Use of Automated License Plate Readers (ALPRs)

in Tennessee Municipal Police Departments

Status report

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Contents

Executive Summary

The use of ALPRs gained strong momentum over the past decade and there is no exception in the State of Tennessee. This study reports on the findings from the 2024 survey of police department chiefs in Tennessee. Overall, 53 departments participated. Two thirds of participating police departments reported the use of ALPRs. Among those not yet in use of ALPRs, the primary challenges are affordability, concerns regarding technical access to hotlists (i.e., pre-loaded databases of car license plates) and lack of community support. Despite these challenges, police departments expressed strong interest to embrace ALPRs soon.

The journey to embrace ALPRs in surveyed police departments started in 2013 and had a sharp increase from 2020. The average number of ALPR units was about twenty, with most police departments owning less than ten units. Most departments learned about ALPRs from law enforcement agencies or vendors and used either their agency budgets or local funding to acquire the units. The adoption of ALPRs was locally driven, attempting to address local needs, funded by local resources and counted on local government support.

Most ALPR units were in fixed locations but also used to assist other investigations. ALPRs were frequently used for traffic control management, local crime investigation and some specialized activities. However, data from ALPR uses has not been well documented and the effectiveness of ALPR uses was quite limited. Most ALPRs have limited access to hotlists, mainly confined to their own jurisdictions, except in very few cases such as AMBER alert or stolen cars where multiple jurisdiction hotlists were available. While departments have started to draft policies for ALPR use, a great deal of variation exists, leaving individual departments on their own. Participating departments identified a few challenges, ranging from procurement cost, legal concerns, to training, and access to hotlists. Nevertheless, police departments in general had expressed high satisfaction levels and intended to either continue or expand ALPR uses.

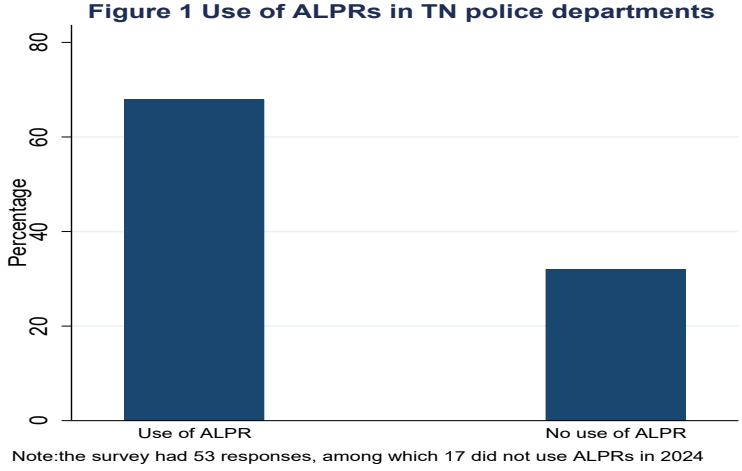
Keywords: ALPRs, Funding and affordability, use patterns, use policies

1. Challenges in Using ALPRs

The use of ALPRs has gained much momentum in the past decade. With its fast diffusion, ALPRs have been deployed in many small- and medium-sized police departments. This trend is no exception to the state of Tennessee. Based on the survey instrument, this session maps the user profiles of Tennessee police departments. For agencies without ALPRs, efforts are made to unearth their challenges and plans.

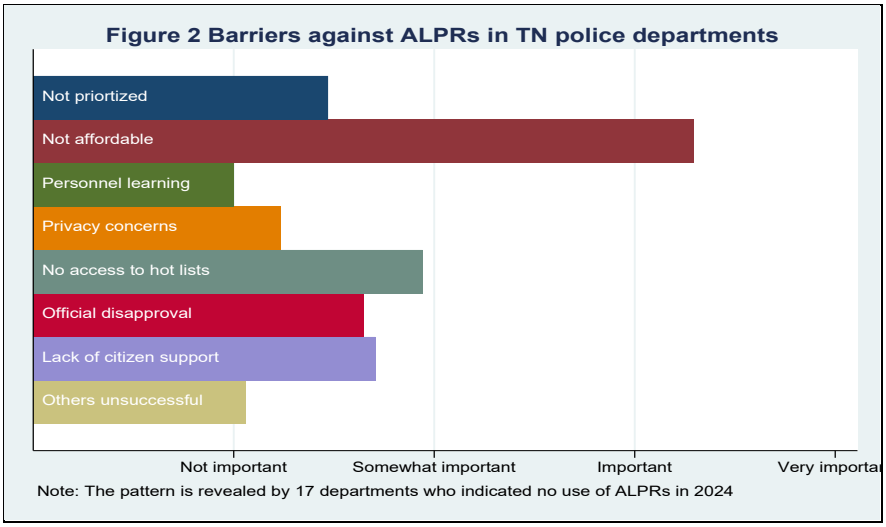
Among 53 police departments who participated in the survey, 36 police departments indicated the use of ALPRs, accounting for 67 percent of the sample. Figure 1 shows the percentages of police departments in use of ALPRs (or lack thereof).

