LICENSE PLATE READER (LPR) SYSTEMS:
SURVEY OF POLICE USE OF LPR

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1. Introduction

As police innovation continues to unfold, technological advancements such as the use of body-worn cameras and License Plate Readers (LPR) have become more widespread. However, this increase exists alongside growing scrutiny of their use, namely surrounding issues of privacy and public trust. LPR, in particular, has garnered significant public attention. The technology operates by using high-speed cameras to capture the license plates of passing vehicles and software that saves information such as the location, date, and time of capture, then cross-checks that data with police databases that contain license plates of interest. This technology is able to capture hundreds of reads in just minutes, and some LPR systems store large amounts of data that police departments have access to. Although research is sparse, there is some evidence that suggests LPR use is effective at preventing crime.[1] However, police must navigate a balance between protecting the privacy of community members and ethical use of the technology versus the benefits LPR provide for public safety. Thus, it is important to find ways in which law enforcement agencies can leverage the benefits of LPR for public safety while protecting individuals' privacy rights and maintaining or improving public trust.

In order to reassess and expand upon the scope of current LPR implementation, deployment, and operational usage among law enforcement agencies throughout the United States, the International Association of Chiefs of Police (IACP) conducted a survey of police LPR. The survey was created with input from a group of subject-matter experts and police practitioners drawn from the IACP's membership. Distributed with cooperation from the State Associations of Chiefs of Police (SACOP) in late 2020, the survey yielded 1,237 agency respondents. Additionally, a focus group of a subset of the agencies surveyed was held in 2021 with more than 40 law enforcement officers, including department leaders. The results of the survey indicated various patterns of LPR use, and the focus group provided clarity in interpreting those results.

Throughout this report, a prior survey conducted by the IACP in 2009 is referenced for comparison.[2] The current survey, however, is a separate and independent effort from that survey and was not conducted with the same methods or the same level of rigor as the 2009 survey. Thus, any comparisons drawn should be interpreted only as approximations. This report builds on previous research and aims at firstly, understanding the practical challenges police face

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[1] See Taylor, B., Koper, C. S. & Woods, D. J. (2011a). Combating auto theft in Arizona: A randomized experiment with license plate recognition technology. Final report to the National Institute of Justice, U.S. Department of Justice. Washington, DC: Police Executive Research Forum ; Taylor, B., Koper, C. S., & Woods, D. J. (2012). Combating auto theft in Arizona: a randomized experiment with license plate recognition technology. Criminal Justice Review, 37(1), 24–50 ; Koper, Christopher S., Bruce G. Taylor, and Daniel J. Woods. 2013. "A Randomized Test of Initial and Residual Deterrence from Directed Patrol and Use of License Plate Readers at Crime Hot Spots." Journal of Experimental Criminology 9(2): 213-244.

[2] See David J. Roberts and Meghann Casanova, *Automated License Plate Recognition (ALPR) Systems: Police and Operational Guidance for Law Enforcement*, Washington, D.C.: U.S. Department of Justice, National Institute of Justice, 2012, https://www.theiacp.org/sites/default/files/IACP_ALPR_Policy_Operational_Guidance.pdf.

in implementing and managing technology; secondly, developing policy recommendations for LPR use; and finally, empowering police leaders to use LPR and other technology effectively and ethically.

2. Results

The survey consisted of 35 questions addressing usage and type of LPR systems, agency policy, and data retention and management. Respondents also had the opportunity to add comments to their answers to provide more context to their responses.

2.1   Respondent Demographics

Although respondents were not sampled randomly and should not be interpreted as a representative sample, the demographic composition of agencies included in this survey closely mirrors that of police agencies in the United States, with the exception of sheriffs' offices,[3] shown in Table 1. The current survey was completed by 1,237 law enforcement agencies in 39 states. Local/municipal agencies were slightly over-represented in this survey, as were mid-sized agencies. Small agencies of less than 50 officers – which make up most police agencies in the United States – were slightly under-represented. Some degree of self-selection bias may be present in the agencies that chose to participate in this survey.

