

The Impact of Location Monitoring Among U.S. Pretrial Defendants in the District of New Jersey

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ONE OF THE primary goals of the U.S. Pretrial Services System is to supervise federal defendants during their pretrial period in the community while also ensuring that these individuals do not pose a risk to the public. More specifically, under the Bail Reform Act of 1984, the court is tasked with setting the least restrictive conditions of release to reasonably ensure community safety and the defendant's appearance in court as required. The functions and powers relating to the role of pretrial services in this process are outlined in Title 18 U.S.C. § 3154, which provides for (a) the investigation of federal defendants for bail-setting purposes, (b) the preparation of reports that provide risk-related information and recommendations to the court, and (c) the monitoring and enforcement of release conditions imposed by the court.

Accordingly, authorities may wish to control or to monitor the location of an individual without resorting to the use of pretrial detention as a means to mitigate risk the defendant may pose prior to trial. One of the release conditions commonly used by pretrial services is location monitoring (also known as electronic monitoring). The Federal Location Monitoring Program (LMP) provides officers

with the technology and capability to better monitor a defendant's compliance with conditions of release, such as restrictions on residence, travel, curfew, and contacts, to name a few. Additionally, certain offenses such as those charged under the Adam Walsh Child Protection and Safety Act of 2006 also require the imposition of restrictive conditions of release, including electronic monitoring.¹

In 2009, as a result of continued technological advancements and increasing policy requirements promulgated by the Administrative Office of the U.S. Courts, the District of New Jersey (the district) reorganized the supervision of location monitoring cases. A thoroughly trained specialized unit was developed with one supervisor solely responsible for the oversight of the location monitoring program. The focus of supervision work transitioned into more of a community-based supervision approach. This strategy improved the ability of officers

to build rapport with defendants and family members, develop collateral contacts with employers and treatment providers, and better ensure that the importance of community safety was at the forefront of supervision. Additional support included the addition of a full-time administrative person assigned to the unit, smaller caseloads (not to exceed 30 defendants per officer), increased use of GPS, and informative training sessions provided for magistrate judges. Finally, the district adopted a 24/7 warrant response plan that ultimately streamlined the process of responding to noncompliance, including requesting arrest warrants from the court during non-traditional hours on nights and weekends.

There are many misconceptions about what LM technology can and cannot do. The technology does not allow officers to intercept bad behavior before it happens. It does, however, provide officers with a wealth of information about patterns of behavior that can be used to address the participant's accountability and improve supervision. Selection of the appropriate technology is critical to the success of pretrial supervision. Radio frequency (RF) is a form of electronic monitoring that alerts an officer when a defendant: 1) leaves a specific

¹ With the exception of the mandatory conditions stated in the Adam Walsh Act, all other conditions imposed on defendants released under 18 U.S.C. § 3142(c)(1)(B) should be the least restrictive conditions to reasonably assure appearance at court and the safety of the community.

location (usually the residence); 2) deviates from a pre-approved schedule; or 3) tampers with the electronic monitoring equipment. The equipment reports only when a defendant enters or leaves the equipment's range, not where the defendant has gone or how far he or she has traveled. Global position system (GPS) monitoring, on the other hand, is an active tracking device that allows continuous monitoring of a defendant's movements. If enhanced supervision is needed, and the whereabouts of the defendant upon leaving the residence needs to be monitored, the use of GPS technology may be the preferred supervision tool.

In the district, the majority of defendants are released on RF technology, which is sufficient to address the identified risks. The overwhelming majority of defendants on house arrest are allowed to leave their home for the purposes of employment, meetings with attorneys, religious services, and medical treatment. While GPS provides more information to officers, it also provides more liberty to defendants needing mobility, such as truck drivers, parents with obligations, and individuals working overnight shifts. GPS technology is often used to allow such flexibility, as well as address noncompliance and enforce more stringent movement restrictions.

The use of location monitoring is extremely cost effective compared to the alternative of pretrial detention, costing on average \$11 per day compared to \$87 for detention.² According to USAOC data for the 12-month period ending March 2017, the federal pretrial system imposes location monitoring on over 5,000 defendants annually. While there are significant costs associated with the LMP, little research regarding the effectiveness of this release condition has been conducted to date.

