THE DETERRENT EFFECTS OF DNA DATABASES

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Executive Summary

The governments of all U.S. states and many countries around the world maintain databases of criminal offenders’ DNA. Law enforcement investigators use these databases to help them solve crimes: matching DNA from crime scenes to DNA in offender databases can lead them to a perpetrator they might not have suspected otherwise. This means that once offenders are added to a DNA database, they are more likely to get caught if they commit another crime. This could deter future criminal behavior.

This issue brief describes new research from the United States and Denmark showing that adding more people to government DNA databases has dramatically reduced recidivism. The effects are largest for younger offenders and first-time offenders, suggesting that adding people early in their criminal careers has the biggest benefits. This brief also discusses the policy implications of these findings, and the potential tradeoffs involved in further expanding DNA databases in the years ahead.
The Evolution and Function of DNA Databases

Government DNA databases for criminal offenders are now used in every U.S. state and many other countries. In the U.S., state databases are linked to form a national network called CODIS, which is maintained by the FBI. A separate database contains DNA profiles from unsolved crime scenes.¹

State laws govern which types of offenders are required to provide a DNA sample for the database. Most states started with the most serious violent offenders: convicted murderers and rapists. Over the years, legislators added robbers, burglars, and other convicted felons. All states now require DNA from any offender convicted of a felony, and many have moved on to include people charged with a felony (without waiting for a conviction) or people convicted of misdemeanor offenses.

The DNA sample is taken with a (quick and painless) saliva swab, and the sample is used to create an identifying string of numbers. Think of this as a Social Security number: it uniquely identifies the individual but has no inherent meaning. This string of numbers—the offender’s DNA profile—is uploaded to the DNA database, where it is compared with DNA profiles from crime scene evidence.

The purpose of these databases is to provide new leads for crimes where law enforcement has not found the perpetrator. When DNA from a crime scene is uploaded to CODIS, it is compared with the DNA profiles in the offender database. Any matches are sent to local law enforcement and might lead them to a new suspect in what is otherwise a cold case. This means that, once they are added to the DNA database, offenders who might have expected to get away with their crimes in the past are now more likely to get caught. This raises two pertinent questions: Does the knowledge that their DNA is on file deter them from committing new crimes? And if so, how much does it change their behavior?

Evidence from the United States and Denmark

I've spent the past several years studying the effects of DNA databases on criminal behavior in the United States and in Denmark (which has a similar system but much richer data). The results: expanding offender DNA databases to add more criminal offenders has a big deterrent effect, reducing the number of crimes they commit in the future.

Using detailed administrative data from seven U.S. states—Florida, Georgia, Missouri, Montana, New York, North Carolina, and Pennsylvania—I considered what happened when states added more convicted felons to their databases.² Simply comparing people who were added to the database with those who weren’t would be misleading, because those people usually have different criminal histories. Those differences in their criminal pasts could drive any differences we see in their criminal behavior going forward.

However, legislated database expansions created “natural experiments” that allowed me to avoid this problem and measure the causal effects of adding more offenders to the database. Consider two very similar felons convicted of the same crime—robbery, for example. One happened to be released from prison on May 28, and the other on June 2. If the state database expanded to include robbery convicts on June 1, the second person would be added to the database but the first would not. In other words, two otherwise identical people receive different treatments, in an essentially random way. The precise timing of their scheduled release relative to the expansion date is due to luck, not to a choice or to past behavior.
One can then follow people who were released on either side of the database expansion date, in order to see if those added to the database have higher or lower recidivism rates down the road. Since nothing else about these people changed at that date, we can be confident that differences in recidivism are due to the addition of their DNA to the database, and not to underlying differences in their propensity to commit more crime.

Crucially, any other changes in the criminal justice system, including broader use of DNA as evidence by police, will affect everyone, whether they were released before the database expansion date or after. Being added to the database simply makes the individual more likely to be identified as a suspect in cases where he might not otherwise have been on law enforcement’s radar. This is the effect that I studied.

Findings: Big Deterrent Effects

• In the U.S., using state database expansions between 1994 and 2005, my study revealed that adding people convicted of a violent felony offense to a DNA database reduced the likelihood of another conviction within five years by 17%. The effect on those convicted of property felonies was smaller (a 6% decline) and less robust, but it provides suggestive evidence that this group also changed its behavior. If criminal behavior did not change at all, we would expect to find an increase in new convictions simply because people are more likely to get caught when they’re in the DNA database—for any crime they do commit, we’re now more likely to see it in the data. This means that these numbers probably underestimate the true deterrent effect on crime.

• In Denmark, I worked with Anne Sofie Tegner Anker and Rasmus Landersø to conduct a similar analysis, but with much richer data. In 2005, Denmark expanded its database from including just a small subset of the most serious violent offenders to including everyone charged with the equivalent of a felony. This set up a natural experiment similar to the one in the U.S. study: people who were otherwise identical who were charged with a felony offense on either side of the expansion date received different treatments (being added to the database or not). For this group, being added to the DNA database reduced the likelihood of a new conviction by 42% in the first year. This large effect persisted for at least three years.

It is possible that some of this reduction in new convictions was due to offenders being more careful to avoid leaving DNA at crime scenes when they knew that they were in the DNA database. This was unlikely to have driven the results, for a few reasons.

First, it’s very difficult to avoid leaving DNA anywhere you go. We are all constantly shedding skin cells when we move around the world, and DNA technology can match offenders to such small DNA samples. You would need to bleach a crime scene to eliminate that DNA; this is extremely rare. Many offenders don’t even wear gloves to avoid leaving fingerprints.