Table 1: Respondent Demographics

	Police Agency US Population[4] (N=17,442)	Survey Respondents (N = 1,088)[5]
Agency Type		
Local/Municipal	72.78%	88.89%
Sheriff/County	17.58%	2.5%
College/University	3.77%	4.67%
State	2.86%	3.64%
Other	1.76%	0.47%
Tribal	1.01%	0.19%
Federal	0.24%	-

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[3] Although sheriffs' offices are eligible to join policing associations, sheriffs' offices may be underrepresented here because of the distribution methods used, which focused on police organizations.

[4] United States Department of Justice, Office of Justice Programs, Bureau of Justice Statistics Law Enforcement Agency Roster (2016) ; Federal Bureau of Investigation, Crime in the United States, 2019: Police Employee Data, https://ucr.fbi.gov/crime-in-the-u.s/2019/crime-in-the-u.s.-2019/topic-pages/police-employee-data.

[5] Although 1,237 surveys were returned, only 1,088 provided information on the size of their agency; 149 respondents elected not to disclose this information.

	Police Agency US Population[4] (N=17,442)	Survey Respondents (N = 1,088)[5]
Agency Size		
Small (0-49)	86.09%	75.64%
Medium (50-999)	13.35%	23.81%
Large (1000+)	0.57%	0.55%
Population Served		
Less than 25,000	67.86%	69.00%
25,000 - 49,999	7.47%	14.00%
50,000 - 99,999	4.11%	9.00%
100,000 - 249,999	1.86%	3.00%
250,000 - 499,999	0.46%	1.00%
500,000 - 999,999	0.2%	1.00%
1 million or more	0.1%	1.47%

2.2   LPR Use

Of the responding agencies, 40% reported that they currently use an LPR system, while 52% reported that they had never used an LPR system (the remaining 8% reported that they had used an LPR system in the past but were no longer using it). This is a large increase compared to results from a survey IACP conducted in 2009 that reported only 23% of agencies surveyed were using LPR. Consistent with the 2009 survey, the current survey indicated that larger agencies
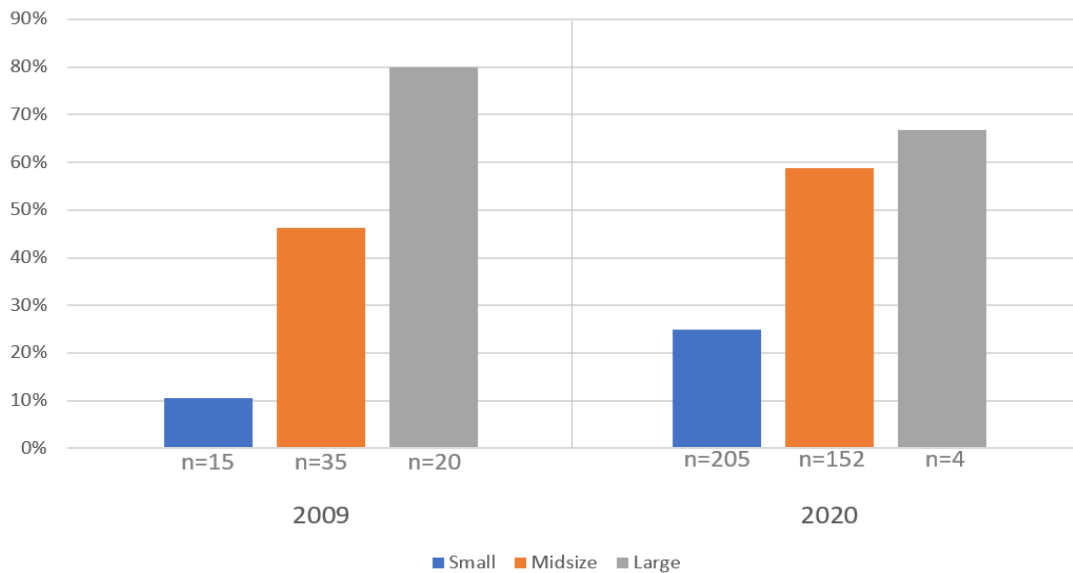

Figure 1: LPR Use by Agency Size, 2009 to 2020

were more likely to use an LPR system than were smaller agencies, although the disparity has decreased, shown in Figure 1.[6] The current survey also identified that state agencies were more likely to report using an LPR system than were other types of agencies.

