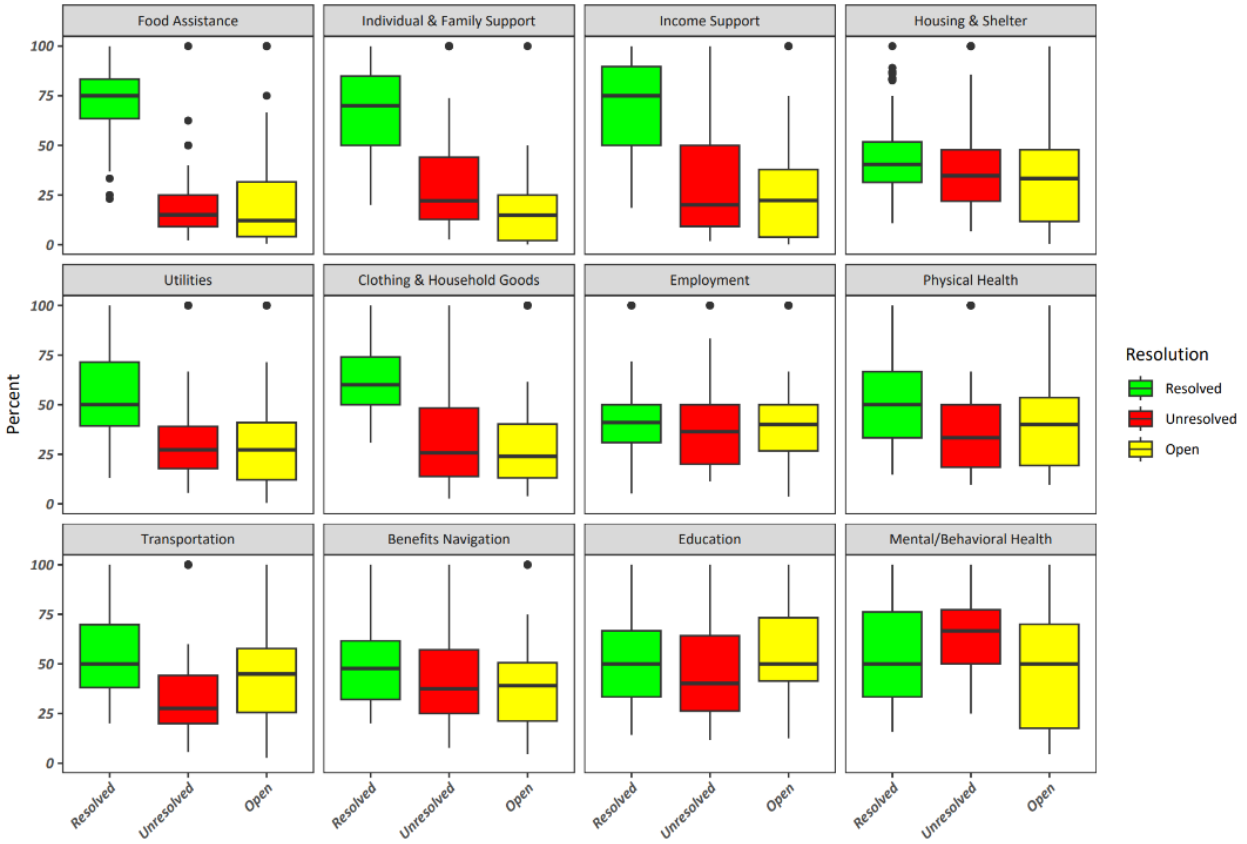

Figure 6: Resolution by social support service type. Boxplots (with median) of outcome (i.e., resolved, unresolved, open) are presented by each social support service type. Service type data were included where the number of total referral cases for the respective type is at least 100. The central bar in the boxplot indicates the median, whereas the box illustrates the interquartile range. The lines below and above each box summarize the upper and lower quartiles, with outliers presented as dots. Social support cases and their outcomes are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

Discussion

Analysis of COVID-19 CHW Program social support cases documented in NCCARE360 from August 2020 through December 2022 provides valuable insights into the spatial and temporal dynamics of service utilization, resolution, and their association with COVID-19 and SVI. Understanding these patterns is crucial for optimizing resource allocation, enhancing service delivery, and addressing the needs of vulnerable populations.

Cases over space, time, and service type

The substantial number of social support cases documented during the evaluation period highlights the magnitude of social care needs within North Carolina's population, particularly during the COVID-19 pandemic. The elevated rates of social support cases observed between October 2020 and February 2021

underscore the heightened demand for social support during the pandemic's peak. Implementation of SSP 1.0 and SSP 2.0 coincided with notable increases in referral rates, demonstrating the effectiveness of targeted interventions in uncovering underrecognized demand and addressing emergent needs.

Spatial analysis revealed variations in social support case distribution across counties, with higher rates observed in central-eastern and some eastern regions. This can likely be explained in part by the presence of SSP 1.0 and 2.0 in these counties (Figures 2, A1). There is a clear pattern of higher case rates in the counties served by these programs, and particularly during the months when the programs were operational. The data do not allow for causal interpretation, but it is possible that the higher availability of services led to an increase in case rates, as CHWs and community members were aware of existing resources. The absence of reported cases in Ashe and Alleghany Counties suggests potential gaps in service access or underreporting in certain areas. The concentration of cases in Mecklenburg County and other urban centers underscores the importance of tailoring interventions to meet the unique needs of densely populated areas.

Service type analysis identified food assistance as the most prevalent need, highlighting the persistent challenge of food insecurity faced by North Carolinians. The temporal variations in case rates across different service types reflect the dynamic nature of social support needs and the evolving impact of the pandemic on individuals and communities.

The positive correlation between COVID-19 cases and social support cases and the strong correlation with SVI underscores the interplay between health outcomes, social determinants, and access to social supports. Counties with higher COVID-19 case rates and greater social vulnerability reported higher rates of social support needs, emphasizing the importance of targeted interventions in addressing disparities and promoting health equity.

Resolution over space, time, and service type

The overall case resolution of 71% came close to the original programmatic target of 75% set by the COVID-19 CHW Program and SSP 1.0 in September 2020. This indicates successful care resource coordination and reasonable availability of social support resources. This is especially true for food assistance, individual and family support, and income support, which had the highest overall resolution throughout the program. Interestingly, though perhaps not surprisingly, we see that resolution generally increased during periods where SSPs were operational (i.e., September 2020 to March 2021 and August 2021 to February 2022). Counties where SSPs were operational also appear to have higher resolution rates. This, too, is unsurprising, as resolution would ostensibly increase in areas where more resources are available to deliver on referrals. The positive association between SSP availability and resolution is further evidenced by binomial regression analysis. Areas that had that overall higher resolution, such as the southeastern counties of Robeson, Bladen, Sampson, and Columbus, were served by both SSPs. The increase in funding as well as infrastructure to deliver them, as provided by SSP, likely resulted in greater success in resolving social support cases.

Implications & Limitations

These results collectively indicate that care resource coordination by CHWs coupled with funding and infrastructure for social support service delivery can deliver high volume referrals and successful outcomes in connecting marginalized communities to address social care needs. Multi-year CHW planning efforts prior to the pandemic, substantial investment in the CHW and Support Services Programs, coordination across programs and external partners, implementation via contracted community organizations, and ongoing community feedback for quality improvement likely contributed to the success

of these NCDHHS programs and CHWs in care resource coordination. The scale of social support referrals by CHWs during the COVID-19 CHW Program and the relative success of referrals during the first major test of NCCARE360 demonstrates the potential of CHWs in care resource coordination in North Carolina and across the U.S. Within the state, there are direct links from CHW efforts during the pandemic to the Healthy Opportunities Pilots (HOP) and realizing the goal of whole-person care. The Healthy Opportunities Pilots were designed to test and evaluate the impact of providing select evidence-based, non-medical interventions related to housing, food, transportation and interpersonal safety and toxic stress to high-needs Medicaid enrollees [18]. As with the combination of the COVID-19 CHW Program and SSP 1.0/2.0, HOP screens individuals for social care needs then directly delivers on them via a network of human service organizations in NCCARE360 supported by network lead organizations and up to $650 million in Medicaid funding over five years. From March 15, 2022 through January 31, 2024, HOP enrolled 20,031 individuals and delivered 266,667 services. These outcomes over the first two years of HOP highlight the more restrictive eligibility criteria as compared to the pandemic programs as well as the massive potential to address social care needs with adequate social care networks including funding and human service organizations. Intentional incorporation of CHWs into outreach and program enrollment as well as screening and service delivery may bolster program reach and effectiveness.

