Understanding Police Enforcement: A Multicity 911 Analysis Summary Brief

September 2020

This brief gives a detailed overview of the larger *Understanding Police Enforcement: A Multicity 911 Analysis* report by the Vera Institute of Justice. The various headings and topics presented in this summary translate to corresponding sections within the full report. These sections explore each aspect of the 911 call-taking system more comprehensively, illuminating how the steps relate and exploring possible areas that can benefit from further research or reorientation.

With more than 240 million 911 calls made each year, a sizable proportion of police officers' time consists of responding to calls for service. Despite the importance of the 911 call system, little information exists on the nature of calls for service, how they are handled, and how police respond. The Vera Institute of Justice (Vera) worked with the Camden County Police Department and the Tucson Police Department, as well as their respective public safety emergency communications departments, to develop an innovative approach to study this crucial and understudied component of the policing system. Researchers employed a five-pronged mixed methods approach, which included the following components:

- Reviewing the literature on 911 calls for service
- Mapping the 911 call system process and analyzing 911 call audio records
- Analyzing computer-aided dispatch (CAD) data in Camden and Tucson, supplemented with public data from three cities
- Applying Natural Language Processing (NLP) techniques to assess narrative fields in CAD data[1]
- Analyzing linked CAD and record management system (RMS) data

Although the 911 call system has been in use for 50 years, there is a lack of information on many of its core features, including how calls are processed; how call-takers, dispatchers, and other personnel are trained; and where opportunities for alternative responses exist and can be expanded. By combining these five research components, Vera sought to identify alternatives to traditional 911 call-processing practices that could potentially improve outcomes for community members, call-takers, dispatchers, and police officers.

The system processing map on page 3 tracks 911 calls from receipt to resolution and provides a comprehensive overview of the process. The response process during call intake includes determining the call's urgency, measured by priority level, and categorizing the incident that the caller is reporting into the appropriate incident type code. Vera researchers coded audio recordings of actual 911 calls and compared these codes to those that call-takers had entered into the CAD system. These codes matched only half of

[1] For more information on the NLP analysis please see chapter 7 of the final report.

the time, and the largest cause of coding misalignment between researchers and call-takers appeared to be related to incident type ambiguity, in which two separate but similar codes were assigned to the same case.

All police activity is typically entered into a CAD system, including both 911 calls for service and officer-initiated activity. Vera's analysis of CAD data from police departments in Camden County (CCPD), Tucson (TPD), Detroit (DPD), New Orleans (NOPD), and Seattle (SPD) provides some preliminary answers to questions related to the volume of 911 calls and how this varies by incident type, time of day, and location. The findings from all departments indicate that officers spend a substantial amount of their time responding to calls for service, most of which are not related to serious crimes in progress, such as violent crimes and calls categorized as Priority 1. This analysis supports the need for further research, discussion, and consideration of underlying needs, causes, and consequences, especially for resource-intensive calls for service that do not involve crimes.

Researchers then conducted a more detailed analysis of linked CAD and RMS data from CCPD and TPD to examine the factors that are associated with 911 outcomes, specifically when calls or officer activity result in arrest. This analysis revealed that the odds of arrest were higher for violent crimes than for mental health, noncriminal, and property damage incidents. However, several other variables, such as time of day and call type, were also relevant, and the relationship between these factors and the odds of arrest varied by city.

System processing map

At the start of the study, Vera researchers reviewed and coded all 911 call processing-relevant documentation from CCPD and TPD, including training materials, protocols, standard operating procedures, and more. Next, Vera conducted three site visits each to Camden and Tucson, allowing researchers to observe call-takers, dispatchers, officers, police officers, communications officers, and leadership teams. Over the course of a cumulative two weeks of site visits in each jurisdiction, researchers observed call-taking and dispatching, conducted ride-alongs with police officers, and facilitated focus groups and interviews with the aforementioned stakeholders to produce the system processing map on page 3.

