Partners in Crisis: Improving Police Response to Individuals in Moments of Crisis by Providing Service Alternatives

[Final Report]

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Executive Summary

Project description

This project was an experimental evaluation of a collaborative partnership among the Center for Evidence-Based Crime Policy at George Mason University (CEBCP-GMU), Roanoke Police Department (RPD), Roanoke County Police Department (RCPD), Salem Police Department (SPD), and Vinton Police Department (VPD) as well as Blue Ridge Behavioral Healthcare (BRBH) in Roanoke Valley region of Virginia to conduct a place-based cluster randomized controlled trial (RCT) to evaluate the effects of the co-responder model on subsequent outcomes of individuals who were experiencing a crisis and involved in mental health-related calls for service.

Study site

The Roanoke Valley, which includes Roanoke County, the cities of Roanoke and Salem, and the town of Vinton, is a predominantly suburban-rural region in southwest Virginia. Each of the jurisdictions listed has its own police department. The City of Roanoke is home to approximately 98,000 residents. Roanoke County has a population of 97,026, and the City of Salem and the town of Vinton have a population of 25,523 and 8,043 in 2022, respectively. As of the beginning of this project, the number of sworn officers in each agency: 268 in RPD, 114 in RCPD, 67 in SPD, and 24 in VPD.

Investigations and interventions

The research team conducted a number of investigation and intervention. In this report, **Chapter 2** describes the design, implementation, and experimental evaluation of an innovative place-based co-responder model in which mental health professionals (MHPs) responded to MH-related calls to provide crisis stabilization services and care coordination during follow ups after police's initial response at the treatment mental health hot spots. Specifically, we reported the effects of the co-responder intervention on mental health-related calls for service (MH CFS) and Temporary Detention Order (TDO) that measured involuntary hospitalizations.

As the implementation rate of the program was not as planned (i.e., low usage of the co-responder services), the research team expanded the scope of the original design to include a dispatch-MHP co-responder model to understand how call takers and clinicians identified MH calls differently and whether embedded clinicians at 911 call centers can help call takers and dispatchers better identify mental health components when taking the calls. **Chapter 3**[1] describes the findings from the comparison between mental health clinicians' coding on police calls for service and dispatch's determination. **Chapter 4** provides a summary of focus group

[1] The content and analyses in Chapter 3, 4, 5 were not part of the initial grant application. We developed these research inquiries along the way as they were critical to the original question. Thus, we decided to include the findings in the report to provide a comprehensive understanding on how the co-responder teans operate in responding to mental health crisis in the community.

interviews with clinicians and 911 call takers/dispatchers regarding their experience and feedback on their partnership.

Since this project adopted an innovative place-based approach for the co-responder services, the research team also conducted a spatial analysis to better understand the longitudinal stability of MH CFS at micro-geographic level. **Chapter 5** describes the results of a spatial analysis of MH-related CFS at street segments in Roanoke County over a 10-year period using both spatial point pattern tests (SPPT) and group-based trajectory modeling (GBTM).

Key findings

Chapter 2: We compared the pre-post change in MH CFS between the treatment and control hot spots for all agencies combined, RPD, and RCPD. The magnitudes of reductions in the treatment streets are generally larger than those observed in the control streets. The results of TDO data analysis showed that on average, there was a significant decrease in TDO cases in the treatment streets in the intervention period relative to the pre-intervention period, while there was an increase in TDO cases in the control streets (-19 vs. 16). Though the *t*-statistic is only borderline significant (p=.07), the effect size reaches a small effect by Cohen's standard (d = -.22) favoring the treatment group. This treatment effect is mostly driven by the trend observed in RPD's jurisdiction. The treatment streets in RPD experienced a reduction in TDO cases, whereas the control streets experienced an increase during the same period (-.38 vs. .16), which led to an effect of -.29. In RCPD's jurisdiction, both treatment and control hot spots experienced a nonsignificant increase in the TDO cases (.29 vs. .32). As for the MH calls, while the differences were in the expected direction, none of the comparisons was statistically significant using both *t*-statistics or effect sizes.

Chapter 3: In order to understand the effects of dispatch-clinician co-responder teams, we closely compared their determination on calls respectively. We analyzed clinicians' coding on calls and compared them with dispatchers' decisions and the ultimate dispositions made by on-site officers regarding the mental health issues of the cases. Over six months, a total of 1,161 calls were analyzed after adjusting for missing data. Our findings show that clinicians were more accurate in identifying mental health concerns, correctly recognizing 99 out of 112 cases, as opposed to dispatchers who accurately identified 69 cases. It was noted that dispatchers tended to under-identify mental health issues, evidenced by 43 calls where mental health concerns were missed. Conversely, clinicians were more prone to over-identification, resulting in 353 cases that officers deemed to be non-mental health-related. This discrepancy underscores the potential need for partnership between dispatchers and clinicians to better recognize subtle cues of mental health issues and highlights the importance of improved mental health training within the emergency response system.

Chapter 4: We explored the collaboration between dispatchers and clinicians through focus groups, offering insights into the benefits and challenges of embedding clinicians at a call center model. A key finding is the enhanced ability of dispatchers to identify and respond to mental health crises with the support of clinicians. Dispatchers reported a shift in their assessment strategies, incorporating more detailed questioning to better discern the mental health nuances of

emergency calls. This shift was facilitated by the clinicians' presence, which not only aided in real-time decision-making but also provided suggestions for recognizing cues indicative of mental health issues. Both dispatchers and clinicians mentioned challenges such as the rapid decision-making required in emergencies and the lack of training of mental health assessments specifically for dispatchers. This collaborative approach highlighted the value of embedding clinicians within call centers, suggesting that such partnerships could enhance outcomes for individuals in mental health crises.

Chapter 5: We geocoded a total of 4,456 MH CFS from RCPD between 2013 to 2022. During the first four years of the study period, the total numbers of MH calls were relatively stable with about 500 calls per year. The numbers started to fluctuate from 2017 to 2022 with a peak of 483 calls per year in 2021. Regarding the spatial concentration, 50% of MH calls were concentrated at between .21% to .36% of streets segments, and less than 2% of street segments accounted for 100% of MH calls in any given year over the 10-year study period. The SPPT analysis showed that all robust *S*-indices between any consecutive two years are greater than .94, indicating a high level of longitudinal spatial stability of MH calls. The GBTM analysis identified a 5-goup model that fitted the data the best. While the majority of the street segments were either free of any MH calls, or had a very low rate of mental health calls over this 10-year study period, a small proportion of street segments (n = 98) showed various developmental patterns of MH calls, including high-rate decreasing, moderate increasing, and moderate decreasing trajectory groups. These 98 street segments accounted for between 31% and 56% of all MH CFS every year from 2013 to 2022. In other words, less than 1% of total street segments notably drove the total volume of MH CFS in Roanoke County.

Recommendations for practices

From the investigations, we identified several recommendations for police departments serving suburban-rural jurisdictions to improve their responses to CFS involving individuals who are a mental health crisis, including:

- Place-based co-responder models in which practitioners concentrate onsite stabilization and follow-up services at mental health hot spots (i.e., street segments with high volume of mental health-related calls for service) might be a feasible approach for suburban-rural agencies.
- Building trust and rapport between police agencies and mental health service providers is central to successful implementation of co-responder programs.
- Facilitating the receptibility to co-responder programs is an integral part of implementation such as leadership support, offering continuing training, and recognizing the effort for making referrals.
- In addition to police-clinician co-responder teams, partnering mental health clinicians with 911 call-takers/dispatchers is also promising in enhancing responses to mental health crisis in the community.

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Chapter 1 Introduction

This final report outlines the investigations and findings from an experimental evaluation of a collaborative research project among George Mason University, four law enforcement agencies and a mental health service provider to improve police emergency responses by diverting individuals in crisis to mental health service programs in Southwest Virginia. Specifically, the Center for Evidence-Based Crime Policy at George Mason University (CEBCP-GMU) collaborated with Roanoke Police Department (RPD), Roanoke County Police Department (RCPD), Salem Police Department (SPD), and Vinton Police Department (VPD) as well as the local Community Service Board (CSB), Blue Ridge Behavioral Healthcare (BRBH) in Roanoke Valley region of Virginia to conduct a place-based cluster randomized controlled trial (RCT) to evaluate the effects of the co-responder model on subsequent outcomes of individuals in a crisis who were involved in mental health-related calls for service.

This **introductory chapter** provides background information about the partners in this collaborative initiative, the study site, and the targeted problem. **Chapter 2** describes the main findings of this evaluation research. As the implementation of the co-responder program was not as planned with the low referral rate among the agencies, the research team switched from the original design to a dispatcher-clinician collaborative approach to understand the identification of mental health calls by both call takers/dispatchers and clinicians. **Chapter 3** reports on the identification of mental health calls in two call centers, comparing the decisions made by clinicians, dispatchers, and response officers on the same calls. **Chapter 4** explores the collaboration experience between dispatchers and clinicians in call centers through focus groups, specifically focusing on how this partnership impacts the identification practices of mental health crises. **Chapter 5** describes the results of a longitudinal analysis conducted by the CEBCP-GMU

team to understand the spatial stability of mental health-related calls for service in Roanoke County over a 10-year period. The **concluding chapter** summarizes the various outcomes and findings of this research collaboration including officers' perception of the project and discusses policy implications and recommendations for future research collaborations.

Team Members

The co-responder program was led by RCPD Chief Howard Hall with assistance from Assistant Chief James Chapman and Crime Analyst Brittni Money, RPD Chief Sam Roman, Operations Deputy Chief Chester Smith, Captain Andrew Pulley, and Senior Crime Analyst Andrew Reece, SPD Captain Daniel Crouse and Crime Analyst Elizabeth Lewis, VPD Deputy Chief Timothy Lawless, RCPD Emergency Communications Manager Rebekah Craft, City of Roanoke E-911 Manager Sonya Roman and Operations Administrator Traci Shelton, SPD Telecommunications Manager Daniel Hartman, and Blue Ridge Behavioral Healthcare Access to Care Division Directors Patty Williford and Allison Taylor, Emergency Services Director Christi Combs, Marcus Alert and Crisis Intervention Team Director Mandy Lee, and two co-responder team clinicians Mary Mowbray and Ben Dunlea. The CEBCP-GMU team was led by Dr. Sue-Ming Yang with assistance from graduate research assistants Yi-Fang Lu and I-Ching Jen.

The Study Stie and Background

The Roanoke Valley, which includes Roanoke County, the cities of Roanoke and Salem, and the town of Vinton, is a predominantly suburban-rural region in southwest Virginia. Each of the jurisdictions listed has its own police department.[2] According the US Census, the City of Roanoke is home to approximately 98,000 residents of which nearly 60% are White, 29% are

[2] As of 2020, the number of sworn officers in each agency: RCPD: 114, RPD: 268, VPD: 24, and SPD: 67.

Black, 3% are Asian, and 7% are Hispanic. About 18% of the population is older than the age of 65. Roanoke County with the largest area (251 mi^2) in the study site has a similar population size to the City of Roanoke (97,026). The County is more racially homogenous: 87% White, 7% Black, 4% Asian, and 4% Hispanic. In Roanoke County, 22% of the population is above the age of 65. The population in the City of Salem is smaller with an estimate of 25,523 of which 85% are White, 8%, Black, 2% Asian, 2%, and 4%, Hispanic. The town of Vinton is the smallest jurisdiction with a population of about 8,000 of which more than 90% are White, 4% are Black, and 3% are Hispanic.

Although the overall Roanoke Valley crime rate is low, MH-related calls are a major and persistent concern for both the police and the community in the region. For instance, MH calls accounted for less than 2% of total calls to RCPD from 2016 to 2017, but the average RCPD officer time spent on MH-related calls was about 3 hours and 38 minutes, compared to 39 minutes for all other call types (Yang et al., 2018). Calls that resulted in officers having to detain individuals under an Emergency Custody Order (ECO) or Temporary Detention Order (TDO)—two options that can be used when individuals are at risk of harming themselves or others or are unable to care for themselves—lasted even longer (5 hours and 43 mins for RCPD and 7 hours and 22 mins for RPD). Individuals who relied on police assistance in a crisis can become trapped in a "revolving door" and may never receive longer-term treatment or intervention services needed.

Furthermore, the risk of police use of force is higher when calls for service involve PMI. Specifically, 20.9% of RCPD's use of force incidents were related to a MH-related calls (Yang et al., 2018). While most people with severe MH issues do not pose a threat to others and are often involved in only minor offenses, their behavior can escalate quickly during encounters with the

police. The likelihood of violence increases dramatically when the individual also uses substances (Clark et al. 1999; Steadman et al. 1998). Further, police officers may mistake the symptoms of a mental illness for resistance or threats, increasing the risk of force being used (Cordner, 2006). Across the nation, about a quarter of fatal police shootings involve PMI (Kindy & Elliott, 2015). This figure is even higher—40%—in the Commonwealth of Virginia (Harki, 2016). Thus, the need for alternatives to help the police better direct individuals in crisis away from criminal justice options and toward appropriate treatment cannot be understated. It is important to identify effective treatment programs and provide immediate assessment for individuals in crisis to prevent repeated episodes and to better use limited police resources.

The research team conducted a place-based randomized controlled trial in the Roanoke Valley from May 2022 to December 2022 to assess whether the utilization of the co-responder team reduce subsequent TDO admissions and CFS involving individuals in a mental health crisis. The co-responder program followed a place-based approach (i.e., the hot spots model) and delivered focused intervention (co-responder team) to the mental health hot spots. Specifically, the co-responder team responded to mental health-related calls generated from the pre-identified mental health hot spots in the Roanoke Valley. Individuals in crisis received crisis intervention and subsequent treatment options from BRBH clinicians. We also incorporated care coordination as part of the treatment plan to assist with participant follow-ups. In sum, this evaluation tested whether the co-responder team visits, followed by care-coordination can potentially improve the wellbeing and subsequent outcomes of individuals in mental health crisis in the Roanoke Valley while reducing the burden on officers responding to mental health related calls. The main findings of this co-responder intervention are discussed in Chapter 2.

Chapter 2 Evaluating the Effects of Co-response Teams in Reducing Subsequent Hospitalization: A Place-based Randomized Controlled Trial

Abstract

Responding to incidents involving individuals with mental illness has been a challenge for police officers. While co-response teams have been embraced as an effective police response strategy, most prior evaluation studies on co-response teams focused on outcomes that are not directly related to individuals' subsequent mental health state. Additionally, the lack of experimental research hinders our ability to draw causal conclusions on the effects of co-response teams. To address this knowledge gap, this study evaluated the effectiveness of co-response teams on hospitalization outcomes of individuals in crisis using a place-based randomized controlled trial in southwest Virginia. Street segments with high volumes of mental health calls for service were randomly assigned to either treatment hot spots (n = 113) or control hot spots (n = 115). The results suggest that the co-response teams had a significant effect on reducing subsequent hospitalizations, with an estimated effect size of -0.22. The findings, challenges, and recommendations for future co-response team implementations were discussed.

