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Cost-benefit analysis of reducing crime through electronic monitoring of parolees and probationers

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A B S T R A C T

Objective: The objective of this study was to estimate the benefits and costs of using electronic monitoring (EM) and home detention to reduce crime committed by parolees and probationers.

Method: Data from a national survey of state prison inmates was adjusted and used to estimate the number of crimes that would have been committed by all parolees and probationers over the course of one year in the absence of EM and home detention. The data were analyzed in combination with existing analyses of the effectiveness and costs of EM and home detention and the economic costs of crime to estimate the benefit-cost ratio of nationwide implementation of EM and home detention with all parolees and probationers.

Results: EM plus home detention could avert an estimated 781,383 crimes every year. The social value of the annual reduction in crime is \$481.1 billion. Society would gain \$12.70 for every dollar expended on the proposed intervention.

Conclusion: EM plus home detention could be an effective deterrent to crime and could have enormous social benefits, especially if it is applied early and saves what would otherwise be habitual offenders from a life of crime.

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Introduction

An estimated 1,382,012 violent crimes were committed nationwide in 2008 (U.S. Department of Justice, 2009). One-third of those crimes were committed by individuals previously convicted of crimes but eventually released into the community on parole or probation, suggesting that repeat offenders are a significant source of crime. A Department of Justice study found that 67.5 percent of prisoners were rearrested for a felony or serious misdemeanor within three years of their release; 46.9 percent were reconvicted of a new crime (Langan & Levin, 2002).

Recent advances in global positioning technology, however, permit law enforcement officials to electronically monitor parolees and probationers through ankle bracelets that track the second-by-second location of each individual. As a consequence, parolees and probationers who are required to wear these bracelets may be deterred from committing new crimes because they know that these devices would place them at the scene of any crimes they commit, essentially ensuring a conviction.

Thus, a promising policy to reduce crime would involve the use of these electronic devices to monitor all parolees and probationers. The first section of this article describes issues in using electronic monitoring (EM). The second section reviews the best available

studies regarding the effectiveness of EM in reducing crime. The third section provides a cost-benefit analysis of the proposed policy. The final section discusses the results and the ethics of requiring all parolees and probationers to wear EM devices.

Electronic monitoring

Electronic offender tracking systems involve devices that are continuously attached to parolees or probationers as they move about the community. They use satellite or terrestrially-based location positioning systems to track an offender's whereabouts 24 hours a day. A recent estimate suggests that 44,000 electronic devices have been deployed in the United States for the purpose of tracking offenders (Drake, 2009). Most of the growth can be attributed to legislation in 32 states that now requires the use of offender tracking equipment on sexual predators (Drake, 2009). The capacity to place any type of violent offender at the scene of a crime through tracking technology suggests, however, the potential of expanding the use of tracking devices to deter all forms of violent crime.

While early tracking devices involved multiple pieces of equipment, one-piece tracking devices are now standard, eliminating "bracelet gone" alarms (Drake, 2008). Advances in technology aim to overcome the main drawback of existing GPS devices, which is signal loss when shielded by concrete and steel buildings. Two vendors now offer devices that use CDMA cell phone towers to triangulate the position of offenders (Drake, 2009). Coverage is good in most metropolitan areas of the United States (Drake, 2009). In addition,

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vendors are developing location technology using WiFi wireless signals, accelerometers, digital compasses, gyroscopes and altimeters (Drake, 2009). Until this technology is incorporated into tracking devices, or until cell phone service is expanded to rural areas, offenders in those areas may, however, be served with two-piece devices that can communicate with the monitoring center through a landline, when placed in a docking station (Drake, 2008).

Active GPS tracking units that transmit offender location on a second-by-second basis are commonly leased for \$8 or less per day (Drake, 2008). Passive GPS tracking systems that download stored tracking data once per day may be leased for \$4 per day (Drake, 2008). In Florida, where parole agents that conduct active-GPS monitoring have caseloads of 17 offenders, the personnel costs of active-GPS monitoring are \$11.13 per offender per day (Peckenpaugh, 2006), implying a total cost of \$19.13 per offender per day (\$20.37 adjusted for inflation) for active-GPS monitoring. In England and Wales, over 225,000 offenders have been electronically monitored. The cost of electronic monitoring of home detention was £14 (\$21.95) per day, including time spent by prison, probation and court staff in administering each case and the costs of police time in dealing with offenders who breached home detention (National Audit Office, 2006).

