



The Future of Genomic Surveillance: Understanding Chinese Action in the Information Environment

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Author: Henry H. Lewis

The College of William & Mary



Henry H. Lewis, E-intern, The College of William & Mary

Henry Lewis is a recent graduate from the College of William & Mary who completed coursework in Economics and Public Policy. His capstone project was on the fiscal cyclicality of military regimes and national debts. He served as part of the TRADOC Virtual Intern Program in 2021.

The Future of Genomic Surveillance

Henry H. Lewis¹

While maneuvering in the *information environment* (IE), it is important to consider the actions of National Defense Strategy and National Military Strategy adversaries, such as China, and understand how their present actions indicate their intentions for future operations. If we can understand the intentions of our adversaries and forecast their intentions over time within the IE, we are better positioned to shape *Joint Force* (JF) strategy and inform planning approaches in effective ways to achieve a position of relative advantage. Emerging signals within the IE point towards an advanced new tool: genomic surveillance, which threatens our competitive edge across the globe. China is building vast databases of genetic material that will, absent American action, give them a comparative advantage over American forces in future cyberconflicts and in the continuing struggle to assert global leadership. The United States must act now to implement adequate defenses to ensure the protection of our genomic assets and to challenge the rising threat of Chinese dominance in this new arena of the IE.

Implications of Genomic Surveillance

The field of genomics is progressing rapidly as new technologies continue to emerge. As understanding genomics allows us to better understand ourselves, genomic surveillance allows others access to some of our most personal data. In the modern era, protecting our digital footprint is of increasingly growing concern, but inadequate attention to security has resulted in an increasing number of new threats to our privacy. Over the course of the next 20 years, we will transition to a completely new era of information, that of genomic information and surveillance. It is of dire importance that we can understand the importance that this new era represents. As our understanding of genomics grows, we must prepare ourselves for the realities of a world of genomic surveillance.

Traditionally, genomic surveillance has been used in the field of epidemiology as a method for tracking disease, but as our understanding of genomics grows, so does the application for the use of genomic surveillance. Now, genomic surveillance includes the process of using the information found within a person's genetic code to study, track, coerce, or control them. The application of this can take many different forms, ranging from targeting specific individuals, to the suppression of ethnic groups.

¹ Contact Information: hhlewis@email.wm.edu

In the digital age, we understand the IE to be the aggregate of individuals, organizations, and systems that collect, process, disseminate, or act on information². The IE is becoming a predominant aspect in warfare and great power competitions and must be incorporated into future planning to emerge from the previous period of strategic atrophy in accordance with the 2018 National Defense Strategy³. By understanding the role that genomic surveillance currently plays, and the dominant role it will have soon, we will be able to better position ourselves to achieve a relative advantage over our adversaries.

On an individual level, genomic surveillance would mean an end to the possibility of an anonymous existence. Surveillance makes it incredibly difficult to move through the world unnoticed. Genomic surveillance will make it impossible. Even if we are somehow not seen on any of the dozens of cameras that most of us pass by every day, we still leave behind traces of evidence that we were there. A strand of hair, a flake of dead skin, even the residue from the natural oils our body produces are all pieces of evidence left behind of our existence. That is not to say that genomic surveillance is the same as DNA forensics, or even that they are applied in the same way. DNA forensics is used on a micro scale, matching samples taken from individuals to specific pieces of evidence. It has been used as evidence in courts around the world to prosecute murders, rapists, and other criminals. It has also been used to exonerate individuals accused of these crimes, offered as evidence that they were not the perpetrators. Genomic surveillance is a separate and new idea, one that involves the collection of as much genetic material as possible to exploit, manipulate, or control either an individual or a group of people. Additionally, genomic surveillance gives us added tools in the fight to track and understand disease, potentially allowing us to identify the next pandemic before it begins.

At the strategic level, genomic surveillance can be a tool used against entire groups of people. Since 2003, when the *Human Genome Project* was able to identify the base pairs that make up our DNA, we have been able to begin to understand the genetic blueprint of humanity. Mapping the human genome allowed for a full understanding of what makes us who we are as individuals. Suddenly ethnicity, which had previously been a social and cultural concept, could potentially be identified within a person by certain genomic markers (Simon, 2019) This was potentially the underlying thinking that led to the mass expansion of DNA collection in China as they sought to use this information as a means of exerting increased power and social control.

² “Department of Defense Strategy for Operations in the Information Environment.” Department of Defense, June 2016.

³ “Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge.” Department of Defense, 2018.

Current Chinese Government Actions

In 2003, China's Ministry of Public Security launched a massive DNA database the likes of which the world had never seen (Kannan, 2020). Until this point, DNA databases such as the FBI *Combined DNA Index System* (CODIS) or the DNA database of INTERPOL only collected DNA samples from people under criminal investigation; however, China began the collection of DNA samples from members of the Chinese public. It is my belief that this is evidence that the Chinese Communist Party (CCP) has another motive: mass surveillance.

