

## **Biological Science as a Force Multiplier in Afghanistan**

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### **Abstract**

The initial invasion of Afghanistan proved to be a huge success for the United States, yet the aftermath has proved less than favorable. Resistance continues eight years after the invasion despite enormous advantages the US military has over militant insurgents in Afghanistan, which demonstrates that military force alone cannot win the conflict. A 'hearts and minds' campaign must include improving the agricultural sector (to replace the drug economy), which sustains the way of life for the majority of Afghans; and modernization of the medical system is also crucial--the Afghan healthcare system ranks 173/190 in the world; life expectancy is 44.4 years--and the key to modernization is training Afghans in the medical professions by creating a fast-track, primary care program and also providing a national immunization program.

**Key words:** Afghanistan, agriculture, biological science, counterinsurgency, healthcare, infectious disease, insurgency

### **Introduction**

In 2001, United States Armed Forces invaded Afghanistan, toppled a suppressive and terrorist-harboring government, and brought notions of democracy and modernization to a region of the world largely untouched by the influences of the Western world. The initial U.S. invasion of Afghanistan went smoothly-- American casualties were few, and the swiftness of the invasion bolstered the U.S. population's confidence in the capabilities of the military and the United States' levels of power abroad. In fact, the months after the terrorist attacks of September 11, 2001 proved to be a high point for U.S. influence in the last two decades. Not only did Americans of every race, region, and economic status rally around President Bush and his determined stance to fight global terrorism, but the United States' allies worldwide rallied behind an American-led invasion of Afghanistan. The U.S. had borne a tragic loss from the events of September 11, but for a short time after the attacks, Americans from all ways of life bonded together, and the popular worldwide support for the United States-led coalition against terrorism re-affirmed America's position as a champion of democracy and a leader of nations.

The initial invasion of Afghanistan proved to be a huge success for the United States, yet the aftermath of that invasion has proved less than favorable. Over eight years after the U.S.

toppled the Taliban government with ease, U.S. Armed Forces still encounter daily resistance from a militant Islamic insurgency, terrorist activity has not been stopped, and American presence in the Middle East has become a controversial issue both internationally and on the American home front. Despite the enormous advantages the U.S. Armed Forces have over the militant Islamic insurgents in terms of technology, numbers, and resources, the events of the last eight years demonstrate that the U.S. cannot beat the insurgency by strictly military means. Thus, the U.S. developed the relatively new strategy of winning the war by reaching out to the Afghan population to demonstrate that the coalition force does not want to be a military occupier as much as it wants to be an auxiliary force designed to help the Afghan population attain a better quality of life. While the long-term effectiveness of General McChrystal's new strategy of less drone bombing, more hearts and minds is yet to be seen, there needs to be a firmer stance on the exact methods that the U.S. plans to use in order to gain the affection of the Afghan population (Watkin). By providing technology-based assistance to the Afghan population in the areas of agriculture, medical needs, and education pertaining to public health, the United States can design a new and improved hearts and minds approach to combating the insurgency. This modified approach will depend on creating the infrastructure and cultivating the knowledge that will provide the Afghan population with sustainable opportunities to improve its living conditions, as opposed to the current approach which is characterized by exorbitant sums of money being used to create short-term fixes for deeply-rooted challenges to Afghan modernization.

Before the U.S. can modify its hearts and minds approach to winning the war against the insurgency, U.S. strategy makers must first have a clear understanding of the nature and complexity of the challenges that U.S. troops are currently facing in Afghanistan. While the number and scope of challenges that coalition forces face in Afghanistan changes on a daily basis, two issues have consistently proved troublesome for the U.S. and its allies; these are the rugged and sparsely populated geography of Afghanistan and the presence of a determined and persistent insurgency.