Parole refers to a period of conditional supervision in the community that often begins before the expiration of a prison sentence. The period of parole is specified by statute. In California, for example, parole is limited to three years beyond the expiration of a sentence, except: a.) parole for a sexually violent predator is tolled for an unlimited period until that person is found to no longer be a sexually violent predator, b.) the duration of parole is 10 years for first- or second-degree murder with a life sentence, c.) parole for sex crimes may be extended to five years beyond the expiration of a sentence (State of California, 2010). In most states, judges may specify conditions of parole including EM, and violations of parole may result in the parolee being returned to prison. Nationally, the portion of the sentence served by convicted state felons before parole was estimated to be 51 percent for persons sentenced to burglary, 60 percent for vehicle theft, 64 percent for robbery, 69 percent for assault, 71 percent for rape, and 61 percent for homicide (Bureau of Justice Statistics, 2010).

Probation is a sentence imposed by the court upon a convicted offender in place of, or in addition to, a period of incarceration, requiring the offender to meet certain conditions of supervision in the community that may include EM. Violations of probation may result in incarceration under the suspended sentence of the prior conviction, in addition to incarceration for any new offense.

In some states, offenders may be sentenced to prison, followed by a period of home detention, where offenders are typically required to stay within a specified home location during specified curfew hours, but are otherwise permitted (or required) to leave the home to seek employment, attend counseling sessions or educational or vocational training programs, and attend to any other court-approved activities. In other states, changes in state law may be needed if judges are to be permitted to impose this type of split sentence.

This change in state laws may be justified based on the results of the Padgett, Bales, and Blomberg (2006) study, described below, suggesting that the number of crimes committed by parolees and probationers could be drastically reduced if offenders were electronically monitored and subject to home detention. To accomplish this, state laws could be changed to permit judges to impose EM and home detention during the second half of each sentence – historically, the time period where many offenders have been released into the community on parole. This change in state laws could be justified on the basis that it would reduce the many violent crimes that would otherwise occur while offenders are on parole. The second half of each sentence would essentially be an intensive form of supervised parole involving electronic monitoring and home detention, after a term in a state prison.

A complication is that most states have shifted to a system of fixed (“determinate”) sentences. In California, for example, violent offenders must serve a minimum of 85 percent of their sentences, and nonviolent felony offenders must serve 67 percent of their sentences. Split sentences, however, could be justified as a means to reduce prison overcrowding – which can force early prisoner releases – while minimizing the amount of crime that is committed. While a split sentence returns offenders to the community more quickly, compared to conventional policies, the period of home detention and electronic monitoring could be extended to cover the conventional period of parole. While offenders would be released into the community relatively early, they would be heavily supervised through a lengthy period of home detention and electronic monitoring in order to protect society as well as protect risky offenders from the temptation to commit new crimes.

A second complication is the transition to a system of split sentencing. State laws, however, could be changed to give current state inmates the option of release to home detention and electronic monitoring throughout their period of parole, upon completion of 50 percent of their sentences and subject to the approval of a parole board. Thus, current and future state inmates would essentially receive equal treatment under the new laws.

Effectiveness of EM

With regard to the impact of EM on crime during the period of monitoring, all previous studies had serious limitations and were of low quality until Padgett et al.'s (2006) well-controlled, large-scale evaluation involving 75,661 Florida offenders placed on home detention from 1998 to 2002. A small percentage of offenders placed on home detention were ordered to wear an EM device as a condition of the home detention sentence, permitting a comparison between these offenders and offenders who were not electronically monitored.

Padgett et al. (2006) controlled for the type of placement: a.) originally sentenced to home detention, b.) split sentence (prison followed by electronically monitored home detention), c.) post-prison sentence (home detention while on parole), and d.) sentence to home detention for a violation of parole. Padgett et al. (2006) also controlled for the type of primary offense committed by each offender as well as a quantitative measure of offender risk, using Florida's scoring system for the purpose of sentencing. Padgett et al. (2006) controlled for the type of EM device (GPS or radio frequency), offender characteristics, criminal history, court-ordered conditions of supervision, the number of days each sentence was mitigated, the judicial circuit in which the offender was supervised, the number of weeks absconded, weeks in treatment, weeks in drug court, and weeks in a non-reporting status. In all, 62 independent variables were included in each model to control for factors influencing community supervision success or failure. Padgett et al. (2006) applied proportional-hazards survival analysis to adjust for right-censoring (bias in calculating “time to failure” that occurs when the end of the follow-up period truncates the observation of supervision failures). Padgett et al. (2006) included time-varying independent variables as well as “time to failure” in the estimation of maximum-likelihood coefficients. No previous study of EM controlled for this array of variables nor involved such a large sample.