Second, the main incentive to avoid leaving DNA at a crime scene comes from the more widespread use of DNA in investigations in the first place, and this will affect all offenders, whether or not they’re in the DNA database. Thus, in our study, we didn’t expect any meaningful additional effect on the behavior of those who were added to the database—though in the end, this is something we could not test empirically.

Finally, in both studies, the evidence showed that expanding the DNA databases lowered crime rates. In other words, these reductions in recidivism had meaningful public safety benefits. This supports the argument that the estimated deterrent effects weren’t simply the result of offenders being more careful not to leave evidence at the crime scene—there were fewer crimes reported to police when DNA databases were expanded, not just fewer people convicted of those crimes. It also means that other would-be offenders did not simply step in to replace those who were deterred.
Comparing the Results

Why were the effects in Denmark so much larger? One possibility is that the U.S. data were simply of lower quality. For example, because I did not have information on who was added to the DNA database or when, I had to impute this information based on individuals’ incarceration records and existing law. This imputation process introduced noise that likely made it more difficult to detect an effect.

But the larger results in Denmark might be due to meaningful differences in the context and policy. The DNA database expansions studied in the U.S. occurred in the mid- to late 1990s, and Denmark’s database expanded in 2005. DNA technology improved and became more widely used between the two studies. In particular, police collected and submitted DNA from crime scenes more often in later years, which is necessary for the database to be able to make matches. That is, DNA databases might be more effective at catching offenders now than they were previously.

Another possibility is that offenders learned about the potential of DNA over time, either from their peers who got caught or from crime dramas on television. Over the years, the likely effects of being added to the database might have become more salient to the offenders that governments were hoping to deter.

It’s also possible that adding those charged with felony offenses, as in the Denmark study, was a more effective deterrent than waiting until a felony conviction, as was the case in the U.S. study. Some people who are charged with felonies will ultimately be convicted of lesser offenses; for this reason, adding people based on their charges, even if they’re not convicted, can include people who committed more minor crimes. (Including people convicted of misdemeanors could have similar benefits.) Also, individuals who are convicted will typically be sent to prison, perhaps for a long time. Those whose charges are dismissed or bargained down to lesser offenses will be back out on the streets sooner. This means that they will have more opportunity to commit new crimes. If we want to improve public safety, this group might be a better target.

Other results from the Denmark study support the idea that adding people to the DNA database earlier in their criminal careers can have the biggest benefits. We found large deterrent effects across most subgroups, including property offenders as well as people charged with acts of violence. But we also found that the deterrent effects are driven mostly by the youngest offenders in our sample—those aged 18–23. Relatedly, we found larger effects for first-time offenders than for people who had been charged earlier. Both these results suggest that adding people to the DNA database sooner, before they go too far down a criminal path, is more effective at changing their behavior.

The rich Danish administrative data also allowed us to measure effects on other aspects of offenders’ lives. If being added to the DNA database spurs some individuals to change their behavior—perhaps they stop hanging out with the people they know will get them into trouble, and invest in skills that will lead to gainful, legal employment—we should see this in the data. Indeed, we did see evidence that being added to the DNA database had these benefits.

The group that reduced their criminal behavior the most—those aged 18–23—shifted from employment to education or training programs. Those from the older group (aged 24–30) shifted from unemployment into employment. We can’t tell from the data whether being added to the DNA database caused this shift in behavior directly, as a conscious investment in noncriminal skills—or indirectly, as the result of no longer having work or schooling interrupted by arrests and incarcerations. Either way, the reduction in criminal behavior due to the deterrent effect of the DNA database appears to have put these individuals on a better track.
Policy Implications

A growing body of research shows that increasing the probability of getting caught can have stronger deterrent effects than increasing the punishment received. This is most likely because most offenders are not particularly forward-looking, so changing the punishment experienced today will be more effective than changing the punishment experienced tomorrow or a year from now. The question is how, in practice, to increase the probability of being caught. Technology is providing new options that are cheaper and more effective than existing investigative methods, and DNA databases are a remarkable example of these options.

The research results that I and my colleagues in Denmark discovered provide strong support for the hypothesis that increasing the probability of getting caught does have a large deterrent effect on crime. In the Danish data, we estimated that a 1% increase in the probability of detection reduces the number of new crimes by 2.7%. This is much larger than the deterrent effects of increasing the length of punishment. Spending more to increase the detection of offenders would significantly improve community safety.

Moreover, expanding DNA databases to include people before they reach the point of a felony conviction is likely to achieve big benefits. If people are deterred from committing more crime before they have a felony conviction on their record, this could make it easier for them to find jobs and stable housing. The Danish results show that being added to the database after a felony charge provides something of a wake-up call that puts individuals on a better, noncriminal path. The effects are largest when individuals are added to the database earlier in their criminal careers.

Nevertheless, while the benefits of expanding DNA databases are large, they should be compared with the costs. Expanding existing databases costs money, but analyzing additional DNA samples is relatively cheap, and will only get cheaper as technology improves. The primary cost that needs consideration is an individual’s privacy. This cost is difficult to measure, and perceptions vary widely. This will be an important subject of discussion in the years ahead.

As these discussions take place, the alternatives need to be kept in mind. All crime-reduction tools involve trade-offs. Putting people in prison has large privacy costs. So does putting cameras or police officers on every street corner. By comparison, a DNA sample that leads to an identifying string of numbers (but is not analyzed for any health data or other personal information) might be one of the less invasive options on the table.

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Endnotes

1 These government databases are separate from private, commercial DNA databases used for genealogy.


3 Ibid.