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Introduction

In the last few years, law enforcement agencies across the nation have faced a growing concern regarding the volume of calls for service (CFS) involving people with mental illness (PWMI). According to the Substance Abuse and Mental Health Services Administration (2017), more than 46 million U.S. adults (19%) had a mental illness, while nearly 11 million U.S. adults (4.5%) had a serious mental illness that greatly affected day-to-day living, or caused serious functional impairment. Previous research shows that mental health-related (MH-related) CFS account for anywhere between 5 and 31% of all calls to the police nationwide (Abbott, 2011; Baess, 2005; Wilson-Bates, 2008; Deane et al., 1999; Eide, 2021; Reuland, 2004) but consume a disproportionate amount of police time and resources relative to other calls (Charette et al., 2014; Gill et al., 2018; Yang et al., 2018).

Though most PWMI do not necessarily pose a threat to others and are often involved only in minor offenses such as disorderly conduct, the extent of their behavioral problems is complex and can often escalate quickly without appropriate intervention. Additionally, the likelihood of violent behavior among PWMI increases dramatically when they also use substances (Clark et al., 1999; Steadman et al., 1998). Such tendencies to violence increase the chances that police will need to use force in an effort to control situations. For instance, Washington Post started tracking fatal police shooting since 2015. According to their real time Police Shooting Database, as of April 5th, 2023, 1,742 victims of fatal police shooting (21% of all victims of fatal police shooting) had some types of mental illness (Jenkins et al., 2023). Among the 1,742 victims who showed signs of mental illness, 1,470 of them were armed with a gun or knife. This figure is even higher in the Commonwealth of Virginia where about 40 percent of the fatal police shootings since 2010 have involved PWMI (Harki, 2016). While there

has been a strong push for leaving police out of crisis responses, Eide (2021) argued that the highly unpredictive nature of MH-related calls make police "still the most qualified responders for mental illness."

With the police being at the forefront handling encounters with PWMI, a number of strategies have been developed to assist police officers to better respond to individuals in crisis and to ensure safe de-escalation in emergency situations. There are three major types of response approaches that have been utilized in practices: Police-based specialized police response (e.g., Crisis Intervention Programs, CIT); Police-MH Co-response models; and MH-based MH response (Deane et al., 1999; Seo et al., 2021). In the first two models, police play an integral role in the responses to requests involving PWMI, either doing it alone, or in partnership with mental health professionals.

Empirical Evidence on the Co-response Models

While there have been some studies discussing the effects of various police response models, not many of them provided quantifiable measures for cross-comparisons. Specifically. Seo et al. (2021) conducted a systematic review and meta-analysis on various police response models for handling PWMI encounters. After a thorough search of existing literature, they initially identified 127,664 studies but only 42 program evaluations involving police responses to mental crisis are eligible evaluation research. For the remaining 42 studies, 24 studies evaluated the effects of CIT programs, and 11 studies focused on evaluating co-response partnership between police and mental health professionals. The outcomes of the studies vary widely including police perceptions, satisfaction, and time spent on calls, to name just a few. Nonetheless, there was almost no study focusing directly on the subsequent outcomes related to PWMI. The lack of empirical evidence on outcomes directly related to PWMI hinders our

understanding on the effects of police response models. Another challenge is the methodological rigor of the evaluation studies. Puntis et al. (2018, p. 9) concluded in their systematic review that, while over two-thirds of the 26 eligible co-response studies they identified showed a reduction in the use of police detention, the lack of randomized controlled trials (RCTs) means there is a "striking lack of evidence" for the effectiveness of co-response models.

The co-response models generally refer to cooperation models between the police and mental health service providers to respond to encounters related to PWMI (Seo et al., 2021). The actual modes of cooperation vary from place to place. Various versions of the co-response model have been implemented around the world (Bailey et al., 2021; Dyer et al., 2015; Helfgott et al., 2016; Kisely et al. 2010; Lamanna et al., 2015; Lamanna et al., 2018; Lamb et al., 1995; Reveruzzi & Pilling 2016; Robertson et al., 2020; Seo et al., 2021; Scott, 2000). For example, in Seo and colleague's meta-analysis (2021), they found that in practices, the term co-response model is used to represent approaches involving police-clinician special units, street triage programs, mobile crisis team, and jail diversion system. Clearly, the so-called co-response model is used as an umbrella term that represents many different types of collaboration between police and mental health professionals (MHPs). MHPs provide clinical support, including stabilizing emergency situations, conducting screening and assessment, reviewing clients' MH history, and referring clients to MH services or treatment, alongside the law enforcement response (Krider et al., 2020). MHPs may ride along with the police in the same car (marked or unmarked), respond on-site separately from the police, or respond remotely via phone or mobile devices (Krider et al., 2020; Puntis et al., 2018; Watson et al., 2019).

In addition to the variation in the content of co-response team, another problem faced in the evaluation of its empirical merits stems from the diverse research outcomes that are not

directly linked to the wellness of PWMI. For example, majority of studies identified in Seo et al.'s meta-analysis focused on evaluating officers' attitudes and perceptions toward PWMI, their confidence of the co-response models, and police response time and time spent on scenes (Hollander et al., 2012; Kisely et al., 2010; Lamanna et al., 2018; Lee et al., 2015). While these are all important outcomes for the co-response teams, it is important to consider outcomes related to PWMI. The evaluations that focused more on the situational outcomes related to PWMI showed promising results for assisting suicidal people (Currier et al., 2010; While et al., 2012), deescalating violence, and decreasing police use of force in situations involving PWMI (Cotton & Coleman, 2010). A number of studies also found that co-response teams are perceived to be less threatening and stigmatizing for people in crisis (Boscarato et al., 2014; Dyer et al., 2015; Evangelista et al., 2016; Kirst et al., 2015; McKenna et al., 2015; Lamanna et al., 2018). Nonetheless, while all the outcomes mentioned above provide important information for the police, almost none of them provides any direct measure on the subsequent condition of the PWMI after the initial contact with the co-response teams. To better understand whether co-response teams could more effectively assist PWMI and improve their subsequent MH wellbeing, we need to focus more on outcomes related to repeat requests for police assistance, repeat or severe MH crisis episodes, contacts with the police, and hospital visits, etc.

In this current study, we examine the effects of a form of co-response team—the police collaboration with mobile crisis team—using a randomized controlled trial. The American Psychiatric Association (APA) Task Force defines mobile crisis services as having the "capacity to go out into the community to begin the process of assessment and definitive treatment outside of a hospital or health care facility" (SAMHSA, 2014, p. 10). Prior research shows that availability of outpatient MH services is known to increase the chances that PWMI receive

proper treatment and medication, thereby decreasing the likelihood of the need for further police intervention (Cordner, 2006; Gilbert et al., 2010). Considering the suburban-rural nature of the study area, the co-response team serves as a secondary response team that partners police officers and MHPs in responding to police requests (see Evangelista et al., 2016 for a similar design). Specifically, officers responded to the call first to assess the situation and secure the scene, and then called to request the presence of the co-response team providing individuals in crisis with needed services, such as crisis stabilization and de-escalation treatment. Additionally, the co-response team offers PWMI more opportunities to access additional services than the police alone are able to provide (Kisely et al., 2010; Steadman et al., 2000; Scott et al., 2000; Lamanna et al., 2018). Seo et al. (2021) concluded in their meta-analysis that co-response models are more effective in "handling police encounters with the mentally ill than providing training to frontline officers" (p. 11). Nonetheless, they also noted that most of the evaluation studies of co-response models were non-experimental. Therefore, they suggested the needs for more experimental research to better control for spuriousness and temporal ordering to establish causality in this area. Our study speaks directly to this knowledge gap by examining the effects of co-response teams using a randomized controlled trial.

The Current Study

To evaluate the effects of the co-response teams, we conducted a six-month randomized experiment in Roanoke Valley, Virginia. Our study involved partnership among four police agencies across the Roanoke Valley with Blue Ridge Behavioral Healthcare, a mental health service provider, to establish a standard crisis response protocol that provides police with peak-hour access to trained MHPs who can offer stabilization services and guide individuals into further treatment if needed. Following the recommendations of a recent evaluation of co-

response models and the hot spots policing literature (Braga et al., 2010; Curman et al., 2015; Gill et al., 2017; Hibdon et al., 2017; Koziarski, 2021; Steenbeek & Weisburd, 2016; Vaughan et al., 2016; Vaughan et al., 2018; Wheeler et al., 2016; Weisburd, et al., 2004; Weisburd & Amram, 2014; Weisburd et al., 2009; White & Goldberg, 2018; Yang et al., 2019), we designed and implemented the co-response program on the mental health hot spots, defined by the amount of mental health calls for services, from May 16th 2022 to December 31st, 2022. The Roanoke Valley, which includes Roanoke County, the cities of Roanoke and Salem, and the town of Vinton, is a mixture between urban-suburban-rural region in southwest Virginia. Each of the jurisdictions listed has its own police department, but due to scarce resources and geographic dispersion of the region, each department has concurrent jurisdiction in the other areas. Although the overall Roanoke Valley crime rate is low, MH-related calls are a major and persistent concern for both the police and community in the region.

For example, MH CFS accounted for fewer than 2% of total calls to Roanoke County Police Department (RCPD) from 2016 to 2017, but the average RCPD officer time spent on MH-related calls was about 3 hours and 38 minutes, compared to 39 minutes for all other call types (Yang et al., 2018). Calls that resulted in officers having to detain individuals under an Emergency Custody Order (ECO) or Temporary Detention Order (TDO)—two options that can be used when individuals are at risk of harming themselves or others or are unable to care for themselves—lasted even longer (5 hours and 43 mins for RCPD and 7 hours and 22 mins for RPD). Meanwhile, individuals who often rely on police assistance in a crisis can become trapped in a "revolving door" and may never receive longer-term stabilization or intervention services (Yang et al., 2018). Thus, the need for alternatives to help police better direct individuals in crisis away from the criminal justice system and toward appropriate treatment services cannot be

overstated. Therefore, all law enforcement agencies in Roanoke Valley joined forces to participate in this RCT to identify effective treatment programs and provide immediate assessment for individuals in crisis to prevent repeated episodes and to better use limited police resources.

Methods

The Co-response Team Intervention

The main intervention of this study was a co-response team program. The co-response team program, which partners police officers and MHPs in responding to MH-related CFS, provides individuals in crisis with more opportunities to access services than police alone are able to provide. It also reduces the time and resources spent by police on MH calls by allowing them to hand-off individuals to MHPs when safety is not a concern (Kisely et al., 2010; Lamanna et al., 2017; Steadman et al., 2000).

To maximize the benefits of the scarce resources, the co-response teams responded to calls during the hours of peak MH needs, from 10 am to 8 pm, Monday to Friday from May 16th, 2022 to December 31st, 2022. Across the four police agencies, RCPD served as the pilot agency to test out of the intervention program. Therefore, the intervention period in Roanoke County started a month earlier than the other three agencies. Due to the lack of resources and understaffing situations in both police agencies and the mental health service organization, it was not possible to form a co-response team for each agency. Thus, the clinicians responded to MH requests based on the receiving order of the requests.

Two clinicians (one full-time and one half-time) were on-call during these hours and any requests made during the non-service hour were recorded and responded on the next business

day when eligible. In this study, the teams often acted as a secondary responder, arriving the scene after the first responding police officer evaluates the crisis situation as appropriate for the clinicians and as low risk for violence. Sometimes, the co-response team responded to calls directly when dispatchers were able to verify the requests involving individuals in a mental health crisis.

Mental Health "Hot Spots" as the Unit of Analysis

The large geographic area of Roanoke Valley posed challenges for the co-response teams to get to the scene in a reasonable time frame. To avoid the delay and better allocate limited resources, the study implemented a place-based experimental design and focused treatment on designated mental health hot spots rather than the whole region.

Based on a recent study conducted in Roanoke, VA (Yang et al., 2019), the concentration patterns of MH incidents are more salient than the common crime concentration found in prior literature. Specifically, Yang et al. (2019) found that 100% of MH-related calls clustered in less than 2% of the street segments in Roanoke County annually. The concentration patterns remain when they look at MH hot spots in a longitudinal fashion and see that a very small number of segments (n=63, 0.4% of the total streets) were responsible for 44.6% of MH calls over a five-year period.

Following the hot spots policing research (Sherman & Weisburd, 1995) and literature on crime concentration (Gill et al., 2017; Sherman et al.,1989; Vaughan et al., 2016; Weisburd et al., 2004; Weisburd et al., 2012; Wheeler et al., 2016; White & Goldberg, 2018), we decided to use street segments with high rates of MH incidents (i.e., MH hot spots) as the study unit at the beginning of the study. We considered the MH needs (judged by the volume of MH CFS) and

the population size of each agency when selecting the MH hot spots. CFS data from the four police agencies from January 2018 to June 2021 were used to identify these MH hotspots.[3]

We excluded common "magnets" in the CFS, such as police departments, jails, and hospitals/mental health facilities that often have high volume of MH calls due to the recording practices. Consequently, the total numbers of MH CFS were 9,168 from RPD, 1,397 from RCPD, 547 from SPD, and 225 from VPD during the period. RPD and RCPD are larger agencies in terms of their size and the population served relative to VPD and SPD. The total number of street segments in Roanoke Valley is 27,593 (see Table 1). While RPD has a smaller jurisdiction compared to RCPD with similar population size, it has a much higher population density due to its urban nature. All the MH calls were geocoded to the street segment level. Trajectory analysis (Nagin, 2005) was applied to the data for each of the four agencies separately to reveal any streets with chronic MH issues. Street segments classified in the trajectory group with constant high frequency were identified as the MH hot spots. These hot spots then were reviewed by each PD to assess issues and problems for co-response team implementation. Some hotspots were excluded after PDs' review because of the co-occurring violent/drug crime problems that may pose risk to clinicians' safety, or due to existing available MH services in places like group homes or assisted living facilities.

Totally, we identified 228 MH hot spots across the Roanoke Valley: 79 were located in Roanoke County, 128 were in Roanoke City, 14 were in the City of Salem, and 7 were in the Town of Vinton. The hot spots were randomly assigned to either treatment (n=113 street segments) or control (n=115 street segments) groups and the co-response teams were instructed

[3] The total numbers of CFS across agencies were 441,574 for RPD and 309,549 for RCPD, while the total numbers of CFS were 121,805 for SPD and 45,773 for VPD.

to only respond to requests originating from treatment hot spots so that we can compare differences in outcomes between the treatment and control hot spots. The total number of treatment and control streets and the intervention duration across agencies are shown in Table 1.