The bulk of empirical work on the effectiveness of location monitoring (LM) has focused on post-conviction outcomes. For example, SPEC Associates (2002) found a significant negative effect of LM on the likelihood of a parole violation. Two additional studies (Bonta et al., 2000; Finn & Muirhead-Steves, 2002) address technical violations in their examinations of LM. Bonta et al. (2000) found no effect of location monitoring on technical violations post-release after accounting for an offender's risk score. Finn and Muirhead-Steves (2002) report that 76 percent of their sample of parolees placed on LM had no violations,

but did not provide comparable figures for parolees not on LM for comparison. Padgett et al. (2006) found that location monitoring significantly reduced the likelihood of technical violations, reoffending, and absconding among a large sample of serious offenders while they were on home confinement.

Much less is known regarding the effect of LM on pretrial outcomes. Cadigan (1991) provides a description of the outcomes for a small sample of defendants placed on location monitoring compared to the nation as a whole. Results of this early study suggest that LM defendants evidenced a failure rate that was higher than the national rate. The author, however, rightfully points out that those in the group placed on location monitoring were at greater risk to fail than those who were not, and were charged more frequently with serious offenses than the comparison group. Similarly, Cooprider and Kerby (1990) found significantly higher rates of technical violation for pretrial release defendants on LM than for those released into the community without the supervision condition. However, neither of these studies adequately accounts for the differences present between the groups being compared. Finally, VanNostrand and Keebler (2009) included LM as a condition of interest in their analysis of pretrial outcomes. Using logistic regression analyses, the authors found there was no statistically significant difference in pretrial failure among defendants classified as moderate or higher risk (PTRA levels 3, 4 & 5); however, they did find that low-risk defendants (levels 1 & 2) were more likely to fail if they were released with a condition of location monitoring compared to those that did not have the condition.

Given the limited research devoted to the use of LM on the pretrial population, little is known about its effectiveness. Compared to unsupervised release, LM might suppress crime during the supervision period, but when it is applied to defendants who would otherwise be detained, LM might expose communities to increased risk. Additionally, much of the empirical work focused on the impact of LM supervision was produced several years ago. As technologies and their applications have evolved, it is important that evaluation of its effects remain current, using the most recent data available. Furthermore, no really stringent statistical tests, such as the matching analysis employed here, have been used to assess the potential impact of LM supervision among pretrial defendants, thus creating a need for additional research

devoted to assessing the impact of LM on pretrial outcomes.

Current Study

The purpose of the current study is to assess the effectiveness of location monitoring on a sample of defendants from the U.S. Pretrial Services Agency in the District of New Jersey. We use a quasi-experimental design, propensity score matching (PSM), to statistically match defendants placed on LM to a group of defendants who were not subject to LM on a host of characteristics that have been shown to be associated with pretrial failure.

As we elaborate below, the use of PSM enables us to discern whether intrinsic differences exist between defendants placed on LM and those who were not, and to make better "apples to apples" comparisons between defendants that differ only in their "exposure" to the LM condition while on pretrial supervision. Said another way, PSM accounts for potential confounding influences on the relationship between LM and pretrial failure and allows us to more directly estimate the effect of location monitoring (including the individual effects of the different technologies used in the District of New Jersey) on pretrial outcomes.

After first matching the full sample of LM clients to a group of defendants who were not subject to a monitoring condition, we split this group according to the type of location monitoring equipment used. By disaggregating based on the technology used (GPS or RF), we are able to further assess the potential impact of location monitoring on the behavior of pretrial defendants. Specifically, we repeat the matching analysis a total of four more times, analyzing (1) a group of GPS-only defendants, (2) a group of RF-only defendants, and (3 and 4) two groups that were placed on some combination of the two groups designated by the technology they spent the majority of their time on while under pretrial supervision. Finally, as prior research has suggested that the impact of LM supervision may vary based on risk level, we split the sample into high- and low-risk subsamples in order to assess whether LM may affect these groups differently.