In 2013, members of the Chinese government began mass DNA collection in regions of China with large minority populations. Most notably this collection occurred in the Tibetan Autonomous Region (TAR) where an estimated 80% of the population, approximately 3 million people, submitted DNA samples to the national database under the guise of receiving a "free health screening." This same strategy for DNA collection was implemented again in 2016, this time collecting nearly 23 million DNA profiles in Xinjiang (Ingram, 2020; Moreau, 2019). The focus on these two areas demonstrates China's larger goal of using genomics as a method of surveillance and for identifying ethnic minority groups. This signals a strategy for oppression that is likely to continue to expand soon. Both the TAR and Xinjiang are under intense scrutiny from the CCP because of their large population of ethnic minorities. In particular, Xinjiang has drawn the attention of the world within the last year because of mistreatment of the Uighur Muslim population. The Chinese suppression of this ethnic minority group meets the United Nations' definition of genocide, and concentration camps are being filled with individuals identified as Uighurs because of the sweeping genomic data collection in the region (Simon, 2020). This is an extremely worrying trend that demonstrates the potential for genomic surveillance to gather information about individuals that can then be used for social control. China has not stopped with areas with exclusively large ethnic groups; rather, they have set a goal of expanding their DNA database to include as much of their population as possible (Wee, 2019). By collecting genetic information from a relatively small portion of their male population, whose DNA contains the Y-STR information, a short tandem repeat found in the sequencing of the Y chromosome, that allows for familial tracing and connections, China will be able to obtain information about the genomics of their entire population, even without collecting samples from every individual (Roberts, 2011). This would allow them to identify members of ethnic minorities within the general population.

These efforts are well underway, with the Australian Strategic Policy Institute estimating that China now has DNA samples of between 100-140 million Chinese nationals (Leibold & Dirks, 2020). Notably, this expansion has been made possible because of American companies which have supplied Chinese Authorities with test kits that have been modified to suit their specific needs centering around mass collection (Wee, 2020). As our understanding of the science behind genomics continues to grow, it is likely that more and more private companies will enter the realm of genomic surveillance. We already

see a vast array of private sector options for consumers wanting to see what their genetic material can tell them about their heritage, what might these companies offer their customers in the future?

Creating a Database of American DNA

Privacy and security concerns regarding China and Chinese corporations are not new. It was once again brought to the forefront of our national attention recently over the popular social media app TikTok, where concerns were so great that the app was almost banned nationwide and was banned for Department of Defense (DoD) employees. This is something that is becoming more and more common as the DoD continues to ban the official use of technologies that may not be fully secure, such as the popular video conferencing platform Zoom and the telecommunications company Huawei (Edwards, 2020). Future security concerns will likely be far more complex. In addition to worrying about Chinese actions in the IE relating to our social media presence and what software we choose to download, we will also need to concern ourselves with their actions when it comes to acquiring our genetic information. It is not hard to imagine why China would want to create a DNA database containing the genetic code of Americans in addition to the one it is currently creating of its own population. This information could give them detailed information on every American, including the health, and family health history of every member of our government and of our service members. A scenario like this would result in a loss of confidence in the United States as a global leader and would decrease American power and influence because of this mass manipulation of our forces.

Creation of such a database may not even be that difficult. There are already a plethora of companies that collect the DNA of American citizens, ranging from medical providers to companies that offer services that allow consumers to learn more about their family history and genetic backgrounds. Additionally, multiple government agencies collect DNA samples for a variety of purposes, such as the Centers for Disease Control, the National Institute of Health (NIH), the Department of Justice (DoJ), and the DoD. Recent security breaches, believed to be the result of Russian hacking, have demonstrated that foreign powers have the capacity to access even some of our most protected areas, so there is no reason to believe that this DNA information is secure in such a way where it could not one day be accessed by Chinese espionage attempts (Miller, 2020). Indeed, it is not impossible that this information has already been accessed for this very purpose. There are additional concerns when it comes to private corporations. Although they claim to protect consumer data, they could also be the target of cyber-attacks, or could be bought out by, or merged with, a Chinese corporation. An Israeli company, MyHeritage, was a victim of one such attack leading to the compromise of 92 million accounts (Brown, 2018). Continuing attacks targeting genetic information across the world cannot be ignored.