When creating the system processing map, researchers sought to answer the following research questions:

1. **How are 911 calls processed from intake to final outcomes?**
2. **What types of training, protocols, standardizations, practices, and alternatives to enforcement exist relative to 911 call processing, during each step of the process?**

Although the details of how 911 calls are processed varies by jurisdiction, the system map shows a call's typical flow, from call-taker to dispatcher to a police officer, and the different actions that may be taken at each step. Although this system processing map describes the general flow of 911 calls, the 911 system is operated primarily by local and state governments, so it is likely that there will be differences across agencies based on available resources, geography, and state and local policies and rules. However, given the consistency in 911 call processing across CCPD and TPD, as well as observations made at three additional sites that Vera researchers had access to during this research period, much of this map likely applies to many communities, making it a useful tool for understanding and advancing 911 call processing as a whole.

General 911 Call Processing System Map

Possible endpoints	Key people	Roles and responsibilities	Resources
• Hang up (may result in call back or officer being dispatched to scene)	**Caller**	• Dial 911 • Relay information	• Can sometimes report non-emergencies by phone or by visiting a police station
• Sometimes reroute call to more appropriate department based on location and/or incident type • Sometimes inform caller of no response policy and/or direct to other resource/procedure for select low-level incidents (e.g., alarms)	**Call-taker**	• Determine if call is police-, fire-, or medical-relevant • Gather information (5 Ws [who, what, where, when, weapons]) • Record information (apply codes to call type and priority level) in CAD drop-downs and narrative text	• Communications supervisor available to assist with high-priority emergencies, ambiguous situations, breaks
• Manually end/defer if directed by command staff in accordance with agency policies	**Dispatcher**	• Assign responding officers over computer/radio based on priority level, call log, availability, location • Can override call type and priority, or request call back • Sometimes also manage other responsibilities (e.g., national crime index look-ups, warrants, directed patrols)	• Communications supervisor available to assist with high-priority emergencies, ambiguous situations, breaks
• No action may be required if incident is resolved before an officer is able to respond	**Patrol officer**	• Sent (or volunteer to go) to scene • Review CAD information (emphasis on priority level and narrative) • Computer message or radio questions to dispatch • Can change call type, request call back • At scene, can keep the peace, take a report, provide instructions/resolve on scene, use enforcement (citation, arrest, etc.), call in other resources	• Supervisors can change priority levels • Fire/medical can assist • Sometimes mental health/substance use resources can be mobilized: Crisis Intervention Team (CIT) officers, co-responders (social workers)
• Problem resolved on scene • If unresolved, visit station, call 911 again, seek other non-police-based support, or submit a complaint	**Community member**	• Provide information/tips • Cooperate or refuse	• Sometimes mental health/substance use resources are available: CIT officers, co-responders (social workers)

First, a caller dials 911 and relays information to a call-taker, who is typically responsible for gathering and recording information in the CAD system, which includes assigning the call type and priority level. Next, via CAD and/or radio, a dispatcher (or automated dispatch system, contingent on priority level) assigns officers to report to the scene based on priority level, officer availability, and incident location. Dispatchers can also override assigned call type or priority or request a call-back for more information. The assigned patrol officers then review the CAD information and, if needed, send questions to dispatch, change the call type, or request a call-back. Once on scene, officers can keep the peace (e.g., prevent violence from occurring); take a report (e.g., of auto accidents or thefts); resolve on the scene (e.g., diffuse the situation); use enforcement (e.g., issue citations or make arrests); or call in other resources (e.g., social services or mental health counselors). Finally, community members at the scene ideally receive necessary services and support while providing responding officers with information and, if the situation requires enforcement, community members can either cooperate or refuse.

If an incident is not adequately resolved through this process, community members can visit a police station, call 911 again, seek other nonpolice support (e.g., family, friends, community organizations, or social services), or submit a complaint.

Audio analysis

How a call-taker treats callers, solicits information, and communicates details to dispatchers and officers can all impact the outcomes of a 911 call, yet little research exists on this topic to date. In this methodological pilot, both CCPD and TPD provided Vera with a random sample of 25 audio records of 911 calls, along with call-taker protocols, training materials, and CAD coding keys. To begin assessing variations in 911 call-taking by key call types, Vera collected and analyzed a random sample of an additional 25 calls per site—stratified by the categories listed in the table in Figure 1. Vera researchers coded each of these calls independently, then checked the corresponding CAD records that were separately provided for each audio record to see how their categorization differed from the codes applied by call-takers. This analysis was conducted to answer the following question:

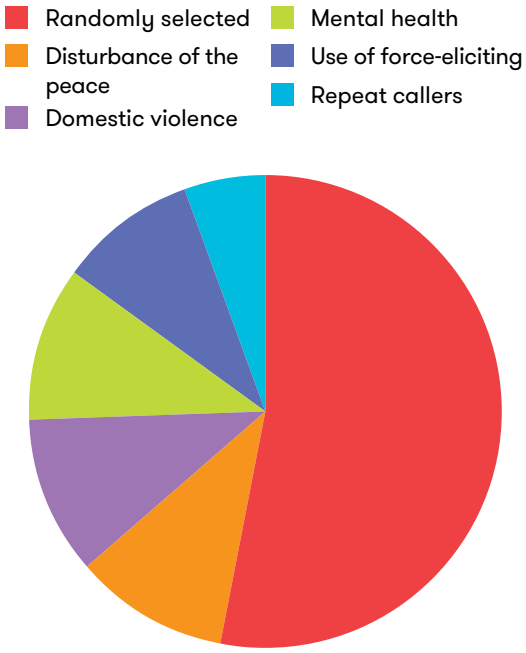
3. Is 911 call data entered reliably into CAD systems, and does this vary by call type?

As Figure 1 on page 5 shows, researchers coded only 54 percent of the randomly selected calls the same way that professional call-takers did, although both groups included the same salient details in the narrative field when processing 76 percent of those calls. The higher narrative match than call type match indicates that, although researchers were likely to record the same salient details as call-takers, the inclusion of those details did not lead them to classify the calls under the same type code. Most of these discrepancies were caused by incident type ambiguity, when similar incident types (e.g., vice complaint and vice complaint (drugs)) were used interchangeably. This discrepancy highlights the need for a coding protocol that would allow for more accurate and standardized capture of information. However, it should be noted that call-takers received training that Vera researchers did not, and it might be useful to have two call-takers perform this exercise to more fully understand the nature of discrepancies. Moreover, dispatch and field response cannot be deployed until a code is entered into the CAD system, requiring call-takers to make split-second classification decisions.

Figure 1

Research Question 3: Calls by type comparison, call-takers versus researcher review

Calls per type



CAD call type	N	Priority level match	Vera call type match	Narrative match
Randomly selected	50	70%	54%	76%
Disturbance of the peace	10	40%	30%	70%
Domestic violence	10	90%	60%	60%
Mental health	10	50%	40%	80%
Use of force-eliciting	9	67%	44%	67%
Repeat callers	5	40%	80%	100%
Total	**94**	**65%**	**51%**	**74%**
Interrater reliability[1]	18	67%	56%	72%

[1] This category refers to calls that were coded by two separate Vera researchers to see how often researchers would apply the same codes.

Descriptive analysis

To improve contextual understanding of the nature of police activity, Vera researchers reviewed two years of CAD entries across five cities, including both calls for service and officer-initiated incidents, and used these datasets to answer the following questions:

4. **What is the volume of 911 calls, and how does this vary by incident type, time of day, and geographic location?**

In all five sites, the most frequent incident type was noncriminal in nature. In four of the five, the most frequent incident type was some variation of complaint or request for an officer to perform a welfare check. These findings support Vera's hypothesis that the majority of calls for service consist primarily of disturbance of the peace complaints and not crimes in progress. Across all sites, the most common priority types were nonemergency codes, further supporting the hypothesis. In three of the five cities, the highest frequency of calls occurred on Fridays, a finding that was counter to Vera's hypothesis that most calls are placed on the weekends. In each city, most calls fell between noon and 10:00 p.m. This wide window does not support the hypothesis that most calls are placed at night. These results are shown in Figure 2 on page 6.

Figure 2

Research Question 4: 911 call volume and variation by incident type, time of day, and location

Research question/topic		CCPD (2016, 2017)	TPD (2016, 2017)	DPD (2017, 2018)	NOPD (2016, 2017)	SPD (2016, 2017)
RQ4: Volume of 911 calls	**Total across both years**	137,426 calls of 508,902 CAD entries	601,072 calls of 833,145 CAD entries	405,289 calls of 877,217 CAD entries	639,657 calls of 848,176 CAD entries	290,701 calls of 833,344 CAD entries
RQ4: 911 call volume variation; the most common of each call type	**Most frequent priority type**	2 (nonemergency)	3 & 4 (nonemergency)	2 & 3 (nonemergency)	1 (nonemergency)	3 (nonemergency)
	Most frequent incident type	Disturbance of the peace	911 hang up; welfare check	Disturbance	Complaint/other	Premise check
	Peak day of the week	Friday	Friday	Saturday and Sunday	Tuesday	Friday
	Peak time of day	1:00 p.m.–7:00 p.m.	Noon–8:00 p.m.	3:00 p.m.–10:00 p.m.	Noon–8:00 p.m.	2:00 p.m.–10:00 p.m.