Padgett et al. (2006) investigated the rate of absconding, a condition where the whereabouts of a supervised offender on parole or probation “are unknown and the court issues a warrant for violation of supervision” (Padgett, et al., 2006, p. 69). Since it is possible for an offender to detach an ankle bracelet and travel outside of the home location, defeating the purpose of the bracelet (but setting off an electronic alarm), a key question is the degree of compliance. Significantly, Padgett et al. (2006) found that GPS-monitored violent offenders were 91.2 percent less likely to abscond than their non-

monitored counterparts, suggesting an extremely high rate of compliance by monitored offenders.

Padgett et al.'s (2006) key result is that EM is startlingly effective at preventing offenders from committing new offenses while they are monitored. Overall, monitored offenders were 94.7 percent less likely to commit a new offense than offenders who were not monitored (Padgett, et al., 2006). Significantly, Padgett et al. (2006) concluded that "EM works equally well for all 'types' of serious offenders" (Padgett et al., 2006, p. 83).

Until recently, studies of the impact of EM on recidivism after monitoring is discontinued also had serious limitations and were of low quality (see the review by Renzema & Mayo-Wilson, 2005). Marklund and Holmberg (2009), however, studied 260 Swedish offenders sentenced to a minimum of two years imprisonment (and therefore convicted of relatively serious crimes) but served the final portion of their sentences in home detention. The offenders were electronically-monitored, required to work or study at least four hours per day, given employment assistance, and confined to home except for hours in employment and education and an hour of "free" time per day. Monitored individuals were matched with similar prison inmates based on the number of prior convictions and the predicted re-offending risk from a logistic regression model. The model was originally developed based on a sample of 6,400 inmates released in 2001 and was validated with a similar-sized population of inmates released in 2002. Most inmates in the control group had been transferred to an "open" institution toward the end of their detention, permitting them to be away from prison on leave for 48 hours every second weekend, and permitting at least one-third of them to work outside the prison during day hours. Marklund and Holmberg (2009) found that 26 percent of offenders in the EM group were convicted of new offenses during the three year follow-up period, while the corresponding proportion of the control group was 38 percent. The EM group relapsed into serious crime at a lower rate: 14 percent, compared to 26 percent of the control group. This suggests that EM has a significant effect in reducing criminality during the three year period after monitoring ends, in addition to the substantial effect found by Padgett et al. (2006) during the period of monitoring.

Cost-benefit analysis

The policy for reducing crime that is the topic of the current analysis involves sentencing all felony offenders to serve 50 percent of their sentences in prison, followed by a period of home detention and EM equal to 50 percent of their sentences, with home detention and EM extended for an additional period equal to conventional periods of parole (Fig. 1). Offenders who would normally receive probation would instead be sentenced to an equivalent period of home detention and EM.

It is useful to conceptualize the benefits and costs of the proposed policy as they are realized by society on an annual basis (although,

from the perspective of individual offenders, the benefits and costs are delayed until the offender is released from prison). To draw an analogy, an increase in college tuition immediately inflicts costs on the large number of parents with college-age children, and raises college revenues, even though young children (and their parents) would not be affected until they reach college age.

The first step in estimating the benefits of the proposed policy is to estimate the number of crimes that would have occurred over the course of one year in the absence of the policy. The process of estimating the number of crimes committed by parolees and probationers in 2008 involved two steps. In step one, raw counts of crimes committed by parole and probation violators were obtained from a U.S. Department of Justice survey of state prison inmates in 15 states (Cohen, 1995). These counts were converted to annualized rates per parolee and per probationer, then multiplied by the numbers of parolees and probationers in 2008 (Glaze & Bonczar, 2009). In step two, the counts of crimes were reduced to account for the substantial portion of parolees and probationers who were not returned to prison. Those who were returned to prison were more likely to have committed new crimes; it is this population that was surveyed by the Justice Department. The adjustment in step two assumed, for simplicity, that parolees and probationers who were not returned to prison had committed no crimes. This assumption produces a conservative estimate of crimes (and any savings when this crime is deterred). The adjustment in step two for parolees was drawn from Langan and Levin (2002), who reported that 51.8 percent of state prisoners released in 1994 were returned to prison within three years. The adjustment in step two for probationers was drawn from Langan and Cunniff (1992), who reported that 46 percent of a sample of felons sentenced to probation were returned to prison within three years of sentencing. The result of this analysis provides estimates of the numbers of crimes for which parolees and felony probationers were convicted and imprisoned in 2008.