Data and Measures

The current analysis evaluates whether being placed on a location monitoring (LM) program during time on pretrial supervision had an effect on three pretrial outcomes (failure to appear, rearrest, and technical violations). Data used in the current study was drawn from the Probation/Pretrial Services

² Memo dated July 13, 2017 from the Administrative Office of the U.S. Courts.

Automated Case Tracking System (PACTS). PACTS is a case management platform used in all 94 federal districts to record all federal defendant and offender case activity. Data drawn from the PACTS system was used to evaluate the effects of LM on all pretrial defendants in the District of New Jersey during the period of 2012-2016. The sample consisted of 2,356 defendants who completed a total of 2,515 periods on supervision, with an average time under supervision of 11.3 months.³ Of the full sample of defendants, a total of 339 (14.4 percent) spent some period of their supervision under an LM condition. Of these clients on LM, 246 were monitored using only RF technology, while 60 were subject to GPS monitoring, and the remainder on some combination of the two (designated as majority GPS or majority RF in subsequent analyses).

Outcome Variables

For the current study a total of three pretrial outcomes were examined: whether defendants failed to appear for their assigned court dates (coded 0/1), were arrested for new criminal activity (0/1), or received a technical violation during their time in the community pending case disposition (a count of technical violations during the supervision period). Importantly, because LM represents a more restrictive supervision condition, we also examine a count of technical violations in which violations associated with LM itself were removed from the total (since defendants who are not placed on LM are not subject to the same violations).

Independent (i.e., "Treatment") Variable
The key explanatory variable is a dichotomous measure (yes/no) indicating whether or not an individual was subject to location monitoring during his or her time on pretrial supervision. An LM condition was determined by consulting client invoices for LM services received from the provider. For the analysis of the full sample, we included individuals subject to voice verification (via phone), as well as radio frequency (RF) and global positioning satellite (GPS) monitoring. In subsequent analyses we

examined the four groups described above individually (RF only, GPS only, majority RF, and majority GPS). Finally we split the sample into two groups based on risk.

Matching Variables

A critical condition in isolating a potential link between LM and pretrial outcomes is to account for common causes. We include a host of individual-level characteristics in our analysis that may be associated with an LM condition while on pretrial supervision and that, as suggested by prior research, are significant predictors of failure. Table 1 provides descriptive statistics (for both the entire population and the sample of defendants who were subject to LM monitoring) for each of the variables used in the matching specification described below. Next, we elaborate on the measurement of a number of these variables.

In addition to demographic characteristics (age, sex, and race), we include indicators of alleged offense type (e.g., violent offense, property offense, sex offense, drug offense). We control for immigration and citizenship status as well as for a host of other conditions that might be placed on a client during his or her time on supervision (i.e., alcohol abstinence, drug testing and treatment, travel/passport restrictions, sex offender or mental health treatment, and computer restrictions). Both offense type and co-occurring conditions are captured using a series of dummy (yes/no) variables. Also included is a measure of the length of time on pretrial supervision, measured in months. Finally, the matching specification described below included a measure of risk, as determined by the Pretrial Risk Assessment (PTRA) used in the U.S. Pretrial Services system. The PTRA contains 11 scored items and provides a risk category that has been shown to be a valid predictor of failure-to-appear, new criminal arrest, and technical violations that lead to revocation while on pretrial release (Cadigan, Johnson, & Lowenkamp, 2012). In the current study we used the risk category provided by the PTRA, scored 1-5, with larger values indicating higher levels of risk. Of the defendants placed on LM supervision (n=339), 45.7 percent were classified as low-risk (PTRA levels 1 or 2), while the remaining 54.3 percent were classified as moderate or high risk (levels 3-5). It is these two groups that we examine independently in order to assess the effectiveness of LM supervision for defendants with differing risk levels.