While the successes of the pandemic programs should be celebrated, we must also note that over 40,000 cases were not resolved (i.e., unresolved or open), indicating gaps in social support service delivery across the state. While we can illustrate where, when, and for what service types this lack of resolution occurred, we are unable to fully explain how and why some cases went unresolved or stayed open without additional detail. Such knowledge gaps are made evident from Figures A4 – A15, which show resolution across counties and service types. For example, with the information currently available, we cannot know why resolution of utilities and housing & shelter cases were higher in the western part of the state than the east (Figures A7-A8), though case rates were generally lower in the west as compared to the east in both cases. Improving the resolution of social support referrals will require a better understanding of the complex process of client engagement, referral documentation, resource provider connection, and delivery of services. Qualitative information and additional context around unresolved and open cases, provided by the CHWs and organizations that administered the program, will be vital in filling these knowledge gaps. However, the results presented can inform future investment in resources; one may infer that service types with higher case rates but lower resolution might need additional coordination of resource networks or funding to provide direct services. Additional understanding of the reasons behind gaps in resolution could help to inform additional policy recommendations.

Based on available data, this evaluation relied on documented cases in NCCARE360, which almost certainly underestimate the true extent of social support needs, particularly among marginalized or hard-to-reach populations. This data also lacked key demographic information, limiting the ability to assess the differential impact of interventions on diverse populations. Additionally, finer geographical resolution than county-level was not possible to detail more localized impact or gaps in referrals or resolution. Deeper understanding is needed from CHWs operating within the programs to provide context around observed outcomes that would enable drawing broader conclusions and developing policy recommendations.

Future Work

To address some of the limitations noted above, we plan to undertake a collaborative qualitative evaluation process engaging CHWs representing diverse vendors/employers and Medicaid regions to interpret the available quantitative data and share insights from their time connecting individuals to social supports during the pandemic. CHWs possess unique insights into community needs, preferences, and

challenges, making their input invaluable for identifying opportunities for program improvement and sustainability. Review of the data and solicitation of qualitative feedback will allow for a more comprehensive evaluation of the program and provide the foundation for further quality improvement and other implementation science findings. Incorporating qualitative methodologies can provide deeper insights into the experiences and perspectives of individuals accessing social supports, informing the development of more person-centered interventions. This work intends to promote equitable and just evaluation practices, ensuring that CHWs are meaningfully involved in data interpretation, and would better incorporate diverse insights and needs into future social care resource coordination programming.

Following completion of this evaluation, we recommend dissemination of the results via one or multiple manuscripts co-authored by PIH, ORH, and CHWs. We hope that dissemination of the findings will highlight successes of CHWs in care resource coordination during the pandemic, facilitate learning across the U.S. from insights drawn in NC, and support policy recommendations for CHWs and social care programming. Future evaluation efforts should focus on longitudinal analyses to assess the long-term impact of CHW and social support interventions on whole person health outcomes and cost savings to support program improvement and investment.

Conclusion

Analysis of the impact of CHWs in care resource coordination during the pandemic makes a compelling case for their impact and ongoing investment and integration, while also highlighting gaps in social care network coverage. These findings underscore the complex interplay between social determinants, health outcomes, and access to support services. They also highlight the necessity of robust infrastructure, both organizational and technical, and intention to provide whole person health, as here illustrated by NCDHHS. The results presented here not only have implications for CHWs in a pandemic setting but are also likely applicable to social care programming including Medicaid transformation and the Healthy Opportunities Pilots in North Carolina as well are more broadly across the U.S. Additional qualitative assessment from the CHW perspective is planned to provide context to outcomes prior to finalizing this evaluation and disseminating the findings. Sustained investments in community-driven initiatives addressing health and social needs involving CHWs and collaborative partnerships are crucial for building healthier, more resilient communities.

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Appendix

NCCARE360 Service Types & Subcategories

- Individual & Family Support (e.g., case management, childcare, caregiving services, etc.)
- Food Assistance (e.g., Emergency Food, Food Pantry, SNAP/FNS, WIC/Other nutrition benefits, etc.)
- Housing & Shelter (e.g., Assisted Living, Rent/Mortgage Payment Assistance, Emergency Housing, etc.)
- Utilities (e.g., Bill Payment Assistance, Home Energy/Utilities Benefits, etc.)
- Income Support (e.g., Emergency/One-time Financial Assistance, TANF/Cash Assistance Programs, SSI/SSD & Disability Benefits, etc.)
- Clothing & Household Goods
- Employment (e.g., Job Search/Placement, Job Training, Career Skills Development, etc.)
- Physical Health (e.g. Medical Expense Assistance, Primary Care, Chronic Disease Prevention & Management, etc.)
- Benefits Navigation (e.g. Health Insurance/Benefits, Benefits Eligibility Screening, ID/Documentation Assistance, etc.)
- Transportation (e.g. Ride Coordination, Transportation Expense Assistance, Transportation Passes/Vouchers, etc.)
- Education (e.g. Degrees/Certifications, Language Classes, Computer/Technology Classes, etc.)
- Wellness (e.g. Nutrition Education, Mindfulness & Meditation, Health Literacy Classes, etc.)
- Social Enrichment (e.g. Youth Development, Arts & Crafts Classes, etc.)
- Sports & Recreation (e.g. Exercise Classes/Groups, etc.).

Source: NCCARE360. Cross-sector collaboration software powered by community. Unite Us, New York, NY.

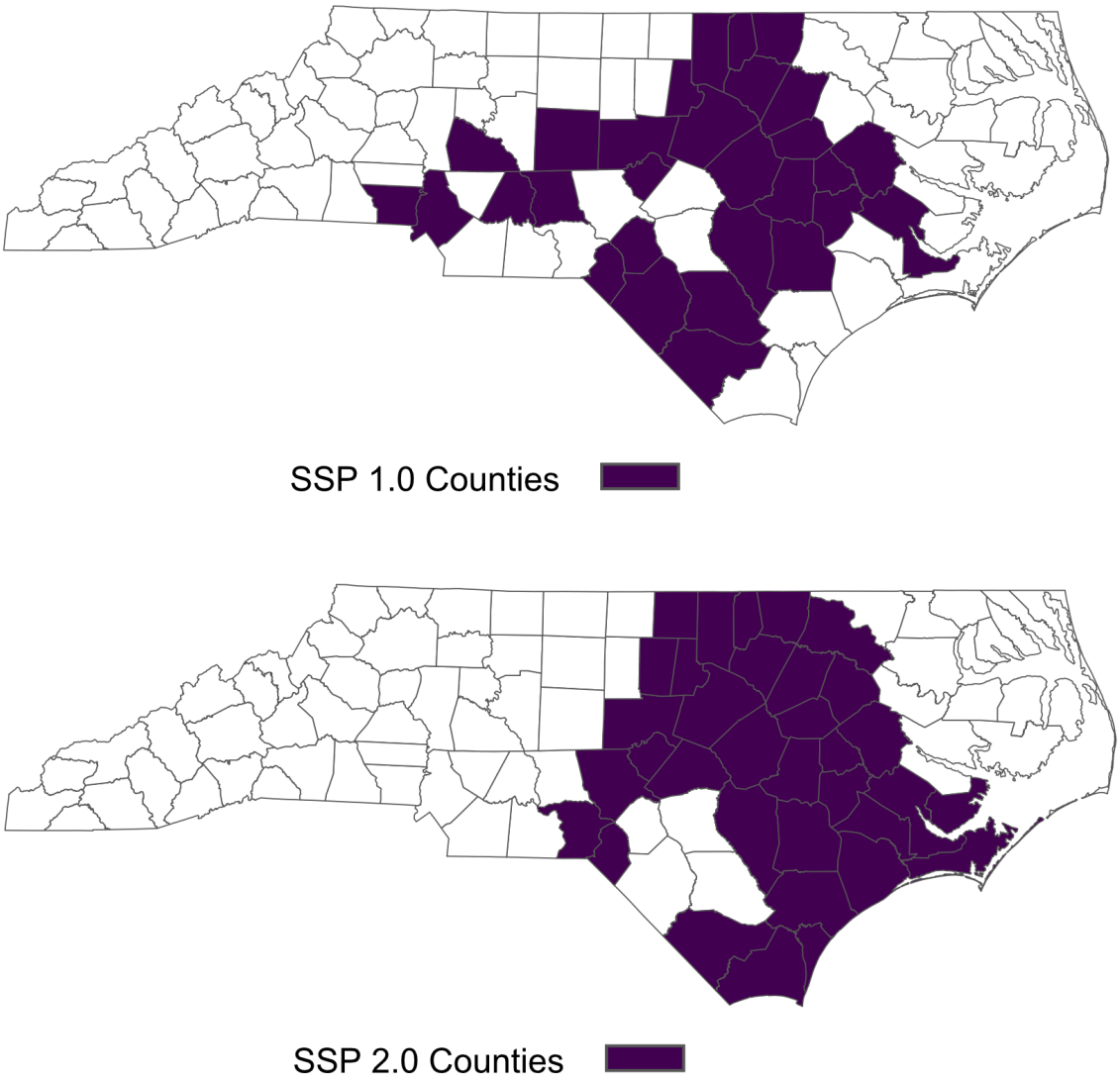

Figure A1. Counties included in the COVID-19 Support Services Program (SSP) 1.0 (top) and SSP 2.0 (bottom). Counties included in SSP 1.0 (top, purple) were Bladen, Chatham, Columbus, Craven, Duplin, Durham, Franklin, Gaston, Granville, Greene, Hoke, Johnston, Lee, Lenoir, Mecklenberg, Montgomery, Nash, Pitt, Randolph, Robeson, Rowan, Sampson, Scotland, Stanly, Vance, Wake, Warren, Wayne, and Wilson. Counties included in SSP 2.0 (bottom, purple) were Brunswick, Carteret, Chatham, Columbus, Craven, Duplin, Edgecombe, Franklin, Granville, Greene, Halifax, Harnett, Johnston, Jones, Lee, Lenoir, Moore, Nash, New Hanover, Onslow, Orange, Pamlico, Pender, Person, Pitt, Richmond, Sampson, Scotland, Vance, Wake, Warren, Wayne, and Wilson.

