

PREVENTING GENETIC DRIFT IN ARTSAKH'S POPULATION

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By Prof. Z. S. Andrew Demirdjian, Los Angeles, 1 August 2021

*"The difference you perceive between humans
--between groups of humans --are the result of
isolation and inbreeding, mutation, and adaptation
to different Earth environment".*

Octavia F. Butler

In addition to the genocidal threats by Azerbaijan and Turkey, Artsakh Armenians face another but subtle threat. The threat is related to genetics and to inbreeding. We shall start by first discussing problems created by genetic drift in small populations and present some of its possible implications for Artsakh's (Nagorno-Karabakh) future well-being.

Artsakh has very advanced characteristics of a modern society, but it has a relatively small population which makes it a candidate for inbreeding and genetic drift if its population gets smaller.

Let's first explain *Genetic Drift*. The phenomenon of genetic drift is based on the theory developed by Sewall Wright in 1930 (the Sewall Wright Effect or Scattering of Variability). It is a recent scientific discovery full of potential to explain changes in biological and behavioral traits of human and animal life in small populations. Genetic drift is an evolutionary change in allelic (i.e. gene variations) frequencies of a population as a matter of chance. It usually occurs in small populations, but its effects are strong and usually devastating. It occurs due to an error in selecting the alleles (genes) for the next generation (e.g. offspring) from the gene pool of the current generation (e.g. parents).

There is still a lot to be learned about genetic drift, also called sampling error, a change in the gene pool of a small population that takes place by chance. Genetic drift can result in genetic traits being lost from a population or becoming widespread in a population without respect to the survival or reproductive value of the alleles involved. It has great implications for heredity (the passing on of traits/genes from parents to their offspring).

Causes of genetic drift, which occur in small populations, result in two major types, Founder Effect and Bottleneck Effect:

Let us take kaleidoscope for an analogy to explain both the Founder Effect and the Bottleneck Effect. People are like a kaleidoscope carrying various traits (genes). Some are beautiful, some are odd in shape, others are either nice or bad to look at.

In the Founder Effect, changes in gene frequency happen due to colonization of a new area (moving to a new habitat) by a limited number of individuals. For example, after a foreign invasion of Armenia in the 7th century, a prince by the name of Hamam Amatuni took a small group of Armenians from around Karin (Erzurum) to Chaldia (in present-day Turkey) and built a fortress (Hamamshen) in his honor on the Black Sea for a new settlement. He (or his wife) probably carried the gene for blonde hair and blue or hazel eyes. After all, princes are supposed to be handsome. Over the years, his

genes were spread among his small group and we ended up having blonde and blue-eyed members among Hamshen people. He may have given them his bad genes as well, but we have not yet analyzed their effects on their mental capacities.

Of all the immigrants the Amish experienced the most complications when they moved from Germany and Switzerland to the U.S. in the mid-1700s. As a result of genetic drift and inbreeding among the Amish babies with Ellis-Van Creveld Syndrome are born with six fingers and short limbs including dwarfism, microcephalism, and polydactylism. Today, the Amish population has far more cases of these syndromes than any other group in the world.

In the Bottleneck Effect factors that cause genetic drift happen due to a drastic reduction in population because of emigration, war, volcanic eruption, earthquake, landslide, massacre, genocide, etc. From a large pool of genes (i.e. kaleidoscope), only a reduced genetic variation goes through (i.e. only a small proportion of the original population survives). The smaller population may not be able to adapt to new selection pressures with the remaining genes.

Let us take an example from the animal kingdom. In 1900, the cheetah population was 100,000. They are now extinct in more than 20 countries. There are fewer than 8,000 cheetahs in the world. What dwindled their population? Poaching and lack of genetic diversity caused the demise. Due to genetic drift of the population bottleneck type, cheetahs will be extinct in the near future unless governments adopt severe penalties against poachers and promote the growth of the population of this fastest animal on Earth.

In the Founder Effect, a large population is subjected to a critical event as a result of which a small population separates and establishes a new habitat (the Hamshen or Cilician Armenians) while in the Bottleneck Effect a large population is reduced (by force such as war, earthquake, volcanic eruption) into a small population (like the cheetah population of the world).

Even though the people of a small population may not betray current problems as time goes by things change surreptitiously. The problem is aggravated when there is a low fertility rate and a high migration to other countries. The remaining population shrinks, increasing the prevalence of inbreeding. As a result, the risk of genetic drift threatens the physical and mental capacities of the new generation.

Before the 2020 Azeri invasion, Artsakh had a small population. Since the devastating war in 2020 caused the loss of thousands of young soldiers (future families), increased immigration to Russia and to other parts of the world, the population has shrunk. The future does not look good from biological and political perspective.

A large population would obviate the biological problems of inbreeding by a small population, which eventually weakens the society mentally and physically. Population size is related to the strength of "genetic drift" (i.e. a change in the gene pool of a small population that happens by chance) and the likelihood of inbreeding in the population. To state it in a different way, the magnitude of the gene

frequency changes due to genetic drift is inversely related to the size of the population; the larger the number of reproducing individuals, the smaller would be the effects of genetic drift.

Small populations tend to lose genetic diversity faster than large populations due to genetic drift. This happens when some versions of a gene are lost in random. This is more likely to occur when populations are small.