Analytic Method

The current analysis employed a propensity score matching (PSM) technique in which we estimate "treatment" effects of location monitoring on multiple measures of "failure" during pretrial supervision. This quasi-experimental approach estimates average treatment effects on the treated (see Guo & Fraser, 2010). This propensity score matching technique is useful for simulating independent assignment of a designated treatment and estimating more directly an independent variable's effects than is typically accomplished with standard regression procedures (Apel & Sweeten, 2010; Rosenbaum & Rubin, 1983). For the purposes of our analyses, "treated" defendants are those that were placed on location monitoring during their time under supervision. We used PSM techniques to match this group of defendants on LM to defendants that were not subject to the monitoring condition, yet were comparable on other observed conditions. Based on this approach, two defendants with similar estimated treatment likelihood scores (probability that they would be placed in an LM program) would be comparable. Therefore, differences between those individuals on a given outcome (in this case, failures to appear, rearrest, or technical violations) could then be more confidently attributed to a given treatment, which in this case is defined as an LM condition while on pretrial release.

The utility of the PSM approach adopted here is based on the assumption that no imbalance in potential confounders exists after matching (Guo & Fraser, 2010; Winship & Morgan, 1999). The accuracy of the matching relies on the quality and comprehensiveness of the designated matching variables. Said another way, any unobserved traits that influence the likelihood of a defendant receiving the treatment will undermine the matching and the accuracy of estimated effects. To address this concern, we include a range of theoretically relevant matching variables that might influence the likelihood of being placed on LM while on pretrial supervision and are also related to our outcomes of interest.

Results

The first step of any matching analysis is to assess the extent of imbalance between clients who were placed on LM and those who were not. We compared these two groups on the set of 28 characteristics described above. As shown in Table 1, there was evidence of significant covariate imbalance between the two groups on most of the measures considered.

³ The analysis described below includes only a single term of supervision for each defendant. In this case we selected the first period of release for each client. Results of ancillary analyses suggest this decision does not have an impact on the results presented. Specifically, we repeated this analysis using supervisions as the unit of analysis, as well as the longest period of supervision for each of the unique clients. Results in each case were substantively identical to those presented.

TABLE 1**Descriptive Statistics for Analysis of the Use of Location Monitoring on Pretrial Supervision**

| Entire Population of Defendants from the District of New Jersey (n=2,356) | | Defendants Subject to Location Monitoring During Pretrial Period (n=339) | |
|---|---|--|--------------------------------------|
| Failure to Appear | Offense Category | Failure to Appear | Offense Category |
| No | 97.9% | Violent Offense | 4.2% |
| Yes | 2.1% | Sex Offense | 2.2% |
| Rearrested | Drug Offense | Rearrested | Drug Offense |
| No | 96.1% | No | 93.5% |
| Yes | 3.9% | Yes | 6.5% |
| Total Technical Violations | Financial Offense | Total Technical Violations | Financial Offense |
| Average | 0.16 | Average | 0.47 |
| Standard Deviation | 0.67 | Standard Deviation | 1.14 |
| Non-LM Technical Violations | PTRA Risk Category | Non-LM Technical Violations | PTRA Risk Category |
| Average | 0.13 | Average | 0.26 |
| Standard Deviation | 0.55 | Standard Deviation | 0.71 |
| Location Monitoring | Category 3 | Sex | Category 3 |
| No | 85.6% | Male | 89.7% |
| Yes | 14.4% | Female | 12.3% |
| Sex | Conditions of Supervision | Age at Intake | Conditions of Supervision |
| Male | Alcohol Abstinence | Average | Alcohol Abstinence |
| Female | Association Restrictions | Standard Deviation | Association Restrictions |
| Age at Intake | Drug Treatment | Length of Supervision (months) | Drug Treatment |
| Average | 40.4 | Average | Mental Health Treatment |
| Standard Deviation | 14.1 | Standard Deviation | No Contact Order |
| Length of Supervision (months) | No New Passport | Race | No New Passport |
| Average | 11.2 | Non-Hispanic White | Report Contact with Law Enforcement |
| Standard Deviation | 7.6 | Non-Hispanic Black | Residential Requirements/Restriction |
| Race | Residential Requirements/Restriction | Hispanic | Substance Abuse Testing |
| Non-Hispanic White | 24.4% | Other | Third-Party Custody |
| Non-Hispanic Black | 47.4% | Weapons Restrictions | Weapons Restrictions |
| Hispanic | 18.8% | Travel Restrictions | Travel Restrictions |
| Other | 19.4% | | |
| Citizenship | Travel Restrictions | | |
| U.S. Citizen | 75.4% | | |
| Non-Citizen | 24.6% | | |