Most (86%) agencies using LPR systems reported fewer than 10 deployable units. Vehicle-mounted and stationary/fixed units were most common, while portable units mounted on something other than a vehicle were less common. Most (74%) agencies using an LPR had been using the LPR system for somewhere between one and 10 years. Of the respondents who said they were not currently using LPR systems, cost of acquisition was the biggest reason they cited for not using the technology (illustrated in Figure 2), and this was especially true among small agencies.

The current survey did not ask specifically for examples of how LPR is used. However, the focus group identified three main purposes: investigations, crime prevention, and traffic/parking enforcement. These results loosely align with the results of the 2009 survey which indicated recovering stolen vehicles, traffic enforcement, and investigations as the most common purposes of LPR.[7] This topic was identified as an area for further exploration (See Section 4).
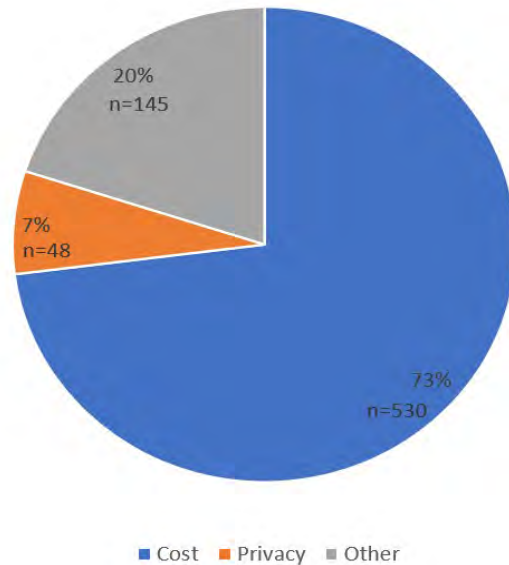

Figure 2: Barriers to LPR Use

Interestingly, most agencies using LPR systems participated in shared usage arrangements with other agencies, though the specifics of these arrangements varied. Approximately 80% of respondents reported sharing data in 2020, compared to only 40% in 2009.[8] These survey results led to some obscurity in who owns the LPR systems and the data gathered from them and who has authority to control the systems and the data gathered from them. The focus group participants distinguished between sharing *systems* and sharing *data* from those systems; data access to a single system was often much wider than that of the agency who owned or controlled the system. This area is changing and developing as technology continues to advance.

Regarding access to the databases, 69% of agencies reported that all employees needed a specific purpose in order to access or search the LPR database. Another 22% of respondents

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[6] David J. Roberts and Meghann Casanova, *Automated License Plate Recognition (ALPR) Systems: Police and Operational Guidance for Law Enforcement*, Washington, D.C.: U.S. Department of Justice, National Institute of Justice, 2012, https://www.theiacp.org/sites/default/files/IACP_ALPR_Policy_Operational_Guidance.pdf.

[7] Roberts & Casanova, *ALPR Systems: Police and Operational Guidance for Law Enforcement*.

[8] Roberts & Casanova, *ALPR Systems: Police and Operational Guidance for Law Enforcement*.

reported that a limited group of employees could access the database without a specific purpose, but other employees needed justification or could not access it at all. Nine percent reported that no specific purpose was required to access the database for any employee. In some cases where agencies shared systems, agency employees could access the system, but the information returned was limited, and additional approval was needed to obtain further data. Thus, system-sharing or data-sharing agreements make the options for data access more complex.