Table 1 The intervention duration and the numbers of streets by jurisdiction

	Pre-intervention period	Intervention period	#Treatment streets	#Control streets	Other streets
RCPD	6/22/2021-3/27/2022	3/28/2022-12/31/2022	38	41	14,120
RPD	9/28/2021-5/15/2022	5/16/2022-12/31/2022	65	63	9,904
SPD	9/28/2021-5/15/2022	5/16/2022-12/31/2022	7	7	2,819
VPD	9/28/2021-5/15/2022	5/16/2022-12/31/2022	3	4	750
Total			**113**	**115**	**27,593**

Outcome Measures

At the outset of the study, we had pre-determined to use the number of TDO cases as the primary outcome of the study. As opposed to using police data, we used the number of Community Service Boards' (CSB) pre-admission screenings that led to the issuance of TDOs.[4] A case that receives a TDO recommendation is usually more severe and requires immediate hospitalization. Unlike CFS data that are directly tied to police practices, TDOs are issued by an independent agency, the CSB, based on rigorous clinical criteria. In Virginia, TDOs are issued after the individual receives an in-depth MH evaluation followed by a formal commitment hearing. For a TDO to be issued, there must be probable cause to believe that: 1) the individual

[4] The Commonwealth of Virginia uses a publicly-funded system of Community Service Boards (CSB) whose clinicians provide pre-admission screenings and crisis services for PWMI. Individuals may come into contact with CSB clinicians through several means, including due to an Emergency Custody Order (ECO). ECOs allow the police to take a person experiencing a mental health crisis into emergency custody in order to obtain a face-to-face mental health evaluation and pre-admission screening from a CSB clinician. The ECO process can be initiated in a number of ways, including by magistrates ("paper ECO"); by police officers ("officer-initiated ECO"), or by the individual in crisis ("voluntary ECO"). Subsequently, the CSB clinician may recommend that the individual in crisis be subject to a Temporary Detention Order (TDO); TDOs are issued by magistrates and require individuals in crisis to receive immediate hospitalization for further evaluation and stabilization until a formal commitment hearing can be arranged to determine their further treatment needs. For this project, we partnered with Blue Ridge Behavioral Healthcare, a CSB serving the Roanoke Valley.

has a serious mental illness and there is a substantial likelihood that the individual will cause serious harm to themselves or others, or suffer serious harm due to their lack of capacity to protect themselves from harm, or to provide for their basic needs; 2) the individual is in need of hospitalization; and 3) the individual is unwilling or incapable of volunteering for hospitalization or treatment. Thus, tracking the number of TDOs issued in treatment vs. control areas provides a valid external indicator of the number of individuals with significant MH disorders, as well as the frequency of these individuals experiencing serious MH crisis incidents. In sum, the TDO data will provide a more objective criterion to show whether the co-response teams help to reduce the severity and frequency of MH episodes occurring in the treatment vs. control hot spots.

We believe that the co-response teams could lead to reduction of MH problems through two possible pathways: first, the presence of co-response team could help de-escalate the situation at the scene to reduce the likelihood of needing to admit the individuals for hospitalization through TDO. Second, the treatment provided by the co-response clinicians, along with follow-up care-coordination, could reduce reoccurring MH crises and hospitalizations in the future. The former one is a more direct outcome of the co-response program and the latter one is related to a long-term prevention effect of the co-response teams. While it is important to consider both as outcomes in the evaluation of the effectiveness of the intervention, in this paper, we used the total number of TDO issuances, which reflect changes through both mechanisms. We also analyzed MH-related police contacts separately because one of the important goals of this project was to reduce the subsequent police contacts of PWMI.

Analytical Strategies

We evaluated the effect of the co-response program by comparing the differences in the number of TDO cases between treatment and control streets before and during the intervention period. We used data provided by the local Community Service Boards (CSB). Additionally, we also analyzed the numbers of MH calls for service to assess whether the numbers of MH-related calls received by the police changed in treatment and control streets throughout the intervention period. We define a 'MH call' as any call falling under the following classifications (call types) in the police CFS data: ECO/TDO, Mental Subject/Mental Health ('1096'),[5] Mental Health with Weapon, Suicide Threat, and Suicide Attempt.[6] We use independent-samples t-tests to compare the changes in TDOs and participants' subsequent police contacts across the treatment and control hot spots.

Results

The numbers of TDOs and MH CFS data are listed by agency in Table 2; as clearly shown in the table, the agencies vary in their size and workload. As described earlier, RPD had more MH calls than the rest of the three agencies combined, both before and during the intervention period. Specifically, RPD had about more than four times of MH requests (Treatment = 345, Control = 249) than RCPD (Treatment = 62, Control = 65), the second highest

[5] The code '1096' is used by the police departments to differentiate general MH calls from ECO/TDO, suicide threat, or suicide attempt calls.

[6] The actual call types vary by agencies. We discussed the nature of calls included in each call type with crime analysts of every police department and senior leaders in the call centers before making the decisions. As expected, different agencies have different practices, and we tried to pull out as valid information as possible for analysis. For RCPD data, the call types in the CFS data were designated by the dispatchers. We checked the consistency in designations between dispatchers and officers with a more recent RCPD dataset including both dispatchers and officers' call type designation. For this set of data with 431 calls, about 98.6% of the call types were the same (MH-related or not). In other words, officers did not change the call types designated by dispatchers for most cases after they arrived at the scenes. RCPD and VPD are based on the same 911 call center. Thus, we believe that using MH calls in the dataset should be an acceptable approach to capture calls related to mental health issues for these agencies. For RPD and SPD, the call types in the CFS datasets were officers' decisions after their arrival. Therefore, the MH call types were verified by officers when they encountered subjects at the scenes.

agency among the four agencies before intervention started. When we focus on the left panel, the treatment hot spots, we see a clear reduction in MH calls for both RPD and RCPD from pre-intervention to the intervention period. There is also a declining pattern for the control hot spots in RPD and RCPD, but the magnitude of reduction is much smaller than in the treatment hot spots. There was not much change in the MH CFS in VPD and SPD due to their low baseline rates across the treatment and control groups.

When we examined the number of TDOs issued within each agency, RPD also had the highest number of TDO cases relative to the other three agencies for both treatment and control groups, with smaller differences. Interestingly, while all agencies experienced declining MH calls and relatedly, a reduced number of TDOs, RCPD was the only agency that had an increased TDO cases over the study period (Treatment = from 10 to 21, Control = from 15 to 28). We see substantial changes in TDOs for SPD's jurisdiction. However, its small base rate makes the fluctuation less meaningful.

Table 2 The total numbers of MH CFS and TDO by agency

	Treatment streets			**Control streets**		
	MH CFS	TDO	# of street	MH CFS	TDO	# of street
RPD						
Pre	345	55	65	249	38	63
During	236	30	65	234	48	63
RCPD						
Pre	62	10	38	65	15	41
During	33	21	38	52	28	41
SPD						
Pre	3	8	7	9	7	7
During	3	2	7	6	2	7
VPD						
Pre	0	1	3	0	1	4
During	0	0	3	0	1	4

Next, we examined the changes in MH CFS between treatment and control street segments after the intervention started. Due to the low activities in SPD and VPD, the subsequent analyses mainly focus on the comparisons using data from RPD and RCPD. Recall from Table 2 that all agencies experienced a decrease in MH CFS volume for both the treatment and control groups. We compared the change in MH CFS (the intervention - pre-intervention) between the treatment and control groups for all agencies combined, for RPD, and for RCPD. The magnitudes of reductions in the treatment streets are generally larger than those observed in the control streets (see Table 3). While the differences in MH calls were in the expected direction, none of the comparisons was statistically significant using both *t*-statistics or effect sizes. Among all, RPD experienced the largest reduction across the board, with an effect size of around -.174, slightly below the small effect size threshold. RPD also had the largest pooled standard deviations across all data points, suggesting that even within the MH hot spots in Roanoke City, there was substantial street-to-street variation in the call volume.

Table 3 Comparing the mean changes in MH CFS over time

	Treatment (SD)	**Control (SD)**	***t*-test (p value)**	**Effect Size (d)**
All Agencies	-1.22 (5.64)	-.27 (3.67)	t = -1.51[a] (p = .13)	-.1449 [-.3225, .0328]
RCPD	-.76 (2.57)	-.32 (3.98)	t = -.60[a] (p = .55)	-.1653 [-.6839, .3532]
RPD	-1.68 (7.15)	-.24 (3.80)	t = -1.43[a] (p = .16)	-.1737 [-.4005, .0531]

Note: a: unequal variance correction; VPD and SPD had too few cases for a separate analysis.

Table 4 shows the changes in the TDO cases between the two groups across agencies. Overall, there was a decrease in TDO cases in the treatment streets in the intervention period relative to the pre-intervention period, while there was an increase in TDO cases in the control streets (-19 vs. 16). Though the *t*-statistic is only borderline significant (p=.07), the effect size

reaches a small effect by Cohen's standard (d = -.22) favoring the treatment group. When we closely examined the results, it became clear that the effect is mostly driven by the trend observed in RPD's jurisdiction. The treatment streets in RPD experienced a reduction in TDO cases, whereas the control streets experienced an increase during the same period (-.38 vs. .16), which led to an effect of d = -.29. Meanwhile, in RCPD both treatment and control streets experienced a nonsignificant increase in the TDO numbers (.29 vs. .32).

Table 4 Comparing the mean changes in TDO over time

	Treatment (SD)	**Control (SD)**	***t*-test (p value)**	**Effect Size (d)**
All Agencies	-.19 (1.46)	.16 (1.34)	t = -1.84 (p = .07)	-0.2204* [-.4251, -.0157]
RCPD	.29 (.84)	.32 (1.35)	t = -.11[a] (p =.91)	-0.0253 [-.4626, .4119]
RPD	-.38 (1.72)	.16 (1.41)	t = -1.95 (p = .05)	-0.2919* [-.5263, -.0575]

Note: a: unequal variance correction; VPD and SPD had too few cases for a separate analysis

Figure 1 illustrates the changes of total TDO cases before and during the intervention between the entire treatment and control street segments. As is evident in Figure 1, the treatment hot spots went from having more than 70 TDOs in the six months before the intervention to approximately 50 TDO cases during the six-month intervention period. In contrast, the control hot spots started slightly lower, with 60 TDO cases six months prior to the intervention, but increased to almost 80 cases during the intervention period.

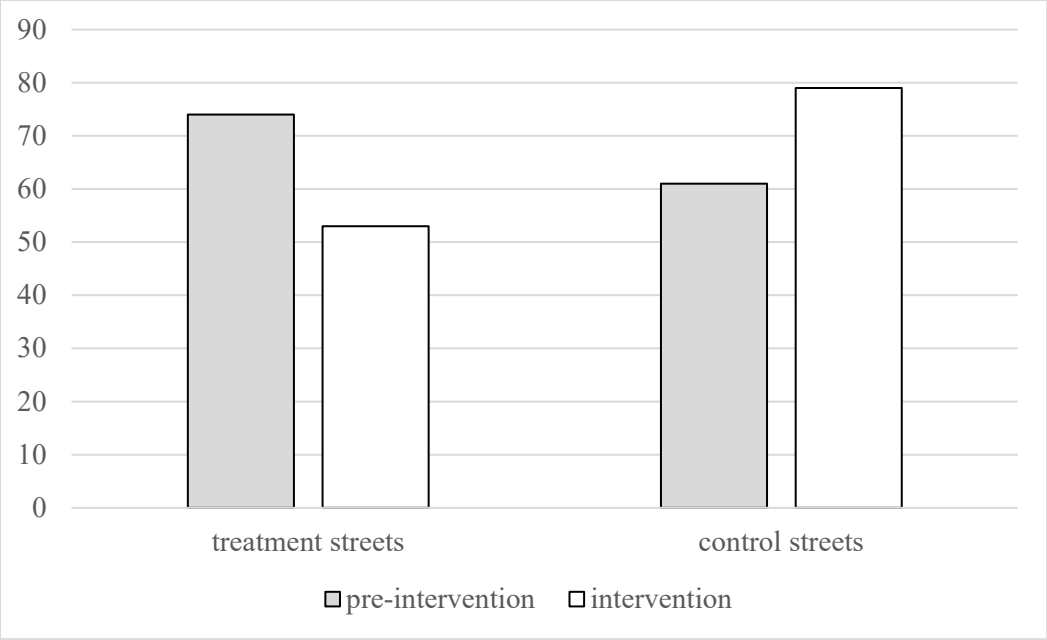

Figure 1 Total TDO cases across agencies between treatment and control street segments

Discussion and Conclusion

Using a place-based RCT approach, we found supportive evidence for the effects of a co-response team in reducing PWMI's subsequent hospitalizations. Specifically, the treatment hot spots showed a small but meaningful reduction (e.g., a small effect size by Cohen's standard) in the number of TDO cases relative to the control hot spots. When we compared the numbers of MH CFS between the treatment and control groups, the effect was not as salient. The findings provide interesting insights for scholars and practitioners who are interested in implementing and evaluating police-MHP co-response teams.

First of all, we believe the place-based approach offers a viable way to allocate scarce mental health resources to places that require them the most. While Roanoke Valley is not a major urban area, it encompasses various levels of urbanization spread across a large geographic area. If we had attempted to assign the co-response teams with only two clinicians to cover all

street segments, they would have been stretched very thin across the 27,593 street segments in the valley. The extreme clustering nature of MH calls and the law of crime concentration (see Weisburd, 2015) make the hot-spots approach an efficient and reasonable choice for deploying co-response teams and designing RCTs to examine their effects.

Secondly, co-response teams are effective in reducing subsequent hospitalizations according to the number of TDO issuances. For RPD, the agency with most MH requests, the treatment streets had more TDOs than the control streets before the intervention. When we look at the TDO cases, the number of TDO issuances declined during the intervention period while they increased for the control streets. It is reasonable to suggest that co-response teams reduced the number of severe MH crises in the treatment hot spots in Roanoke Valley. We also want to highlight that MH crises are more of an individual level phenomenon, unlike crime. Therefore, the changes that occurred in the treatment and control hot spots were unlikely to be an artifact due to problem displacement. During the intervention period, there was also a fire incident in the treatment hot spots, which might have impacted the results. However, since we did not know where the frequent callers were relocated to, we could not examine the possible displacement effect, if any, due to the fire.

Thirdly, the comparisons between CFS and TDO data highlight the importance of selecting the outcomes that are not affected by police practices when examining police tactics. While the overall trend in MH CFS and TDO cases align for RPD, in RCPD, they moved in opposite directions. That is, the hot spot streets within RCPD witnessed an increase in TDOs during the intervention period compared to the pre-intervention period, while the number of requests for police services declined. We cannot say for sure what contributed to the different patterns in RCPD, whether it be police deployment, incapacitation effects resulting from

hospitalization, or other unaccounted factors. However, it is evident that relying solely on police CFS as a source to assess the levels of mental health needs in an area would overlook certain aspects of the phenomenon, particularly for the cases with greater severity.

When we examined how police practices might have affected the CFS numbers, interviews with line-level officers in focus groups provided some insights. As described by an officer in a focus group, "subjects need to meet criteria, [but] most will not be eligible" because of ECO (due to their severity in crisis). Another officer also noticed more ECOs in recent years since the pandemic. Additionally, some agencies require officers to generate CIT reports if the incidents involve PWMI, which might have impacted officers' discretion in reporting the incidents. An officer mentioned: "if there are mental health components, we need to generate [a] report, [thus we] might not add mental health disposition to the call." This focus group discussion shows how police practices might have impacted the accuracy of the CFS data. It is likely that examining the results based on CFS data might partially reflect biases in police reporting practices. Therefore, it is important to select outcomes less susceptible to police discretion when designing a project.

Several challenges of implementing the co-response team approach should be noted. Over the study period, there were abundant MH calls in the MH hot spots from time to time, but not all of them were referred to the co-response teams. Often, the calls were resolved by the primary responding officers before contacting the co-response teams. As has been commonly found in prior evaluation studies, implementing any intervention program with high fidelity is challenging for the officers. It is no exception in this study. For instance, in focus groups officers raised concerns regarding their perception of the long wait for MHP to be on scene. As described by a supervisor, "Officers might prefer spending 15 minutes to transport subjects to hospitals

instead of waiting for 45 minutes [for the clinician to arrive]." While the long wait times for the co-response teams turned out to be merely a speculation upon examining the data, it illustrates officers' perceptions and their resistance to adopting new tactics.