In fact, the LM group differed significantly from the control group on all but four of the measures included in the matching specification. For example, nearly 90 percent of the LM group were male, compared to roughly 76 percent of the control group ($t = 5.74$, $p < .000$). The group subject to LM was more likely to be Black or Hispanic than the group who were not placed in the monitoring program. LM clients also belonged to higher PTRA risk categories than the comparison group (mean of 2.67 vs. 1.73, respectively). Many differences exist between the treatment and control group regarding the co-occurring conditions of their supervision (i.e., drug treatment, travel

restrictions, or weapons restrictions). This highlights the need to account for preexisting differences among the groups before drawing conclusions regarding the relationship between LM and pretrial failure. We attempted to do so in the present analysis by applying PSM techniques to match the individuals on LM to a more suitable sample of defendants that were not placed on LM, but were comparable on all other observed characteristics, to more accurately assess the efficacy of LM as a pretrial supervision strategy.

The matching process unfolds in two steps. We first estimated propensity scores using a logistic regression analysis in which we

predicted the likelihood of a defendant being placed on LM during his or her period under pretrial supervision ($n=339$). This model included all of the measures shown in Table 1 as matching dimensions. We then used the estimated likelihood scores from this analysis to match clients on LM (the treated group) to clients who were not placed on LM, applying one-to-one nearest neighbor matching without replacement, and a .10 caliper setting. Using these specifications, matches were found for all but 29 (8.5 percent) of the clients in the treatment group. The remaining 29 cases fell off support during the matching procedure because no suitable matches in the

TABLE 2
Pre- and Post-Matching Outcomes for Treatment and Control Groups

| Panel A: Unmatched Samples | | | | | |
|----------------------------|-----------------------|-----------------------------|------------|------|--------|
| | LM Clients (n=339) | Non-LM Clients (n=2,018) | | | |
| | Mean | Mean | Difference | S.E. | t |
| FTA | .035 | .019 | .016 | .008 | 1.96* |
| Rearrest | .065 | .035 | .030 | .011 | 2.66** |
| Technical Violation | .472 | .113 | .359 | .039 | 9.25** |
| Technicals – LM Technicals | .265 | .113 | .152 | .032 | 4.75** |

| Panel B: Matched Samples | | | | | |
|----------------------------|-----------------------|---------------------------|------------|------|---------|
| | LM Clients (n=310) | Non-LM Clients (n=310) | | | |
| | Mean | Mean | Difference | S.E. | t |
| FTA | .032 | .032 | 0 | .014 | .000 |
| Rearrest | .068 | .106 | −.038 | .023 | −1.71** |
| Technical Violation | .448 | .326 | .122 | .030 | 1.53 |
| Technicals – LM Technicals | .277 | .326 | −.049 | .065 | −.75 |

Note: * $p<.05$, ** $p<.01$

pool of eligible “controls” (i.e., those defendants who were not placed on LM) could be found. In other words, for these unmatched cases there is no satisfactory counterfactual, at least in the sample of pretrial defendants used in the current analysis.⁴

The results suggest that the matching procedure employed yielded treatment and control groups that show strong signs of balance on the covariates considered. For all variables, the standardized bias statistic (SBS) values in the matched samples fall below the conventional cutoffs (Rosenbaum & Rubin, 1985). We observed no significant differences across the samples on any of the characteristics considered once the groups had been matched. Using these matched groups (310 defendants who were subject to LM prior to adjudication and 310 who were not), it is possible to more accurately assess the relationship between LM and pretrial failure.

Table 2 shows the results most pertinent to our research question by comparing the outcomes (failure to appear, rearrest, and technical violations) both before (Panel

A) and after (Panel B) matching on the observed covariates. Looking at Panel A (before matching), LM clients fare significantly worse than the control group across all four of the outcomes considered. Defendants who were subject to LM were more likely to fail to appear at their assigned court date or be arrested for a new offense while on supervision. Clients on LM supervision also had significantly more technical violations on average than the comparison group (.472 and .113, respectively). Even after removing any technical violations associated with location monitoring itself, the LM group had significantly more technical violations than the matched control group (.265 vs. .113).