Users of the LPR system were trained in 88% of responding agencies using LPR. Generally, training focused on technical aspects of the system and how to use. In the other 12% of responding agencies, training was not required to use the system. Although many survey participants indicated that training was required to use the system, discussion in the focus group uncovered that these trainings tended to be vendor-run, short in duration, and only issued before initial access to the system without recurring refresher training.
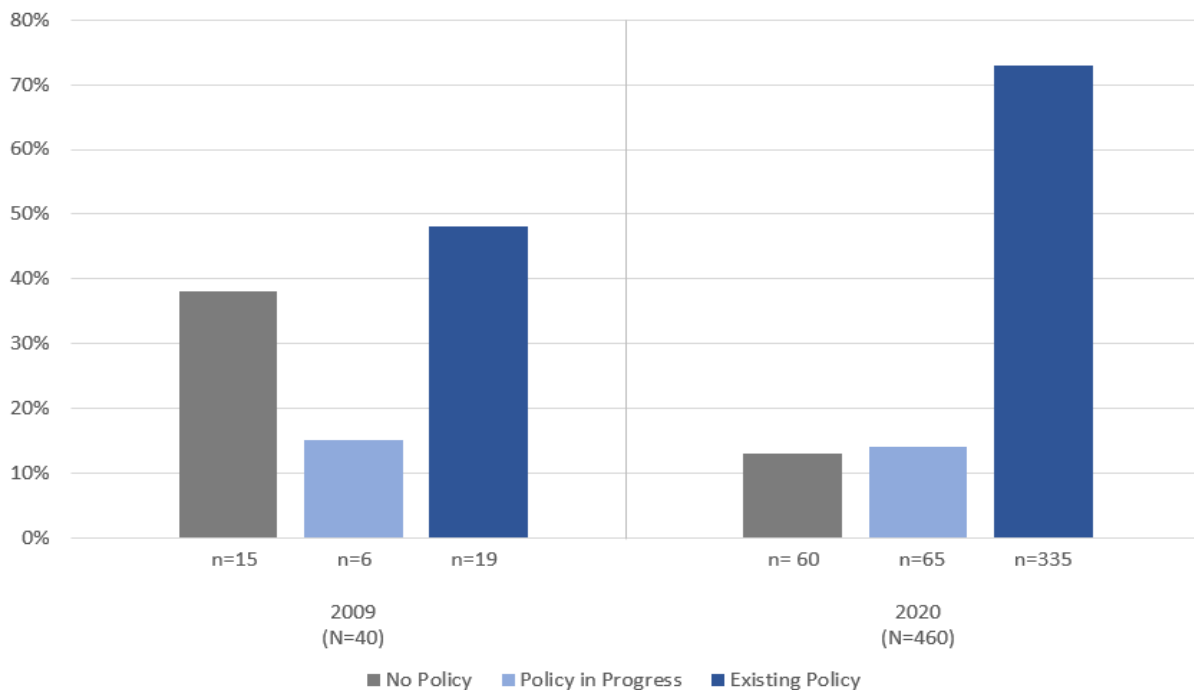

Figure 3: Prevalence of Agency LPR Policy

2.3   Policy

Among respondents using an LPR system, 77% had a policy in existence, and another 14% were developing a policy for their agency, shown in Figure 3. This is an increase from 2009 when only 48% of agencies using LPR had a policy, and 15% were in the process of developing a policy.[9] The current survey indicated agency policies were influenced by state and/or local legislation, vendor

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[9] Roberts & Casanova, *ALPR Systems: Police and Operational Guidance for Law Enforcement*.