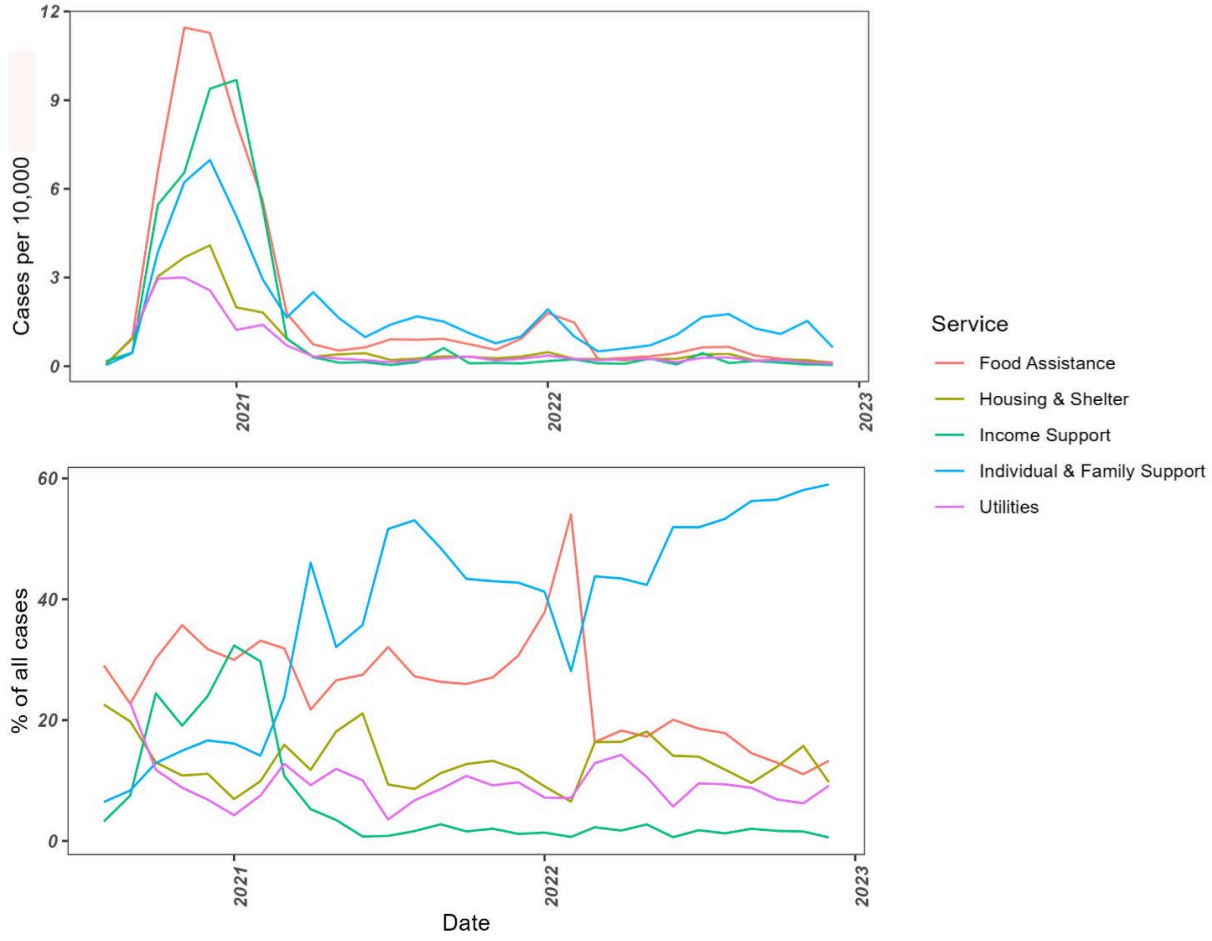

Figure A2. Top five social support service types by case rate and case proportion over time. The top five social support service types are plotted by case rate per 10,000 persons (top) and support service cases as a proportion of all referral cases over time (bottom). Data extracted from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

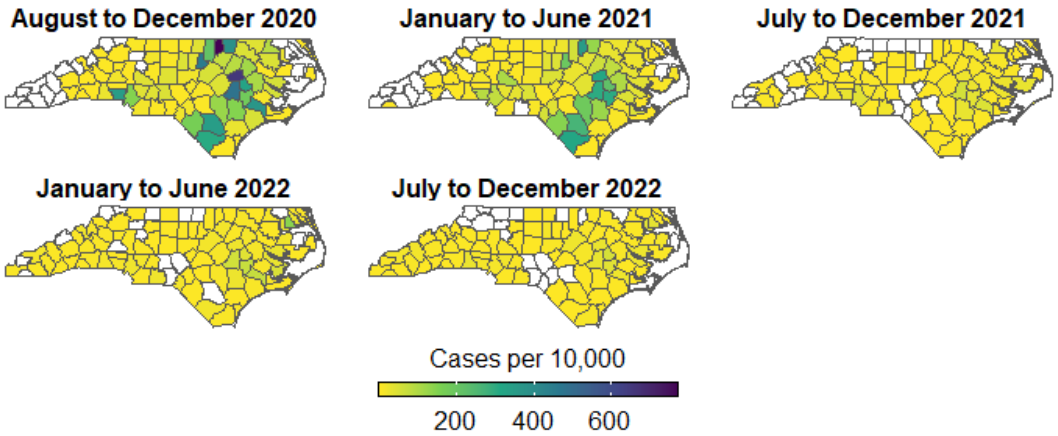

Figure A3. Social support cases by county and time. Case rates per 10,000 persons are aggregated into (approximately) six-month periods over the duration of the COVID-19 CHW Program. White indicates no reported cases during that time period. Data on social support cases are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

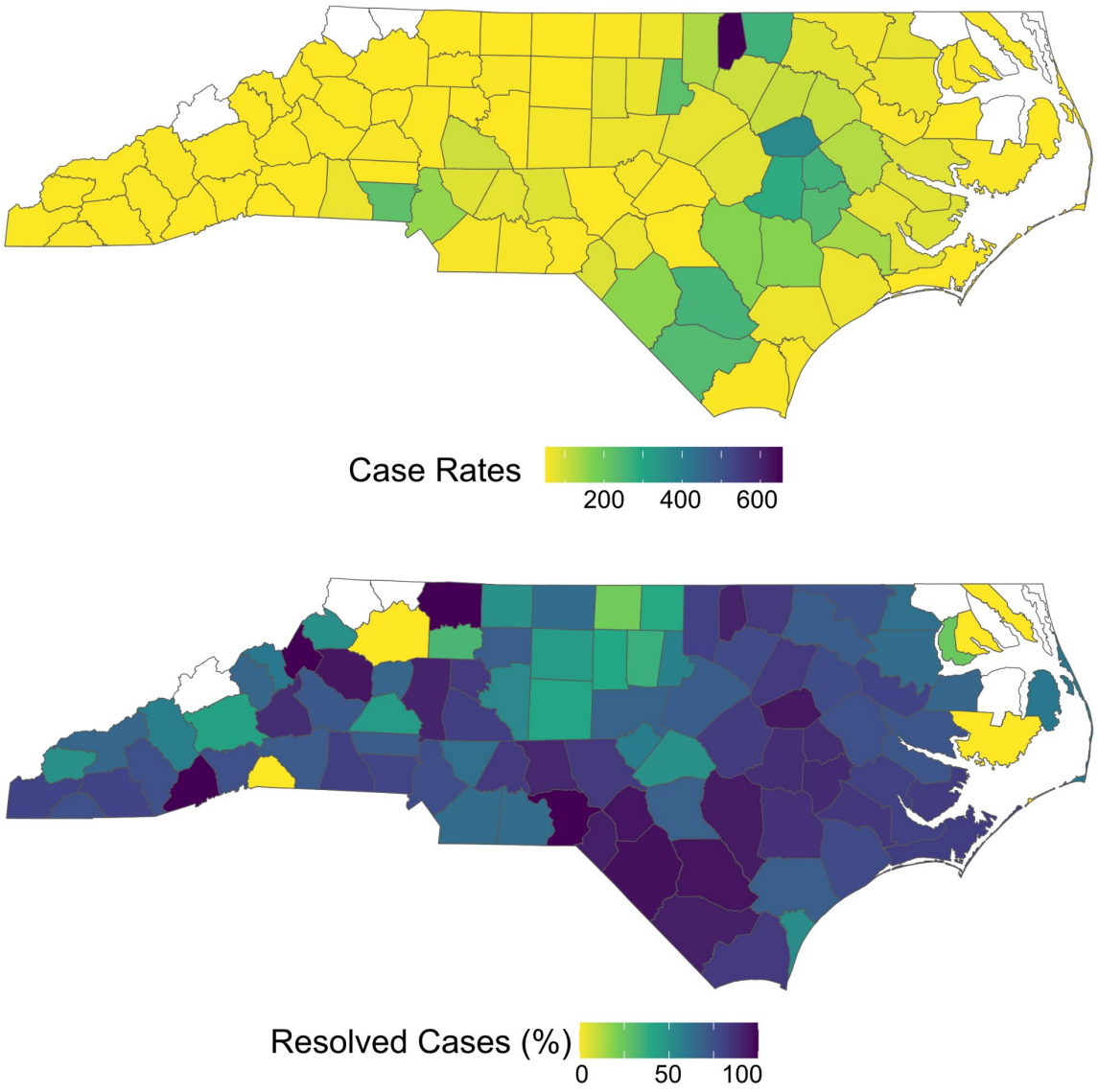

Figure A4. Food assistance case rate and resolution across counties. Social support referrals classified as food assistance are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