The first major challenge that Afghanistan presents to the U.S. counterinsurgency effort is its rugged terrain and wide-spread population. The Hindu Kush Mountains perhaps Afghanistan's most distinguishing geographical factor neatly divide the country into three regions, the central highlands, the southwestern plateau, and the northern plains (The World Factbook). In addition to creating a vast physical obstacle that interferes with U.S. communications, logistics, and combat operations, the mountains of Afghanistan have shaped the population development of the impoverished nation. Unlike Iraq's other major combat effort Afghanistan is not an urbanized nation. Only 24 percent of Afghanistan's nearly 30 million inhabitants are considered to live in urban areas. Furthermore, with an estimated annual urbanization rate of only 5.4 percent, the largely rural population of Afghanistan is not likely to undergo a major shift in the near future (The World Factbook). Thus, Afghanistan's thinly distributed population presents U.S. Armed Forces with significant logistical challenges. Since the population is so thinly spread, coalition forces cannot maintain a strong presence in every village all the time. Thus, when coalition forces leave a village, members of the insurgency have free reign to come down from the cover of the mountainous terrain and intimidate the Afghan villagers into compliance with al-Qaeda and/or Taliban objectives. Unless the U.S. can find a way to provide lasting security to Afghanistan's numerous villages or demonstrate that the coalition can, indeed, provide a better lifestyle for the village

inhabitants than the Taliban can, U.S. forces will not be able to win the allegiance of Afghanistan's rural population. While the U.S. may be able to control Afghanistan's few urban areas surrounding Kabul, the mountainous terrain of the nation will certainly continue to prove a challenge to U.S. counterinsurgency efforts in the underdeveloped nation.

In addition to dividing the Afghan population into numerous small and rural villages, the rugged terrain of Afghanistan has interfered with the nation's ability to modernize. With only 51 airports, only 16 of which have paved runways, and eleven heliports, air transportation in Afghanistan is, at best, very limited. Furthermore, the mountainous terrain has interfered with the development of a ground transportation system. Afghanistan, with just over 12,000 km of paved roads and 29,800 km of unpaved roads, ranks 87th in the world in terms of the total length of maintained roadways. Considering that Afghanistan has the 41<sup>st</sup> largest area out of all the nations, its network of roadways is severely lagging behind that of other nations (The World Factbook). Afghanistan's lack of airports and roadways proves a continual logistical challenge for coalition forces in the rural areas of the country. Finally, Afghanistan's lack of transportation infrastructure has limited the nation's ability to modernize. Without adequate airports and roadways, Western influence has largely bypassed Afghanistan. Thus, the population relies largely on traditional forms of technology and is characterized largely by provincial and tribal customs. The unique customs and culture that are evident in the various regions of Afghanistan prove to be a challenge for U.S. troops, for tribal leaders are as unaccustomed to dealing with westerners as coalition commanders are unaccustomed to dealing with village elders and tribal leaders. Clearly, Afghanistan's mountainous terrain has contributed to underdeveloped transportation infrastructure, which poses continual challenges to U.S. and coalition forces in Afghanistan.

In addition to the challenges that arise from Afghanistan's mountainous terrain, coalition forces routinely face resistance from a determined and persistent insurgency. The insurgency's determination lies in the fact that it remains a deadly and viable fighting force almost nine years into U.S. control of Afghanistan. Thus, the members of the insurgency are unwilling to back down, even in the face of clearly superior U.S. military forces. In fact, the Obama administration views the resurgence and persistence of the Taliban as "the greatest threat to U.S. security" (qtd. in Jalali). Evidence of the insurgency's determination and effectiveness is evident in numerical categories. One would expect the level of U.S. and coalition casualties to decrease each month that passes, but this is not the case. August 2009 proved to be the most deadly month of the war for American troops (Watkin). Figure 1 below details the number of U.S. fatalities by month and year:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2001	0	0	0	0	0	0	0	0	0	3	5	4	12
2002	10	12	14	10	1	3	0	3	1	6	1	8	69
2003	4	7	12	2	2	7	2	4	2	6	8	1	57
2004	11	2	3	3	9	5	2	4	4	8	7	2	60
2005	2	3	6	19	4	29	2	33	12	10	7	4	131
2006	1	17	13	5	17	22	19	29	38	17	9	4	191
2007	2	18	10	20	25	24	29	34	24	15	22	9	232
2008	14	7	20	14	23	46	30	46	37	19	12	27	295
2009	25	25	28	14	27	38	76	77	70	74	32	34	520
2010	45	55	39	34	43								216