recommendations, and legal guidance. Of those agencies that had a policy in place or in development, 73% of agency policies specified data retention conditions, while 12% referenced a separate government data retention policy, and 15% did not specifically include data retention periods in their policy. Most (63%) specified guidance for maintaining hotlists, and most (62%) also included a statement on motorists' privacy.[10] Most of the 13% of responding agencies who did not have a policy participated in a shared LPR system such that another agency owned the system and set policy.
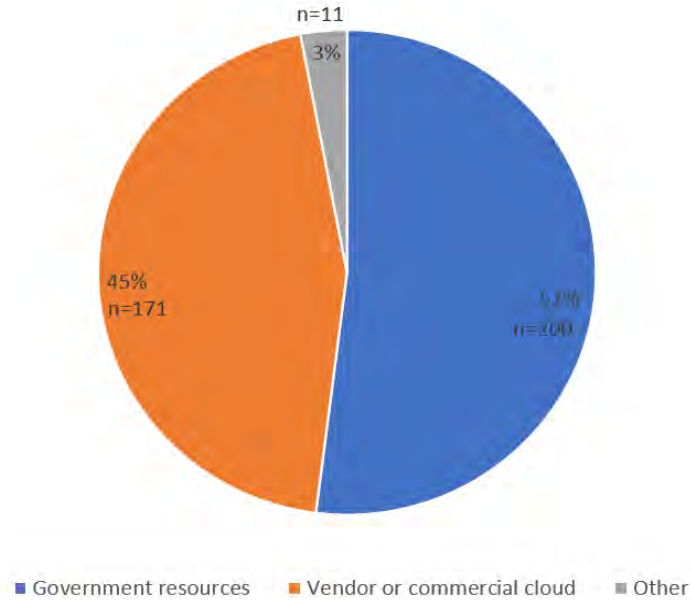

Figure 4: Data Storage Locations

2.4   Data Management

Questions on data management showed a high non-response rate, with approximately one-third of responses in this section left blank. It is possible that respondents were not comfortable sharing their data management practices. However, it may be more likely that respondents did not know the specific details of their agency's data management practices and so chose to leave these questions unanswered. As many agencies share LPR systems with other agencies, this may further complicate data management. If, for example, the responding agency used an LPR system owned by another agency, the respondent may not have had complete knowledge of the system's data management policies.

The survey asked about data retention periods and provided an ordinal scale for response, along with an option indicating that no retention period was specified in their policy. Across all data types specified in the survey, the most frequent answer was that the agency had no specific data retention policy. This was the case in approximately 25% of responding agencies, compared to the 52% who had no data retention policy in 2009.[11] However, during the focus group, some participants clarified that the laws of their state specified LPR data retention periods, and thus, their agency policy did not. Of those that did specify retention periods in the current survey, 31-90 days was the most common duration (similar to the 2009 survey which indicated common

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[10] Further, only 5% (n=20) of agencies using LPR had a publicly published Privacy Impact Assessment.

[11] David J. Roberts and Meghann Casanova, *Automated License Plate Recognition (ALPR) Systems: Police and Operational Guidance for Law Enforcement*, Washington, D.C.: U.S. Department of Justice, National Institute of Justice, 2012, https://www.theiacp.org/sites/default/files/IACP_ALPR_Policy_Operational_Guidance.pdf.

retention periods of 90 days to six months[12]). Moreover, 75% of agencies in the current survey noted that their agency allowed for retention beyond the specified period for alerts associated with a criminal incident.

More than half (52%) of agencies stored their data on government resources, while slightly less than half (45%) stored their data on a cloud, and 3% indicated some other method of data storage such as a hybrid approach (depicted in Figure 4).

Responding agencies were also asked about the frequency at which they audit their LPR databases. The majority of agencies (56%) reported that they did not perform regular audits of their LPR programs. Among those who did conduct regular audits, they were most often performed on an annual or quarterly basis. This data is shown in Figure 6. Similarly, 87% of respondents reported that they were not required to regularly run statistical reports of the system.

3. Implications

Recent advancements in technology have allowed for capabilities that were previously thought to be impossible. Technology has helped make work more effective and society more efficient. Yet, the increased reliance on technology also poses increased concerns about individuals' privacy. In the case of LPR, police may have access to large amounts of data with the potential to be mis-used, conflicting with Constitutional rights to privacy. Although data from LPR are generally not considered personally identifiable information to be protected,[13] community-police relations have emerged as paramount concern, making public trust imperative.

