VIDEO TRANSCRIPT

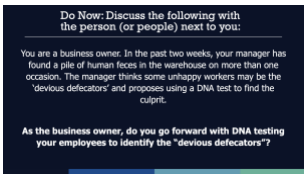
DNA, Crime, and Law Enforcement

Link to video.

Slide 1

This PGED lesson aims to examine how advances in DNA technology impact individuals, law enforcement, and society.

Slide 2



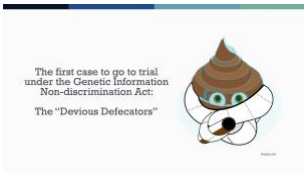
Before delving into the presentation, we like to explore the following scenario as a way to introduce some of the topics that are covered in this lesson:

Imagine you are a business owner. In the past two weeks, your manager has found a pile of human feces in the warehouse on more than one occasion. The manager thinks some unhappy workers may be the 'devious defecators' and proposes using a DNA test to find the culprit.

As the business owner, do you go forward with DNA testing your employees to identify the "devious defecators"?

You may want to pause here to think about your own answer to this question.

Slide 3



The scenario described on the previous slide is based on a real-life story, where someone had been repeatedly defecating in a grocery warehouse in Atlanta. The manager suspected it was Dennis Reynolds and Jack Lowe, who worked for the company. As the employer, the manager asked them that they submit a DNA sample to test if they were in fact the "devious defecators", a nickname coined in the media to describe this case. Reynolds and Lowe, afraid of losing their jobs, agreed to a DNA test. The results indicated that they were not the perpetrators. However, it was illegal for the manager to ask for a DNA sample, because the Genetic Information Non-Discrimination Act (GINA) forbids employers from asking for DNA from their employees. The men sued their employer and won $2.25 million US dollars in damages to be shared between them. This was the first case that went to trial under GINA. It shows how the law protects employees from employers seeking genetic information to make a decision to fire employees.

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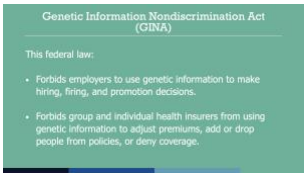

So, what exactly is GINA?

GINA is a federal law that prohibits employers and health insurance providers from discriminating on the basis of genetic information. GINA was passed by the United States Congress in 2008. This law prohibits employers from making hiring, firing, or promotion decisions based on a person's genetic information.

GINA also prohibits health insurers from using genetic information to 1) deny a person the right to buy health insurance - and secondly to raise or lower the cost for buying health insurance.

There are exceptions and limitations to what GINA covers though. For example, GINA does not apply to employers with fewer than 15 employees. In addition, GINA's protections do not extend to all types of insurance. For example, life insurance and long-term care insurance are not covered by GINA. It is important to be aware of these exceptions, so people can consider the potential benefits of learning about their genetic information against the risk that they may be denied coverage for these types of insurance as a result.

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This presentation consists of 3 parts: 'DNA databases,' 'uses of DNA as a forensic tool,' and 'limitations.'

The first part of this lesson explores the DNA databases that are used to aid criminal investigation, how these databases of genetic information are created, and how their composition has changed over time.

In the second part of the presentation, the focus shifts to the ways in which DNA can be used as a forensic tool to (i) identify suspects, (ii) identify victims and missing persons, and (iii) provide evidence to support exonerations.

The third and final part of the presentation highlights that although DNA is a powerful tool in forensic investigations, there are a number of limitations and controversies surrounding its use from both technical and societal perspectives.

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So, what exactly is a criminal DNA database?

Criminal DNA databases are generally broken into two parts:

A forensic database stores DNA profiles from samples collected at crime scenes, whereas an offender database stores DNA profiles from people who have been arrested, charged or convicted of a crime. These two databases can be compared to one another to identify possible suspects of the crime being investigated.