Figure 1 Use of ALPRs in TN police departments

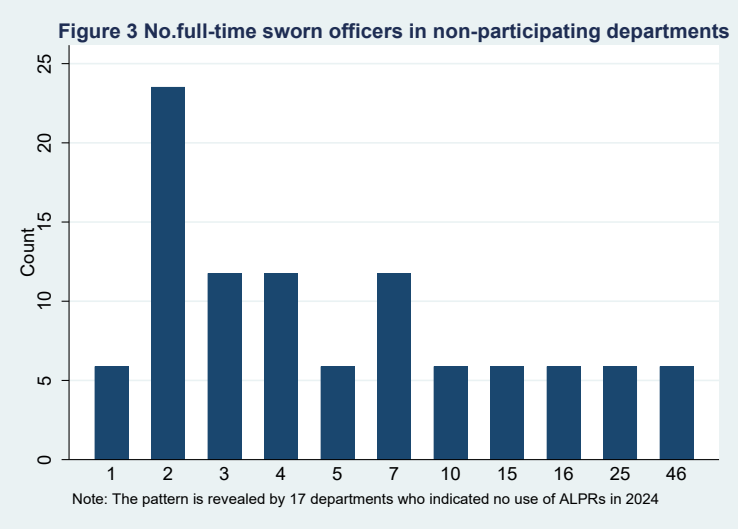


Note:the survey had 53 responses, among which 17 did not use ALPRs in 2024

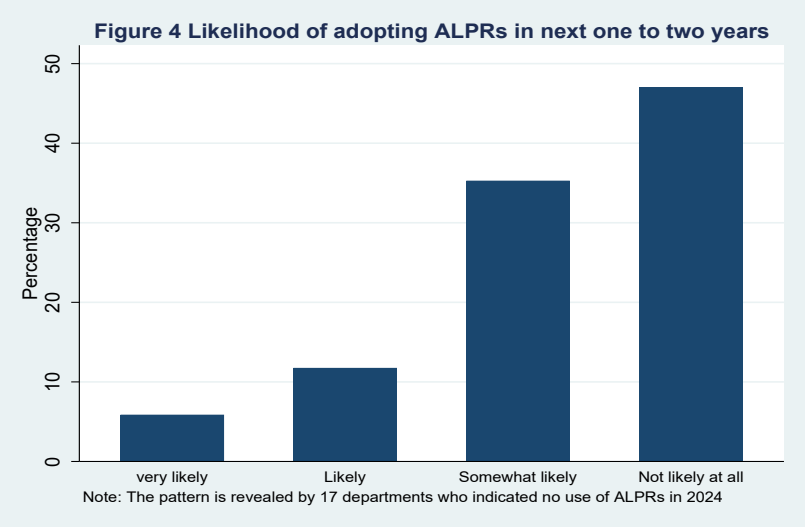
For the seventeen departments without ALPRs, the survey solicited their opinion on potential challenges. Figure 2 lists eight primary barriers: ranging from internal priority, affordability, personnel learning and use, privacy concerns, to technological access, official disapproval, citizen support, and other peers' unsuccessful experiences. Affordability is the biggest challenge, followed by technical access to hotlists, community support (both governmental officials' and citizen's), and agencies' priorities on other technologies and/or equipment.



A question is raised on whether affordability and technical access issues are confined to small-sized police departments. Using the number of full-time sworn officers as a proxy for department sizes, Figure 3 shows the profiles of non-participating departments. The number of full-time officers hired by non-participating police departments range from one to 46, with two thirds of departments hiring less than 10. Correlation analyses show no significant relation between departmental sizes and affordability issues, nor with technical access issues. For all non-participating departments, financial strains are the primary forces hindering their use of ALPRs.



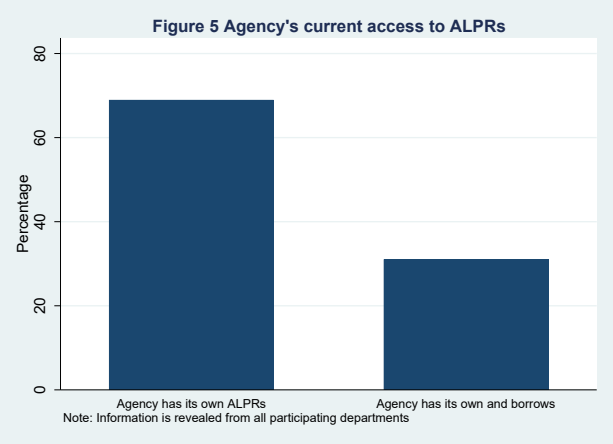
When asked about how likely it is that the department will acquire ALPRs in the next year to two, close to half (8 departments) indicated “not likely at all” and slightly over one third (6 departments) suggested “somewhat likely”, with 2 departments being “likely” and one “very likely”. Figure 4 shows the distribution of departmental plans for having ALPRs in the next year or two.



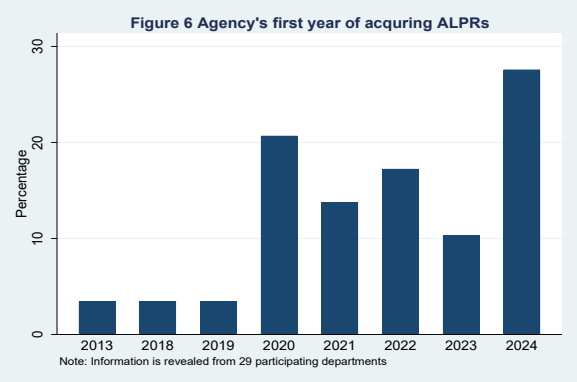
Studies show that large police departments were more likely to use ALPRs than smaller agencies (Congressional Research Service, 2024). Judged by departmental sizes, police departments in Tennessee are small and heavily constrained by affordability concerns, both regarding acquiring the units and access to the data system.