Expansion Through the Belt and Road Initiative

China's main foreign policy strategy, the *Belt and Road Initiative* (BRI), involves investing in the infrastructure of nearly 70 nations (Chatzky & McBride, 2020). It is widely seen as an attempt to create a Sino-centric international trade network to expand Chinese influence, most notably into Africa. By fostering new relationships with African nations, China will be able to obtain more than just its regional economic goals and may be able to use these relationships to further its strategic goals, as well as expanding its use of genomic surveillance. Recent work in the field of genomics that has taken place in Africa has primarily related to understanding and tracking the spread of disease. The African Center for Disease Control, a multinational organization based in Ethiopia, launched the Pathogen Genomics Initiative in the fall of 2020 to "build a continent-wide disease surveillance and laboratory network based on pathogen genomic sequencing⁴." Funding for this initiative, as well as funding for the African Center for Disease Control Headquarters, included \$80 million from the Chinese government.

Given China's interest in expanding its regional influence in Africa, this move is not surprising. While a disease surveillance network would be of incredible benefit to the continent, it is hard to believe that China's intentions here are purely benevolent. This move has implications deeper than just pathogen genomic sequencing, and likely ties into China's attempts to expand their genomic databases. The United States should expect a massive increase in "free health screenings" offered in Africa by the Chinese, like those offered in the Tibet Autonomous Region and Xinjiang, designed as a method for collecting genetic data. This would mark a dangerous expansion on the precedent already set by China in the realm of genetic data collection. The transition from the collection of genetic material of Chinese nationals to the direct collection of genetic material from non-Chinese citizens is the next step in what is currently a one-sided arms race for dominance in the realm of genomic surveillance.

Building a Bold Vision for the Future

If the United States is to maintain its competitive advantage over our adversaries, we must be prepared to act decisively on new information and begin to prepare ourselves for the future. Immediate steps that should be taken to ensure American dominance in this new realm of the IE include creating a comprehensive plan to defend the genomic information of Americans, particularly service members. The DoD should initiate a policy review to consider banning its employees from using third-party genetic testing kits designed to provide information about one's ancestry or heritage. While these companies offer unique and interesting insights about our DNA, they ultimately represent a serious threat to our security. Employees of the DoD should not engage in any genomic testing that is not recommended by a medical professional. As is the case with TikTok, the security risk here substantially outweighs the benefits of use. Further, to increase our defensive capabilities in the emerging world of genomic surveillance, the DoD, and the entirety of the US Government should prioritize the protection of our current genomic assets at all costs. This means increasing the security protocols, both physical and in

cyberspace, for existing databases containing genetic material and for sites where genetic material is often collected such as hospitals. If we accept that the next generation of conflicts will play out largely in cyberspace, then we must do everything in our power to defend our genomic data to prevent it from falling into the hands of our adversaries. On a broader whole-of-government (WOG) approach, the United States must develop a more comprehensive defense of genetic material. This should include a review of the security protocols surrounding DNA in all government agencies, stricter laws regarding the collection and protection of sensitive information of American citizens, and potentially even limits on the abilities of American companies to work with the Chinese government in the field of genomics and genetic collection.

In order to counter the expansion of Chinese influence in the field of genomic surveillance, the United States should employ genomic surveillance of its own across the world. In the immediate future the United States should begin to expand the infrastructure behind our genomic surveillance capabilities. This does not mean to begin mass DNA collection of American citizens, a practice that I would consider to be an unethical invasion of privacy, but rather finding other ways to boost our presence in this new realm of the IE vis-à-vis China. One way this can be achieved is through expanding our presence in the field of genomics abroad. By creating partnerships with organizations such as the African CDC, we will be able to minimize Chinese influence in these areas. We will be able to exert our own authority and provide organizations such as this with alternatives to the Chinese government and can create safeguards within these institutions to prevent access to sensitive information that would facilitate the growth of a Chinese DNA database beyond its own citizenry. By exerting soft power in areas of strategic importance we will be able to lower the effectiveness of Chinese efforts. While our national security concerns relating to genomics should surround the actions of the Chinese government, we should not ignore the enormous potential genomic surveillance can have as a force for good. Genomic surveillance can be used in so many positive ways, from tracking disease to prevent the next global pandemic before it begins, to creating new medicines able to target specific aspects of a person's genetic code, to treating disease before it emerges.

The United States should consider the use of genomic surveillance holistically, and within the context of other emerging signals that indicate what the future will look like. If we combine our understanding of genomic surveillance with the power of other new technologies such as artificial intelligence and the gene editing technology CRISPR there is no telling what can be accomplished. These are the kinds of tools that will define the next generation of what we are able to accomplish. The kinds of tools that will allow us to achieve the previously unthinkable, to cure diseases like cancer and Alzheimer's, to

⁴ "Africa CDC Launches Africa Pathogen Genomics Initiative to Strengthen Public Health Surveillance, Laboratory Networks Across Continent." *KFF*, Kaiser Family Foundation, 13 Oct. 2020, www.kff.org/news-summary/africa-cdc-launches-africa-pathogen-genomics-initiative-to-strengthen-public-health-surveillance-laboratory-networks-across-continent/.

dramatically increase our life expectancy, and to discover how our genes can predict who we will become from the moment of our birth.

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