Padgett et al.'s (2006) results suggest that the proposed policy could avert 94.7 percent of the crimes typically committed by parolees and probationers. A portion of benefits would, however, be offset by determinate sentencing practices that are now in use in a majority of states. In states such as California that employ determinate sentencing, a change in state law that replaces the second half of each prison sentence with home detention and electronic monitoring, and extends home detention and electronic monitoring for periods equal to conventional periods of parole, would have two effects. The overall effect would be to reduce crime, as a consequence of home detention and electronic monitoring of parolees after they are released from prison. This effect would, however, be slightly offset because offenders would be released to the community more quickly. In California, violent offenders must serve a minimum of 85 percent of their sentences, and nonviolent felony offenders must serve a minimum of 67 percent of their sentences. A change in state law that replaces the second half of each sentence with home detention

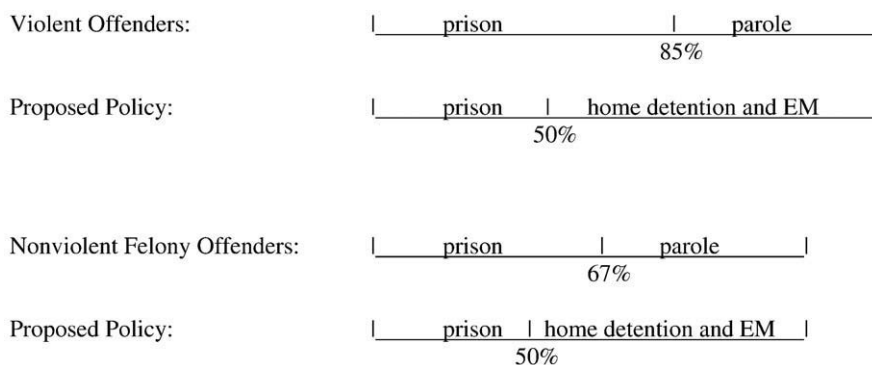


Fig. 1. Schematic comparison of conventional policies and sentencing under the proposed policy.

and electronic monitoring would release offenders into the community after serving 50 percent of their sentences. Under the proposed policy, these parolees would be subjected to home detention and electronic monitoring that would, based on Padgett et al.'s (2006) results, deter 94.7 percent of the crime that would ordinarily be committed by these parolees. Society may expect, however, to bear 5.3 percent of the crime that would occur in the absence of home detention and electronic monitoring. The gains and losses from the proposed policy are depicted schematically in Fig. 2.

If all state prisoner release dates are advanced so that prisoners are released after serving 50 percent of their sentences, prisoners would be released early but the annual flow of prisoners into the community would remain unchanged. For the purpose of the benefit-cost analysis, it is useful to calculate the amount of crime that would be generated by each annual cohort of prisoners who would be released early under the proposed policy. The crime that would be committed, in the absence of home detention and EM, is equal to the crime rate among current parolees, multiplied by the number of parolees, multiplied by the period of time that prisoners would be released early.

The Department of Justice divides parole discharges into two categories. Successful discharges are those where no violation occurred that resulted in parolees being returned to state prison. Unsuccessful discharges are those where a violation occurred that resulted in a return to state prison. Violations include the commitment of new crimes, as well as technical violations (such as absconding). Thus, the crime that would be committed by each annual cohort of prisoners who are released early under the proposed policy was calculated by applying the annualized rate of crime per unsuccessful parole discharge to the annual count of unsuccessful state parole discharges in 2005, multiplied by the reduction in time-served under the proposed policy for each category of crime, multiplied by .053.