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In the United States, each state maintains its own database and may share information with the FBI's database, known as the Combined DNA Index System (CODIS). As of May 2020, CODIS has DNA profiles from over 14 million people in the offender database, and about 1 million DNA samples recovered at crime scenes in their forensic database. This includes over almost 4 million DNA profiles obtained from people who have been arrested, but not necessarily charged or convicted.

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So, what types of crimes require a person to provide a DNA sample?

As shown on the slide, each state determines its own rules about the types of offenses that require offenders to provide a DNA sample. Some states only require DNA samples from offenders of felonies, whereas others also include misdemeanors.

A felony is considered the most serious category of crime and includes violent crimes, many sex offenses, and many

drug-related crimes. A misdemeanor, such as trespassing, is a criminal offense that is less serious than a felony and often punished by a fine or short jail term.

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Misdemeanors can include graffiti painting as well as being part of a protest. Law enforcement agencies argue that collecting DNA samples from people who commit misdemeanors helps catch people who may have already committed more serious crimes, or who may do so in the future. Privacy advocates, on the other hand, argue that the scope of DNA collection is too broad, will have negligible effects on public safety, and increases the risk of wrongful prosecutions and convictions.

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Even more controversial than collecting DNA for misdemeanor convictions is collecting DNA samples from individuals that are arrested, but not necessarily charged with or convicted of a crime.

In 2009, Alonzo King was arrested for assault, and his DNA was collected in the course of the arrest. Maryland authorities used this DNA sample to search a forensic DNA database. They found a match linking King to an unsolved rape from 2003, and he was charged and sentenced to life in prison for this crime.

The question of whether it is legal to collect DNA from an arrestee made its way to the US Supreme Court in Maryland v. King. In a 5-4 ruling, the Supreme Court ultimately decided it is constitutional to take DNA samples from arrestees for the purpose of linking a suspect to other possible crimes. In its majority opinion, the Court argued that a DNA profile is fundamentally the same as a

fingerprint, used to confirm identity, and that people who are arrested should expect diminished privacy protections. The Court was sharply divided, and the dissenting justices argued that DNA collection from arrestees is a violation of the 4th amendment, which forbids unreasonable search and seizure.

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Though the Maryland v. King case determined it is constitutional to collect DNA samples from arrestees, laws on DNA collection vary from state to state. The map on this slide illustrates, as of 2019, states with DNA arrestee laws (shaded in blue), while those in grey represent states with no DNA arrestee laws.

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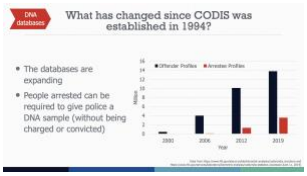

Since CODIS was established in 1994, it has continued to expand. Between 2000 and 2019, over 13 million profiles were added to the offender DNA database. Evidence suggests that the databases grew more quickly as a result of the Maryland v. King Supreme Court decision, which allows DNA collection from arrestees.

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The original intent of CODIS was to find perfect matches - linking a possible criminal to a crime scene with the DNA matched on every single marker that was examined. Now, law enforcement agencies are increasingly also using a technique called familial searching, which uses specialized software to intentionally search DNA databases to identify people whose DNA is similar, but not a perfect match, to DNA found at a crime scene. As we share part of our DNA with our biological relatives, the assumption is that the similarity in DNA occurs because the identified person is a family member of the actual suspect. This means that

criminals who have never been arrested or convicted - and whose DNA has therefore not been entered in an offender DNA database - can still be identified through a family member whose DNA is present in such a database.

Now that we have seen how criminal DNA databases are created and how their composition and use has changed over time, let's have a look at how this DNA can be used as a forensic tool to:

1. Identify suspects
2. Identify victims and missing persons
3. Provide evidence to support exonerations.

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This first case study explores the use of DNA as a forensic tool to identify suspects.