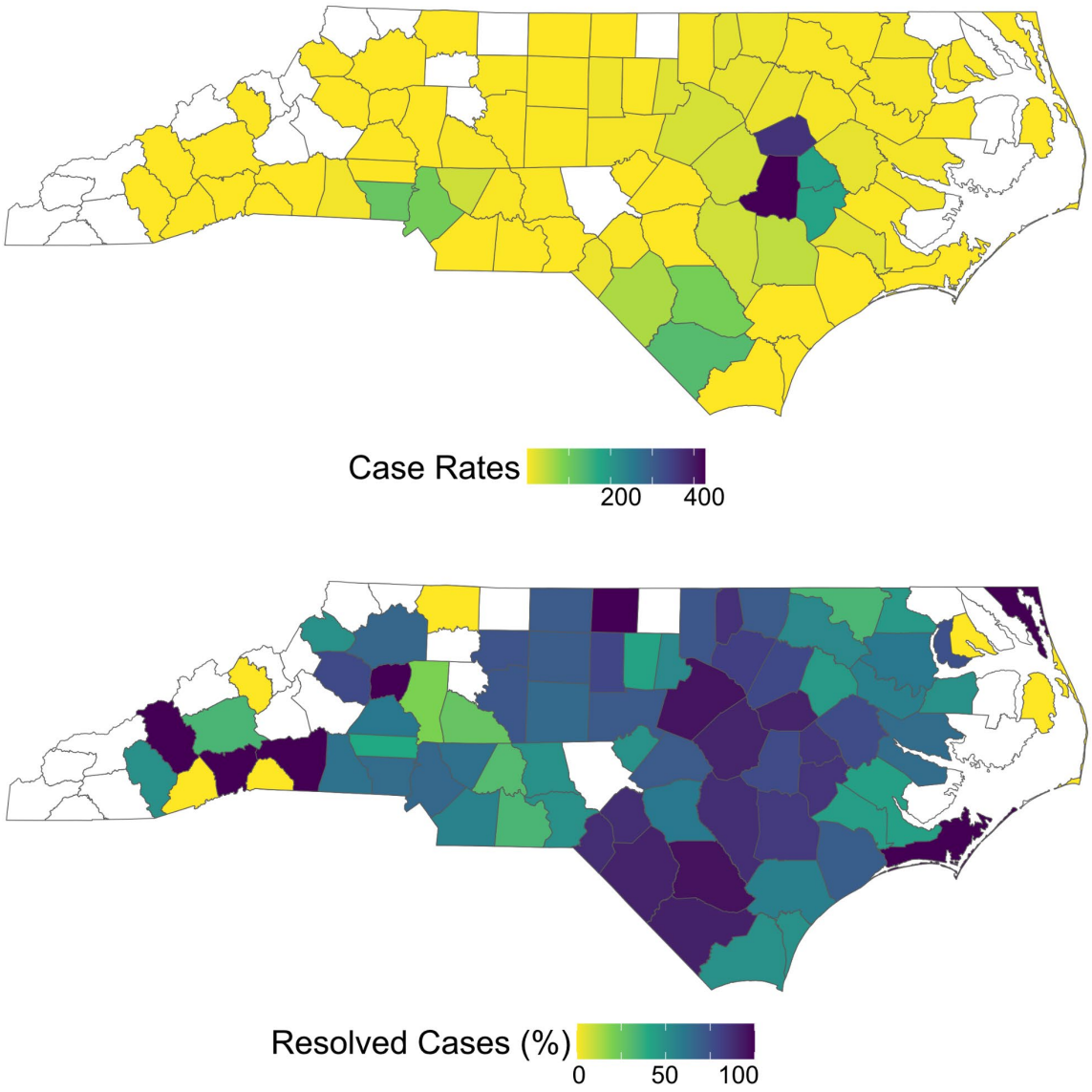

Figure A5. Individual and family support case rate and resolution across counties. Social support referrals classified as individual and family support are shown by case rate per 10,000 persons (top) proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

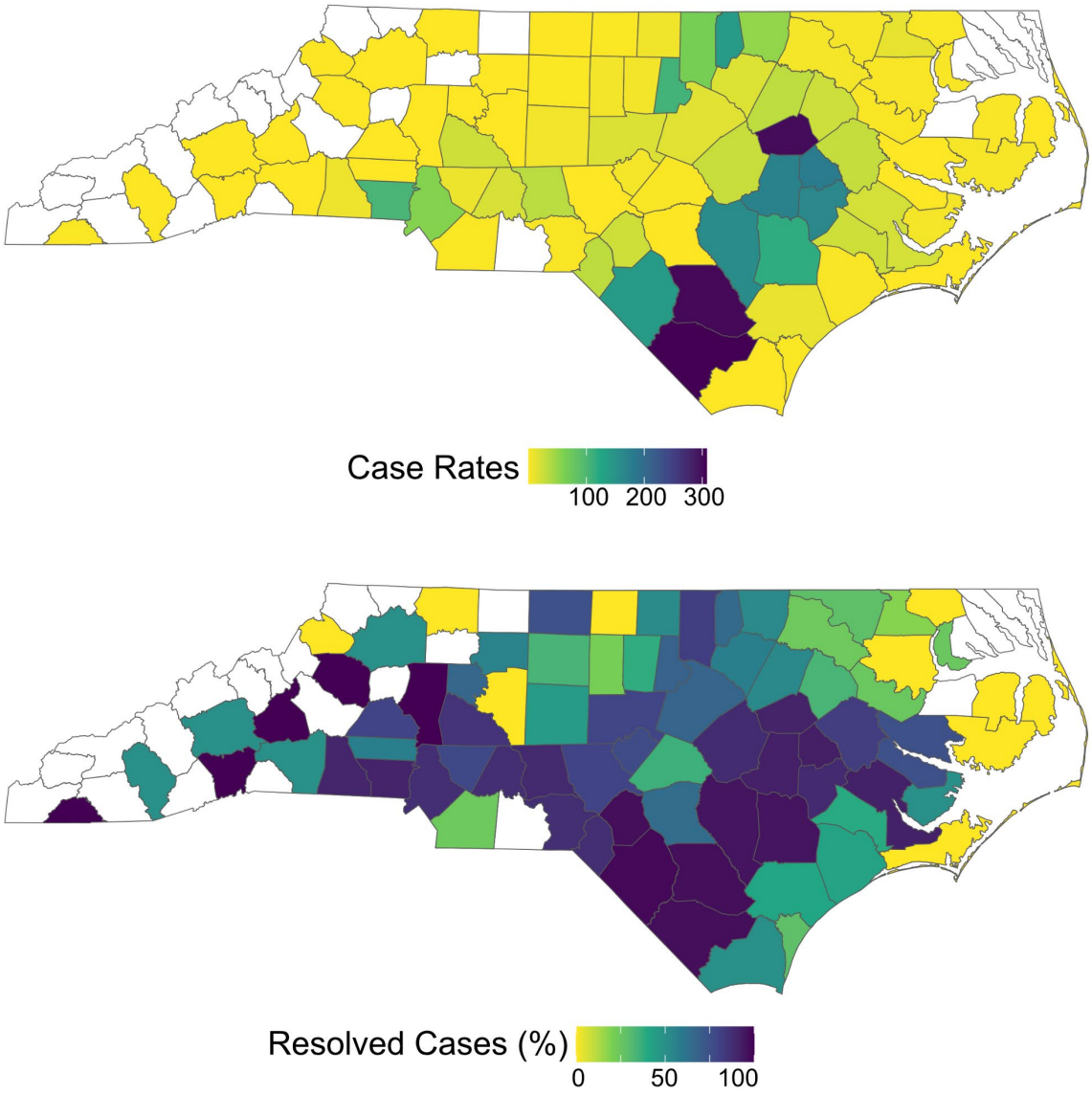

Figure A6. Income support case rate and resolution across counties. Social support referrals classified as income support are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