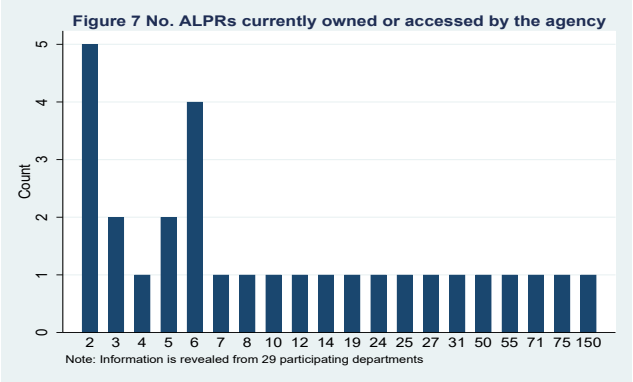
2. Embracing ALPR Technology

This section intends to map the landscape of Tennessee police departments embracing the ALPR units. Figure 5 shows that twenty police departments currently have their own units, while nine departments have both owned and loaned units. No departments depended fully on loaned units.



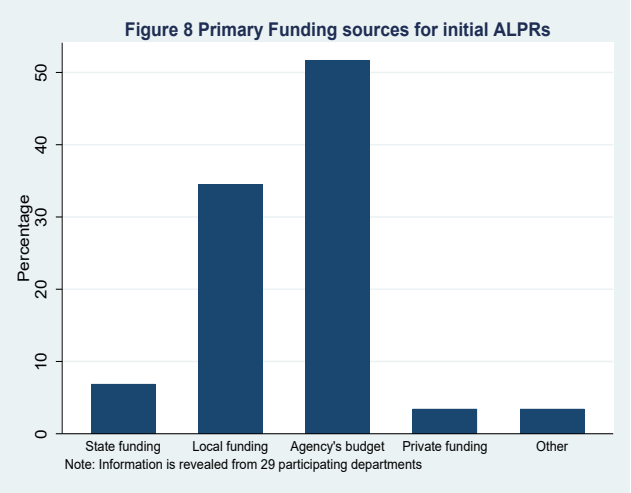
Among all respondents (Figure 6), the earliest year for having ALPR units dated back to 2013, and the momentum did not take off until the year 2020, when six police departments acquired ALPR units. During the past five years, more police departments embraced ALPRs. Examining the number of currently owned units (Figure 7), police departments have made some progress. Seventeen departments owned less than ten ALPRs units, and nine departments owned more than twenty units, with wide variations spreading across departments.

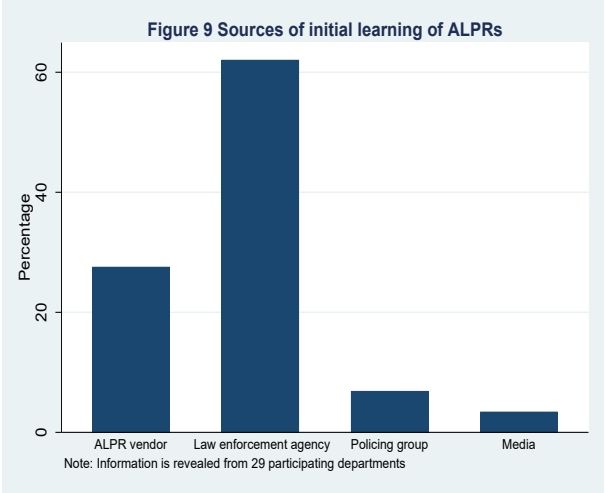




Police departments were asked about their funding sources for initial ALPR units as well as information sources. Figure 8 presents the pattern of funding sources. Less than 10 percent used state funding for the units. The two most important funding sources for ALPR units were from agencies' own budget and local jurisdiction funding. While departments tend to use their own funding, it is probable that some of their funding comes from federal support or other sources. When it comes to information sources for initial learning, 60 percent of police departments learned about ALPRs from other law enforcement agencies, and 20 percent

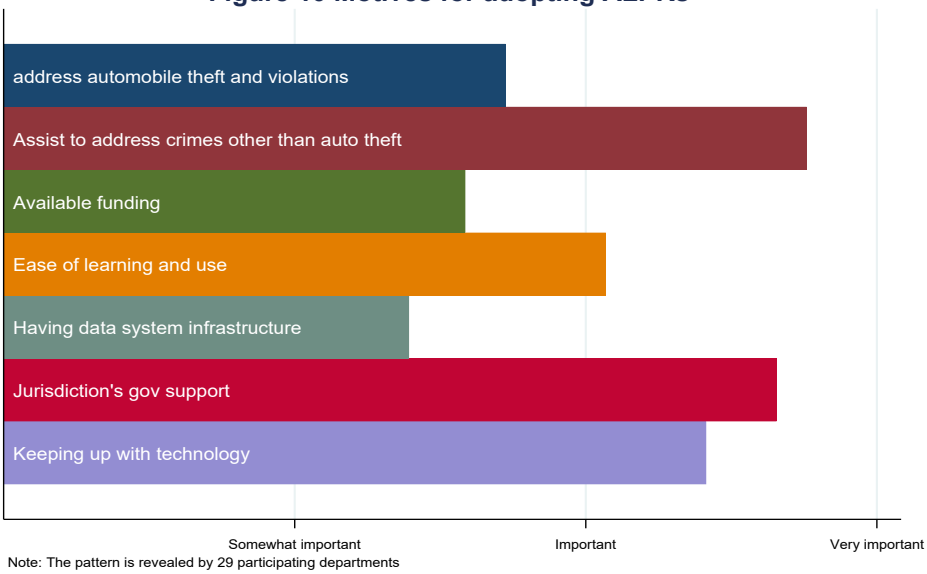
secured information from ALPR vendors. It is likely that their learning was filtered through other channels, the survey nevertheless did not show much nuance.