In the period of 1985-1988, there was a string of unsolved murders of Black women in Los Angeles. Many of the victims were killed with the same gun, so police suspected it was a serial killer. In 2007, a murder took place that investigators were able to link to the 1980s murders through DNA evidence. The serial killer was given the nickname "The Grim Sleeper", because police thought he had taken a break (or "slept") for a long period of time between the killings. However, they now believe he probably never "slept", as he has been linked to multiple murder cases that happened during his supposed "break". When law enforcement compared the likely killer's DNA against an offender DNA database, they did not find a perfect match. However, using familial searching, they did identify someone whose DNA was very similar: Christopher Franklin.

Christopher Franklin was too young to be the murderer, but his father, Lonnie Franklin, was of an age where it was possible that he was the killer. Police obtained a DNA sample from Lonnie by following him to a restaurant and, with an officer posing as an employee, collected tableware and pizza crust with his DNA on it. Lonnie Franklin's DNA was a perfect match with the DNA found at the crime scenes, and he was arrested. He was convicted and sentenced to death in 2016 for the murders of ten women and girls, but police think he may have murdered more than 25 people. In March of 2020 he was found unresponsive in his cell and pronounced dead.

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This second case study is another example of the use of DNA as a forensic tool to identify suspects, but in this case, the DNA database that was used was never intended for use by law enforcement.

The "Golden State Killer" is a serial killer and rapist who committed at least 13 murders and over 50 rapes between 1974 and 1986 in California. After failing to find a match in the government-created databases, investigators in this case uploaded the perpetrator's DNA to an open-source genealogy database, called GEDmatch. GEDmatch is a privately created database that welcomes people to upload their DNA analysis from private companies like 23andMe or Ancestry.com, in the hopes of building a large community for people seeking familial connections.

Law enforcement found a genetic connection in the database – a distant cousin of the suspected killer. Using genealogical research to construct a family tree, investigators narrowed down the possible suspects and, with

additional DNA testing, an arrest was made. In 2020, Joseph James DeAngelo pleaded guilty in exchange for a sentence of life in prison instead of the death penalty.

This case is an example of how quickly a new technique can take hold. Though GEDmatch was not developed to be a legal tool, in the months after the arrest of the suspected "Golden State Killer", law enforcement agencies used the database to make arrests in several other "cold cases." Some people have reacted positively to this news by saying that any and all methods are justified in the pursuit of solving crimes. Others have voiced concern regarding the fact that if even one biological relative uploads their DNA to a genealogy database like GEDmatch, then some of their shared DNA is also part of a system that is now being used for law enforcement reasons. In fact, using another genealogy database similar to GEDmatch, the investigators in the Golden State Killer case originally suspected an Oregon man was responsible for the crimes. A warrant was obtained to take his DNA sample, and his biological relatives were exposed to further investigations before it was ultimately determined that none of them were viable suspects.

GEDmatch later changed its terms of service so that DNA profiles are now by default opted out of use for law enforcement investigations. Users can choose to opt-in, but only a small percentage have chosen to do so. GEDmatch has since been taken over by the forensic genomics firm Verogen, raising new concerns over privacy and the use of personal data.

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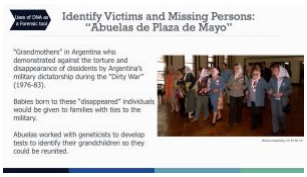

The third case study focuses on the use of DNA as a forensic tool to identify victims and missing persons.

During the "Dirty War", Argentina's military dictatorship declared a war against those suspected of being left wing "communist opponents". War tactics included killings, torture, abduction and the so-called "disappearing" of children. Top officers gave the "disappeared" children away to military couples and pregnant people were major targets. Identities of children were erased. As a result, the "Abuelas de Plaza de Mayo" (Grandmothers of the Plaza de Mayo), organized in response to their grandchildren's disappearance. Weekly demonstrations in front of the presidential palace gained international attention, including from geneticists.