**Figure 1: U.S. Fatalities in Afghanistan by Month and Year (iCasualties.org)**

Looking at the yearly totals for the number of fatalities, the insurgency is actually becoming more effective as time passes. Perhaps the most alarming fact is that the insurgents are continually able to recruit new members to their cause. With drones and Special Forces targeting and eliminating members of the insurgency every passing day, one can only question how the insurgency keeps its numbers up. The answer to this question lies in what David Kilcullen refers to as the "accidental guerilla." Kilcullen's main argument asserts that the vast majority of Afghan recruits that join the insurgency have no strong terrorist ideology or ties to the Taliban; rather, these new recruits to the insurgency see the U.S. as a hostile army marching through their homeland—land for which many Afghan citizens are willing to fight (Kilcullen). Thus, the presence of a dedicated group of Taliban-loyal insurgents provides a core insurgency that begrudged Afghan citizens can turn to when they feel that the U.S. presence in their province has become more of a detriment to their way of life than an advantage. The determined and effective insurgency in Afghanistan has plagued U.S. and coalition efforts for nearly nine years, and the challenges posed by the militant insurgency are not going to disappear in the near future unless the U.S. can improve its "hearts and minds" strategy to the point at which Afghan village leaders prefer the presence of coalition forces to that of the Taliban.

The persistence of the insurgency stems from another one of Afghanistan's significant problems—opium. A large portion of Afghanistan's rural economy is focused on the cultivation of the poppy plant—the source of opium and its derivatives, such as heroin. A United Nations survey conducted in 2007 showed that opium is equivalent to more than half (53%) of the country's licit GDP—insurgents and warlords control the business of producing and distributing the drug—the rest is made by drug traffickers (UNODC). The U.S. must decrease the production of Afghan opium if it hopes to decrease the funding available to the insurgency. However, simply destroying poppy fields is not a viable option, for doing so would further alienate the segment of the Afghan population that relies on the cultivation of the poppy. Currently, 8% of the Afghan population is engaged in poppy cultivation, and the U.S. cannot risk alienating nearly one tenth of the population with an overly aggressive policy advocating the destruction of poppy fields (McKechnie 113). Thus, the U.S. must implement a "hearts and minds" policy that provides poppy farmers with an incentive to switch their crop of choice to a

sustainable crop that is congruent with U.S. policy objectives of combating the militant insurgency.

Despite the challenges of Afghanistan's mountainous geography, rural population, and persistent insurgency, there is hope for the United States to turn the tide in Afghanistan and remove coalition troops sooner rather than later. David Kilcullen estimates that under an improved policy of winning the hearts and minds of the Afghan population, the U.S. will be able to rectify enough of the problems in Afghanistan within two to five years to allow an almost complete troop withdrawal and associated takeover by Afghan security forces (Watkin). General McChrystal's desires for a troop surge have been answered by President Obama, albeit the President approved an additional 17,000 troops rather than the hoped-for additional 30,000 troops (Starr). Furthermore, President Obama has allocated increased spending on Afghanistan, more of which will be seen by the Afghan people as dictated by the most recent U.S. strategy built on winning the hearts and minds of the Afghan population. With more money and troops flowing to Afghanistan than in previous years, U.S. Armed Forces have a significant opportunity to turn the tide in the current stalemate. The extent to which the U.S. can improve the conditions in Afghanistan depends largely on how commanders choose to utilize the increased levels of resources. If money is simply used to pay-off villagers and would-be insurgents in order to create a short-term fix to a troublesome situation, Afghanistan's future will be dismal. However, if commanders choose to use their troops and resources to interact with the Afghan people and help Afghans develop sustainable solutions that make use of modern techniques and technologies, the Afghan population will have a greater propensity to embrace the advantages of modernization and democracy. Albeit there are many areas of focus in the new "hearts and minds" strategy, three of the most prominent technological-based areas for improvement involve agriculture, medical needs, and education pertaining to public health and disease.