Tennessee police departments reported a wide variety of motives behind their initial adoption of ALPRs, ranging from the need to address car theft, available funding, to ease of learning and using the technology, having data/system infrastructure, and jurisdiction's government support. Figure 10 presents a graph for understanding different motives and highlighting their strengths, respectively. Being able to assist agencies to address other crimes besides automobile theft was ranked highest in its importance to adopt ALPRs, followed by jurisdiction's government support and the need to keep up with technology.

Figure 10 Motives for adopting ALPRs



Note: The pattern is revealed by 29 participating departments

Table 1 presents the descriptive statistics of all motives and reports general patterns from principal component analysis (PCF). PCF is a statistical method that helps to identify common dimensions and capture the most variation across different motives. Based on the analysis results, three main motives stand behind the decision to have ALPRS: practical application/needs, resource availability and jurisdiction's government support. The findings resonate well with the previous statement that the adoption of APLRs was locally driven, contingent mostly upon local needs of crime deterrence, local funding availability and local government support.

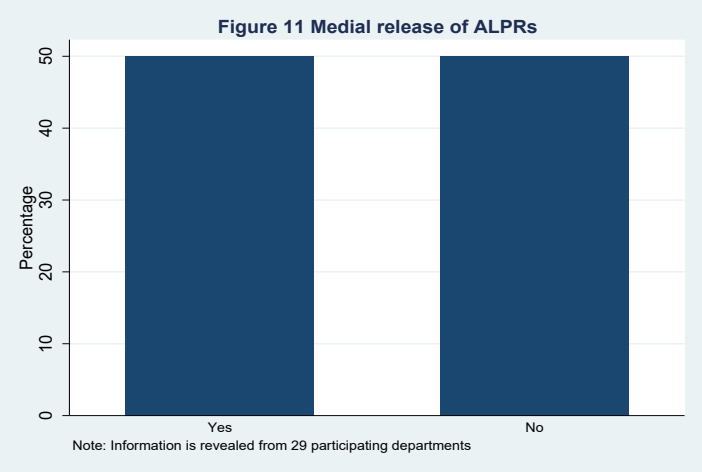
Table 1 Motives for adopting ALPRs and dimensions

Motives	Mean	Std. Dev.	Dimension		
			Practical application/needs	Resource availability	Juri's gov support
Need to address car theft and violations	2.72	1.00	.54		
Addressing other crimes besides car theft	3.76	.51	.85		
Important to keep up with the latest law enforcement technology	3.41	.87	.84		

Availability of funding from a grant or other external sources	2.59	1.15		.79	
Ease of learning and using the technology	3.07	.92		.70	
Had data systems infrastructure to use ALPRs	2.39	1.20		.71	
Support from jurisdiction's government officials	3.66	.48			.95

Note: PCF analysis, with varimax rotation.

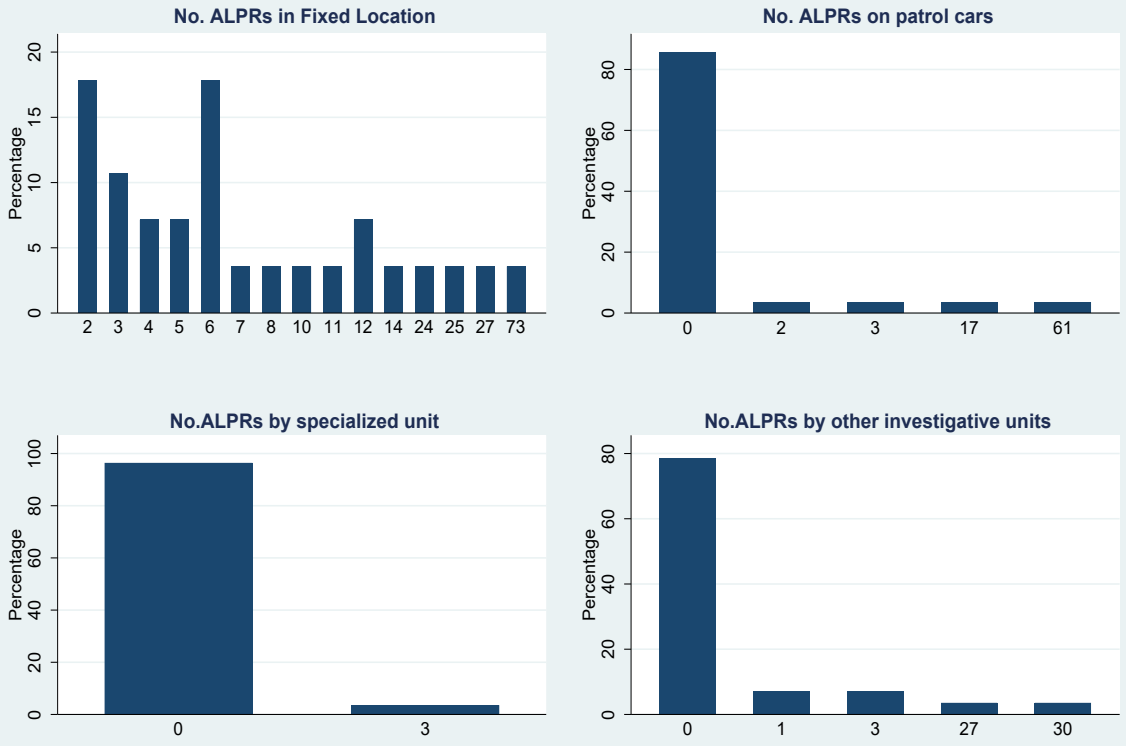
Given that the adoption of ALPRs was locally driven, the news media had not been widely used to publicize the acquisition and use of ALPRs. Only half of the police departments had press release regarding this issue.