The benefits of the proposed policy were adjusted to reflect the projected reduction in crime if all states employ the 85 percent sentencing requirement for violent offenders, and the 67 percent sentencing requirement for all other nonviolent felony offenders. While some states use indeterminate sentencing and formal sentencing policies vary, actual state sentencing and parole practices have converged so that violent felons are now likely to serve a minimum of 85 percent of their sentences, in part because the federal government provided states with funding, through the *Violent Offender Incarceration and Truth in Sentencing (VOI/TIS) Incentive Program*, to build or

expand correctional facilities, contingent upon evidence that an eligible state had implemented (or planned to implement) laws that required violent offenders to serve a minimum of 85 percent of their sentences (Bureau of Justice Assistance, 2010). By the year 2000, 35 states and the District of Columbia had adopted the federal truth-in-sentencing standard that requires violent offenders to serve at least 85 percent of their sentence before they are eligible for parole (DeLisi & Conis, 2009, p. 377). Nonviolent felony offenders are, however, typically eligible for release into the community after serving 67 percent of their sentences.

While the latest available data suggest, historically, that the percentage of time-served falls well below the 85 percent and 67 percent benchmarks, this primarily reflects a lag in the data, which was obtained from offenders released in 2005. A large proportion of these offenders were sentenced in the 1993–1999 time period, before sentencing laws were changed. As the proportion of inmates sentenced under truth-in-sentencing laws continues to grow over the next several years, it is expected that the time-served data will approach the 85 percent and 67 percent benchmarks. However, to the extent that actual time served by offenders across the nation is less than 85 percent for violent offenders, and less than 67 percent for nonviolent felony offenders, the current analysis underestimates the reduction in crime that could be expected through the proposed policy (if the proposed policy results in fewer than the expected number of offenders being released “early,” less of the gains from the proposed policy would be offset). Note that sentences, under the proposed policy, would be split but offenders would serve out the complete terms of those sentences, either in prison or in home detention. Thus, no state would be disqualified from the VOI/TIS program as a result of the proposed policy (the percentage of the sentence served would rise to 100 percent under the proposed policy). To maintain incentives for prison inmates to behave, release to home detention and EM after serving 50 percent of their sentences in prison could be made contingent on good behavior.

Table 1 breaks down the estimated reduction in crime due to the proposed policy, adjusted for the consequences of releasing prisoners into the community after serving 50 percent of their sentences.

An estimated total of 781,383 crimes would be averted annually. Significantly, 466,748 violent crimes would be averted annually, including 68,792 murders, 13,378 deaths by manslaughter, 14,205 kidnappings, 29,824 rapes, 43,211 other sexual assaults, 191,700 robberies, and 105,639 assaults. In addition, an estimated 190,582

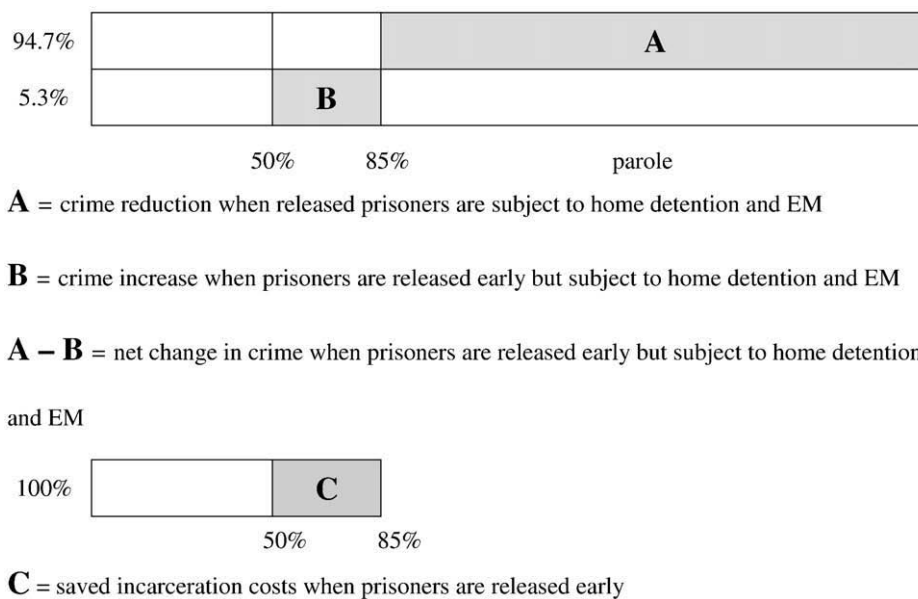


Fig. 2. Schematic representation of annual gains and losses of proposed policy for violent offenders currently subject to the 85 percent time-served requirement.