5. **How promptly do call-takers, dispatchers, and police officers respond to calls? How does this vary by call volume, incident type, time of day, and geographic location?**

The five sites have a wide range of dispatcher and officer response times, a finding that warrants further analysis. However, the two sites that have response time by priority level data available show that response times are faster in emergency incidents. This supports Vera's hypothesis that officers respond fastest to the scene when an incident involves a serious crime in progress. Among the fastest response times for dispatchers and officers were behavioral health incidents, medical emergencies, traffic stops, officer requests for help, area checks, and alarms. Although this metric is important for staffing purposed and community satisfaction, the crucial nature and resulting quick response times associated with Priority 1 emergencies will always be fastest in relation to other calls, but offer little insight into the overall effectiveness of the response. In other cases, dispatchers and officers may take the requisite time to ensure that the call for service is met with the proper response, which may result in a longer response time but be linked to higher community satisfaction. There was no clear correlation between day of the week and response time, but across cities both dispatchers and officers responded with the greatest speed between the hours of 10:00 p.m. and 5:00 a.m. Because the greatest call volumes generally fell between noon and 10:00 p.m., this finding supports Vera's hypothesis that both call-takers' and officers' response times are slower when call volumes are high. These results are shown in Figure 3 on page 7.

Figure 3

Research Question 5: 911 response times and variation by call volume, incident type, time of day, and location

Research question/ topic		CCPD (2016, 2017)	TPD (2016, 2017)	DPD (2017, 2018)	NOPD (2016, 2017)	SPD (2016, 2017)
RQ5: Dispatcher response time	**Average response time**	2016: 7.5 min 2017: 23 min	———	2017: 40 min 2018: 35 min	2016: 63 min 2017: 74 min	———
RQ5: Fastest dispatcher response time per priority, incident, day, and time	**Priority level**	1	1	———	———	———
	Incident type	Health and behavioral health	Medical emergency, officer needs help, 911 hang up	Traffic stop, towing, special attention	Traffic calls	———
	Day of week	Negligible variation	Sunday	Wednesday	Negligible variation	———
	Time of day	10:00 p.m.–5:00 a.m.	Midnight–5:00 a.m.	Midnight–5:00 a.m.	Midnight–5:00 a.m.	———
RQ5: Officer response time	**Overall**	Both years: 7.6 min	———	2016: 8.4 min 2017: 8.2 min	2016: 8.1 min 2017: 7.3 min	2016: 34 min 2017: 33 min
RQ5: Fastest officer response time per priority, incident, day, and time	**Priority level**	1 & 2	1	———	———	———
	Incident type	Alarms, health	Medical emergencies, officer needs help	Traffic stops	Traffic stops, area checks	Domestic violence–no arrest, assault/ other
	Day of week	Sunday	Sunday	Negligible variation	Negligible variation	Saturday and Sunday
	Time of day	10:00 p.m.–5:00 a.m.	10:00 p.m.–5:00 a.m.	10:00 p.m.–5:00 a.m.	10:00 p.m.–5:00 a.m.	Midnight–5:00 a.m.

6. What proportion of police activity is proactive versus reactive?

In Tucson and New Orleans, 911 calls for service accounted for the majority of CAD entries in both years, a finding in line with Vera's hypothesis that the majority of police activity and enforcement is reactive rather than proactive. However, for both years in both Camden and Seattle, officer-initiated events accounted for the majority of CAD entries. In Detroit, the proportions of CAD entries switched between 2017 and 2018 from being mostly 911 responses to mostly officer-initiated events. Overall, these findings neither support nor refute Vera's hypothesis of reactive policing as the norm. Results for Research Question 6 are shown in Figure 4 on page 8.