3. Deployment and use of ALPRs

Once police departments secured ALPR units, the deployment pattern remains to be investigated. Figure 12 presents the percentages of ALPRs deployed in different ways on a typical day. Over 90 percent of ALPRs have been deployed in fixed locations. A few agencies mounted units on patrol cars for general services and among those few, the numbers of ALPRs changed substantially, ranging from two to sixty-one. Less than 5 percent of ALPRs were deployed by specialized units and not many were deployed by investigative units. For Tennessee police departments, ALPRs have primarily been deployed in fixed locations.

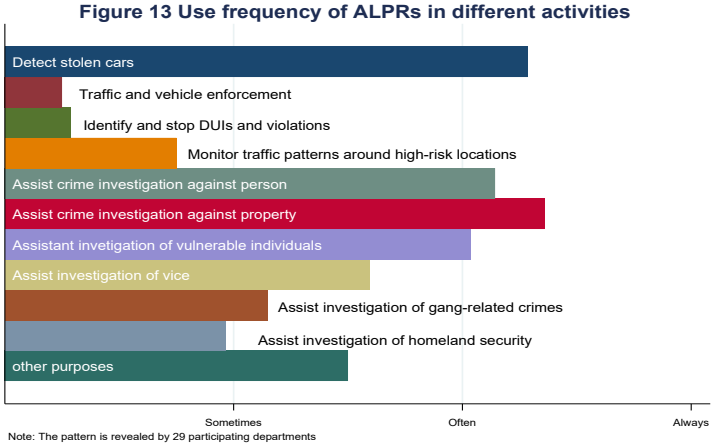
Figure 12 Common deployment of ALPRs



Note: Information is revealed from 29 participating departments

More than just locations, police departments were asked how often ALPRs were deployed in a wide variety of activities. Figure 13 maps the deployment frequency of ALPRs. ALPRs have been very frequently deployed to detect stolen vehicles. Also, high deployment frequency has been manifested on assisting with specific investigations of crimes against property (e.g. burglary, theft, fraud, property destruction), against persons (i.e. homicide, robbery, assaults) as well as on investigation of vulnerable individuals such as juvenile, runaways, missing persons, mentally ill and elderly. ALPRs have not been widely deployed for traffic enforcement or voilations. Also, ALPRs seemed to be mainly deployed for local challenges rather than federal concerns such as homeland security.

Figure 13 Use frequency of ALPRs in different activities



Note: The pattern is revealed by 29 participating departments

Efforts are made to further analyze the main dimensions of ALPR deployment. Table 2 presents descriptive statistics of deployment frequencies and their main clustering effects. Using varimax rotation, three deployment dimensions stand out: specialized activities, local crimes (stolen cars, crimes against person, property or vulnerable individuals), and traffic management. The most salient deployment pattern seems to be on investigating local crimes.

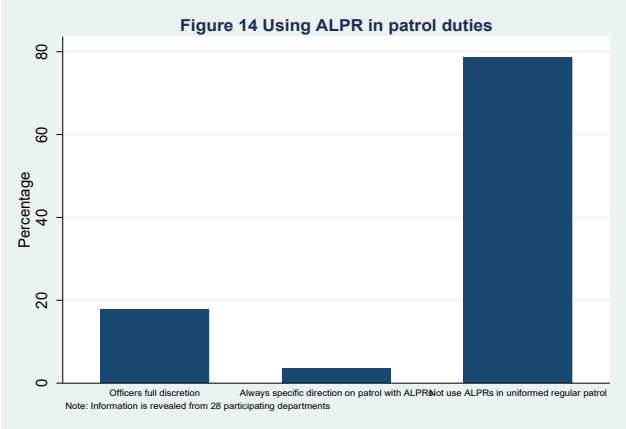
Table 2 Deployment frequency of ALPR units in police departments

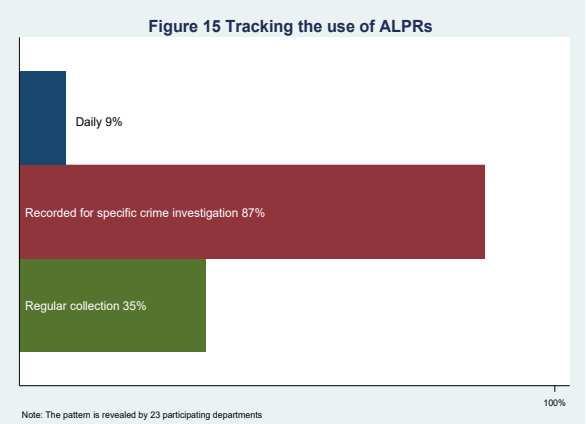
Use frequencies	Mean	Std. Dev.	Dimension		
			Specialized activities	Local crime investigation	Traffic control managemt
Detect stolen automobiles	3.29	.81		.61	
Conduct traffic enforcement	1.25	.52			.95
Identify and stop DUIs and violation	1.29	.53			.92
Monitor traffic patterns around high-risk locations	1.75	.89		.70	
Assist with investigations of crime against persons	3.14	.76		.71	
Assist with investigations of crime against property	3.36	.62		.75	
Assist with investigations of vulnerable individuals	3.04	.96		.60	
Assist with investigations of vice	2.59	.97	.53		

Assist with investigations of gang-related crimes	2.15	.99	.57		
Assist with investigations of homeland security	1.96	.98	.90		
Used for purposes other than listed above.	1.5	1.07	.88		

Note: PCF analysis, with varimax rotation.

