# Epidemiology of Ambulance Calls in Rural Armenia

Ani Arzoumanian '22 | Colgate University | June 8 – August 17, 2022 | Armenia

**Project Summary**. A strong and accessible emergency medical services (EMS) system is essential to reduce poor outcomes associated with severe injury and to prevent fatality. Armed conflict directly harms soldiers and civilians, and also strains overall healthcare capacity by depleting resources and damaging health infrastructure. The COVID-19 pandemic has placed additional, unprecedented stress on healthcare systems across the globe. As a result, these factors lead to even greater rates of morbidity and mortality. In rural Armenia, research indicates that recent border conflicts and the COVID-19 pandemic have stressed healthcare capabilities, but to date, no studies have assessed these effects on ambulance corps. The primary purpose of this project is to collect and analyze de-identified ambulance patient data to further understand the effects of war and COVID-19 on EMS capabilities, to help the Ministry of Health of the Republic of Armenia improve utilization and quality of these services.

**Background**. Armed conflict can have disastrous consequences for human health. Globally, war results in greater death and disability than all major diseases combined (Levy & Sidel, 2008). Conflict directly impacts both soldiers and civilians, causing premature death, psychological trauma, disability, and other physical injuries (Reza et al., 2008). Exposure to armed conflict has documented effects on those living outside of directly involved regions as well, including higher rates of mental illness and maternal mortality (Murthy & Lukshminaryana, 2006; Urdal & Che, 2013). War can devastate populations in indirect ways, often by causing a deficit of resources directed to health services, which can severely diminish the quality of staff training and medical equipment (Iqbal, 2010; Levy & Sidel, 2008). Additionally, loss of infrastructure including hospitals and ambulance corps can halt medical service capabilities for long stretches of time. These reductions of health resources, especially in low- and middle-income countries, lower the overall capabilities of health systems to care for patients, which can result in even greater loss of life. This was demonstrated most recently by surging COVID-19 cases globally, which overwhelmed the healthcare systems of many countries, including the US (Khan et al., 2020).

The history of the Republic of Armenia is riddled with instances of war and violence. Following the Armenian Genocide of 1915-1918, which resulted in approximately 1.5 million deaths at the hands of the Ottoman Empire, Armenia was conquered by the USSR (Kevorkian, 2011). Violence against Armenians arose again at the end of Soviet rule when, in 1988 and 1990, Armenians living in Sumgait and Baku (cities in Soviet Azerbaijan) were victims of pogroms (Miller & Miller, 2003). These massacres led hundreds of thousands of Armenians to flee from their homes and settle in Soviet Armenia. When the USSR collapsed, the conflict between Armenia and Azerbaijan erupted into war over the disputed territory of Nagorno-Karabakh (known as Artsakh by Armenians), and heavy fighting continued until a ceasefire agreement was signed in 1994 (Modebadze, 2020). Since then, numerous ceasefire agreements have been signed and broken. Conflict resurged in 2016, leading to a four-day war, and again in 2020, this time lasting six weeks. The war in 2020 was especially brutal for the Armenian population, as the Azerbaijani military employed biochemical warfare, including banned white phosphorus munitions, and targeted religious and health infrastructure with drone bombings (Markosian et al., 2021; Modebadze, 2020). Azerbaijan emerged victorious, claiming much of Nagorno-Karabakh territory and forcing tens of thousands of Armenian refugees to relocate (UN High Commissioner for Refugees, 2020). To this day, Azerbaijan holds Armenian prisoners of war hostage (Human Rights Watch, 2021), and the border remains unstable (Aljazeera, 2021).

When the COVID-19 pandemic spread across the globe, countries faced unprecedented medical, economic, and social consequences. Early on, world leaders feared that armed conflict would only add to these stressors, which led the Secretary-General of the UN, Antonio Guterres, to call for "an immediate global ceasefire in all corners of the world" (Guterres, 2020). His call for peace was endorsed by 170 nations, including Armenia, but not Azerbaijan (UN, 2020). Despite these efforts, conflict ensued between Armenia and Azerbaijan, which exacerbated the effects of COVID-19 on the Armenian population - positive cases rose 172% in 63 days from the start of the war, which placed Armenia 10th in world rankings for COVID-19 cases per million people (Markosian et al., 2021). At the same time, many COVID-19 centers were forced to shift their focus to accommodate increasing health needs caused by war and refugee relocation (Kazaryan et al., 2021). Armenia was dealing with two deadly wars at once, and its healthcare system was unable to keep up. In the aftermath of the war, researchers with the US-based Public Health

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Working Group for Armenia concluded that "The compounded impacts of the pandemic, war and immediate relocation of an entire population have overwhelmed the healthcare system in Armenia as competing priorities have exhausted hospital and healthcare capacity" (Balalian et al., 2021).

To date, the effects of the 2020 war and the COVID-19 pandemic on the quality and epidemiology (frequency, pattern) of emergency ambulance calls in rural Armenia have not yet been evaluated. Emergency management in Armenia follows a Franco-German model, which allows physicians to travel via an ambulance to homes or emergency scenes and administer treatment to patients (Chekijian et al., 2021). Ambulance calls are recorded on paper, and stored in thick notebooks throughout the country's 10 provinces. These collections are not well organized, systematically examined, or available digitally for analysis. As a result, much is unknown about the types of emergency calls that come in and which people most utilize and benefit from ambulance services. Without analysis of these data, it is impossible to direct empirically-driven interventions and quality improvement efforts of ambulance corps. For this reason, in a 2021 review, Chekijian et al. wrote that "The uniform collection and analysis of [emergency systems] data should be prioritized, examined, and organized to direct future efforts and policy" (p. 8).