The gap between the desired application of the co-response teams and the actual implementation is a common problem in policing research (Braga & Weisburd, 2006, 2019). In this case, due to the recent social movements and the impacts of the pandemic, all the police departments we collaborated with experienced a significant understaffing situation throughout the entire period. Hence, there is a possibility that officers may not consistently utilize the co-response teams even when the situation warrants their involvement.

We have also observed that leadership style and organizational culture affected how the front-line officers reacted to the new initiative (Willis et al., 2004). Some officers from one police agency voiced their concerns regarding liability and responsibilities when partnering with clinicians. One supervisor said that "if officers leave the scene and the situation gets worse, officers need to take the responsibility." Effectively communicating from the leadership in the police department with the officers and obtaining buy-in from officers are critical factors for the successful implementation of the project. Without constant communication and reminders, it is very difficult to change officers' mindset and practices with any new intervention programs. Though our program was designed based on the hot-spot policing model, the collaboration with community partners posed new challenges to officers' daily practices. One officer added: "This project is new and fresh but came so quickly so there might be no buy-ins." Furthermore, since most officers are very familiar with their districts, sometimes they rely on their own memory without checking the laptops to see if they are responding to calls inside of hot spots. As such, they might have missed the opportunity to utilize co-response team services until later. There

were also challenges for MHPs, it is very difficult for them to contact the clients who called after hours. When MHPs followed up with them afterwards, most subjects did not answer the door or did not want to talk to them anymore.

While the valley-wise co-response teams were not utilized as much as we were hoping for, the significant findings of the co-response program nonetheless show that officers were engaged in their own problem-solving behaviors more often when responding to MH calls in treatment hot spots during the intervention period. This type of phenomenon is referred to as "shallow problem solving" by Braga and Weisburd (2019), in which officers try to solve problems in a more rudimentary way with a small scope of effort. Throughout the project period, we regularly reviewed cases in our bi-weekly meetings, involving all parties participating in the study. Thus, it is possible that officers in our study were well aware MH crisis calls would be closely scrutinized, leading them to invest more time and attention in responding to these calls.

Based on what we have found, there are clear implications for police practices in the future. Using a place-based approach, it is important to concentrate resources in the areas with the greatest needs, such as where homelessness or economically disadvantaged population cluster. At the same time, it is important to continue studying whether MH hot spots are stable both geographically and temporally for the hot-spot approach to be effective. If we apply the co-response teams to places where the baseline is low (Eck, 2003), it is hard to expect detectable effects from the intervention. Future programs can consider targeting a few places that need the services the most—i.e., where there is a high volume of MH calls frequently.

Finally, perhaps we should reconsider whether an "ideal implementation" of policing strategies is an obtainable goal. As pointed out by Braga and Weisburd (2006), it is often unrealistic to expect line-level officers to follow the principles perfectly in practice. While we

were fortunate to have strong support from the police leadership, emergency call centers, and the local mental health organization throughout the project, there were still some hiccups from time to time that required team effort to resolve. Thus, it might not be practical for researchers who are interested in this type of research to assume an ideal collaboration and a perfect execution when planning the research. Instead of planning for a complex program that requires in-depth problem-solving efforts, perhaps a loosely defined program where line-level officers could exercise their discretion would be a more feasible approach.

Chapter 3 Exploring the Possible Effects of Partnering 911 Dispatch and Mental Health Clinicians in Triaging Calls for Service

Introduction

In the realm of emergency response systems, dispatchers or call takers serve as a pivotal first point of contact (Dupont, Cochran & Pillsbury, 2007; Simpson, 2021). Dispatchers or call takers play a role in not only determining the urgency and nature of the assistance required but also in ensuring that the caller is connected to the appropriate services (Dupont et al., 2007; Simpson, 2021; Watson & Fulambarker, 2012). In situations involving mental health crises, this responsibility requires a nuanced understanding of mental health issues and the ability to make quick yet informed decisions (Dupont et al., 2007), as it ensures the redirection of individuals with mental illnesses away from the criminal justice system. Moreover, by accurately identifying mental health issues, dispatchers can provide CIT officers with necessary information regarding cases related to mental health, which further increases the likelihood of a safe and effective response (Dupont et al., 2007). The dispatcher's role, therefore, is not only as a gatekeeper of emergency services but also as a vital connector between individuals in crisis and the broader mental health support system.

There is not much research on how dispatchers, who are the first to respond to emergency calls, deal with mental health crisis situations (Simpson, 2021). Considering that dispatchers are often the first point of contact in emergencies, gaining an understanding of how they assess mental health cases is important. Such an understanding is crucial not only for the dispatchers themselves but also for enhancing the effectiveness of co-responder teams that rely on dispatchers' initial assessments and information to form their response strategies. This area of

research holds potential for improving the efficiency and safety of emergency responses to mental health crises.

In our study, we aimed to compare how dispatchers, clinicians, and on-scene officers make decisions regarding whether a caller's narrative or description is related to mental health issues during the assessment and interpretation of emergency calls. Our research focuses on two key questions. Firstly, we aimed to determine the consistency in recognizing mental health issues among dispatchers, clinicians, and officers. Secondly, in cases where this consistency is lacking, we sought to identify the inconsistencies in their assessments.

Study Site

This research was conducted at two primary locations, both are 911 call centers serving their respective areas. The first site is the Emergency Communications Center at the Roanoke County Police Department (RCPD). This center is responsible for handling a wide range of emergency calls, including those related to mental health crises, within Roanoke County. The second site is the E-911 Center within the City of Roanoke . Similar to the RCPD, the RPD's E-911 Center is a vital point of contact for emergency situations in Roanoke City, managing an array of emergency calls.

Data and Method

In our research, the data collection process was conducted at both the emergency communications center and the E-911 center. At each of these centers, a clinician was assigned to work at a given time, with their primary task being to shadow a dispatcher during their shift. This setup allowed the clinicians to listen to selected calls as they occurred. This approach gave the clinicians access to information about a call for them to analyze and determine whether a

caller's situation potentially involved mental health issues based on the interactions between dispatchers and callers.

The data collection primarily involved coding the content of conversations between dispatchers and callers. The elements of this coding process included assessing whether the case could be related to mental health issues, promptly writing down the caller's statements, determining if there was involvement of weapons, drug use, or alcohol use, noting any indications of self-harm or potential harm to others, and evaluating the urgency level of each case on a scale (Marcus Alert scale[7]) from 1 to 4, as well as deciding whether the intervention of a crisis clinician was needed.

Our study faced staffing constraints, which meant that only one clinician could be on duty at a selected time. This limitation led to not all emergency calls at the centers being coded; instead, only selected calls were coded. During the data collection process, between December 2022 and May 2023, we collected data from 445 cases at the RCPD and 741 cases at the RPD.

Coding the Data

In our study, we merged clinicians' summary of the calls and the information recorded by dispatchers for the same calls from two agencies, the RCPD and the RPD. We began by categorizing the types of calls recorded in the call for service data from both agencies into two primary categories: "mental health-related" and "non-mental health-related." In this regard, for the RCPD, calls classified as 1096, emergency commitment orders (ECO)/temporary detention orders (TDO), suicide threats, suicide attempts, and calls from which crisis intervention team

[7] The Marcus Alert legislation, as part of The Marcus-David Peters Act, represents a collaborative effort mandated by the state of Virginia to enhance the response of law enforcement, 911 call centers, and mental health clinicians to incidents involving mental health crises. See Figure 2 for more information.

(CIT) reports were generated were identified as mental health (MH) cases. All other call types were considered non-MH cases. Similarly, for the RPD, calls related to a mental subject, ECO, and suicide attempts/threats were categorized as MH cases, and the rest as non-MH cases. We then removed any cases with missing data (26 cases, 2.19%) . After this process, our final dataset included 1,161 cases, 423 cases at the RCPD and 738 cases at RPD.

Next, we compared the decisions regarding mental health calls made by dispatchers and clinicians with the assessments of on-site officers in these cases. This comparison enabled us to examine the consistency in the decision-making process about mental health issues by dispatchers and clinicians and to contrast these decisions with the final dispositions made by the officers.

Results

Table 5 showed that dispatchers and officers displayed a high level of agreement in their assessments, particularly in cases not involving mental health issues. This suggests that dispatchers' determinations were very closely resembled the decisions of the officers when the calls were deemed to be irrelevant to mental health concerns. However, when it comes to recognizing cases involving mental health issues, clinicians showed a higher level of accuracy, correctly identifying 99 out of 112 mental health cases, as confirmed by comparing their assessments to the final dispositions made by officers. Dispatchers, on the other hand, accurately identified mental health cases in 69 out of 112 instances. This indicates that clinicians are better at recognizing mental health-related cases compared to dispatchers.

Table 5 Assessing cases across dispatchers, clinicians, and officers

		Officers' Call Disposition	
		Non-MH	MH
Dispatchers	Non-MH	1029 (88.7%)	43 (3.7%)
	MH	10 (0.9%)	69 (5.9%)
Clinicians	Non-MH	259 (22.0%)	1 (0.09%)
	MH	353 (30.4%)	99 (8.5%)
	Maybe	421 (36.3%)	12 (1.0%)

Furthermore, the results showed the tendency of dispatchers to have more false negatives in their assessments. That is, these results suggest that when it comes to discerning whether callers have mental health issues, dispatchers are more likely to under-identify or miss cases, resulting in a higher rate of false negatives—failing to flag someone who has mental health concerns (in the 112 cases that officers confirmed as mental health-related, dispatchers had 43 false negatives, representing 3.7% of these cases).

In contrast, clinicians are more likely to have false positives. This means clinicians are prone to over-identification, leading to a higher rate of false positives, where they may label individuals as having mental health issues even when the final disposition by officers indicates they are non-mental health-related (out of 1039 cases that officers determined as non-mental health-related, clinicians had 353 false positives, which accounts for 30.4% of the cases based on officers' disposition).

Marcus Alert Evaluation

One aspect of the data coded by clinicians involves evaluating the urgency level of each case on a scale from 1 to 4, in accordance with the four-level urgency triage framework of the Marcus Alert system. The Marcus Alert legislation, as part of the Marcus-David Peters Act, represents a collaborative effort mandated by the state of Virginia to enhance the response of law enforcement, 911 call centers, and mental health clinicians to incidents involving mental health crises (Virginia Department of Behavioral Health and Developmental Services, 2021; 2022). This initiative is not just a protocol but an approach to how mental health emergencies are addressed, emphasizing the diversion of such calls from the 911 emergency system to dedicated crisis call centers. These centers are tasked with comprehensive risk assessments and the mobilization of appropriate response units, from mobile crisis teams to community care teams (Virginia Department of Behavioral Health and Developmental Services, 2021; 2022).

Figure 2 shows that the Marcus Alert system is a four-level urgency triage framework designed to facilitate clear communication across various sectors and provide structured response planning at the local level (Virginia Department of Behavioral Health and Developmental Services, 2021; 2022). The levels—ranging from Level 1 (routine) to Level 4 (emergent)—guide dispatch's decisions and inform the necessary response intensity.

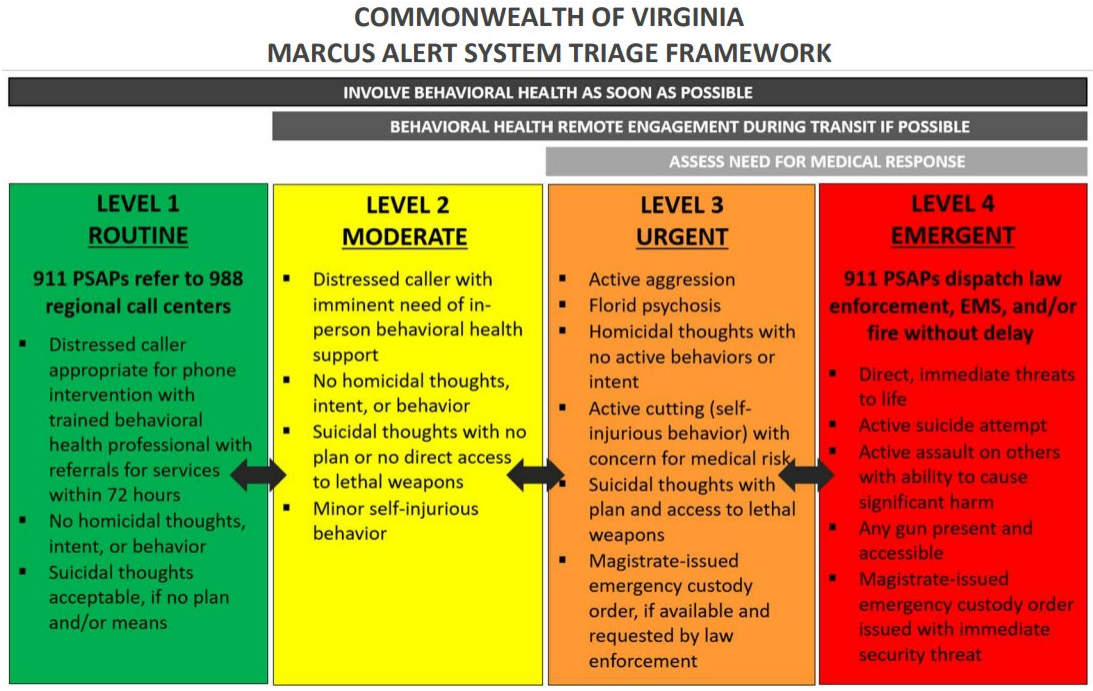

Figure 2 Four-level of Marcus Alert urgency triage framework
Note: The chart is adapted from *Summary: State Plan for the Implementation of the Marcus-David Peters Act*, by Virginia Department of Behavioral Health and Developmental Services, 2021.

Table 6 shows that in cases initially evaluated as non-mental health-related by dispatchers, clinicians identified 24 cases as level 1, 87 cases as level 2, 350 cases as level 3, and 68 cases as level 4 based on Marcus Alert levels. On the flip side, in situations dispatchers tagged as mental health-related, clinicians determined 1 case to be level 1, 10 cases to be level 2, 44 cases to be level 3, and 22 cases to be level 4 for Marcus Alert levels. This result indicates that despite being categorized as non-mental health-related by dispatchers, at least 350 cases might still require mental health assistance, such as Mobile Crisis Teams or clinician involvement. Additionally, at least 68 of these cases may need an immediate emergency response or the involvement of Emergency Medical Services (EMS).

Table 6 Clinician assessment of Marcus Alert levels

		The level of Marcus Alert assessed by clinicians				
		1	**2**	**3**	**4**	**N/A**
Dispatcher	Non-MH	24	87	350	68	498
	MH	1	10	44	22	2

Discussion

The findings of our study shed light on aspects of the emergency response to mental health crises, with a particular focus on the decision-making processes of dispatchers and clinicians. We found a high level of agreement between dispatchers and officers in cases not related to mental health, which suggests dispatchers are effective in identifying such situations. However, a notable discrepancy arises in the identification of mental health issues, where clinicians demonstrated greater accuracy compared to dispatchers. This could be attributed to dispatchers primarily focusing on immediate emergency situations, potentially leading to an oversight of underlying mental health issues. For example, when a caller is involved in an overdose situation, even if it might be related to a mental health issue, dispatchers must prioritize addressing the most urgent concern, which is the caller's immediate safety.