Agriculture is the primary means of subsistence for most of Afghanistan's citizens. Over eighty-five percent of the citizens populate rural areas, and approximately two-thirds of Afghans are employed in the agrarian labor force (Rotberg 112). This accounts for fifty-three percent of the legal gross domestic product for Afghanistan (Rotberg 113), and a significant amount of additional revenue results from the widespread illegal opium trade. In a 2003 investigation of Badghis, Herat, Kabul, Kandahar, and Nangarhar provinces, agricultural cultivation and farm work accounted for at least seventy-five percent of the labor activities of rural Afghans on average (Nojumi 175). Since the overwhelming majority of the population relies on agriculture to survive, this is a relatively easy avenue to access the hearts and minds of its citizens.

With this in mind, the United States currently sponsors several efforts aimed at improving the agricultural sector of Afghanistan. The United States Department of Agriculture (USDA) Foreign Agricultural Service (FAS) has facilitated and sponsored trilateral working groups between Afghanistan and Pakistan to improve food security, trade management, and watershed rehabilitation (USDA 1). Provincial reconstruction teams employ one civilian advisor for agricultural reconstruction; this individual's efforts vary depending on the needs of the province, but ultimately aim at establishing both the institutional and physical infrastructure required for the reconstruction of a thriving agricultural sector (USDA 2). The United States also sponsors technical assistance and stateside training for Afghan officials to more effectively set up agricultural systems and increase cooperation between the U.S. and Afghanistan (USDA 3). These efforts are civilian sponsored and require little manpower or funding compared to the greater reconstruction budget that the military often aids in distributing.

Financially, the United States allocates approximately five to six percent of the reconstruction aid funding towards agriculture. From 2002-07, we provided 304 million dollars of aid to agricultural and environmental projects, and in 2008 and 2009, the U.S. provided an additional 186 million dollars (USAID 1-2). This is from an eight year budget totaling approximately 9.5 billion dollars. Since the introduction of the new counterinsurgency manual authored by General Petraeus in 2006, there has been an increased strategic emphasis placed on counterinsurgency doctrine. The concept of allocating more human resources towards winning the hearts and minds of the people and using less powerful rhetoric regarding the democratization of a foreign nation saw success in Iraq. Unfortunately, when you compare the agricultural allocations above to the 343 million and 352 million dollars spent towards "Democracy / Governance" in the same 2002-07 and 2008-09 time periods, it appears that the government expects troops to do more with less while investing an increasing amount of aid towards bureaucratizing a fragmented conglomerate of tribes scattered across a rural countryside.

Regardless of how policy-makers decide to allocate funds in the reconstruction budget, it is the work of United States soldiers that will truly impact the Afghan population. The counterinsurgency manual mentions agriculture in several places for three purposes. First, the USDA is cited as a cooperative organization with resources commanders should be aware of; this organization's primary areas of involvement have been summarized above (Petraeus 38). Second, agriculture is mentioned as a means of employment offered by insurgencies; rather than promoting economic development, insurgencies generally perpetuate economic stagnation by using the labor as a means to garner support to delegitimize the government (Petraeus 97). Third, agriculture is mentioned several times as a consideration for troops to properly describe the effects of a decision on the operational environment (Petraeus 175). This is the most important advice for troops, because it emphasizes the people's means of subsistence as something that must be protected when making tactical decisions. The manual does not mention it in the context of sustaining capabilities or humanitarian relief, though. Without a substantial emphasis in these areas, once again it seems as if agriculture is not a strategic priority.

The best document for military commanders is a RAND publication for supporting economic development in stability operations. The checklist provided to a commander recommends seven steps one must be prepared to carry out with respect to agriculture. First, the commander must conduct a thorough assessment of the infrastructure, key crops and livestock, and times for planting, harvesting, and selling crops (Crane 74). Then, the commander should develop a means to track the local situation and inventory what civilian assistance is available. Next, he or she must provide security to transportation routes and markets while ensuring troops do not interfere with daily business. Last, the commander should allocate troops to making repairs to agricultural infrastructure and secure funds to continue to improve irrigation systems and fallow lands (Crane 75). While this publication does an excellent job of laying out the tools for a commander, it is fairly unlikely a commander will utilize this resource in Afghanistan.