Although the mechanism of the loss of genetic diversity due to inbreeding and drift is different, the effects on populations are the same. So, what are some of the negative consequences of genetic drift in small populations? Based on recent research, geneticists and biologists have come up with the following gradual problems, which would debilitate a small population over time:

1. Both inbreeding and genetic drift reduce genetic diversity in small populations. For example, Armenians of Artsakh may lose a well-established trait of being resilient due to inbreeding and genetic drift when their population becomes smaller.
2. Reduced genetic diversity has been associated with an increased risk of population extinction. The Kalash tribe of Pakistan (blonde hair, blue-eyed, white-skinned descendants of Alexander the Great's soldiers) may soon become extinct due to inbreeding and genetic drift.
3. Reduced genetic diversity has been related to a decrease in population growth rate. Many of the small societies around the world, especially in Europe, are facing the problem of reduced genetic diversity because of low fertility rate and a massive influx of foreign nationals.
4. Reduced genetic diversity has shown limited potential for response to environmental change. Small populations are the last to adapt to changes in social, political, and economic changes for their reduced genetic diversity makes them cling to traditional ways of doing things like most primitive tribes of the world have been doing.
5. And most importantly, reduced genetic diversity has caused decreased disease resistance which impacts the ability of related individuals to survive and reproduce in the wild. Many of the small populations around the world, such as the Inuit of Canada, have shown little disease resistance when viruses attack them.

The afflictions of inbreeding and genetic drift happen to both primitive as well as advanced societies. The criterion is being few in numbers. There are serious implications for Artsakh. Currently, the people there have strong personality traits such as resilience to rise from the ashes, to never give up what is morally and rightfully theirs. In 2020, they put up a valiant fight against an adversary consisting of five or six nations (Turkey and Azerbaijan plus Israel's remote piloting of killer drones). Due to their small population, they run the risk of inbreeding thus the likelihood of genetic drift increases. There might be loss of the gene of resilience in the future generations as it had happened to the Caucasian Albanians (Udis) of Azerbaijan for not fighting against forced Azeri assimilation regimes.

For instance, once the Udis were in the thousands and thousands living in their ancestral lands, now

known as Azerbaijan. Due to yielding to assimilation, their population became smaller and smaller. Through inbreeding and genetic drift, they may have the social gene for love of country weaker and weaker in every succeeding generation to the point of only 3,500 Udis now live in two villages in their ancestral lands. They have become so weak that they have no longer the genes to fight for the survival of their culture and heritage.

Whereas, the Armenians of Artsakh fought against forced assimilation and have kept their population strong with certain genes which have been transmitted down generations. Artsakh people are brave, patriotic, and intelligent, but because their population is getting to be smaller, the future may cause them complications due to inbreeding and genetic drift.

It is important to note that just because there is the Republic of Armenia and the Armenian Diaspora, it does not mean Artsakh will not be susceptible to genetic drift. Genetic drift is based on the fact that a sub-sample (e.g., small, isolated population like Artsakh) that is derived from a large sample set (e.g. Armenia/Diaspora's large population) is not necessarily representative of the larger set. The smaller the population, the greater would be the chance of misrepresentation of the larger population and end up with significant variation in genetic drift in one generation. In some extreme cases, drift (e.g. change in a trait) over the generations can result in the complete loss of that trait.

This may have long term implications for the people of Artsakh. How long will the people of Artsakh resist genetic drift when the population is declining by the day? How can they prevent inbreeding when their numbers are dwindling? We should sound the alarm to Artsakh decision-makers to take measures to forestall the dreadful effects of genetic drift in the future.

The process of genetic drift is slow so people do not become aware of what is happening to their society. Let's not forget that a decrease in genetic diversity instigated by a sharp decline in population is cause for alarm. After all, heredity is the passing on of good or bad traits from parents to their offspring. Who wants to see their people suffer from genetic drift?

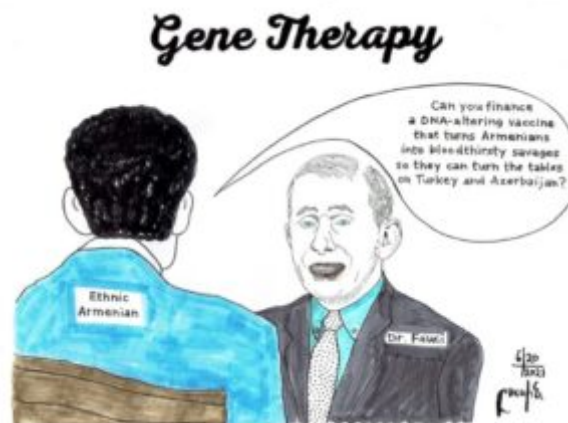


Father and son affected by genetic drift,
which can result in physical and mental

complications in small populations due to lack of genetic diversity and inbreeding. Let us not forget: Perception is seeing with the mind's eye of what does not exist presently; just because we do not see something with our physical eyes now, does not mean it won't happen in the future. So, let us get to work to populate Artsakh.

Ideas have changed the world; ideas can also help Artsakh's future. One way to get Artsakh in a safe mode toward prosperity and good health is to increase its population. Intuitively and scientifically, we can say there is power in numbers and Artsakh's government should not continue in the business as usual mode when its population needs to be vaccinated against the debilitating effects of genetic drift leading to physical and mental deterioration of people. Armenians have lost many lands but cannot afford to lose the people of Artsakh in any way, shape or form. So, please populate and prosper.

Reversing the evolutionary progress of the Homo sapiens would be counterproductive. We all want our Artsakh brothers' and sisters' wellbeing. So, let us find ways to populate Artsakh for prosperity in social, economic, and political spheres by making sure they maintain healthy conditions to avoid the problems caused by inbreeding and genetic drift.



Courtesy of Lucine Kasbarian | Oh, yes, we should also get the population genes of Artsakh altered to make them become cruel and aggressive just as their next-door Turkic neighbors are.

Comments



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Medialab.am cartoon "Stop Killing Peaceful People" <https://medialab.am/97179/>