Undoubtedly, this tendency can have some impacts. Officers responding to incidents without being informed of possibilities of mental health issues might handle these situations differently than officers who are well informed, , increasing the risk of escalation or unnecessary use of force (Simpson, 2021; Taylor, 2020). Additionally, there is a concern that responding officers may not be aware of the need for mental health clinician intervention, which could be crucial in certain scenarios (Simpson & Orosco, 2021).

On the other hand, clinicians in our study were sometimes found to identify mental health issues in cases where the final disposition was non-mental health-related. This tendency could be due to their adeptness at recognizing subtle and underlying mental health issues stemming from their professional training in identifying such problems. They are more attuned to identifying potential mental health risk factors, a skill dispatchers may not possess to the same extent.

A notable aspect of our study is that clinicians assessed around 30% of cases, which dispatchers determined to be non-mental health cases, to be classified as level 3 calls under the Marcus Alert system. This indicates that these cases, which require intervention from mobile crisis teams or clinicians, might not have received the necessary help. Such a finding underscores the importance of integrating more robust mental health training for dispatchers and enhancing collaboration between dispatchers and mental health professionals. By doing so, the emergency response system can be better equipped to identify and respond to mental health crises accurately, ensuring that individuals receive the most appropriate and effective care.

Dispatchers are quite skilled at identifying cases that do not involve mental health issues. This proficiency is crucial as it ensures that police resources are not inappropriately allocated to situations where they are not needed, thereby conserving these resources for cases where they are more suitable. Further, one of the challenges for dispatchers lies in identifying mental health issues based solely on the content of calls. Our findings suggest the possible benefits of incorporating external resources into the emergency response system to enhance the call triaging efficiency. Building upon these findings, future research can delve deeper into the analysis of callers' descriptions. In this regard, the goal is to identify specific linguistic or verbal cues—such as particular phrases, terminology, or patterns in repetition—that might indicate a mental health issue. Recognizing these signs could help improve dispatchers' ability to assess a caller's mental

health status, leading to more accurate and timely responses. Such advancements in understanding and training could transform the way emergency services respond to mental health crises, ensuring that calls are appropriately categorized and directed to the most suitable responders.

Chapter 4 Understanding the Effects of the Dispatch-Clinician Co-response

As mentioned in the previous chapter, we experimented a new co-response partnership between emergency call dispatch and mental health clinicians from December 2022 and May 2023. In addition to the consistency analyses discussed in Chapter 3, we also conducted three focus groups to understand the utilities of this new co-response team from the perspectives of the involved parties. Among the three focus groups, focus group 1 comprised clinicians who participated in the co-response initiative. They are integral in providing insights into the clinical challenges encountered within a 911 call center environment and shedding light on the clinical perspective on how to better handle calls involved individuals in crises. Focus groups 2 and 3 consisted of emergency dispatchers drawn from two separate call centers. Their feedback helps us understand the utilities of involving mental health clinicians in emergency calls and how dispatchers react to this new partnership in call triaging.

Key Themes Emerged from Analyzing the Focus Group Interviews

This study employed a qualitative research design, using MaxQDA to conduct a thematic analysis of focus group interviews with dispatchers and clinicians handling mental health calls in the two call centers. The analysis began by identifying preliminary codes from the transcriptions, focusing on recurring ideas and participant insights. These codes were compared across the focus groups to identify similar or identical themes. Subsequently, related codes were organized into potential themes, ensuring they reflected the discussions accurately. This process involved multiple data reviews, allowing for a deep and coherent understanding of the thematic structure that emerged from the focus groups.

Overall, the thematic framework highlighted the potential benefits of this collaboration between dispatchers and clinicians. We identified five separate themes from analyzing the focus group interviews. Below we detail and describe each of the theme.

Theme I. Recognizing and Identifying Mental Health Issues

This theme underscored the importance of recognizing and identifying mental health issues. Dispatchers have developed their own ways in determining whether a call has mental health components based on the content of the call.

> *"I think when someone's talking about a recent trauma that they've experienced, like they've had someone recently passed in their family, and they're starting to feel differently than what they weren't before. For example, callers are talking about stress or in life, and also the traumatic experience, like a breaking out, or like the death of a family member, or some other thing, and then they tell you they feel like they're not like themselves or being depressed or sad. Those descriptions or statement will make you kind of ring the bells and say, maybe something is going on there. It'll prompt dispatchers to ask him some different questions."* (Dispatcher 2, FG2)

Dispatchers also rely on the past call history to determine whether the incoming call is possibly mental health related.

> *"They look more at the person, the person's name or the address. Okay. And then, as they're looking into the call, if they find something that's very similar. What was the disposition? Did the officer actually put an MH on it or not to indicate this might be real versus this is more mental health related?"* (Dispatcher 4, FG3)

As for clinicians, their training and experience allow them to detect details that help them make the determination before dispatchers could do so. The information that was used in identifying calls involving mental health crisis involves verbal cues from the callers, such as the pace and tone of speech, which might indicate underlying conditions like psychosis or mania. Clinicians stressed the necessity for dispatchers to be equipped with the skills to detect these subtle signs, which can be crucial for triaging the calls effectively.

> *"Clinicians tend to focus significantly on the caller's tone, which is a stark contrast to our approach as dispatchers."* (Dispatcher 2, FG2)

> *"It wasn't always obvious to the dispatcher, but to us, it hinted that the person might be experiencing hallucinations, especially if they were reporting a disturbance or suspicious behavior"* (Clinician Supervisor 1, FG1).

> *"For me, it often came down to how they spoke, the pace of their speech. Many of the calls I listened to involved people who were transient and exhibited extreme religious delusions, like claiming they saw the devil or were talking to someone who wasn't there"* (Clinician Supervisor 1, FG1).

> "*I know, I remember a couple of different calls, whereas they were talking, I was like, I don't think that there's a person in that car that they see, I think this is probably mental health related"* (Clinician 2, FG1).

While the clinicians mentioned ways to detect possible mental health situations (26 times, see Figure 3), they also acknowledged the challenges in making the determination with limited time and information during calls (24 times).

"In those moments, you're working with limited information, making it challenging to draw definitive conclusions"(Clinician Supervisor 1, FG1).

"The main challenge comes from getting just a brief glimpse into the situation with each dispatch call. You don't receive all the details" (Clinician 2, FG1).

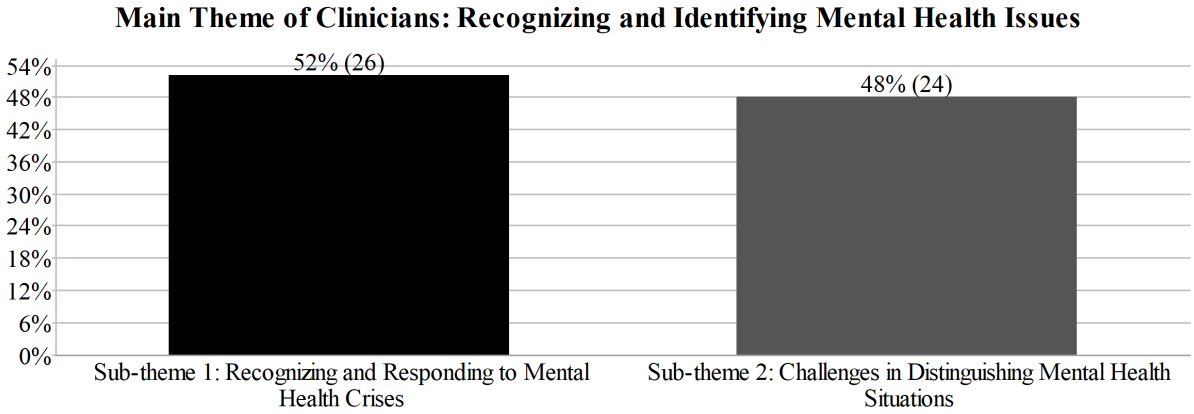

Figure 3 Proportional analysis of clinicians focus on mental health issues

Theme II. Challenges in Handling Mental Health Calls

When we talked with dispatchers from call centers, they also shared the challenges they face while handling mental health calls. In the focus group 2 and 3 with call dispatchers from Roanoke City's 911 Call Center and Roanoke County's Emergency Communications, various focal concerns were reported (see Figure 4). However, there are some common issues identified by dispatchers shown in the middle of the graph. For instance, dispatchers discussed the difficulties in making rapid decisions with limited information and the additional layer of complexities added by mental health factors. These findings underscore the need for specialized training that can support dispatchers in better identifying mental health-related calls. This is even

more relevant now call centers are in charge of implementing the Marcus Alert system and referring low severity calls to 988 (National Suicide and Crisis Lifeline).

> *"Previously, our calls were not evaluated with a mental health perspective in mind...we were primarily focused on whether to dispatch police...Now, dispatchers are required to engage in more critical thinking and ask additional questions to accurately assess each situation. I believe I have a packet with more information that I could share with you.*" (Dispatcher Supervisor 1, FG2)
>
> *"We introduced specific questions for them to ask, especially when a call involves mentions of suicidal harm. This was necessitated by additional training aimed at helping them determine the urgency of the call—whether it requires an immediate police response with a clinician code or if it's a situation that can be managed over the phone in consultation*." (Dispatcher Supervisor 1, FG2)
>
> *"Another significant challenge is accurately identifying the risk level. Differentiating between [Marcus Alert] risk levels 1 and 2 can be particularly difficult...The ambiguity between levels 1 and 2 poses a significant challenge, as they can be almost indistinguishable in practice."* (Dispatcher 3, FG2)
>
> *"I think that as dispatchers, we're often looking for very black and white determination. So again, makes resolution easier. However, this level of clarity isn't always possible with issues involving ambiguity, making things more challenging."* (Dispatcher 2, FG2)
>
> *"We're used to focusing solely on the law enforcement side. And a lot of the times it's someone who's not directly involved in the call across the room going "hey, don't forget to Marcus Alert that", don't forget to triage and don't forget to dispatch them out.*

Because you do get tunnel vision and focusing on like we had a call the other day."

(Dispatcher 4, FG3)

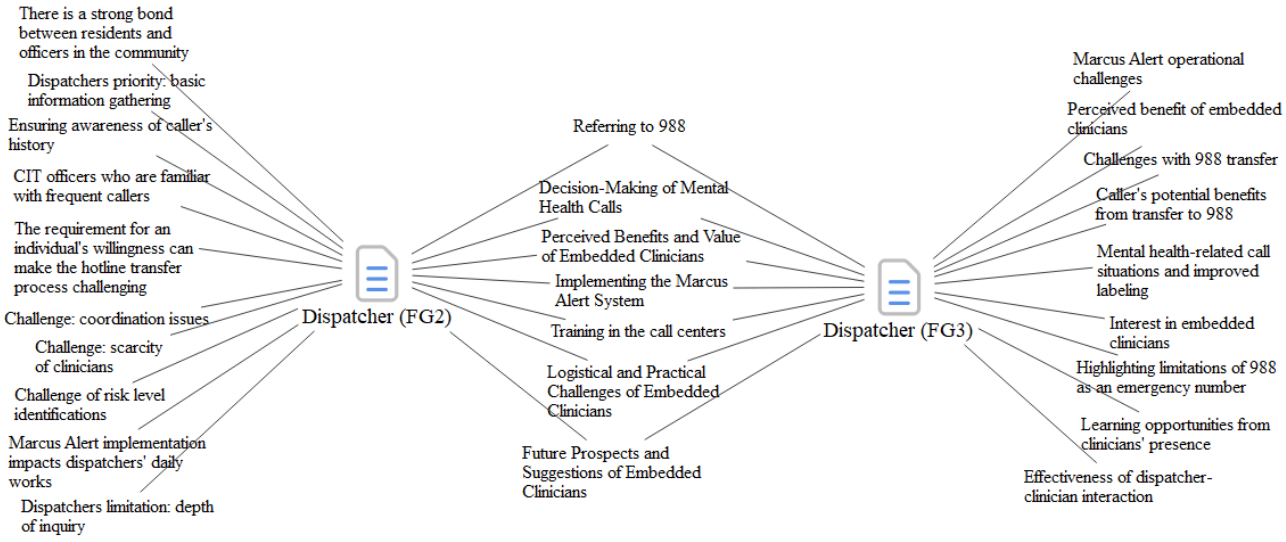

Figure 4 Focal concerns reported by E911 Call Center and Emergency Communications

Theme III. Improving Response to Mental Health Crises

The theme of Improving Response to Mental Health Crises is shared by both clinicians and dispatchers, capturing that collaboration between dispatchers and clinicians has been identified as a crucial step in enhancing the response to mental health crises. Clinicians advocated for a more active presence in call centers, which would allow them to contribute their expertise in real-time, enhancing the accuracy and sensitivity of the triaging responses. Dispatchers, similarly, highlighted how this collaboration has transformed their approach from a simple dispatch focus to a more nuanced way handling mental health situations, leading to improved outcomes and reduced recurrence of crisis calls.

"There were moments, though, where I found myself suggesting, 'Hey, ask this question. Try this.' So yes, I was sort of priming them. We did that occasionally." (Clinician Supervisor 1, FG1)

"I recall a situation where I assisted a dispatcher during a call from someone feeling suicidal, and they were uncertain how to proceed. I guided them to ask specific questions to gauge the level of risk." (Clinician 2, FG1)

The presence of clinicians within call centers was discussed as a beneficial and educational practice within this theme, potentially transforming the immediate response to mental health calls by providing timely decisions. They indicated that an early involvement by clinicians can potentially reduce future repeat calls.

"Dispatchers learn a lot from the presence of clinicians." (Dispatcher Supervisor 1, FG2)

"This collaboration taught our dispatchers to listen for certain cues, enhancing their ability to handle calls more effectively." (Dispatcher Supervisor 1, FG2)

"Maybe having an embedded clinician would also be beneficial...Perhaps starting with a co-response model like we've implemented, not necessarily full-time but maybe a few days a week, could provide some initial exposure and support." (Clinician Supervisor 1, FG1)

"Working with clinicians has certainly taught us to delve a bit deeper, as the situation might be related to mental health in ways we hadn't initially considered." (Dispatcher 3, FG2)

"Which was another piece that we wanted was what were one of the clinicians' feedback on what my staff hadn't been trained to catch that the clinician recognized so that we could share that knowledge. And I think the knowledge sharing went both ways." (Dispatcher 4, FG3)

Theme VI. Integration of Training

Lastly, the importance of Integration of Training was discussed across focus groups, including clinicians and dispatchers (see Figure 5). In the focus group discussions with dispatchers, they have acknowledged the importance of having additional training in better triaging mental health calls.