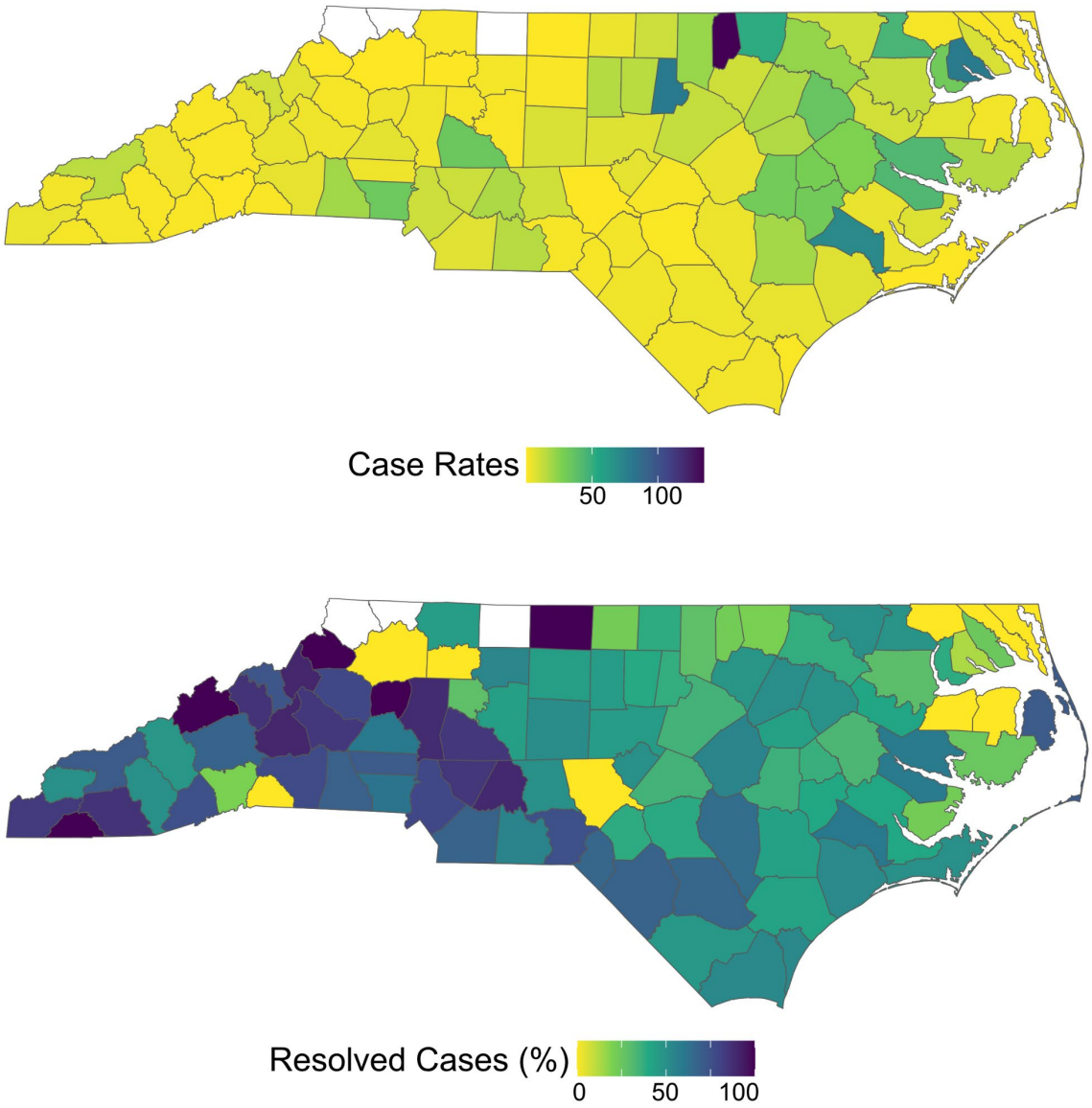

Figure A7. Utilities case rate and resolution across counties. Social support referrals classified as utilities are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

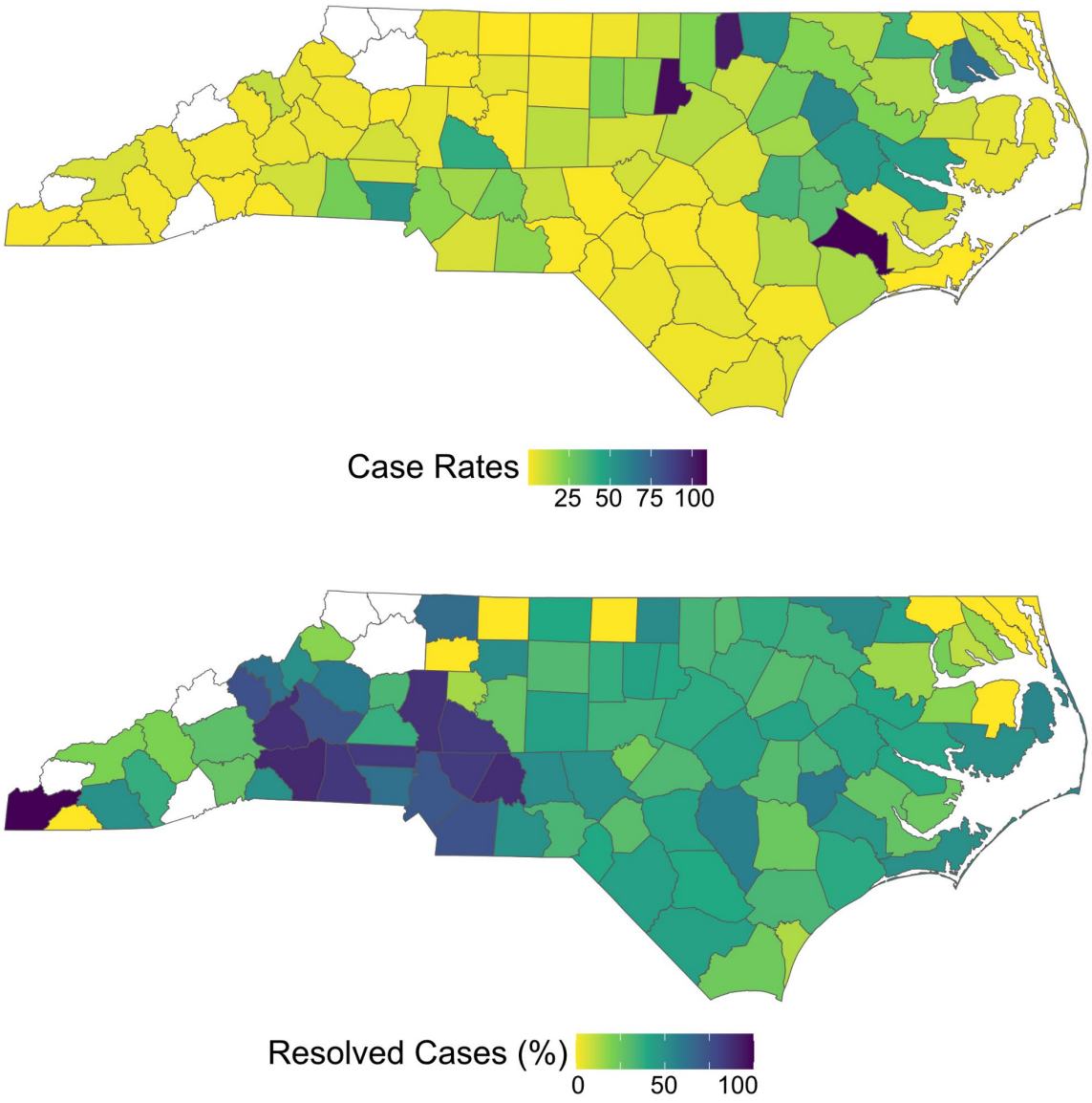

Figure A8. Housing and shelter case rate and resolution across counties. Social support referrals classified as housing and shelter are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