Figure 4

Research Question 6: 911 response times and variation by call volume, incident type, time of day, and location

Research question/ topic		CCPD (2016, 2017)	TPD (2016, 2017)	DPD (2017, 2018)	NOPD (2016, 2017)	SPD (2016, 2017)
RQ6: What proportion of police activity is proactive versus reactive?	% of CAD entries that are calls for service	2016: 25% 2017: 29%	2016: 71% 2017: 73%	2017: 54% 2018: 40%	2016: 78% 2017: 73%	2016: 54% 2017: 52%
	% of CAD entries that are officer-initiated	2016: 75% 2017: 52%	2016: 29% 2017: 27%	2017: 46% 2018: 60%	2016: 22% 2017: 27%	———

Note: Some sites have CAD entry types that are neither calls for service nor officer-initiated incidents, such as motor vehicle stops or suspicious person stops.

Outcomes analysis

Vera researchers merged Camden and Tucson CAD and RMS data to answer the following questions:

7. **To what extent do CAD events (911 calls and officer activity) result in arrest?**
8. **What factors are associated with CAD events (911 calls and officer activity) that result in arrest, such as call type, incident type, and time of day?**
9. **Which new variables or data systems should be integrated into CAD datasets to systematically capture relevant information that is currently relegated to the narrative field?**

The cross-site analysis shows similarities as well as differences in the predictors of arrest in Camden and Tucson. (See "Predictive factors of an arrest" on page 9.) However, it is important to note the limits of cross-site comparisons due to differences in the characteristics of the sites. In addition to socioeconomic and demographic differences, the nature and scope of the data varies between sites. Specifically, there are differences between the two sites in how call-taking, dispatching, and officer response are deployed and coded. Thus, incident types, disposition outcomes, and other CAD codes are not always uniform or directly comparable. Additional research may explore ways to further standardize and harmonize data across sites.

This table presents results from models that include the predictors of arrest (call type, incident type, and time of day) as well as controls for district, sector-level majority race-ethnic group, sector-level poverty, and year.

Predictive factors of arrest

Call type

- The odds of arrest were greater for officer-initiated events than 911 calls in both Camden and Tucson.
- In Camden, for officer-initiated events, the odds of arrest were more than 50 percent higher for domestic violence incidents than for violent crimes. This pattern was not evident for 911 calls. In Tucson, this finding was reversed. For 911 calls, the odds of arrest were twice as great for domestic violence incidents than violent crimes, but this pattern was not evident for officer-initiated events.[1]

Time of day

- In Camden, compared to early evening, the odds of arrest were higher in late morning and afternoon and lower at other times.
- In Tucson, compared to early evening, the odds of arrest were higher at night but lower at other times.

Incident type

Compared to odds of arrest (AOR)* for violent crime, the odds of arrests for the following incident types were:

Incident type	In Camden	In Tucson
Domestic violence[1]	No statistically significant difference.	More likely to result in arrest (AOR 2.01)
Mental health/ medical emergency	Less likely to result in arrest (AOR 0.05)	Less likely to result in arrest (AOR 0.54)
Noncriminal incidents	Less likely to result in arrest (AOR 0.13)	Less likely to result in arrest (AOR 0.6)
Police operations[2]	N/A	More likely to result in arrest (AOR 6.39)
Property crimes	Less likely to result in arrest (AOR 0.18)	Less likely to result in arrest (AOR 0.67)

*AOR = Adjusted Odds Ratio, the odds of arrest from an incident type compared to the odds of arrest for violent crime, after accounting for other predictors of interest (call type, incident type, time of day), as well as controlling for district, sector-level majority race-ethnic group, sector-level poverty, and year. Only results that are statistically significant at or above a 95 percent confidence level are reported ($p<0.05$).

[1] Arizona and New Jersey state policies mandate arrest for domestic violence.
[2] This is an amalgamation of 26 codes relating to proactive police activity, including warrants and attempts to serve.

This brief provides an overview of some of the major findings from Vera's multi-site study of 911 calls. For the full results of this research and a detailed discussion of implications for policing practice, see the technical report at http://www.vera.org/understanding-police-enforcement-911

For more information

To learn more about Vera's 911 data analysis initiative, visit https://www.vera.org/projects/ understanding-police-enforcement. For more information about this project, contact Caroline Walcott, policing team manager, at cwalcott@vera.org.

Vera INSTITUTE OF JUSTICE
34 35th Street, 4-2A, Brooklyn, NY 11232 212 334 1300 vera.org