Some ALPR units had been mounted on patrol cars for general services. Police departments were surveyed on their discretional uses. Figure 14 shows that less than 20 percent of agencies grant their officers full discretion and 80 percent did not use ALPRs in uniformed regular patrol. The finding is consistent with the previous statement that the majority of ALPRs were deployed in fixed locations.

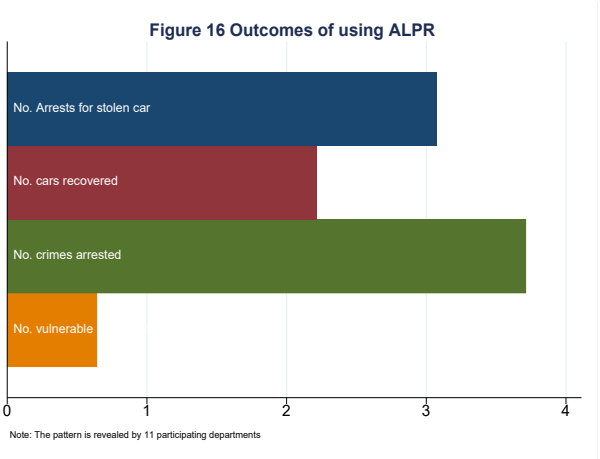




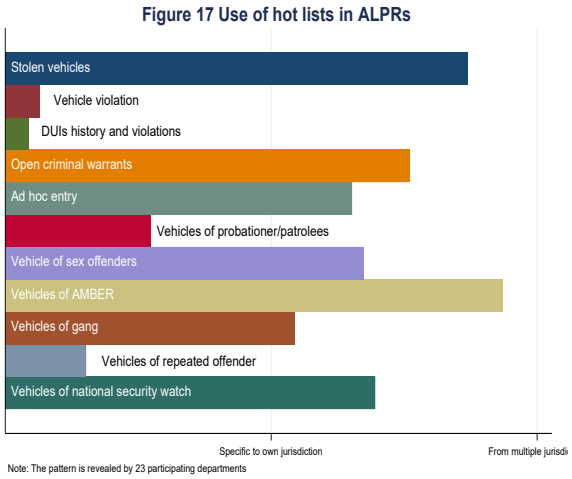
Police departments were surveyed on whether or not they track ALPR deployment. Only 9 percent recorded information on daily ALPR deployment. When ALPR were deployed for a specific criminal investation, 87 percent of agencies records such uses. Roughly 35 percent agencies regularly collected performnce measures associated with ALPR deployments.

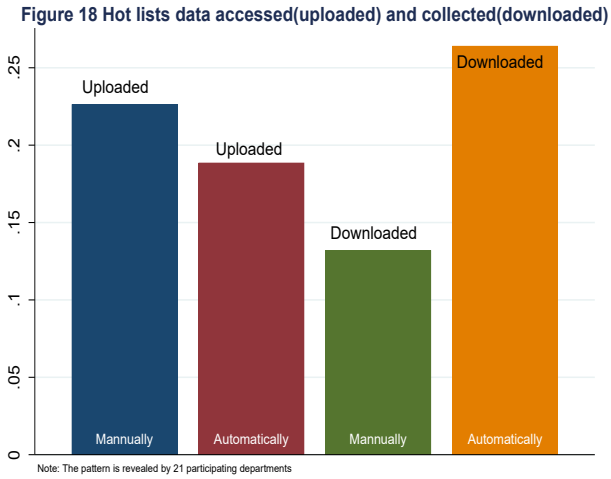
Police departments were asked to provide statistics from using ALPRs. Only a few responded. Figure 16 shows the pattern. Among 11 departments, the average number of arrests made for stolen cars due directly to ALPR were 3, ranging from 2 to 9. Approximately 3 stolen automobiles were recovered because of ALPR uses. On average, 5 arrests for crimes other

than auto theft or violations were reported. Roughly two vulnerable persons cases were solved thanks to ALPRs.

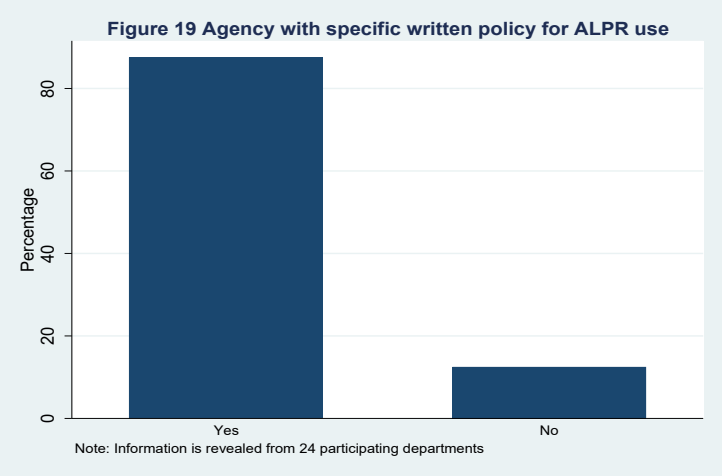


It is essential for ALPRs to have access to hotlists. Figure 17 examines their access patterns. Ideally, access from multiple jurisdiction hotlists would be preferrable to access from its own jurisdictions. However, access is not guaranteed. In cases of stolen vehicles and AMBER alerts most departments have access to multiple jurisdiction hotlists. Departments often have some access to multijurisdictional hotlists when cases were about vehicles registered with open criminal warrants, or vehicles of gang members, sex offenders, and those under national security watch. Departments could have access to data entered on an ad hoc basis by law enforcement officials. For vehicle violations, DUIs, repeated offenders, and vehicles of probationers, police departments tended not to use hotlists, possibly due to those being primarily local issues.