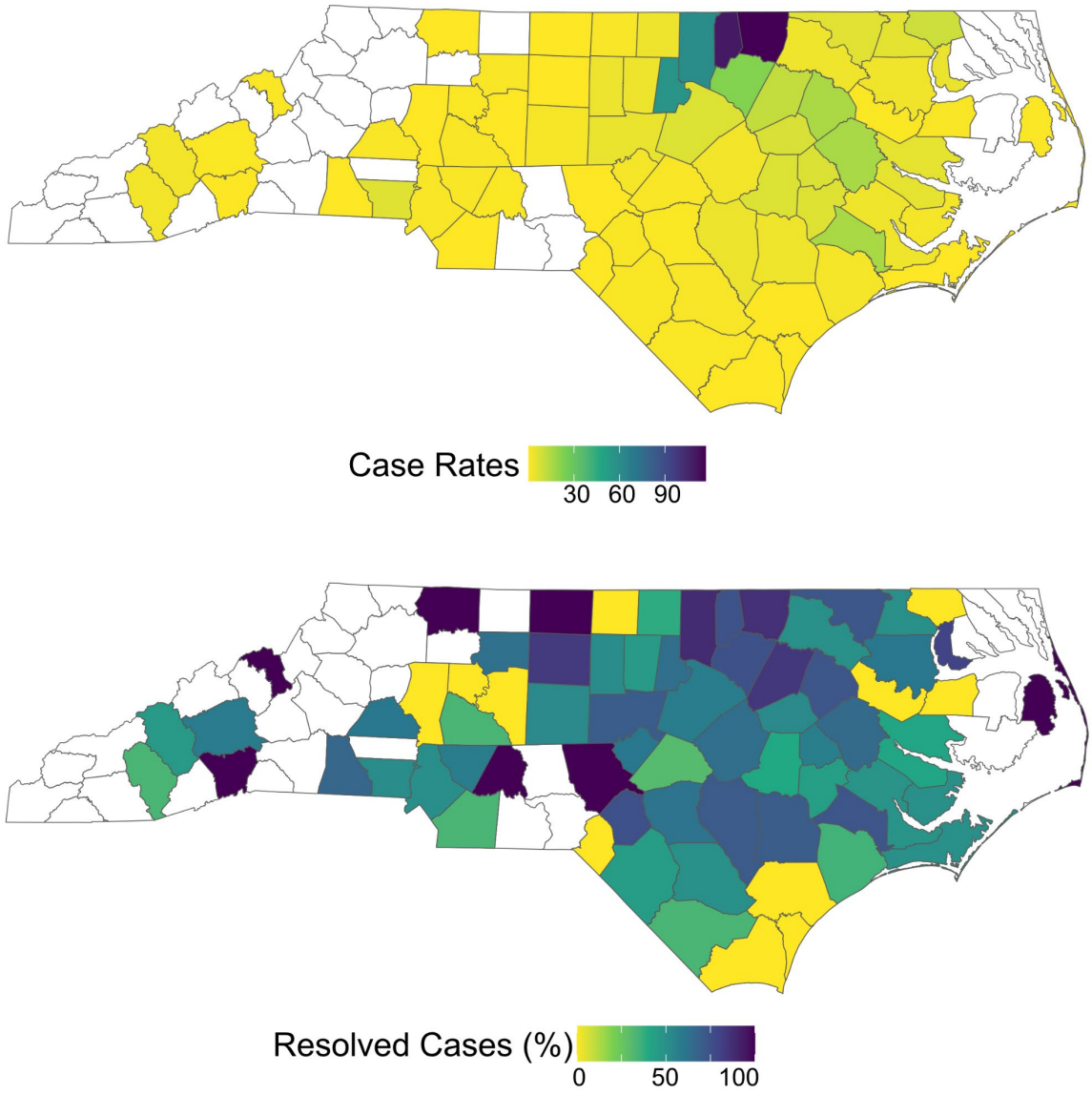

Figure A9. Clothing and household goods case rate and resolution across counties. Social support referrals classified as clothing and household goods are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

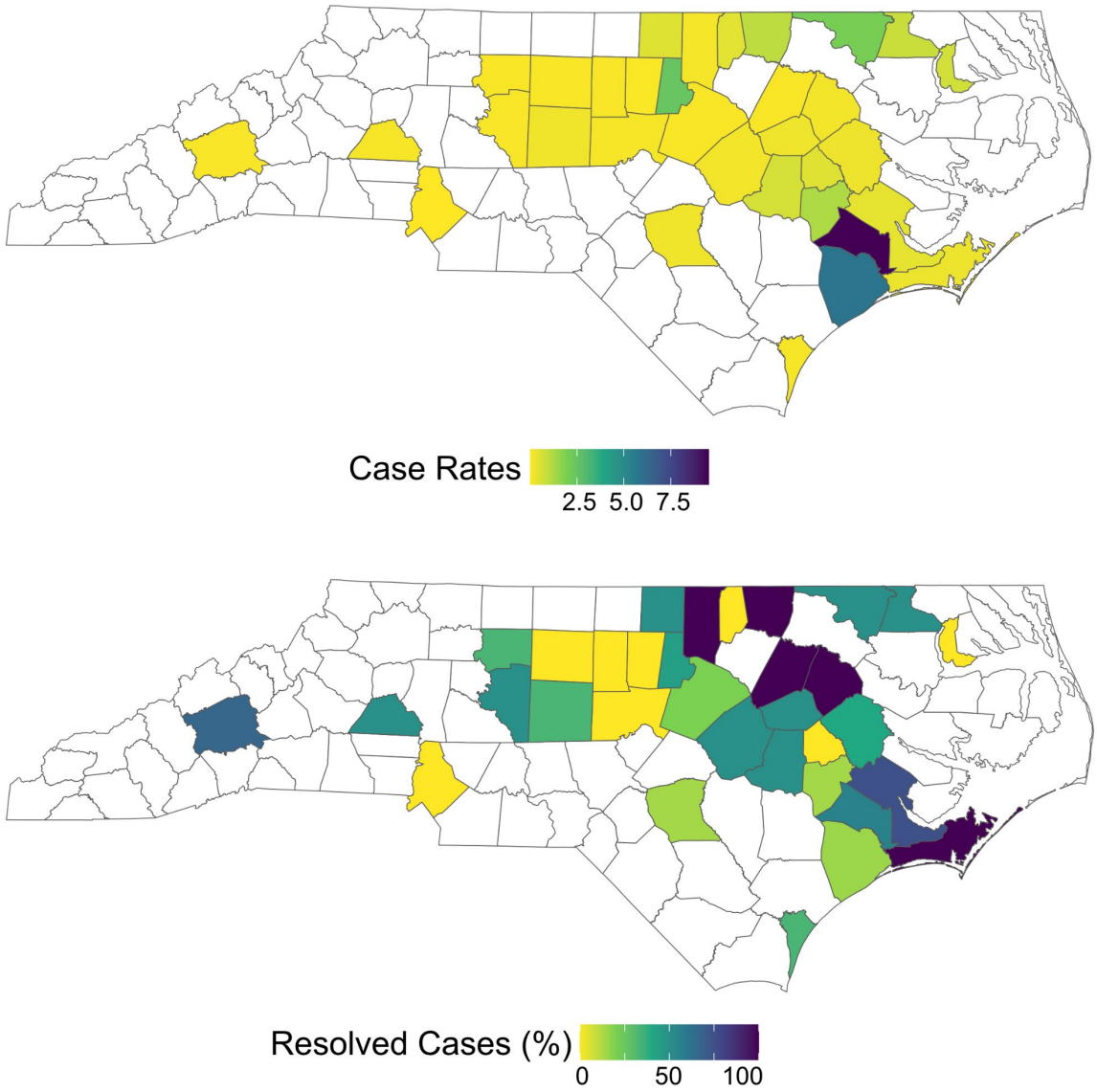

Figure A10. Education case rate and resolution across counties. Social support referrals classified as education are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