"We introduced specific questions for them to ask, especially when a call involves mentions of suicidal harm. This was necessitated by additional training aimed at helping them determine the urgency of the call—whether it requires an immediate police response with a clinician code or if it's a situation that can be managed over the phone in consultation." (Dispatcher Supervisor 1, FG2)

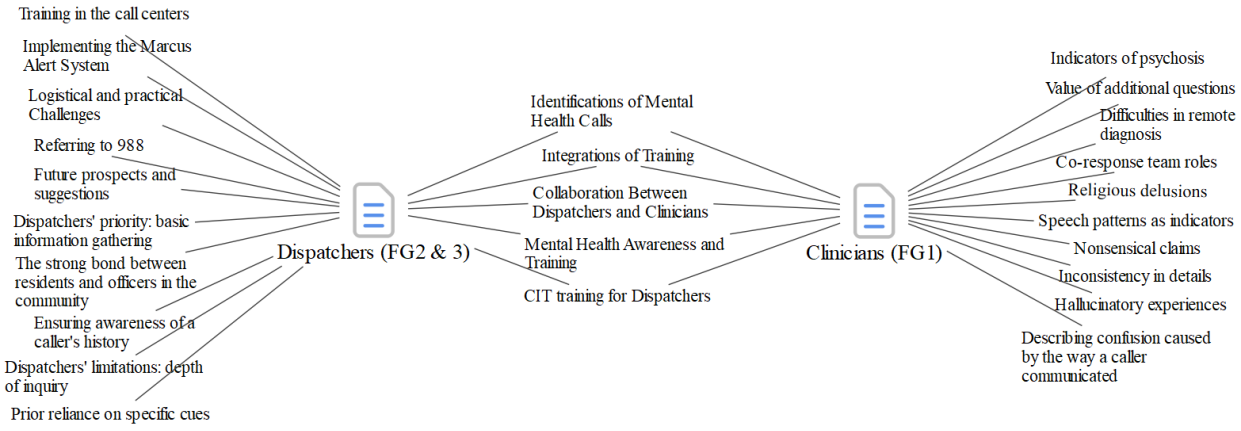

Figure 5 Focal concerns reported by dispatchers and clinicians

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All groups mentioned the importance of CIT training specifically designed for dispatchers because while dispatchers frequently handle crises, they often lack specific training in mental health awareness, which is crucial for accurately identifying such situations. The discussions emphasized that such customized training should include elements that help dispatchers recognize verbal cues indicative of mental health issues, use some strategies to identify mental health crises such as questions related to sleep, appetite, or general orientation, and apply effective communication strategies to enhance their decision-making capabilities during such calls.

> *"I mean, implementing CIT training for dispatchers is crucial. While it doesn't replace the invaluable role of an on-site clinician, it ensures that all staff are aware and can recognize potential signs of mental health issues."* (Dispatcher Supervisor 1, FG2)

> *"CIT training is specific to the officers. They're supposed to be making one specific to dispatchers."* (Dispatcher 4, FG3)

> *"I think it's [CIT training] necessary. And I was really pushing for them not to implement the Marcus alert until they actually provided us with the training that they said we had to have."* (Dispatcher 4, FG3)

> *"Definitely think having some kind of mental health training for dispatchers is key...This kind of training would really help them spot when someone's having a mental health crisis and how to handle it right."* (Clinician Supervisor 1, FG1)

Theme V. Benefits of Embedded Clinicians in Call Centers

The dispatchers provided a strong consensus on the potential benefits of having embedded clinicians in call centers. They cited reasons such as improved immediate responses and a more

integrated approach to handling mental health calls. This theme also pertains to the logistics and practical aspects of embedding clinicians directly in call centers. The findings highlight the dispatchers' support for this model, noting it could lead to better outcomes for callers and potentially reduce the burden on dispatch resources.

> *"I would like to see more clinicians in the call center because they might be able to intervene directly."* (Dispatcher Supervisor 1, FG2)

> *"I've observed that when clinicians were present, our staff had the opportunity to ask questions that they typically wouldn't know to ask. A clinician could overhear part of a conversation and either choose to listen in more closely or pose questions to the dispatcher, facilitating a more informed response."* (Dispatcher Supervisor 1, FG2)

> *"I think they provided validation to the dispatchers on a call by call basis. "That was a really good question I didn't think of that," or, "Hey, you picked up on that that was great."* (Dispatcher 4, FG3)

> "*The interaction between dispatchers and clinicians proved to be quite effective. Dispatchers were exposed to new perspectives they hadn't considered before, gaining insights into the clinician's way of thinking."* (Dispatcher Supervisor 1, FG2)

While there is currently a national suicide and crisis lifeline (988) available to residents with low severity levels of mental health crisis, often time residents do not want to take this option and rather to talk to someone locally.

> *"So they refuse the transfer, when the criteria may be something that could be talked to with a clinician...Some of it may be tied to, they're lonely, and they need that physical contact, not just a voice, a disembodied voice on the phone...they may think that they're*

just getting, you're just trying to get rid of me. Or I've already talked to them, and they can't help me because they're not here in our area." (Dispatcher 4, FG3)

"Residents prefer interacting with officers they're familiar with and have built rapport with, rather than being directed to clinicians. Even when suggested that a clinician could offer help, many resist, expressing no interest in being 'held' in that way. They much prefer the personal, in-person support from those they know and trust." (Dispatcher 3, FG2)

Additionally, the benefit of the collaboration goes both ways. While the dispatchers reported benefits of working closely with clinicians on call triage, the experience also helps mental health clinicians to better understand the triaging process.

"But I think that the time that we had with them was definitely beneficial in building that bi-directional relationship...And they said this, and they can do a little bit more education on "Okay, that sounds like this medical terminology or this clinical terminology." And they can explain it a little better, in a way that after they've seen what we do, they can put it to the staff in a way that is understandable...They help bridge that gap." (Dispatcher 4, FG3)

Conclusion

The analysis results of focus group interviews highlight the different approaches taken by dispatchers and clinicians, which help explain the consistency analysis results from previous chapter. Dispatchers react to crisis calls from the law enforcement perspectives, emphasizing on allocating the scarce police resources to cases that are higher in severity. On the contrary,

clinicians have practical experiences and are trained to detect signs of mental health disorder such as unusual tones, scenarios, and behaviors from seemingly ambiguous information. Nonetheless, both parties acknowledged the benefits of working together and how the partnership can enhanced responses to mental health crisis. The results further demonstrate the promise of integrating clinicians within emergency call centers, where they can enhance the dispatchers' ability to recognize and respond to mental health crises more effectively.

Additionally, the need for specialized training for dispatchers is underscored, reflecting a requirement to equip them with the skills necessary to identify mental health-related calls, especially in the context of the implemented Marcus Alert system. This collaboration enriches dispatchers' understanding through real-time insights and guidance from clinicians while it also helps provide clinicians a better understanding of the triaging process.

Chapter 5 Examining the Longitudinal Spatial Stability of Mental Health-related Calls for Service at Micro Places over a 10-year Period

Abstract

Prior research on crime and place has shown that crime incidents and calls for service (CFS) are highly concentrated at micro places and that the concentration patterns are stable over time. However, little is known about the stability of the geographical distribution of mental health-related (MH) CFS in suburban and rural context. This chapter attempted to address this gap by analyzing 10-year MH CFS data from Roanoke County Police Department in Southwestern Virginia. We geocoded all mental health calls from 2013 to 2022 to the nearest street segments in Roanoke County (n = 14,201). In order to understand the long-term developmental patterns of the mental health calls, we used two separate methods, the spatial point pattern tests (SPPT) and group-based trajectory modeling (GBTM) to examine the MH-related calls at the street segment level. Furthermore, the results can help us understand whether MH hot spots are stable over time. In sum, the SPPT analysis showed that all robust *S*-indices between any consecutive two years are greater than .94, indicating high longitudinal spatial stability of MH calls. The trajectory analysis identified a 5-goup model that fitted the data the best. While the majority of the street segments were either free of any MH calls, or had a very low rate of mental health calls over the 10-year study period, a small proportion of street segments (n = 98) showed various developmental patterns of MH calls, including high-rate decreasing, moderate increasing, and moderate decreasing trajectory groups. The implications of the findings are also discussed in this chapter.

Introduction

Previous studies have shown that about 1 to 10 % of calls for police service involved persons with perceived mental illness (PwPMI) (Gill et al., 2018; Hodgkinson & Andresen, 2019; Livingston, 2016; Lum et al., 2021; Vaughan & Andresen, 2018; Vaughan et al., 2018; White & Goldberg, 2018; Yang et al., 2018). Though this type of calls only accounted for a small proportion of all CFS, these incidents tended to be resource intensive. For instance, police spent 1.4 to 2.2 times more on addressing calls involving PwPMI than calls not involving PwPMI (Charette et al., 2014; Schulenberg, 2016). Specifically, Yang et al. (2018) found that MH calls, on average, took officers more than 3 hours to resolve, while calls related to domestic disputes took about 1.5 hours and drug/alcohol-related calls took less than 1 hour in a suburban-rural police department. It is clear that MH calls tend to consume a disproportionate amount of police resources. Therefore, it is important to understand the spatial distributions and long-term stability of MH calls in order to develop effective interventions to address the issues. As such, this chapter focuses on identifying the spatial distribution of MH CFS at micro places in a suburban-rural setting, which might further provide some insights for police or non-police place-based practices.

Crime Concentration at Micro Places

Over the past few decades, a substantial body of evidence has demonstrated that crime incidents are not distributed randomly but are highly concentrated at micro places such as addresses or street segments (Gill et al., 2017; Lee et al., 2017; Sherman et al. 1989; Weisburd, et al., 2004; Weisburd et al., 2012; Wheeler et al., 2016). Specifically, Weisburd et al. (2004) discovered that between 4 to 5% of street segments generated half of crime incidents in Seattle, Washington and that these concentration patterns were very stable over a 14-year period. This line of research has led to what Weisburd (2015) called the law of crime concentration, which

states that “for a defined measure of crime at a specific microgeographic unit, the concentration of crime falls within a narrow bandwidth of percentages for a defined cumulative portion of crime” (Weisburd, 2015, p. 138). These spatial concentrations of crime incidents have also been found in many cities around the world (Curman et al., 2015; Park & Lum, 2021; Steenbeek & Weisburd, 2016; Weisburd & Amram, 2014).

Similar to the concentration of crime, other types of social problems appeared to be clustered at a small proportion of micro places (Hibdon et al., 2017; Weisburd et al., 2009). For instance, Hibdon et al. (2017) examined drug-related CFS and emergency medical service (EMS) calls in Seattle and found that 50% of CFS were found in less than 1% of the street segments and half of EMS calls were found in about 2% of the streets. Likewise, 50% of juvenile arrests were found to be concentrated at less than 1% of streets in Seattle over a 14-year period (Weisburd et al., 2009). In general, studies that use specific types of crime and problems tend to find a higher level of concentration rates compared to studies that use a general crime category.

Spatial Concentration of MH-related Calls for Service

In line with the scholarship on crime and place, the concentration patterns of MH CFS are similar. Prior studies have shown that 50% of calls were concentrated at 1% to 4% of street segments and that all MH calls were generated by between 7.4% and 34% of street segments in several Canadian municipalities and one metropolitan area in the United States (Koziarski, 2021, 2022; Vaughan et al., 2016; White & Goldberg, 2018). When further examining these MH hot spots, MH-related calls often clustered in high-risk places like homeless shelters or motels with transient populations (Hodgkinson & Andresen, 2019; Ratcliffe, 2021).

Moreover, a recent study revealed that the spatial concentration patterns of MH CFS appeared to be extremely stable over a 7-year period and that the global spatial patterns of MH calls were substantially similar from year to year in a Canadian suburban context (Koziarski, 2022). To the best of our knowledge, this is the only longitudinal study examining the spatial patterns of MH CFS. Though Koziarski (2022) aimed to investigate longitudinal stability of MH calls by calculating the volatility scores to capture the changes within each street segment over time, it is still unclear how these changes occurred from his findings based on his methods. In other words, in which year did these changes occur? Did these changes indicate a constant increase or decrease or fluctuations from year to year? Clearly, more research is needed to better understand whether MH incidents are stable in other settings, and if so, whether there is any variation within the stable global spatial patterns of MH CFS trends.

The Present Study

To fill this research gap, we examined the concentration of MH CFS and the longitudinal spatial stability of MH CFS over a 10-year period in Roanoke County, a suburban-rural setting. Particularly, we answered two research questions in this chapter: (1) How concentrated were MH-related CFS at micro places in a suburban-rural setting? (2) How stable were the spatial patterns of MH-related CFS over a 10-year period? We first provided descriptive statistics to demonstrate the extent of concentration of the MH CFS in the study site and compare the spatial patterns of MH CFS between any of the two consecutive years. Given the high concentration of MH CFS shown by previous literature (Koziarski, 2021, 2022; Vaughan et al., 2016; White & Goldberg, 2018), the developmental patterns of MH hot spots are very likely to be driven by the strong stable global patterns of MH calls. Therefore, we also used a dynamic analytical model

(GBTM) that enables the identification of varying trajectories of micro places to understand the different developmental patterns of street segments over 10 years.

Methods and Data

Study Site

Roanoke County is located in Southwestern Virginia with a population of 96,914 in 2022 (US Census Bureau, 2022). The area is roughly 250 square miles and mostly rural and mountainous. Most residents live close to Roanoke City that is located within Roanoke County or nearby suburbs. The demographic of the residents is homogeneous with nearly 87% White, 7% Black, 4% Asian, and 4% Hispanic or Latino, and about 22.4% of residents are older than the age of 65 (US Census Bureau, 2022). Roanoke County Police Department (RCPD) is the primary law enforcement agency in the study site with a total of 134 sworn officers and 16 civilian staff in 2022.

Data

All MH CFS made to RCPD from January 1, 2013 through December 31, 2022 were extracted. The CFS datasets include incident numbers, dates and times the calls were generated, the geographical information (such as addresses, longitudes, and latitudes), and call types. Specifically, RCPD has five call types related to mental health issues in their call type designation operation: ECO/TDO (Emergency Custody Order/Temporary Detention Order), "1096" (i.e., calls involving mental health subjects), "1096 with weapon," suicide threats, and suicide attempt. We extracted all these MH-related calls from 2013 to 2022 as our study sample. After excluding calls from hospitals, police departments, courts, magistrate offices, and jails, we had a total of 4,456 MH calls over this 10-year study period.

Unit of Analysis

We analyzed the MH CFS at the street segment level. We followed the definition of past crime-and-place research defined a street segment as "the two block faces on both sides of a street between two intersections" (Weisburd et al., 2004, p.290). There are a total of 14,201 street segments in Roanoke County.[8] We plotted each of the 10-year MH CFS based on the x-y coordinates and geocoded them to the nearest street segments using the "NEAR" tool in ArcGIS 10.8.2. We then aggregated the annual total of MH calls by street segments for further analyses.

Analytical Methods

In order to investigate the yearly concentration rate of MH CFS at the street segment level, we calculated (1) the percentage of street segments that had any of MH CFS and (2) the percentage of street segments that accounted for 50% of MH CFS in any given year. These two measures were used in previous research on the spatial patterns of calls involving PwPMI, indicating how concentrated the mental health calls are at the street segment level (Hodgkinson & Andresen, 2019; Koziarski, 2021; Vaughan et al., 2016; White & Goldberg, 2018).