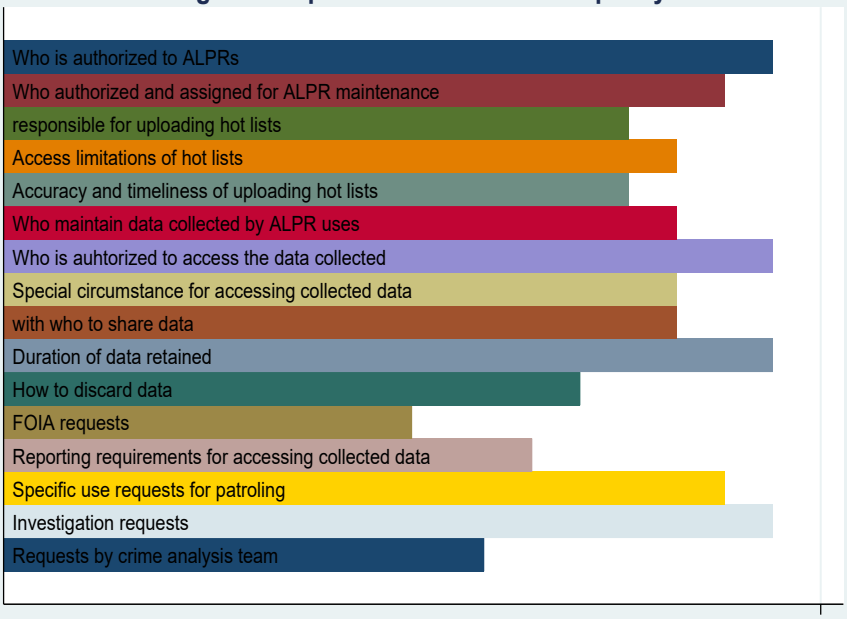


Regardless of their specific uses, police departments are essential partners of hotlists, contributing to and benefiting from the data infrastructure. Figure 18 shows how each police department uploads and downloads data from hotlists. Slightly over 20 percent of departments upload information manually and less than 20 percent were able to upload automatically. Fifteen percent of departments downloaded information manually, and over 25 percent downloaded automatically. Automation, either uploading or downloading, enhances efficiency. For Tennessee police departments, investment in information systems may be warranted for more effectiveness.



Most police departments have developed specific written policies for ALPR use. Figure 19 shows that 21 out of 24 police departments had written policies. Further inquiries revealed the specific content of those policies (Figure 20). Departments tend to have more written policies on assignments of ALPR units, data access and duration, and various special requests. Slightly over half of respondents have written policies on FOIA requests or requests by crime analysis team. Based on the findings, it shows that the majority of responding departments have some specific policies to regulate ALPR deployments and uses.

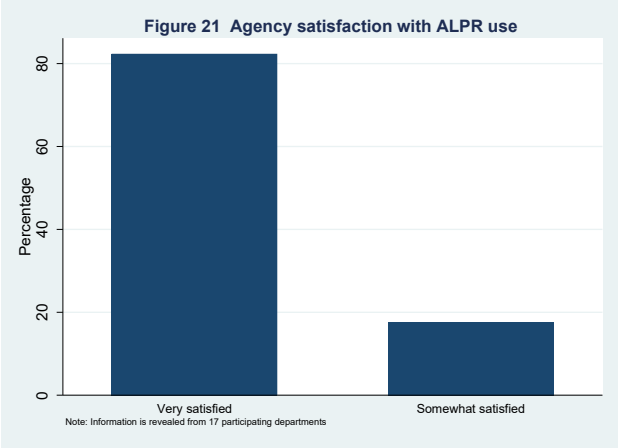
Figure 20 Specific content of ALPR policy

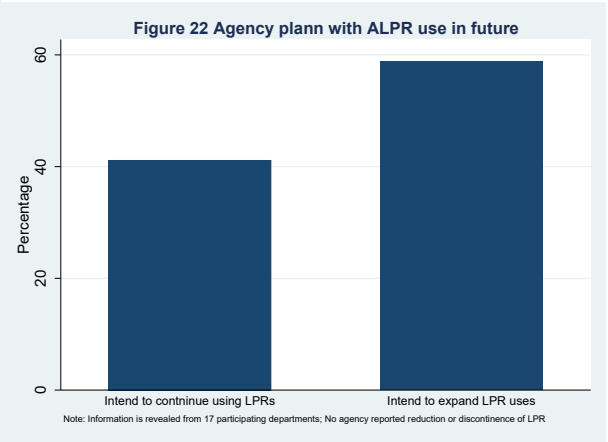


Note: The pattern is revealed by 17 participating departments

The survey further checked on the duration of data being stored. Out of 16 responses, half indicated one month duration, and a quarter suggested three months, with a few others being variable or even on an indefinite basis. When asked about the frequency of ALPR data being discarded, slightly over half also indicated one month duration, with a few being either quarterly or annually. Regarding FOIA requests, only two departments indicated that they restrict the release of ALPR data, the same manner as is for Criminal Justice Information Services (CJIS). Others either had not accommodated data requests or referred the requesters to vendors who maintain the information.