In 1984, Dr. Mary-Claire King, a geneticist from the University of California in Berkeley teamed up with Dr. Ana Maria DiLonardo, a geneticist from Buenos Aires, Argentina. They developed a test that could identify a genetic link between the grandmothers and their grandchildren using mitochondrial DNA. Mitochondrial DNA is a part of our DNA that is generally passed down to offspring via the egg and not via the sperm. Thus, this type of DNA provides a genetic link from the grandchildren, via their biological mothers, to the Grandmothers, who are trying to find them.

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The last case study focuses on the use of DNA as a forensic tool to provide evidence in support of exonerations.

Darryl Hunt was freed after serving 19 years in prison for a crime he did not commit. In 1984, he was sentenced to life in prison for the murder of journalist Deborah Sykes. In 1994,

a DNA test showed that Darryl's DNA did not match the DNA found at the crime scene, but nonetheless his appeal was rejected. He was exonerated in 2003 after further DNA testing proved that he was not the perpetrator.

DNA evidence collected at the crime scene was compared to a DNA offender database. They didn't find a perfect match - but did find someone whose DNA was quite similar. With that information, investigators were able to narrow down their search to the brothers of that person and, through their investigation, police identified Willard Brown as a suspect. Investigators were able to show that DNA from a cigarette discarded by Willard Brown matched the DNA found at the crime scene of Deborah Sykes' murder. Following Brown's confession, Darryl Hunt was exonerated. Hunt became an activist and educator, and was awarded $1.6 million dollars in damages from the city of Winston-Salem, in North Carolina. Sadly, Hunt took his own life in March 2016.

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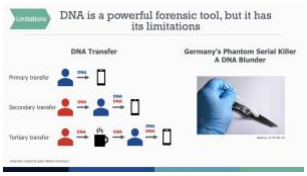

As we have seen in the 4 case studies, DNA is a powerful forensic tool. However, it is by no means perfect and has its limitations.

One limitation of DNA as a crime solving tool is that crime scene conditions can make collecting and interpreting DNA complicated. People 'shed' different amounts of DNA, and secondary and tertiary transfer of DNA, as illustrated on the slide, can be sources of contamination. This means that the mere presence of someone's DNA at a crime scene is not necessarily sufficient for conviction. An example of this is the story of Germany's Phantom Serial Killer. German investigators spent years on the hunt for a female serial killer,

as they repeatedly found her DNA at multiple crime scenes. However, it turned out that this DNA actually belonged to a female factory worker, who had accidentally and repeatedly contaminated forensic laboratory materials with her own DNA.

DNA at crime scenes may be limited in amount, of poor quality, and a mixture of many individuals' genetic material; all of which can result in an incomplete DNA sample of the perpetrator. With an incomplete DNA sample from which to generate a profile, there is an increased risk of identifying the wrong person as a suspect.

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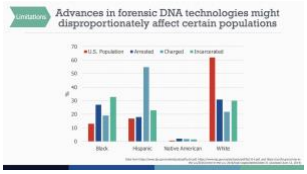

Another limitation of using DNA as a forensic tool, is that the advances in forensic DNA technologies might disproportionately affect certain populations. The growth in DNA collection has led to worries that existing racial biases in the American criminal justice system will be reinforced and amplified. US government data from the FBI and the Bureau of Justice Statistics, have shown that communities of color are disproportionately affected by the criminal justice system. This is particularly the case for Black, Hispanic and Native American people. As can be seen on the graph, these communities are arrested, charged, and incarcerated at higher percentages than their representation in the US population. These racial differences translate into over-representation of DNA from Black, Hispanic and Native American people being collected in criminal databases.

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In this presentation we have seen how criminal DNA databases are created and how their composition and use has changed over time. We examined 4 case studies to explore the various ways in which DNA can be used as a forensic tool - and highlighted some of the technical limitations, as well as the ethical and societal implications of the use of DNA in law enforcement.