Once the groups were matched, however, the comparison of the two groups tells a very different story. Of the 310 LM clients successfully matched to individuals of the control group, 3.2 percent failed to appear for their court date. This was identical to the proportion of the control group that failed to appear. This indicates that once the differences observed between the groups were accounted for, pretrial defendants on LM were no more likely to fail to appear than those who were not placed on LM. In terms of rearrest, once matched, defendants subject to LM were significantly less likely to be arrested for a new criminal act while on supervision (6.8 percent compared 10.6 percent). While the LM group averaged more technical violations, this difference was not statistically significant. Further, once those violations associated with LM itself were removed, the treatment group

(LM) actually averaged slightly fewer technical violations than the matched control group, although this difference was not statistically significant. This analysis provides evidence that defendants on supervision subject to LM did not exhibit higher rates of failure than individuals who were not subject to the same conditions of release. In fact, defendants placed on LM were significantly less likely to be arrested for a new crime while in the community on pretrial supervision than those who were not subject to the monitoring.

In order to assess whether the positive impact of location monitoring is present across the various types of LM technology used, the analysis was repeated four additional times with the goal of examining specific subgroups of the LM population.⁵ Specifically, we repeat the matching analysis analyzing a group of GPS-only defendants, a group of RF-only defendants, and two groups who were placed on some combination of the two groups designated by the technology they spent the majority of their time on while under pretrial supervision. This allowed us to investigate whether the potential benefits (in terms of reducing pretrial failure) were seen across each of the major LM technologies employed by the District of New Jersey. Notably, however, the group of defendants who were subject to voice verification was so small ($n=8$) that a separate analysis was not feasible.

Results of this secondary analysis suggest prior to matching that the 246 defendants who were monitored using RF technology were significantly more likely to be rearrested and have technical violations (even after those associated with LM were removed) than the population of clients who were not subject to RF location monitoring. Once matched, however, to a subset of clients who resemble those monitored using RF, the group of LM clients was significantly less likely to be arrested and were not significantly different in terms of FTAs or technical violations.

A slightly different story emerged among the clients monitored using GPS technology. In comparison to the full population, GPS-monitored defendants had significantly more technical violations, and this was also true once LM violations were removed. They were not, however, more likely to be rearrested than defendants not subject to GPS monitoring. Once matched, clients monitored using GPS technology still, on average, had more

⁴ A closer look at the cases that fell off support revealed that the defendants who were not successfully matched were more likely to be higher risk than those that were. This group was also less likely to have been charged with a financial crime, more likely to have been charged with a firearms offense, and more likely to have residential restrictions or third-party custody as a condition of their release. Importantly, however, these 29 individuals did not significantly differ on the pretrial outcomes, and thus their exclusion is unlikely to have impacted the results presented here.

⁵ Separate propensity scores were estimated for each subsample and balance was reassessed (results not shown in tabular form).

technical violations, but this difference was insignificant once technical violations associated with location monitoring were removed.

As some clients were monitored using a combination of RF and GPS technology throughout the course of their supervision, we repeated this analysis twice more. For this ancillary analysis, defendants were placed in a group based on which technology they were monitored using during the majority of their time on supervision. For example, if a defendant was monitored using RF for 150 days, but then was placed on GPS monitoring for a total of 165 days because of travel associated with a new job, the defendant would be classified as a majority GPS client. While imperfect, this allowed us to include the full sample of LM clients in an analysis, rather than excluding those who were monitored using some combination of technologies.

Results for these two groups, which are slightly larger than the LM- or GPS-only groups, are remarkably similar to those presented above. Once matched, the groups on LM were less likely than their counterparts to be rearrested, while being relatively similar on the other outcomes. The only exception to this was that the majority-GPS clients had significantly more technical violations than the matched group even after removing those technical violations specifically associated with location monitoring.