Spatial Point Pattern Test

The Spatial Point Pattern Test (SPPT) was developed by Martin Andresen (2009) to measure the degree of similarity between two spatial point patterns of phenomena through a nonparametric Monte Carlo approach. To understand the stability of the spatial patterns of MH CFS over the entire study period, we applied the SPPT to examine how similar the spatial patterns of MH CFS between any of the two consecutive years are from 2013 to 2022. In the

[8] The VA roads shapefiles were retrieved from US Census Bureau (2020) on April 9, 2021 at https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html

SPPT, *S*-index measures the extent to which one spatial point pattern is similar to another, which represents the percentage of areas that are classified as similar. The values of *S*-index range from 0 (perfect dissimilarity) to 1 (perfect similarity). A value of .8 has been considered as a threshold for similarity (Andresen et al., 2017). This method was also used by prior studies examining the longitudinal spatial patterns of crime at micro places as well as CFS involving PwPMI (Andresen et al., 2017; Koziarski, 2022). The full bootstrapping and proportion differences versions of the *sppt* package were applied in the *R* programming environment (Wheeler et al., 2018).[9]

Group-based Trajectory Modeling

Though the SPPT provides indices that measure the similarity between two spatial patterns globally, group-based trajectory modeling (GBTM) can yield a more nuanced comparison regarding the group differences illustrated by the developmental trajectories over time. While GBTM was initially developed by Nagin (1999) to capture the developmental patterns of individual criminal offending (see also Nagin & Land, 1993), it has been applied to research on longitudinal crime distributions across geographic locations (Gill et al., 2017; Griffiths & Chavez, 2004; Weisburd et al., 2004; Weisburd et al., 2009; Yang, 2010). The primary assumption of GBTM is that patterns of observations of interest over time can be approximated with a set number of groups characterized by polynomial growth curves (Nagin, 2005; Nagin & Tremblay, 1999). In this study, we used GBTM to identify different developmental trajectories of MH CFS, particularly street segments that had relatively high

[9] Wheeler et al. (2018) discussed some major limitations of the original SPPT and developed two functions to address these limitations including the full bootstrapping (*sppt_boot*) and proportion differences (*sppt_diff*) versions of SPPT. According to Steenbeek and Wheeler (2020), because of the advantages of the function of proportion differences when the number of points per areal unit is small or zero, their advice is to use this function.

volume of MH calls over time (i.e., the hot spots) and to understand whether hot spots and cold spots stayed stable during the study period.

Results

Figure 6 shows the total numbers of MH CFS every year from 2013 to 2022 in Roanoke County. During the first four years of the study period, the total numbers of MH calls were relatively stable with about 500 calls per year. The numbers started to fluctuate from 2017 to 2022 with a peak of 483 calls per year in 2021.

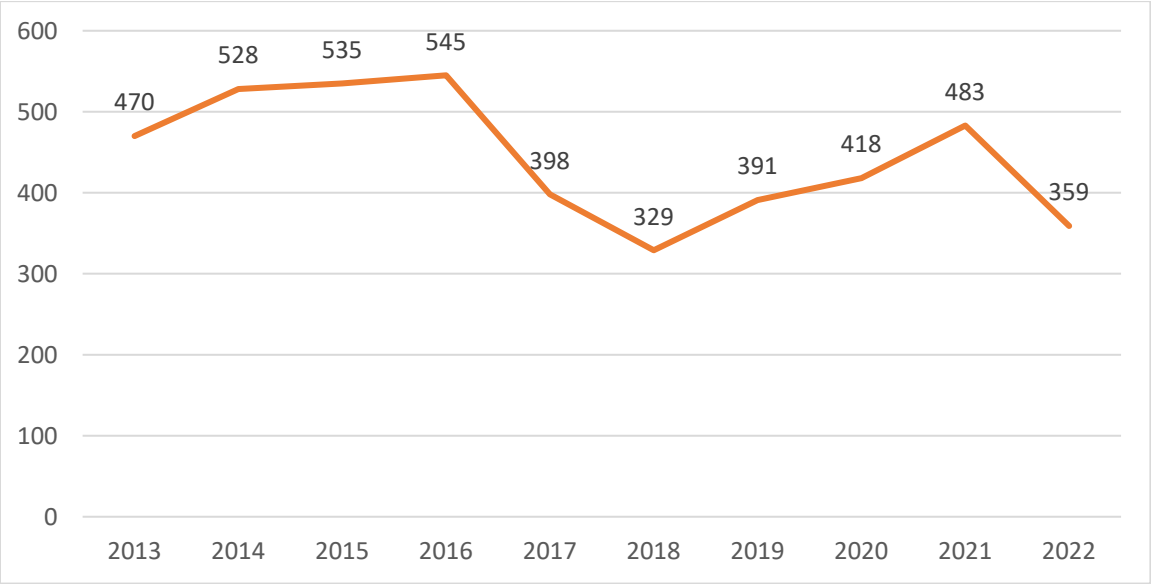

Figure 6 Total MH calls per year from 2013 to 2022

When we list total numbers of MH CFS and street segments with 50% and 100% of calls, it is clear that the concentration rates of MH calls are much higher than general crime reported by past studies. As shown in Table 7, in any given year, less than 2% of street segments accounted for 100% of MH CFS, and 50% of calls were concentrated at between .21% to .36% of streets segments from 2013 to 2022.

Table 7 Concentration rates of 50% and 100% of MH calls from 2013 to 2022

	Total MH CFS	Street segment with any calls	Percent units accounting for 50% of calls	Percent units accounting for 100% of calls
2013	470	239	.28%	1.68%
2014	528	251	.25%	1.77%
2015	535	283	.34%	1.99%
2016	545	280	.32%	1.97%
2017	398	206	.29%	1.45%
2018	329	169	.21%	1.19%
2019	391	195	.29%	1.37%
2020	418	208	.21%	1.46%
2021	483	254	.36%	1.79%
2022	359	202	.33%	1.42%

Results of the SPPT

Since the results of the full bootstrapping and proportion differences versions of the SPPT are very similar, we only included the results of the proportion differences version of SPPT in Table 8. As shown in bold, all standard *S*-indices are greater than .99, and all robust *S*-indices are greater than .94 between any of the two consecutive years.[10] These pairwise comparisons suggest that the spatial point patterns of MH CFS are very similar from year to year.

[10] The measurement of standard *S*-indices includes the spatial units with no mental health calls, while robust *S*-indices exclude those units in order not to inflate the similarity between two spatial patterns.

Table 8 Standard and robust pairwise S-indices

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2013		**.999**	.999	.999	.999	.998	.998	.999	.998	.997
2014	**.958**		**.998**	.998	.998	.999	.998	.999	.998	.998
2015	.955	**.949**		**.999**	.998	.999	.997	.998	.998	.997
2016	.955	.945	**.966**		**.998**	.998	.997	.998	.998	.997
2017	.955	.932	.943	**.948**		**.999**	.998	.999	.998	.998
2018	.939	.945	.949	.942	**.948**		**.999**	.999	.999	.999
2019	.942	.916	.917	.910	.921	**.959**		**.999**	.998	.999
2020	.949	.952	.935	.939	.943	.951	**.952**		**.999**	.999
2021	.938	.945	.945	.944	.940	.951	.945	**.966**		**.998**
2022	.912	.926	.920	.917	.931	.943	.953	.954	**.940**	

Note: Standard *S*-Indices are in the upper right triangle. Robust *S*-Indices are in the bottom left triangle.

Results of GBTM

Based on prior literature (Nagin, 2005; Weisburd et al., 2012), we followed an exhaustive approach to identify the most optimal trajectory model for the data. That is, we went through all possible number of trajectory groups and polynomial order to identify the solution that fits the data the best. Other than the Bayesian Information Criteria (BIC), Akaike Information Criterion (AIC), and Entropy, we also considered the average posterior probability, the odds of correction classification (OCC), and whether meaningful groups were revealed for the selection of our final model. Our analysis ended up with a 5-group linear zero-inflated Poisson model that best fits the data based on the aforementioned criteria (BIC=-13980.44, AIC=-13911.39, Entropy= 0.952). The average posterior probability ranges from .888 to .998, and all OCC values are greater than 3 (see Table 9).

Table 9 The average posterior probability and odds of correct classification of 5-group model

Group membership	Estimated percentage of total street segments	Average posterior probability	Odds of correct classification
High-rate decreasing	0.0703	0.9975	563171.25
Moderate increasing	0.1231	0.9973	304859.83
Moderate decreasing	0.5252	0.8884	1508.50
Low-rate stable	5.7725	0.9460	285.71
MH-free	93.5089	0.9784	3.14

Figure 7 illustrates the five-group trajectories of street segments over the 10-year study period. Of the 14,201 street segments, 13,554 streets experienced almost no MH CFS over these 10 years (MH-free trajectory). Another 549 streets exhibited extremely low level of MH CFS, and this pattern stayed stable over time with an average ranging from .21 to .40 MH calls per year (low-rate stable trajectory). Additionally, there is one trajectory with 71 streets showing a slightly decreasing pattern over time (moderate decreasing trajectory). While the great majority of the street segments had no or very low levels of MH calls over the 10-year period, we identified trajectories that exhibit substantial changes over the study period. For instance, one trajectory with 17 streets demonstrates an increasing pattern over time (moderate increasing trajectory). This group of streets started from 2 calls per year but increased to around 8 calls per year in 2020 and 2021. Notably, one trajectory including 10 streets showed an extremely high-volume of MH calls for the first half of the study period (ranging from 9.8 to 13.1 calls per year) but cooled down subsequently in the second half of the study period (the high-rate decreasing trajectory).

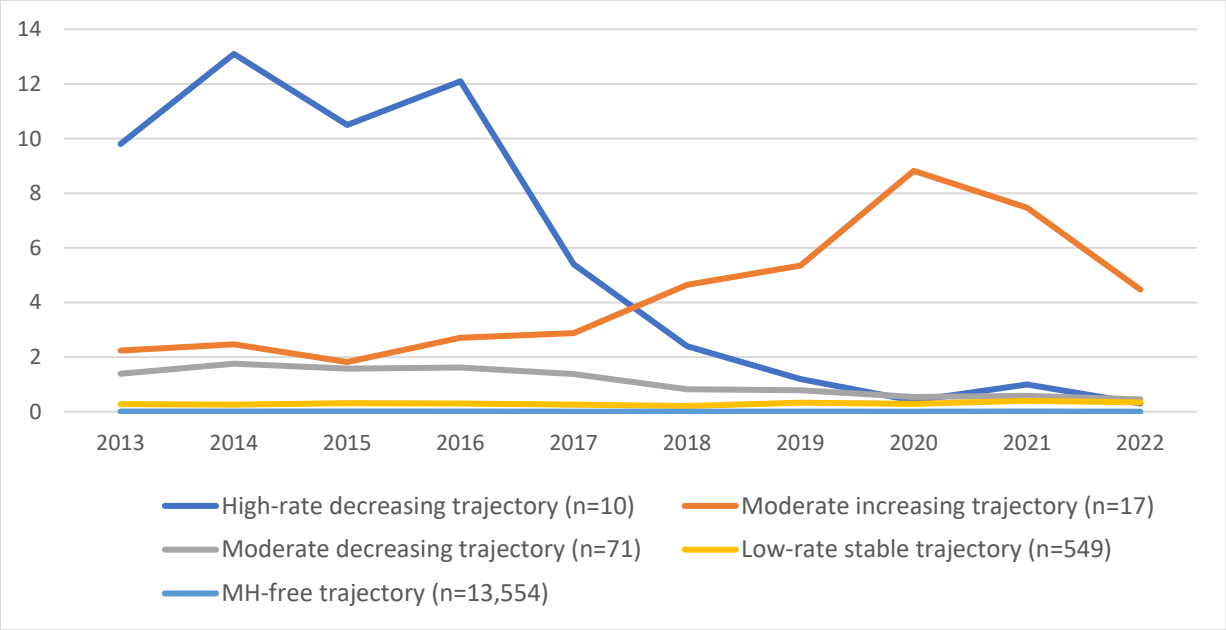

Figure 7 Annual average of MH CFS by five trajectories (n=14,201)

Figure 8 shows the total volumes of calls every year attributed to each of the five groups of street segments. The top three groups of street segments include high-rate decreasing, moderate increasing, and moderate decreasing trajectories. While they consist of only 98 street segments (.7% of the total street segments), they accounted for between 31% and 56% of all MH CFS every year from 2013 to 2022.

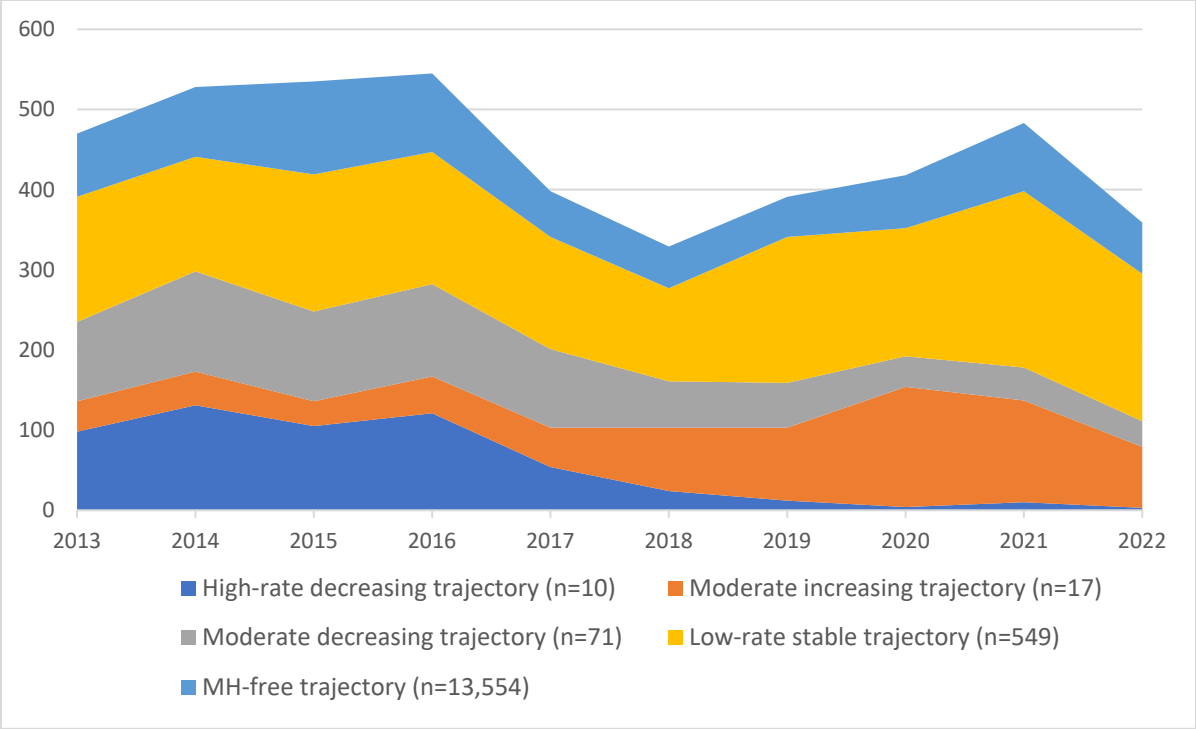

Figure 8 The total volume of calls across the five-group of street segments

Discussion

This chapter examined the spatial concentration of MH CFS at micro places over a 10-year period and the longitudinal spatial stability of MH CFS in a suburban-rural setting by applying the spatial point pattern tests and group-based trajectory modeling. Our findings suggest that CFS involving MH subjects were extremely concentrated at the micro geographical level by showing that less than 2% of street segments generated all MH CFS in any given year. We also found the longitudinal stability of MH calls. Specifically, the similarity of the spatial patterns of MH calls between any of the two consecutive years is extremely high. In spite of this high longitudinal stability, there was a small proportion of street segments that demonstrated different developmental trajectories of MH calls over time.