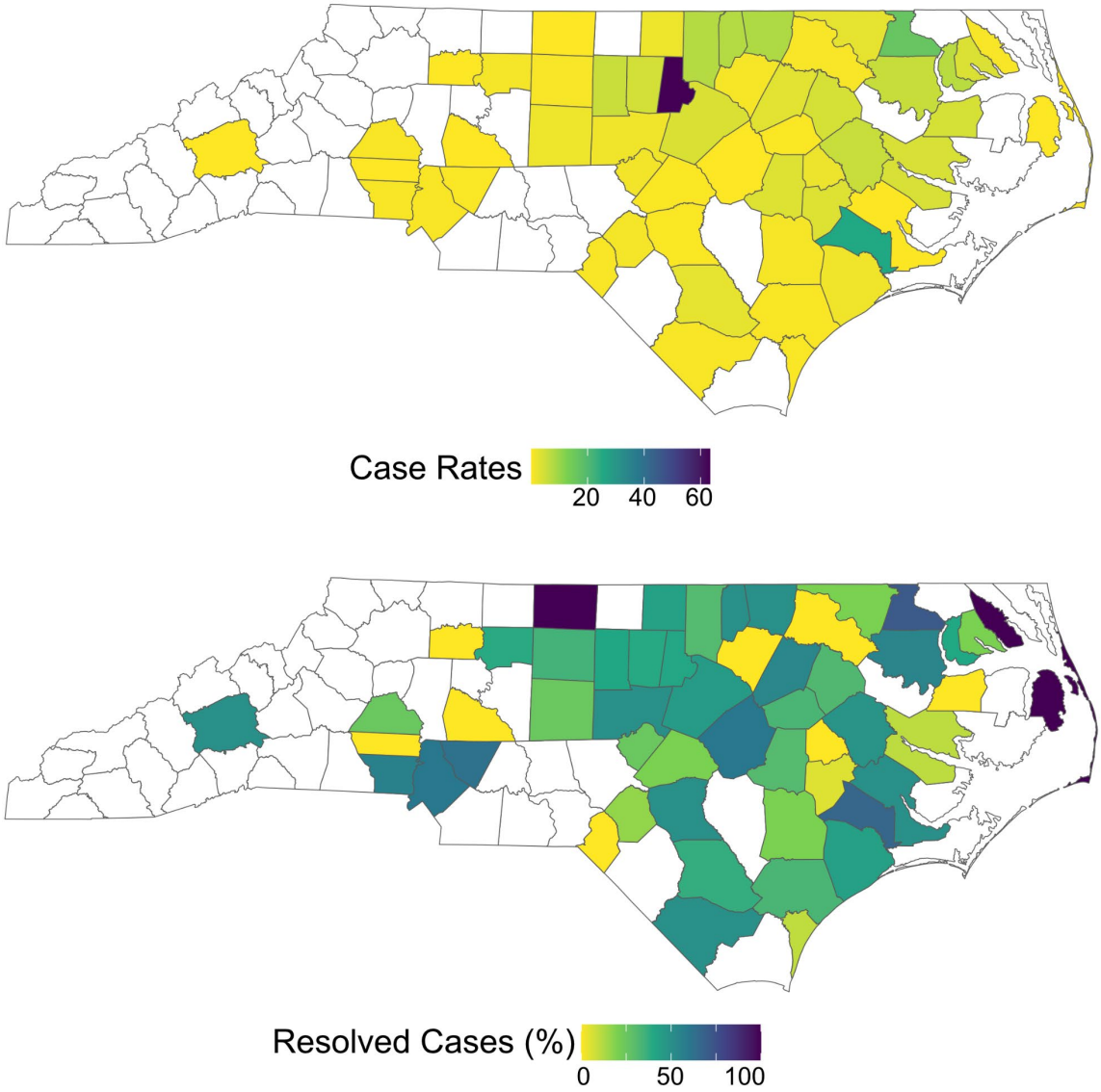

Figure A11. Employment case rate and resolution across counties. Social support referrals classified as employment are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

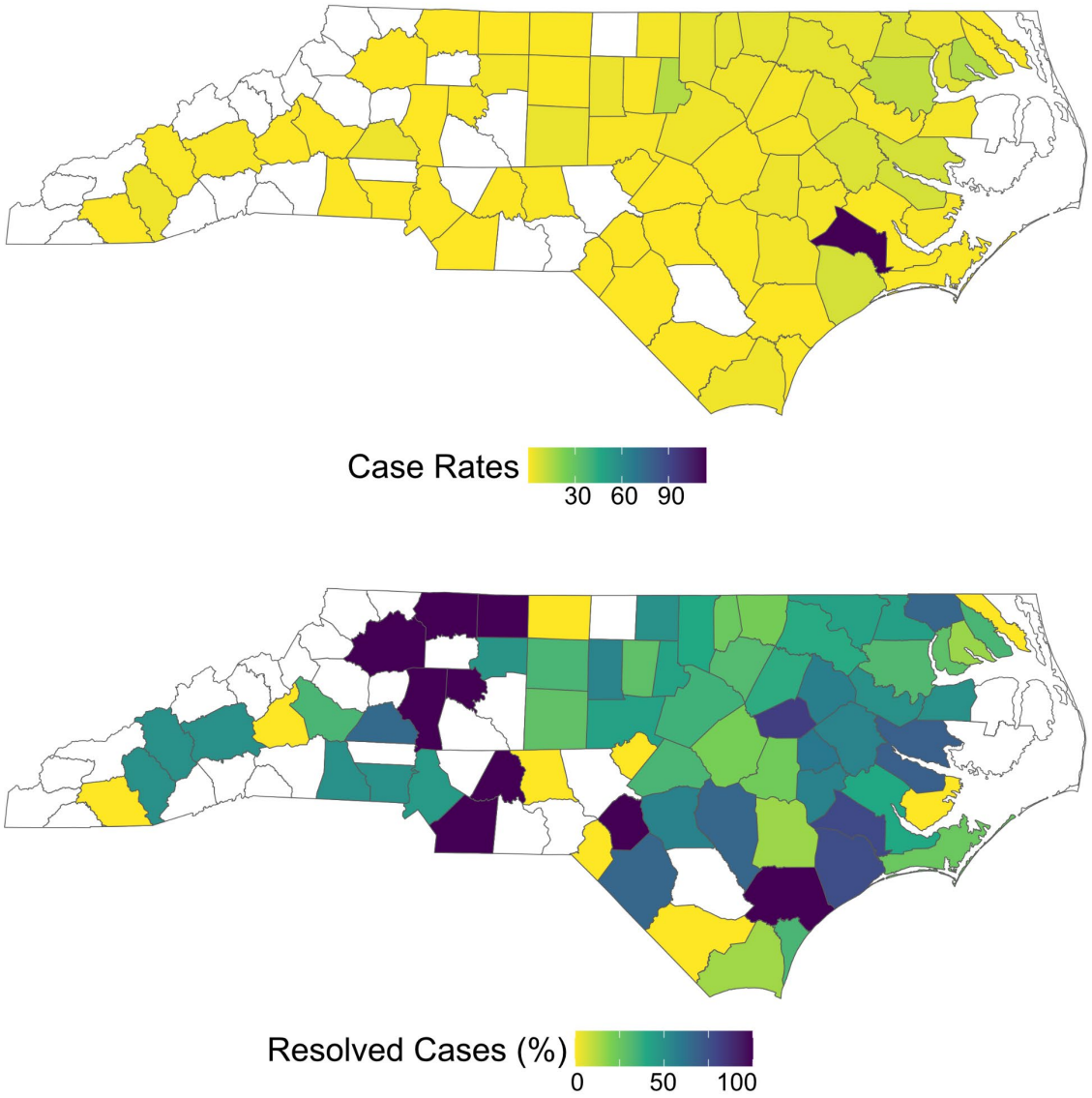

Figure A12. Physical health case rate and resolution across counties. Social support referrals classified as physical health are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

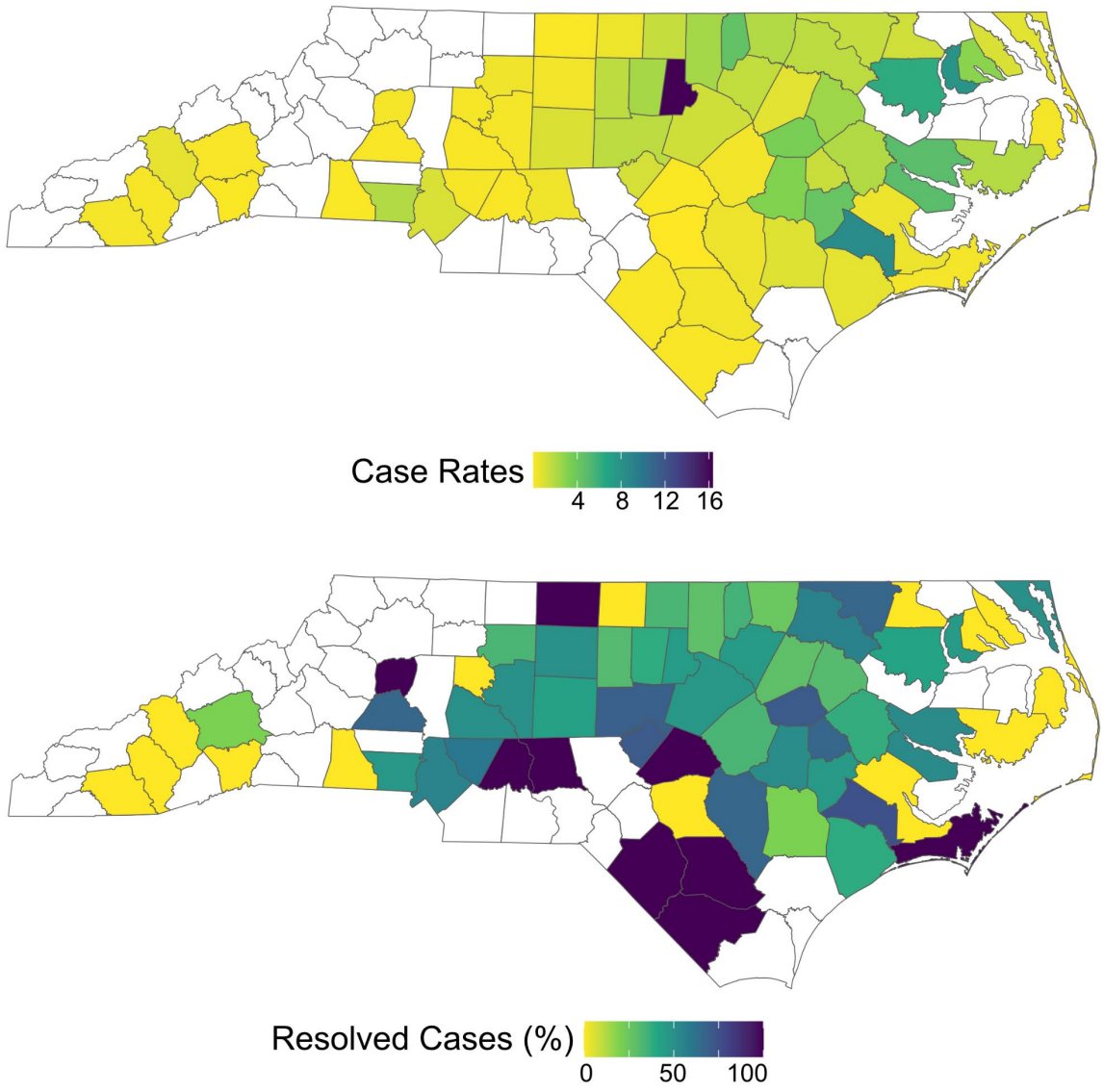

Figure A13. Transportation case rate and resolution across counties. Social support referrals classified as transportation are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