The priorities and areas of concern set out in the RAND guidebook largely address the needs cited in literary sources on the reconstruction of Afghanistan. A previously successful livestock sector was devastated by years of drought and animal disease, requiring added attention by commanders to available range pastures (Weinbaum 202). Only twelve percent of the total land area is arable, and staple crops such as wheat often have low yields; this demands particular attention to irrigation systems, because these increase the yields of simple rain-fed crop fields (Rotberg 113). In addition to irrigation, the implementation of genetically engineered crops

could substantially increase the yields of many crops. Horticultural fruits including nuts, grapes, almonds, apricots, and apples have several engineered capacities, most commonly including seedless and pesticide resistant versions. In addition to procuring funds for infrastructure, commanders could increase the effectiveness of the crop Afghans are actually growing through this method.

Winning the hearts and minds of the Afghans involves an understanding of the strategic impact of tactical level decisions. In the 2003 report regarding conditions in rural Afghan provinces, less than four percent of aid was given in the categories of seeds and livestock discussed above (Nojumi 200); in fact, out of the provinces surveyed, not a single one was provided with veterinary care or livestock. Over half the aid in each province was categorized as a distribution of free food or food in exchange for manual labor (Nojumi 200). While this satisfies the basic needs of Afghans, it fails miserably at empowering them or justifying the purpose of our humanitarian or nation building strategy.

This gap between the needs of the people and the support the U.S. provides must be closed. As demonstrated by the statistics, agriculture is a way of life for the majority of the Afghan population. It is what puts food on the table, commonly what brings tribes together at various markets, and ultimately what drives the national economy. The United States has some infrastructure and funding in place to help restructure this vital national interest for Afghanistan, but we must give it an improved standing in our broad counterinsurgency strategy. Giving agriculture an increased standing in the budget or redistributing the aid such that farmers can be empowered to produce more are two opportunities to do this on the policy-making level. The U.S. would benefit from equipping tactical commanders with the RAND guidebook and giving the USDA volunteers training to embed with selected military units. Most importantly, the U.S. must ensure that the enlisted forces that regularly interact with the Afghan farmers are encouraged to offer assistance in whatever way possible. As high school graduates, U.S. soldiers have baseline scientific knowledge to report a problem up the chain so that commanders can allocate funds to improve it. For example, if a private notices fleas on the livestock, commanders can provide the appropriate medication and instructions for the farmer to raise a healthier animal. Ultimately, policy-makers should recognize agriculture is a means to win the hearts and minds of the Afghan population with several opportunities for improvement and increased emphasis. By instituting some changes down the chain and utilizing the resources that U.S. forces already have available, the United States can make significant progress toward its goal of winning over the Afghan population.

In addition to improving Afghanistan's agricultural and livestock systems, the modernization of the Afghan medical system can significantly improve the lives of many Afghan citizens, leading to a notable enhancement of the current "hearts and minds" policy. While U.S. and coalition doctors currently provide medical care for some Afghan citizens, this medical care is often not extended into the rural areas of the country due to the logistical challenges presented by the mountainous terrain. Even if coalition forces could extend advanced medical care to all Afghan citizens, this would not provide the lasting infrastructure that is required in a newly designed "hearts and minds" strategy. While hypothetically providing medical care to the entire Afghan population would be a huge accomplishment in the current policy of winning the hearts and minds of the populace, this accomplishment would become meaningless the day that coalition forces leave Afghanistan, for the state of healthcare would quickly revert back to what it was before outside forces brought advanced medical care into the country. This hypothetical scenario emphasizes the necessity of a new "hearts and minds" policy that seeks to implement

lasting healthcare infrastructure rather than providing a quick fix to the more deeply-rooted problem of a non-existent Afghan healthcare system.