Table 1
Averted crime with home detention and electronic monitoring, by offense

Category of most serious offense	Annual Reduction in Crime with EM	Averted Victim and Property Loss Per Crime (dollars) ^a	Averted Incarceration Costs per Crime (dollars) ^b	Total Value of Averted Crime Per Year (dollars) ^c
Violent offense	466,748			
Murder	68,792	4,467,460	307,678	328,488,989,958
Negligent manslaughter	13,378	4,467,460	112,020	61,262,259,004
Kidnapping	14,205	226,893	112,020	4,814,193,879
Rape	29,824	132,200	195,932	9,786,214,128
Other sexual assault	43,211	132,200	112,020	10,553,008,254
Robbery	191,700	12,156	140,000	29,168,446,707
Assault	105,639	14,284	84,030	10,385,723,056
Property offense	314,635			
Burglary	190,582	2,127	56,030	11,083,631,931
Larceny/theft	79,637	562	56,030	4,506,818,315
Motor vehicle theft	36,366	5,622	28,020	1,223,439,257
Arson	8,050	56,983	84,030	1,135,122,063
Total (all offenses)	781,383			472,407,846,552

Notes:

^a From Miller 1996, *Victim Costs and Consequences: A New Look*. Costs of kidnapping from Cohen (1988), Pain, Suffering, and Jury Awards: A Study of the Cost of Crime to Victims. All costs adjusted for inflation.

^b Discounted at 3.5% per year.

^c Omits averted incarceration costs due to early prisoner releases.

burglaries, 79,637 thefts, 36,366 motor vehicle thefts, and 8,050 acts of arson would be averted annually.

The social value of the annual reduction in crime, \$481.1 billion, was calculated based on estimates of the averted loss to each victim and averted property losses for each crime (Cohen, 1988; Miller, Cohen, & Wiersema, 1996), plus averted costs of incarceration (Stephan, 2004) based on average time served per offender for each of eleven major categories of crime (Bonczar, 2010), plus averted costs of incarceration when offenders are released early (not included in Table 1), adjusted for inflation, with incarceration savings discounted at an annual rate of 3.5 percent (since these savings would accrue over time).

If prison terms are reduced from 85 to 50 percent of sentences for violent offenders, the proposed policy would reduce the corresponding prison population by 41.18 percent. Similarly, if prison terms are reduced from 67 to 50 percent of sentences for nonviolent offenders, the proposed policy would reduce the corresponding prison population by 25.37 percent. These changes would virtually eliminate prison overcrowding and the need to build new prisons. Currently, overcrowding is a serious issue: the most recent available data show that 13 states exceeded their maximum prison capacities in 2008 (Sabol, West, & Cooper, 2009). In California, a federal court has ordered the state to reduce its prison population by one-third in order to comply with constitutional requirements (Moore, 2009). Reducing the length of state prison terms would not only reduce overcrowding but would also save taxpayers an estimated \$8.7 billion annually.

If the total cost of monitoring each offender is \$20.37 per day, the annual cost of monitoring all 5,095,200 parolees and probationers in 2008 (Glaze & Bonczar, 2009) would equal \$37,883,066,760. If, however, the probationers who were recommitted to a state prison were those who were previously convicted of felonies rather than misdemeanors, then EM could be limited to that subset (felony probationers), plus all parolees, reducing the total annual cost by half, to \$18,638,138,730.

The cost-benefit ratio (benefits divided by costs) equals 12.70, implying that society would gain \$12.70 for every dollar expended on the proposed form of EM plus home detention for all parolees and probationers. If monitoring of probationers is limited to those with felony convictions (and if probationers who are typically returned to state prison are those convicted of felonies), the cost-benefit ratio equals 25.81, implying that society would gain \$25.81 for every dollar expended on EM plus home detention for all parolees and felony probationers.

Sensitivity analyses

Sensitivity analyses provide information about the degree to which the results are sensitive to changes in the underlying assumptions. The most important assumption, based on Padgett et al.'s (2006) results, is that EM plus home detention for all parolees and probationers would reduce crime by 94.7 percent. If, instead, the effect is half as large, then the amount of crime averted is half as large, benefits are half as large, and the cost-benefit ratio falls to 6.35. Similarly, if the equipment and personnel costs of EM – which include the salaries of the officers assigned to monitor the parolees and probationers – are double the amount estimated above, then the cost-benefit ratio is halved, to 6.35. In each case, however, benefits remain six times as large as the costs, suggesting that the results of the cost-benefit analysis are robust to major changes in the underlying assumptions.