Finally, we repeated the matching analyses using two subgroups of the full sample based on risk-level (drawn from the PTRA). Among the matched samples of moderate or high-risk defendants (PTRA levels 3-5), LM supervision was associated with significantly lower rates of rearrest. There were no significant differences between the two groups in regards to failure to appear or technical violations. For the low-risk sample, defendants on LM were more likely to receive a technical violation, and these differences remained significant even after matching. However, once technical violations associated with LM were removed, the differences between the two matched groups were not statistically significant. Results of these ancillary analyses suggest that LM may be most effective among higher risk defendants. This is consistent with prior work conducted by VanNostrand and colleagues. Among lower risk defendants, LM supervision was associated with more technical violations; however, many of those appear to be associated with LM itself. Once those violations were removed, the differences were no longer statistically significant.

Discussion and Future Work

We were interested in whether federal defendants placed on LM in the District of New Jersey were more likely than other defendants to fail while in the community on pretrial supervision. The current study assessed rates of failure using three different measures of defendant behavior, failure to appear, rearrest, and technical violations. The results of our investigation were illuminating, and informative to policy. We found that there were substantial differences between defendants who received "treatment" (i.e., were placed on LM during their supervision) and defendants who did not. Defendants subject to LM differed significantly across many individual and case-specific characteristics typically associated with pretrial failure, including being classified as higher risk on the PTRA, a validated risk assessment. The PSM procedure, applied successfully, eliminated a substantial proportion of the observed differences between the treatment and control groups, allowing us to make more accurate comparisons of the two groups on subsequent behavior. Results of this approach suggest that defendants given an LM condition were significantly less likely to be rearrested than individuals with very similar characteristics but who were not placed on LM. Further, the two groups did not differ substantially on the other outcomes examined. Clients on LM were no more likely to fail to appear, and had relatively fewer technical violations than the control group (though not significantly).

Results were similar when we disaggregated based on the type of LM technology used. Both defendants placed on RF and those on GPS were significantly less likely to be rearrested than their matched counterparts. However, clients monitored using GPS technology were more likely to be issued technical violations, even once matching was complete. Results based on subsamples of defendants of differing risk highlight that LM technology may be most effective among moderate- to high-risk clients. This is consistent with federal supervision policy for LMP, which indicates that appropriate use of LM should account for the risk posed by the defendant. The use of LM and the type of technology to address the level of risk should always be considered. Finally, supervising officers should routinely assess the need for monitoring and ensure

that the most appropriate technology is being used. The effective use of LM technology will avoid the risk of under-supervising high-risk participants and over-supervising low-risk defendants while accomplishing the goals of supervision (*Guide to Judiciary Policy*, Volume 8, Part B, Chapter 3, 355.30).

The results of this study are not without limitation. First, the technical violations measure employed does not differentiate between violations that led to revocation and those that did not. A stronger approach would be to examine violations that resulted in the revocation of pretrial release and in confinement. Second, it is possible that location monitoring is more effective for particular subsets of the pretrial supervision population. Differentiating by alleged offense category represents one potential avenue to explore in future work.

While definitive conclusions about the effectiveness of location monitoring to address risk of flight and/or danger concerns are not warranted based on the available data, a few observations can be made. First, results suggest that location monitoring during the course of pretrial supervision may reduce the likelihood of rearrest among defendants with similar risk characteristics. As location monitoring during pretrial release preserves resources by not incarcerating individuals who may otherwise pose a risk to the community, it represents an attractive option for many jurisdictions. It is also important to highlight that, following a 2017 Administrative Office District Review, the District of New Jersey was commended for the execution and oversight of their location monitoring program. Within this review of the district's location monitoring program, the Administrative Office uncovered zero findings (operational issues that, if significant, could impact community safety), suggesting that the program was being operated with a high degree of fidelity to the guidelines put forward. The findings of the present analysis appear to suggest that the district's focus on allocating appropriate resources to the supervision of location monitoring cases and providing training and mentoring of officers has been successful in terms of reducing pretrial failure among defendants being monitored. Results of this analysis also suggest that although further study is needed, location monitoring offers promise as an effective alternative to pretrial detention in federal pretrial cases. Finally, our study highlights a potentially fruitful approach to examine the impact of pretrial release decisions more generally, and thus future research might benefit

from applying similar techniques on larger samples that span multiple jurisdictions.

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