As of the year 2000, Afghanistan ranked 173 of 190 in the World Health Organization's ranking of world healthcare systems. Rounding out the bottom twenty nations were a variety of other impoverished nations, such as Somalia, Ethiopia, and Cambodia. While the World Health Organization no longer compiles a ranking of the world's health systems due to the complex nature of the task, all current aspects of Afghan healthcare demonstrate that conditions have not improved since the World Health Organization's assessment in 2000. The CIA's World Factbook categorizes Afghanistan's risk of major infectious diseases as "high," with the additional food or waterborne diseases of "bacterial and protozoal diarrhea, hepatitis A, and typhoid fever" also being prevalent (World Factbook). Additionally, the life expectancy of an Afghan citizen is a mere 44.4 years, which ranks 219<sup>th</sup> among the nations of the world. Finally, Afghanistan has the second highest infant mortality rate in a comparison against other countries, with a death rate of approximately 153.14 deaths/1000 live births (World Factbook). While Afghanistan's mountainous terrain and sparse population may contribute to the inability to provide medical care to a large portion of the population, statistics clearly show that Afghanistan has room for improvement in its healthcare system. Using coalition doctors and nurses to provide care to the Afghan population is an important aspect of winning the hearts and minds of the Afghan population, but this provision of care does not provide a long-term solution to Afghanistan's healthcare problem. In addition to continuing to provide care for the Afghan population while U.S. troops remain in-country, the new U.S. "hearts and minds" policy must focus on addressing two of Afghanistan's main healthcare shortcomings: the lack of qualified medical professionals and the lack of immunization programs.

With a population of nearly 30 million, Afghanistan is severely understaffed in the medical career fields. As of 2004, Afghanistan only had four medical schools (World Directory of Medical School). Currently, developmental leaders in Afghanistan have recognized this shortcoming and the current number of medical schools is six. The cumulative student bodies of Afghanistan's six medical schools numbers 11,000 students, or an approximate breakdown of 1,800 students per school and 458 students per medical school class. In comparison, the United States has 168 medical schools, with the largest class size of an M.D. program numbering just over two hundred students (D.O. granting medical schools in the U.S. have slightly larger class sizes). Another shortcoming of Afghan medical training is the conflict between Shari'a Law and science. Under the Taliban rule, medical students were forbidden from using cadavers, for the Taliban considered cadaver use in conflict with Muslim law. As a resort, medical students were driven to extreme methods of study, such as stealing bones or other remnants from cemeteries (Sarwar). These conditions have improved since the displacement of the Taliban.

Currently, Afghanistan's medical training programs lack the quality of programs found in the U.S., but this is to be expected in a developing nation. The U.S. policy of winning Afghan hearts and minds does not need to focus on providing the most-highly trained and specialized Afghan doctors; rather U.S. efforts must be oriented toward getting the greatest number of qualified physicians into the Afghan countryside as quickly as possible. In order to accomplish this feat, the U.S. must try to work with the Afghan government to set up medical training programs designed solely for primary care physicians. Due to the necessity of putting physicians in rural areas as soon as possible, the training program can be streamlined to teach aspiring physicians the skills they will need to know on a regular basis, to include emergency care, illness

diagnosis, and basic pharmacology. If a doctor encounters a case that is beyond his or her skill level, the patient can be brought to an urban area where Afghanistan's few medical specialists practice. Through this abbreviated training program, the U.S. will be able to help Afghans train a greater number of physicians in a shorter time period, and this will translate to improved healthcare for the rural Afghan population in the short term. Thus, by creating a system in which primary care physicians can be trained in the essential aspects of care they are likely to encounter, the foundations of a sound primary care healthcare network will be in place in Afghanistan when U.S. forces leave.

An important aspect of the proposed physician training program is the inclusion of women in medical training. Under Taliban rule, women were not allowed to practice medicine, and accordingly, women were not allowed to enroll in Afghan medical schools, such as Kabul Medical University (Sarwar). Since 2001, after the U.S. displaced the Taliban from power, women have made significant gains in the medical profession. In 2006, the first class of women graduated from Kabul Medical University since the Taliban rule, and the class had 90 women out of its 460 total students (Sarwar). By incorporating women into the medical professions, Afghanistan is taking strides to create an intellectual middle class of empowered women—a characteristic of many Western nations. By inviting women into the medical profession, not only can Afghanistan garner a greater number of healthcare professionals, but the country will simultaneously be taking great strides toward recognition from the rest of the world as a modern state. By helping to establish the infrastructure to train medical professionals of both genders, the U.S. can significantly bolster its "hearts and minds" strategy by improving the medical care offered to Afghan citizens while simultaneously creating a lasting solution to the present shortcomings in the Afghan healthcare system.