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[12] David J. Roberts and Meghann Casanova, *Automated License Plate Recognition (ALPR) Systems: Police and Operational Guidance for Law Enforcement*, Washington, D.C.: U.S. Department of Justice, National Institute of Justice, 2012, https://www.theiacp.org/sites/default/files/IACP_ALPR_Policy_Operational_Guidance.pdf.

[13] See Lauren Fash, 2019, Automated License Plate Readers: The Difficult Balance of Solving Crime and Protecting Individual Privacy. Maryland Law Review Online, 78, pp. 63-98 ; International Association of Chiefs of Police, Privacy impact assessment report for the utilization of license plate readers, September 2009, https://www.theiacp.org/sites/default/files/all/k-m/LPR_Privacy_Impact_Assessment.pdf.
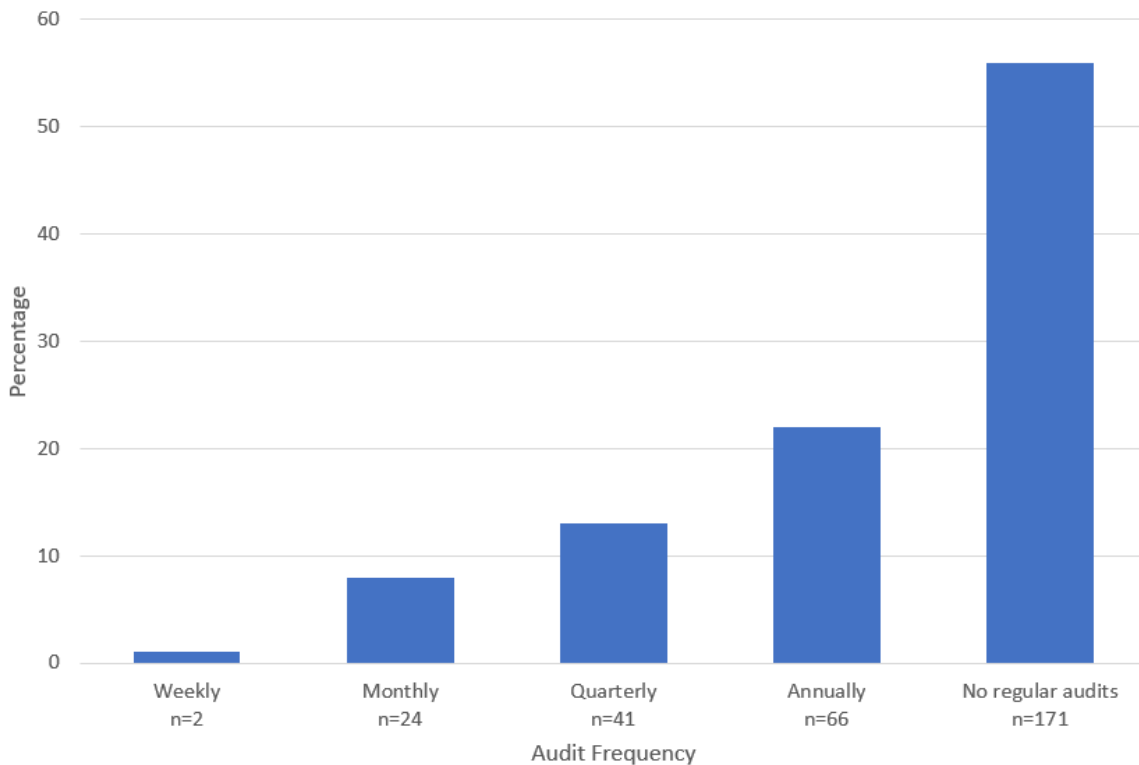
Figure 5: Audit Frequency

Lum et al. (2010)[14] assert that LPR use can be thought of as a continuum. As the use of LPR becomes more complex (more interconnected to other data sources, longer data retention periods, etc.), community concern is heightened, as shown in Figure 7. Lum et al. conducted a community survey and found that community members were generally supportive of immediate uses of LPR but believed that data should only be stored for longer periods of time if it could be helpful to solving serious crimes. Although still generally supportive of LPR, opposition toward the technology increased regarding LPR use that stored long-term data on "average" members of the community not associated with a crime. The study suggested that one way to potentially mitigate public concerns about LPR use may be to require approval or permission before LPR data can be saved.