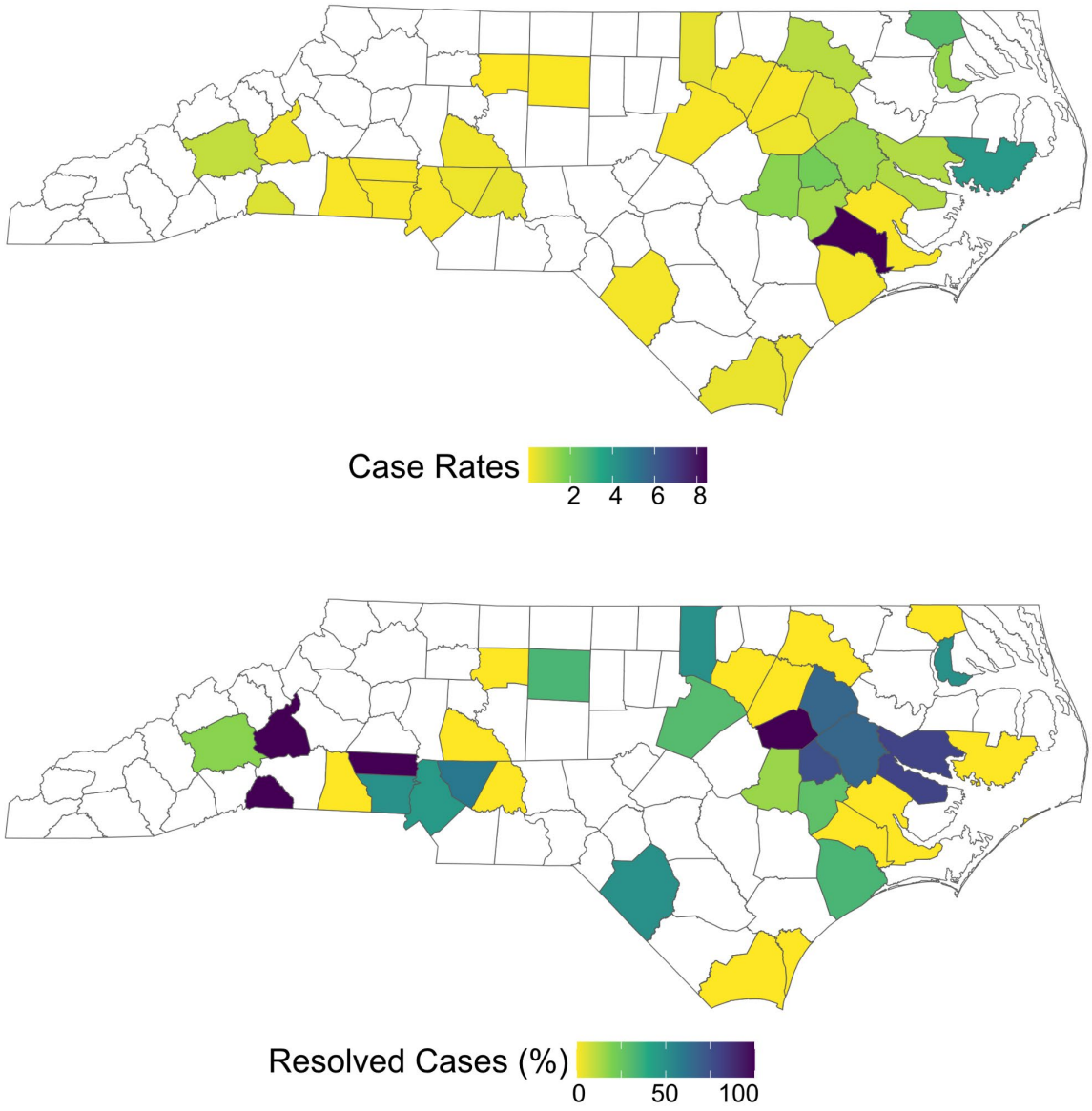

Figure A14. Mental and behavioral health case rate and resolution across counties. Social support referrals classified as mental and behavioral Health are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).

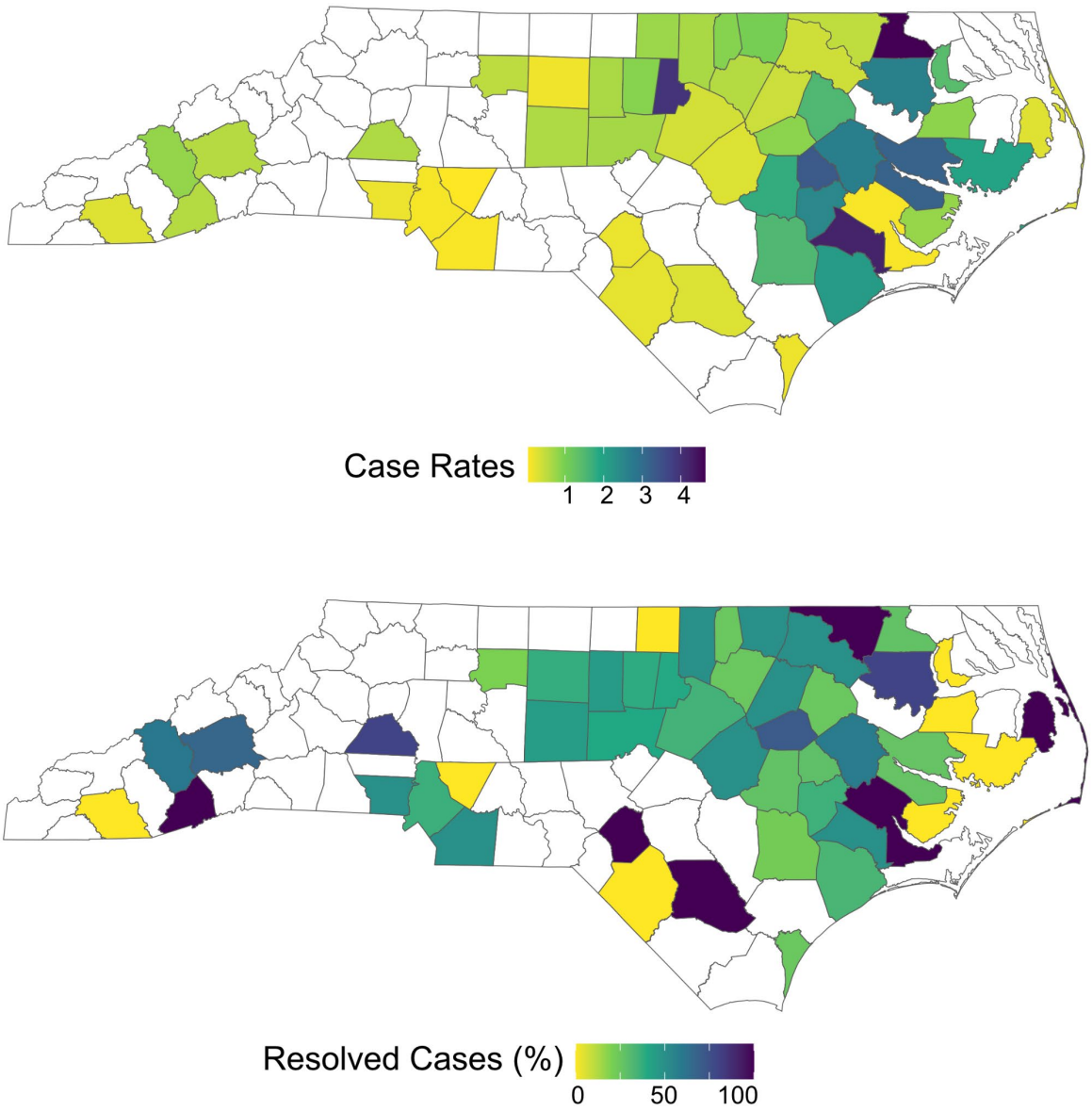

Figure A15. Benefits navigation case rate and resolution across counties. Social support referrals classified as benefits navigation are shown by case rate per 10,000 persons (top) and proportion of cases resolved (bottom). White indicates no reported cases of this service type. Data on social support cases and their outcomes (i.e., resolved, unresolved, open) are from NCCARE360 North Carolina Department of Health and Human Services Dashboard for 8 CHW vendor organizations (August 2020 – December 2022).