Conclusion

The available evidence suggests that EM plus home detention could be an effective deterrent to crime and could have enormous social benefits, especially if it is applied early and saves what would otherwise be habitual offenders from a life of crime. Based on self-reported crimes over their existing criminal careers, a cohort of 500 habitual offenders were arrested an average of 60 times each and created victim and criminal justice costs, and lost offender earnings, exceeding a total of \$570 million (DeLisi & Gatling, 2003). EM plus home detention may be viewed as an appropriate intervention for high-risk youth whose first encounters with the criminal justice system typically result in a sentence of probation. This form of early intervention could have disproportionate benefits. For example, Welsh, Loeber and Stevens et al. (2008) found that a typical cohort of 500 boys in an urban area, beginning in childhood through late adolescence, created victimization costs that were conservatively estimated to range from a low of \$89 million to a high of \$110 million. Miller, Fisher and Cohen (2001) found that in Pennsylvania alone, the state's juvenile offenders created a total of \$2.6 billion in victim costs during a single year. On an individual basis, Cohen (1998) estimated that the cost incurred by society for each chronic juvenile offender ranged from \$1.7 million to \$2.3 million. However, new evidence, using estimates of the public's willingness to pay for reductions in crime, suggests that the costs incurred by society for each chronic juvenile offender are much greater, ranging from \$2.6 million to

\$5.3 million (Cohen & Piquero, 2009). EM plus home detention could potentially be very effective, and very cost-effective, in aborting the criminal careers of individuals who would otherwise settle into a pattern of habitual offending.

Discussion

For a number of reasons, the results of the current analysis are likely to be conservative. First, the proposed policy would avert a large portion of crimes by a group of parolees and probationers that was not included in the analysis of benefits – those who were not returned to prison for crimes committed while released to the community and, therefore, were not covered by the Justice Department survey that the analysis is based upon. The costs of monitoring this group, but not the benefits, are included in the current analysis. An indicator of the amount of averted crime that is omitted from the current analysis is suggested by the low probability of any offender being apprehended and incarcerated. The probability of an offender being incarcerated is negligible for residential burglary (0.8 percent), vehicle theft (0.6 percent), robbery (1.7 percent), and assault (1.2 percent); and fairly small for rape (12.4 percent) (Farrington, Langan, & Tonry, 2004). Even in the case of homicide, the probability of incarceration is only 42.3 percent (Farrington et al., 2004). Thus, the current analysis only captures the tip of the iceberg, involving parolees and probationers who were unlucky enough to be re-arrested and returned to prison (and available to participate in the Justice Department survey of state inmates).

Second, even the tip of the iceberg is underestimated. It is extremely unlikely that the state prison inmates surveyed by the Department of Justice admitted to any crimes for which they were not arrested. Historically, the arrest rate is only 3.3 percent for residential burglary, 4.9 percent for vehicle theft, 5.7 percent for robbery, 12.8 percent for assault, 32.1 percent for rape, and 85.3 percent for homicide (Farrington, et al., 2004). This suggests that a substantial amount of crime committed by parolees and probationers who participated in the Department of Justice survey upon which the current analysis is based was undetected by that survey. Much of this crime would be avoided with EM, but was not included in the analysis.

Third, it is likely that some parolees and probationers committed crimes that triggered federal jurisdiction, perhaps crossing state lines. These individuals may have been arrested and even imprisoned, but they would have ended up in federal prison and their crimes would not have been counted in the Justice Department survey, which was limited to state prisons.

Fourth, the Marklund and Holmberg (2009) study suggests that EM reduces crime in the three year period after the expiration of monitoring. These benefits were not counted in the current analysis.

Fifth, the current analysis uses conservative estimates of the costs of crime. More recent estimates, based on the public's willingness to pay to avert crime, are between 1.5 and 10 times higher than previous estimates (Cohen, Rust, Steen, & Tidd, 2004).

Sixth, the current analysis omits the psychic and material benefits to parolees and probationers as a consequence of avoiding prison for crimes that are averted by the proposed policy. These benefits are likely to be enormous, because they would involve estimation of the value to each prisoner of avoiding the assaults, rape, fear, physical confinement, lack of privacy, and lack of control that accompany imprisonment.

Seventh, the current analysis omits the lost output to society when offenders are incarcerated. The loss of output involves not merely the loss during the period of incarceration, but the lower productivity and loss of output subsequent to incarceration as a consequence of foregone work experience, foregone opportunities to pursue education and training, and the unwillingness of employers to hire ex-convicts. It is estimated that each offender loses, on average, \$14,626 in foregone wages for each year of imprisonment (Cohen & Piquero,

2009), but this ignores the loss of work experience and the stigma that depress earnings for years after release from prison.