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[14] Cynthia Lum, Linda Merola, Julie Willis, and Breanne Cave. License Plate Recognition Technology (LPR): Impact Evaluation and Community Assessment. 2010. https://cebcp.org/wp-content/evidence-based-policing/LPR_FINAL.pdf.
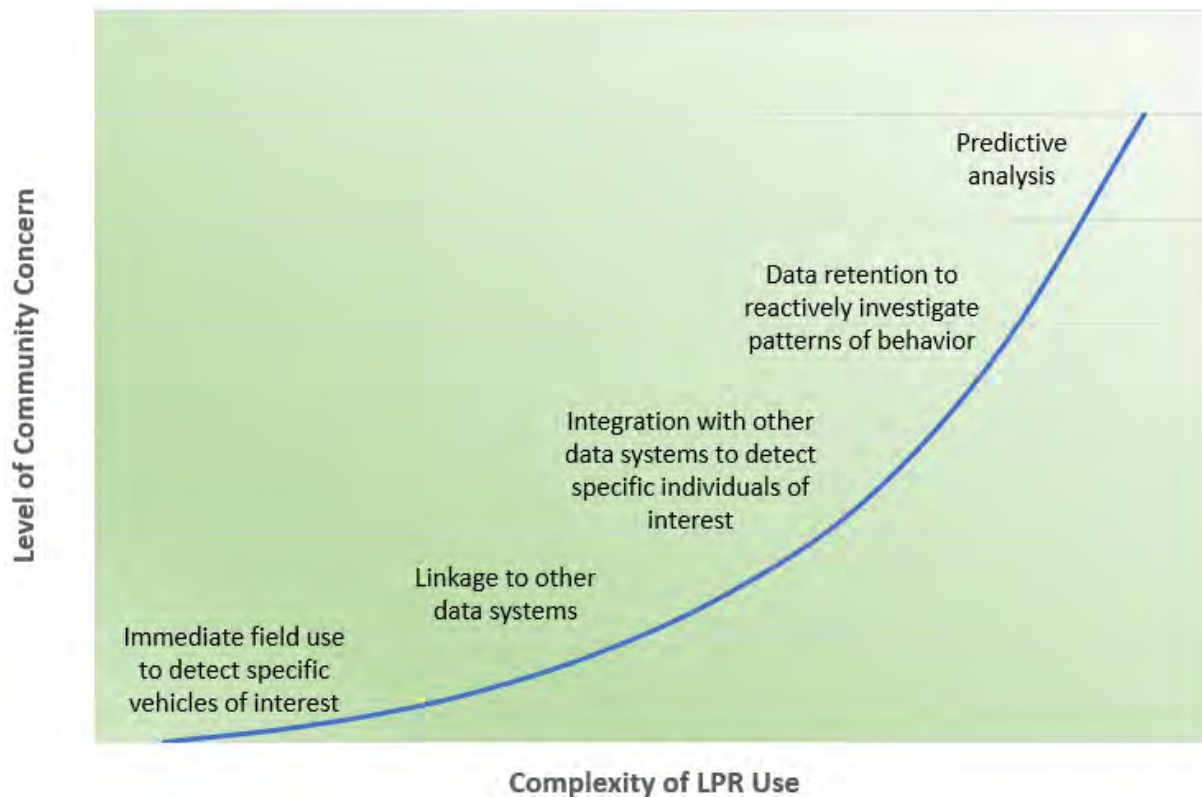
Figure 6: Level of Community Concern by Complexity of LPR Use. Adapted from Lum et al. (2010).