In line with the crime and place literature (Andresen et al., 2017; Gill et al., 2017; Hipp & Kim, 2017; Weisburd et al., 2004; Weisburd et al., 2012), CFS involving mental health subjects were not randomly distributed at micro places. In fact, we found that most of street segments were free of any MH calls from 2013 to 2022. Regardless of the call volumes, only 2% of street segments were with any MH CFS in any given year. Our findings can probably be explained by the semi-rural characteristic of the study site and the rarity of MH CFS. With more than 14,000 street segments in this relatively large and remote area and less than 550 MH calls per year, the concentration of calls might essentially be higher than urban or suburban settings. More specifically, the clusters of residential units and the relatively smaller population at risk might drive these immense concentration patterns of MH CFS in our study site.

Compared to other studies focusing on the spatial concentration of calls involving PwPMI (Hodgkinson & Andresen, 2019; Koziarski, 2021; Vaughan et al., 2016; White & Goldberg, 2018), our analyses indicated a higher level of concentration. Prior studies have shown that 50% of calls were concentrated at 1% to 4% of street segments and that 100% of MH calls were generated by between 7.4% and 34% of street segments in several settings in North America (Koziarski, 2021, 2022; Vaughan et al., 2016; White & Goldberg, 2018). In our findings, the spatial concentration of MH calls is stronger in the suburban-rural study site. Particularly, we found that 50% of MH calls were concentrated at only .21 to .36% of street segments in Roanoke County and that all MH calls were generated by less than 2% of street segments over the 10-year study period. These concentration patterns are similar to one cross-sectional study conducted in a medium-sized midwestern Canadian city which showed that 50% of calls related to mental health issues and attempted suicides were distributed to .30% and .45%

of street segments, respectively and that all MH calls and attempted suicide incidents occurred at .67% and 1.81% of streets (Hodgkinson & Andresen, 2019).

In terms of the longitudinal concentration of MH calls, our results showed even stronger concentration patterns of MH calls than a longitudinal study conducted in the City of Barrie, Canada in which the author found that the annual concentrations of 50% of calls involving PwPMI fall between 2.3 to 2.7% of street segments and that 100% of MH calls were from 9.5 to 12.6% of street segments (Koziarski, 2022). The more concentrated patterns might result from the rural nature of our study site. While Barrie has about two-fold of population compared to Roanoke County, there is only a total of 2,975 street segments.

When turning to the longitudinal stability of the spatial patterns, our SPPT results suggest that MH CFS are remarkably stable across street segments over time. Our findings are similar to what Koziarski found in Barrie over a 7-year period. However, it is worth noting that the GBTM results provide more nuances for these global spatial patterns. Specifically, we found five groups of street segments that show similar trajectories of MH calls over time. More than 99% of street segments (including MH-free and low-rate stable trajectories) were with only sporadic to none MH calls from 2013 to 2022, and these cold spots stayed extremely stable over the 10-year period. On the other hand, a small proportion of street segments showed different development patterns of MH CFS, and these 98 street segments fairly drove the total volume of MH calls. Particularly, 10 hot spots experienced a relatively high-volume of calls in the first four years, but the MH calls decreased to a very low level in the last three years of the study period. We also observed two groups of streets that started at a moderate level in which one group demonstrated an increasing pattern while the other one exhibited a decreasing pattern over time. These downward changes can probably be explained by the co-responder interventions, the relocations

of frequent fliers, or the deceases of high utilizers during the study period in the study site. The COVID-19 pandemic might have also affected people's help seeking behavior. Since our data covered a relatively long period of time including the pandemic, these all were likely to influence the longitudinal patterns of MH hot spots.

To conclude, we found a high level of global stability of MH CFS from 2013 to 2022 in Roanoke County with a few MH hot spots that showed either increasing or decreasing patterns and notably drove the total volumes of calls from year to year. This chapter added to the existing knowledge by showing the different developmental trajectories of MH hot spots within the stable global spatial patterns of MH calls over time. Based on these findings, there are some policy implications. Firstly, given the concentration of MH calls at the street segment level, police agencies can consider adopting place-based approaches or focused interventions to address mental health crises and prevent future contacts with PwPMI such as allocating the co-responder resources, conducting proactive wellbeing checks, or distributing information on mental health resources such the 988 Lifeline at mental health hotspots. For future research, both researchers and practitioners can look into the potential risk factors of the increasing trajectories and the protective factors of the decreasing trajectories as well as whether there are any co-occurring problems at the hotspots that could help identify early signs of potential mental health crisis. Identifying the risk and protective factors and the co-occurring problems can help develop future interventions to more effectively address and prevent mental health calls to police.

Conclusions

This report outlines the findings from various investigations over a three-year collaborative project between the Center for Evidence-Based Crime Policy at George Mason University, Roanoke Police Department, Roanoke County Police Department, Salem Police Department, and Vinton Police Department as well as Blue Ridge Behavioral Healthcare to conduct a place-based randomized controlled trial to understand the effects of the co-responder model on subsequent outcomes of individuals who were experiencing a crisis and involved in mental health-related calls for service in the Roanoke Valley region of Virginia. **The introductory chapter** provides the background information about the team members, the study site, and the targeted problem.

Chapter 2 describes the implementation, the experimental design, and the assessment of the co-responder approach in the Roanoke Valley. The findings revealed that while the differences in MH calls were in the expected direction, none of the comparisons was statistically significant using both *t*-statistics or effect sizes. The results of TDO data analysis showed that on average, there was a decrease in TDO cases in the treatment streets in the intervention period relative to the pre-intervention period, while there was an increase in TDO cases in the control streets. The effect reaches a small effect size that favors the treatment group (d = -.22). These findings show promise for assisting PWMI with place-based co-responder approaches in suburban-rural settings. In the next few paragraphs, we discuss some of the challenges in the implementation of the co-responder program in the study site.

We conducted three focus groups with two officers and three supervisors from RPD and three officers and two supervisors from RCPD in July 2022. We report the key findings from

these focus groups here. Firstly, officers responded to mental health-related calls fairly often from every day to several times a week, and some officers perceived an increase in MH CFS in the past two years. Officers' time spent on these calls depends on the needs of the subjects (such as medications or crisis stabilization) and the disposition of the calls. The calls involving ECO usually took several hours to a few days. It also takes time to build rapport with MH subjects; yet, some officers felt that they could not spend much time on MH calls due to the high call volume in their jurisdiction. The understaffing issue might also have exacerbated this problem. Secondly, though the use of the co-responder service is low, an officer who made referral mentioned that the clinician arrived in a timely manner, and the call went very well. That officer felt happy to connect the subject to the service and discussed the call with the clinician who responded afterwards. The implementation of a place-based co-responder model appeared to be feasible in this suburban-rural community.

However, both supervisors and officers mentioned some challenges that should be noted. For police, officers serving the jurisdiction with lower levels of needs felt that they did not have the chance to make referral as they had not responded to MH calls in the treatment hotspots or MH calls had been ineligible (i.e., ECO required). A more common problem revealed from the focus groups is that officers just got used to the existing standard operation procedure (SOP). When responding to a MH call, the first thing that came to their mind is to ECO or not; they did not incorporate making referral in the treatment mental health hot spots into their daily practices. And when they responded in the areas where they were familiar with, most of them did not need to look at the map on their laptop; therefore, they might have missed the opportunity to use the co-responder services. The research team then worked with dispatchers to provide the reminder and relay information on calls to officers who responded in the treatment hot spots, but we did

not see a significant increase in the use of the service. Other than the adherence to the existing SOP, there was a common but unverified belief in one PD that "there were only two clinicians and if they were in Vinton, it might take them forever to get to the scene." Officers felt that they did not have much time to wait for clinicians to arrive, which might have affected their willingness to make referral for eligible calls. In the focus group discussion, the research team also brought up an alternative in which police can leave the scene after making a call to the clinician. Yet, the major concern for officers would be liability and accountability if the situations escalate or get worse after they leave. The societal change over the past few years may also put more pressure on officers. Though officers believe that the co-responder service might be beneficial for mental health subjects, they did not want to take that risk.

Regarding the challenges at the organizational level, since not every individual officer had been exposed to research projects or the co-responder model, low buy-in might be another concern in some of the police departments as indicated by one supervisor. This would have affected the implementation of the program. Besides the initial training, the CEBCP-GMU team asked the leadership staff at each agency to remind their officers of this initiative through emails and in lineups and provide training to those who were newly recruited. The clinicians also sat in two of the largest police departments to increase their visibility and to build rapport with officers during roll calls. However, we did not see a significant improvement after the effort for continued education and rapport building. The other underlying problem was related to internal communication within the organizations. Though the CEBCP-GMU team has built relationships with leaders across the four agencies by having in-person meetings with them and weekly check-ins to monitor the implementation, one supervisor mentioned that the issue of communication between leadership staff and frontline officers might also have impeded the program

implementation. Another supervisor also pointed out the low morale in the department, which could be a huge challenge for program implementation at the frontline. When CEBCP-GMU team provided the training to officers, some officers also expressed their prior negative experience of working with the mental health service organization to assist PWMI. Though the two clinicians were hired particularly for this co-responder project, the prior impressions might also have made them less willing to make referral.

For mental health clients, the most common problem might be the unwillingness to receive mental health services and treatment. As one officer indicated, the mental health subject declined the co-responder services when he offered this opportunity. Officers also noticed that some people with existing services still call police from time to time like those living in retirement communities. When the clinicians conducted follow-up, some clients did not answer the door or refused to answer clinicians' phone calls even though they received the initial co-responder service. These were some of implementation issues related to clientele in this experiment. Overall, there were challenges in implementation at different levels from clients themselves, frontline officers to leadership staff. There might not be enough buy-in after initial training at the frontline. Even some officers expressed their interests in this innovative approach, they did not use the co-responder services for eligible calls for several reasons like the high call volume with other priority calls to address, the overreliance on existing SOP, and the mistrust between police and the mental health service provider. For officers who were more willing to make referral, they might not have the chance to do so due to the low needs in their jurisdictions. Due to the low referral rate even after we made some adjustments as mentioned above, the research team decided to expand the co-responder models to include 911 dispatch in the collaboration.

Chapter 3 describes the collaboration between clinicians and call takers/dispatchers in two of the 911 call centers in the Roanoke Valley. The findings show that dispatchers are quite skilled at identifying cases that do not involve mental health issues. This proficiency is crucial as it ensures that mental health resources are not inappropriately allocated to situations where they are not needed, thereby conserving these resources for cases where they are more suitable. At the same time, around 30% of the cases determined by dispatchers to be non-mental health relevant were classified as high in mental health crisis (level 3 calls) by clinicians under the Marcus Alert system. This indicates that these cases, which require mental health intervention, might not have received the necessary help early enough. Such a finding underscores the importance of integrating more robust mental health training for dispatchers and enhancing collaboration between dispatchers and mental health professionals.

Chapter 4 describes the analysis of interviews with 911 call takers/dispatchers. The findings show that one of the challenges for dispatchers lies in identifying mental health issues based solely on the content of calls with their training. Dispatchers shared that working with mental health clinicians helped broaden their experience on identifying calls with possible mental health components. Moreover, the interviews show that embedding mental health clinicians in emergency call centers can be promising in enhancing the emergency response system in handling mental health crisis.

Chapter 5 describes the longitudinal stability of mental health hot spots in Roanoke County over a 10-year period. There were a total of 4,456 MH CFS from 2013 to 2022. We found a high level of MH CFS concentration—50% of MH calls were concentrated at between .21% to .36% of streets segments, and less than 2% of street segments accounted for 100% of MH calls in any given year over the 10-year study period. We also found that the global

stability of MH CFS from 2013 to 2022 was high with all robust *S*-indices between any of two consecutive years over .94. However, the GBTM results showed that there were a few MH hot spots that demonstrated either increasing or decreasing patterns but notably drove the total volumes of calls from year to year. This chapter added to the existing literature by showing the different developmental trajectories of MH hot spots within the stable global spatial patterns of MH calls over time.

Recommendations for practitioners

From the findings and investigations, we have some recommendations for police departments serving suburban-rural jurisdictions in future implementations of the co-responder model.

- Place-based co-responder models in which practitioners concentrate onsite stabilization and follow-up services at mental health hot spots (i.e., street segments with high volume of mental health-related calls for service) might be a feasible approach for police agencies in suburban-rural jurisdictions.
- Building trust and rapport between police agencies and mental health service providers is central to the successful implementation of co-responder programs.
- Facilitating the receptivity to the innovative initiatives is important for the police organizations. This can be achieved by providing training/refresher and sending out regular reminders to frontline officers or organizing lunch and learn sessions with clinicians when rolling out the programs. Leadership support is also fundamental to supervisors' and officers' receptivity.

- In addition to police-clinician co-responder teams, partnering mental health clinicians with 911 call-takers/dispatchers is also promising in enhancing responses to mental health crisis in the community.

Recommendations for researchers

For the co-responder program evaluation research, the place-based RCT might be a feasible approach, particularly in suburban-rural settings. However, researchers should pay more attention to the following aspects of research when conducting collaborative projects with practitioners. It is important to assess organizations' readiness for the co-responder program implementation beforehand.

- Staffing: For agencies with severe understaffing issues, adding another layer to officers' daily practices might be overwhelming for frontline officers.
- Mutual trust: Since co-responder approaches require collaboration between police agencies and mental health professionals, mutual trust and rapport between police departments and mental health service providers, particularly frontline officers, are the foundation for the implementation of co-responder programs.
- Feasibility: Though RCTs are considered as the gold standard in evaluation research, it is often unrealistic to expect frontline officers to follow the protocol perfectly. It is thus crucial to balance the rigor of the study design and the feasibility of the program at the frontline including the randomization and the referral process.

List of Products

Conference papers

Yang, S.-M. & Lu, Y.-F. (2023). The Effectiveness of a Co-responder Team in Reducing Subsequent Mental Health Episodes—A Placed Based Approach. Presented at the Annual Conference of American Society of Criminology, Philadelphia, Nov. 15-18, 2023.

Jen, I.-C., Yang, S.-M. & Lu, Y.-F. (2023). Exploring the Effects of a Clinician-Dispatch Co-responder Model in Triaging Mental Health Calls. Presented at the Annual Conference of American Society of Criminology, Philadelphia, Nov. 15-18, 2023.

Lu, Y.-F. & Yang, S.-M. (2023). Examining the Longitudinal Spatial Patterns of Mental Health-related Calls for Service at Micro Places. Presented at the Annual Conference of American Society of Criminology, Philadelphia, Nov. 15-18, 2023.

Chapman, J., Yang, S.-M., Gill, C. (2023) The 4Ts of Building a Successful Researcher-Practitioner Relationship. Presented at the Annual Conference of American Society of Criminology, Philadelphia, Nov. 15-18, 2023.

Yang, Sue-Ming and Yi-Fang Lu. (2023). A Tale of Two RCTs: Lessons Learned from Two Field Experiments on Mental Health Co-response Teams in Rural Areas. Symposium Celebrating the Retirement of David Weisburd. Jerusalem, Israel.

Publications

Yang, S. M., & Lu, Y. F. (2024). Evaluating the effects of co-response teams in reducing subsequent hospitalization: A place-based randomized controlled trial. *Policing: A Journal of Policy and Practice*, *18*, paad080.

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