Finally, the current analysis omits a number of other costs: a.) the cost to society of the rehabilitation, counseling, and treatment services that are required when convicts exit prison, b.) the excess cost to society of the personnel, resources and facilities required to arrest, detain, try, convict, and supervise offenders, beyond the cost of incarcerating convicted offenders for the terms of their sentences, and c.) costs related to the intergenerational transfer of crime, due to the fact that children whose parents are career criminals are likely to be at high risk of becoming criminals themselves (Cohen & Piquero, 2009).

What are the ethics of the proposed policy? The answer requires answers to three questions that were not addressed in Padgett et al.'s (2006) study. First, how do parolees and probationers react to EM and home detention? Second, how does monitoring work in practice? Third, what is the mechanism by which it achieves its effects?

Interviews with 36 Swedish offenders suggest that their experience was very positive, facilitating their re-adjustment to work and family routines (Marklund & Holmberg, 2009). This theme recurs in interviews commissioned by Britain's National Audit Office (NAO), which is responsible for auditing the performance of Britain's national EM and home detention program, serving over 225,000 offenders. Interviewees were "generally positive" about their experiences (National Audit Office, 2006, p. 44). Younger males in particular were "quite happy" with home detention and viewed it as a good method of easing them back into society (National Audit Office, 2006, p. 44). Interviewees asserted that, without EM and home detention, it would be easy to slip back into criminal routines (National Audit Office, 2006, p. 44). Interviewees also asserted that EM was more effective at halting the development of a criminal career, compared to serving out their sentences in prison, which provided an education in criminal activity (National Audit Office, 2006, p. 44). Interviewees generally felt that release to home detention had a positive effect on social relationships with family (National Audit Office, 2006). In general, interviewees felt that the monitoring device was satisfactory to wear (National Audit Office, 2006). They stated that they had not attempted to tamper with the equipment as the risks of being discovered were too high (National Audit Office, 2006).

The NAO study team also conducted tests to determine the extent to which EM works as intended (National Audit Office, 2006). Members of the study team were tagged and monitored for one week by contractors. The members sought to defeat and trick the equipment, and recorded a diary of events that was later compared with the remote contractor's simultaneous log of events. The contractor's log accurately recorded all attempts to tamper with the equipment – disconnection from the power supply, shaking, dropping, damaging and cutting off the bracelet. With one exception, there were no instances of false alarms. The single instance occurred when one wearer took a bath in a metal bathtub, which shielded the signal (normally, the device is not affected by baths and showers).

In instances where a signal was lost, contractors were required to contact the offender by telephone to confirm that the offender was at home. If there was no answer, a violation was assumed and the contractor was required to visit the home within four hours. Equipment that signaled possible tampering triggered a contractor's visit. In addition, contractors were required to visit each offender's home every 28 days to confirm that the equipment was working properly. Breaches by offenders were reported to the Home Office, which notified the police. The NAO surveyed the police and concluded that breaches account for a small proportion of incidents handled by the police and do not impair police effectiveness (National Audit Office, 2006).

The NAO study team summarized its report by stating that "the technology is robust: the equipment and monitoring system work" (National Audit Office, 2006, p. 16). The NAO and the Marklund and Holmberg (2009) studies suggest that EM works because offenders

like it, cooperate with it, and find that it helps them to transition back into society without slipping into criminal activities.

It may seem paradoxical that monitoring, which has no treatment component, could be effective. One possible explanation is that offenders who are not monitored may have poor impulse control and may be easily tempted by the short-term gain of crime (Nagin & Pogarsky, 2004). They may fail to consider future consequences or may believe that the probability of arrest and incarceration is slim (Nagin & Pogarsky, 2004). In either case, Padgett et al.'s (2006) results suggest that an ankle bracelet helps offenders to control their impulses and make better decisions.

It may be the case that poor impulse control is a consequence of poverty or bad neighborhoods. Nothing in the current analysis should be interpreted as saying that policymakers should discontinue efforts to reduce poverty and improve the social conditions that tend to promote criminality. Instead, it may be argued that it is both humane and ethical to view poor impulse control as a treatable condition requiring a monitoring bracelet and a home detention curfew for an extended period of time, but otherwise permit offenders to seek employment, education, training, and counseling in the community, and to live in their own homes with their families.

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