Public concerns over police LPR use include fear of LPR misreads, being surveilled, and computational errors. These concerns allude to the need for clear communication with the public so that the public understands exactly what information is being gathered, how it will be stored, and how it will be used. Relatedly, the focus group conducted in the current study emphasized the importance of police transparency with the community. Focus group participants suggested that community members are generally more supportive of LPR use when they understand exactly what the data collected is being used for and also what it cannot be used for. For example, before implementing an LPR program, the Redlands, CA, Police Department held a live streamed community meeting to explain how police planned to use the technology and how it would benefit the community. This strategy was so successful that local community groups agreed to help fund the Redlands Police Department's LPR program.[15]

Additional research can also help police departments gain community support for LPR use. Currently, there is very little scientific evidence supporting or refuting the effectiveness of LPR use. Rather, practitioners rely on anecdotal evidence of missing persons found and criminals

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[15] Travis Martinez, Utilizing Automated License Plate Reader Technology to Enhance Community Partnerships. California Police Chief, Spring 2019, pp. 30-31. Available at https://view.joomag.com/california-police-chief-fall-2013-cpca-2019-spring-magazine-final/0056827001557855111?short.

convicted. Systematic research may be able to demonstrate similar outcomes in a more empirical manner. Further, research could also investigate efficiency in terms of officers' time and, correspondingly, costs to the department. Measurable evidence may be helpful in gaining support of the technology from community members who are skeptical.

Police departments can conduct small-scale research studies by piloting LPR equipment before making a large investment. For example, a police department may purchase only a few cameras, initially, to test their utility and community reaction. If the department finds the technology to be helpful and is able to communicate its benefits to assuage public concerns, the program can be expanded with the purchase of additional equipment.

Auditing is also important to verify LPR systems are being used correctly and in accordance with agency policy. Creating policy is important, but it is equally important to ensure the policy is being adhered to. Regular audits can help ensure only authorized users are accessing the system and its data and only for authorized purposes. Audits can also measure program effectiveness by examining statistics and outcomes of the system's use.

> **Limitations and Directions for Future Research**
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> The responses gathered from this survey effort did not fully reflect the uses of LPR that the working group of subject-matter experts who created the survey believed to be true. Respondents to this survey represent only a small portion of the approximately 18,000 police agencies in the United States, and members of the working group were aware of several police agencies that did not respond who are using LPR innovatively and with successful outcomes. Thus, future plans include targeted outreach to agencies actively using LPR in order to compile a consolidated collection of successful use cases.

Still, for many agencies, the cost of purchasing equipment and maintaining the system poses a barrier. Nonetheless, the example presented above from the Redlands Police Department demonstrates how focusing firstly on community transparency and public support may actually lead to funding opportunities. Additionally, shared systems across agencies - as the current survey indicated is quite common - can help lower the costs for any individual agency. While LPR systems are expensive, agencies can maximize their results by sharing data with other agencies. This can be coordinated among just two agencies, or a region, or even a large data-sharing consortium. The more data that is gathered and shared, the larger the likelihood of seeing positive results, and the lower the cost to each participating agency.

Police departments operating an LPR program or thinking about one in the future should consider these implications and incorporate them into training. The current study indicated that many agencies did not require training specific to LPR use or provided only cursory functional training without exploring ethical concerns. Understanding the ethical concerns of any technology used in policing is crucial, especially in terms of public engagement and building trust in places where the public or policy makers have been resistant to police use of LPR.

4. Conclusion

Overall, there exists large variation in how LPR policy is set, how systems are used, and how data is managed. In any use of technology, it is important for agencies to communicate transparently with the community, define specific policies and monitor adherence to them, and consider the role of police in using technology ethically. Doing so will help strengthen community-police relations, enhance public trust, and better enable police to do their jobs efficiently and effectively.

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