A public health framework outlined by Reza et al. (2008) in *War and Public Health* highlights four steps necessary to prevent the health consequences of armed conflict: (1) define the problem, (2) identify underlying causes and associated factors, (3) develop and test intervention strategies, and (4) broadly implement these strategies. My project targets the first two steps by analyzing pre-existing ambulance data and determining feasible interventions. The mitigation of the effects of war and conflict on the health of civilian populations is imperative, and this project will lay the groundwork for alleviating these issues.

**Methods**. The project will be implemented in the following steps: (1) translate and transcribe existing ambulance data from paper records to create a de-identified digital patient database, which will include pre- and post-war as well as pre- and post-COVID-19 information from the past three years, (2) collect prospective data through ambulance ride-alongs, (3) collaborate with the TUMO Center for Creative Technologies to develop and implement a secure app to facilitate ongoing digital data collection, (4) work with local administrations to assess the availability and quality of training and equipment, and (5) analyze data to identify the most common reasons people call an ambulance, changes of complaints over time, and possible needs of improved training and equipment. These steps will be implemented in two (non-conflict) rural regions in Armenia -Armavir and Lori provinces. The results of this project will be helpful in understanding the health implications of war and conflict on the general population, and could reveal specific ways in which interventions can help to mitigate these adverse effects.

**Long-Term Impact and Sustainability**. The creation of a database is the first step toward improving the efficiency and quality of EMS systems in Armenia. The translation and transcription of de-identified ambulance call data in rural Armenia, paired with prospective data from ambulance ride-alongs, will provide future health professionals and researchers a better understanding of the resource needs of ambulance corps and the health needs of rural communities. This information is paramount to the development of interventions and policies that would best improve EMS systems. It will also allow for ongoing evaluations, as the data would include pre- and post-intervention statistics. If an intervention is found to have a beneficial effect in these regions, it can be scaled up and implemented across the country, thereby addressing the health effects of warfare on the general population.

**About the Student**. Ani Arzoumanian is a senior majoring in Neuroscience, with minors in Creative Writing and Anthropology. She is a certified Interior Firefighter and EMT, and has volunteered with the Hamilton Fire Department since 2018. She is a native English speaker, and is fluent in Eastern and Western Armenian. Ani's experiences in Armenia started very young, spending childhood summers in a rural village in Gegharkunik province with her family. In the summers of 2017 and 2018, Ani accompanied doctors on medical missions as a translator and medical assistant. This program was a joint collaboration between the Armenian American Health Professionals Organization (AAHPO) and the Children of Armenia Fund (COAF). Ani kept in touch with COAF health staff, and returned to Armenia over the summer of 2021 to intern for them, during which she visited and interacted with emergency ambulance corps staff and fire stations in Armavir and Lori. This sparked Ani's interest in strengthening Armenian emergency systems. After graduating, Ani hopes to pursue a medical degree and continue her work in Armenia as a physician.

**Affiliations**. I will finalize all affiliations in coming months: (1) Dr. Aline Baghdassarian, MD, MPH, FAAP - Dr. Baghdassarian is a pediatric emergency physician and Associate Prof. of Medical Education at the University of Virginia, and is familiar with emergency medical systems in Armenia from past research projects. She expressed interest in this project, and has agreed to mentor me throughout the summer. (2) American University of Armenia - I plan to recruit a research assistant, and have corresponded with the

Dean of the School of Public Health, Dr. VarduhiPetrosyan. (3) Ministry of Health of the Republic of Armenia - Dr. Baghdassarian and I have been in contact with Dr. Shant Shekherdimian, a senior advisor to the Ministry of Health of the Republic of Armenia. (4) TUMO Center for Creative Technologies - I will partner with this organization to create a secure digital system to continue data collection post-project. (5) Children of Armenia Fund (COAF) - I have been in contact with Dr. Lusine Antonyan, the Health Programs Manager of COAF, to access contact information of ambulance corps administrators.

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| Name: Ani Arzoumanian | | | | | | | | | |
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| Project Name: Epidemiology of Ambulance Calls in Rural Armenia | | | | | | | | | |
| School: Colgate University | | | | | | TOTAL FUNDS REMAINING: | | | |
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| Total Additional Funding: | | | | | | TOTAL EXPENDITURES: | | | |
| | | | | | | | $10,000 | | |
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| Student Expenses | | | | | Project Expenses | | | | |
| Travel (Including Airfare) | Lodging | Communications | Food (Biweekly) | Miscellaneous | Non-Student Travel and Lodging | Direct Equipment and Supplies | Marketing and Event Support | Staffing Costs | Miscellaneous |
| Airfare: | $3,000 | $100 | $130 {biweekly}= | $0 | $150 | $350 | $0 | $1,600 | $0 |
| $1,500 | | | $1,300 | | | | | | |
| Ground: | | | | | | | | | |
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| $3,500 | $3,000 | $100 | 1300 | $0 | $150 | $350 | $0 | $1,600 | $0 |
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| Total Student Expenses: | | | | | Total Project Expenses: | | | | |
| $7,900 | | | | | $2,100 | | | | |