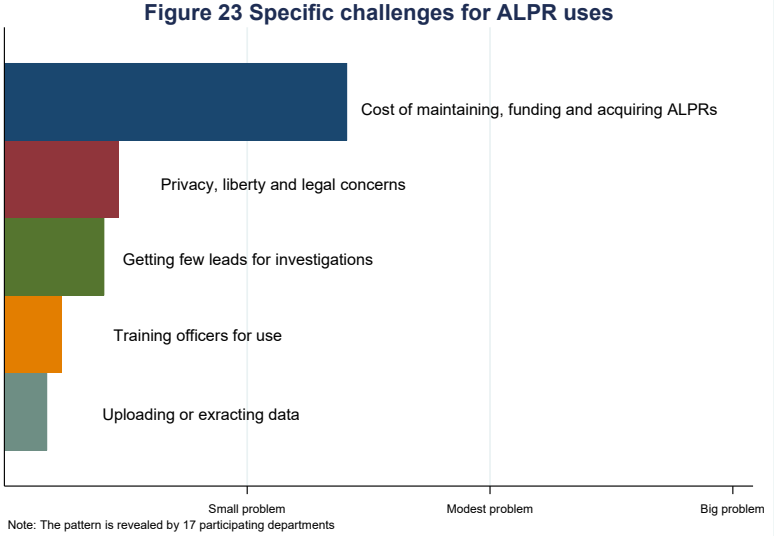
In general, police departments are satisfied with ALPRs, with 82 percent indicating very satisfied and 18 percent “somewhat satisfied.” No agency expressed dissatisfaction with ALPR. Given their high satisfaction levels, it is not surprising that police departments either intended to continue to use what they have or expand ALPR uses. Indeed, 59 percent of agencies intend to expand ALPR usage.





Reporting high satisfaction and expansion plans do not mean that police departments will not have challenges moving forward. The survey attempted to identify those potential challenges. Figure 23 presents the list of issues agencies had in using ALPR. It is noticeable that all responding departments framed these as small or at most modest problems, resonating well with their high satisfaction levels. Also, it echoes prior finding that the cost of maintaining, funding, and acquiring ALPR is a concern, even for those agencies who already have the units in use. Further examination shows a wide variation in departmental sizes, measured by the number of full-time sworn in officers currently employed. Within responding departments, 22 percent had less than 10 full-time sworn in officers, and 30 percent had between 11 and 23, with only two departments hiring over 100 police officers (108 and 473 respectively). Further analyses show that large departments tend to see bigger challenges in both training their personnel and getting leads for an investigation. Other challenges seem to be widely shared among all responding units.

Figure 23 Specific challenges for ALPR uses



Note: The pattern is revealed by 17 participating departments

4. Conclusion

This survey presents a snapshot picture of adopting and using ALPRs in police departments in the state of Tennessee. The majority of participants are small- and medium-sized police departments, who just started the journey. The findings revealed a few highlights:

- Tennessee police departments have been acitvely pursuing the adoption of ALPRs and adopters have shown high satisifaction with the technology. The main motives for using ALPRs aim to meet with local needs for law enforcement and crime reduction. Local government support has been strong. Challenges are mainly on the lack of funding either to start the journey or to maintan the units and expand its uses.
- The functions of ALPRs have moved beyond the primary use for detecting and recovering stolen vehicles or vehicle-related crimes. While the majority of ALPR units are mounted in fixed locations, it is trendy to deploy such units in more mobile fashion. ALPRs have been extensively deployed to assist investigations of various crimes, ranging from crime against persons, property, to gang-related crime or homeland security issues. The spectrum of ALPR deployments and uses have been expanding over the time.
- ALPR uses have been tracked to varying degrees depending on their functions. Tracking daily deployment has been limited whereas tracking the deployment for specific crime

investigations have been high. Roughly one third of departments collect performance measures on the numbers of cars stolen, recovered, or of persons arrested or helped.

- Most police departments have developed specific policies for ALPR uses, ranging from assignments, data access and duration, to FOIA or other requests for patrolling or investation. Wide variation exists on adoption (or lack thereof) of different policies as well as on varying practices of specific policies.

Tennessee police departments have made progress regarding adopting and using ALPRs. Echoing the national trend, this new technology in policing has gained strong momentum and it is anticipated that more ALPR units will be secured and deployed in Tennessee.

This survey also reveals some concerns that may demand policy attention. First, the performance measures collected by police departments are mainly on the efficiency index of this new technology. Police departments have been focused on collecting such data as deployment frequencies for different functions or by different units as well as data use with hotlists. Yet, to what extent ALPR use results in crime reduction and prevention requires more assessment. This question has practical implications, particularly given resource scarcity in small- and medium-sized police departments in Tennessee.

Two early randomized experiments have shown that ALPR deployments result in more scans, more arrests and more stolen vehicle recoveries, but demonstrate no positive effects on crime reduction and prevention relative to manual checking (Koper et al., 2013; Lum et al., 2011). This likely suggests that no one-size-fits-all approach works universally and best practices for ALPR uses need to be further tailored to different functions and different contexts (Koper et al., 2019; Lum et al., 2010). Police departments may also need to conduct impact assessments to further the effectiveness of ALPR deployments and uses.

Second, there is an emerging concern about privacy and liberty from ALPR uses, though most departments perceive that to be a minor problem. Yet, it touches on policing legitimacy and public trust (Merola et al., 2019). Only half of police departments had press releases on the acquisition and use of ALPRs. Further communication and consultation with local communities may be needed to enhance the effectiveness of general policing and build up more trust and legitimacy.

As is often the case with adopting new policing technology, ALPR deployments and uses have been well recognized and embraced by police departments in the state of Tennessee. New practices for its use have been constantly explored and new polices are being developed to test

their strengths and weaknesses. There are promises to be fulfilled and Tennessee police departments are at the frontline to deliver them.

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