While addressing Afghanistan's lack of medical professionals will be a critical aspect of improving the nation's standard of healthcare, an equally important consideration is the country's lack of immunization programs. By implementing immunization programs and making use of vaccinations that are commonplace in developed nations, the Afghan healthcare system can decrease the number of patients that are sent to overwhelmed and incompletely trained doctors. It is currently estimated that 75% of healthcare activities in Afghanistan are being provided by NGOs (Islamic Republic of Afghanistan Ministry of Public Health). In 2003, with assistance from outside agencies, the Ministry of Public Health in Afghanistan developed eight goals for an expanded immunization program, as seen below:

1. Achieve and sustain 80% coverage of childhood immunizations of all antigens (DPT-3) among children aged 0-11 months by the end of 2005.
2. Achieve and sustain 80% coverage of TT2+ among women of child-bearing age (15-45 years) by the end of year 2005.
3. Eliminate neonatal tetanus by end of year 2005 in at least 80% districts of Afghanistan.
4. Interrupt poliovirus transmission by the end of 2004 and sustain it.
5. Reduce measles morbidity rate by 33% and mortality by 50% by the end of year 2005.

6. Improve injection safety and provide 100% safe injections during all EPI sessions by the end of the year 2005.
7. Ensure AEFI monitoring for all campaigns by end 2003 and establish a reliable AEFI surveillance system for EPI by end 2004.
8. Introduce Hepatitis B vaccine in EPI by the end year 2005 under the Global Alliance for Vaccine and Immunization (GAVI) initiative.

In 2004, \$31.5 million was spent on Afghanistan's national immunization program, with costs decreasing after 2005 due to the number of vaccinations that will not need to be distributed a second time (Islamic Republic of Afghanistan Ministry of Public Health). Currently UNICEF distributes all injection systems, and it is estimated that 73% of injections in Afghanistan are deemed safe by the accepted standards of the developed world (Islamic Republic of Afghanistan Ministry of Public Health). Afghan health officials are currently experiencing great success with their immunization efforts. Various NGOs have provided the necessary funding for the immunization supplies, but coalition forces need to improve the distribution of immunizations and vaccines. While a "cold room" has been established in Kabul to store the stockpiles of immunization supplies, the U.S. needs to assist Afghan officials in creating a more efficient and safe system to distribute vaccines to provincial areas. In other words, the U.S. needs to help Afghanistan decentralize the immunization program in order to promote its effectiveness in reaching the entire population; however, quality and safety must not be sacrificed during the decentralization process. Furthermore, while the actual immunization and vaccination supplies are provided by various NGOs, the financial resources and training programs are not in place for Afghans to continue the success of the immunization program without U.S. support. The Afghan Ministry of Public Health recommends that immunization and vaccination education and refresher training occurs in the following areas:

- Training and refresher trainings of vaccinators
- Training of district health coordinators
- Training of mid-level managers and supervisors in management and supervisory techniques.
- Training about new technical issues, such as the introduction of new vaccines and modified schedule, to facilitate effective vaccine management and administration.
- Special training provided on specialized subjects, e.g. data management, computer use in EPI.
- Training of non-EPI health staff in relation to their potential role in improving immunization coverage.

While support from the World Health Organization will cover the necessary expenditures for the refresher training detailed above until 2008, Afghanistan will need to find a new funding source after 2008 if it hopes to continue to provide refresher training to immunization administrators. Furthermore, there is currently inadequate funding allocated to educational programs that inform rural inhabitants about the benefits and necessity of immunizations. The U.S., while continuing to provide financial support for Afghan immunization programs, must simultaneously train Afghan citizens to take over the immunization program so that a national immunization program will remain effective after the U.S. troop withdrawal. By helping Afghan health officials create a

de-centralized immunization system that is effective in reaching all provincial areas of Afghanistan while retaining its safety and efficiency, the U.S. can go a long way in helping Afghan citizens create a major aspect of a reliable and sustainable healthcare system. Finally, by teaching Afghan citizens the importance and benefits of immunizations, U.S. troops can gain the trust and support of rural populations, thus adhering to a "hearts and minds" strategy that seeks to implement long-term solutions to Afghan issues rather than using exorbitant amounts of money to create short-term fixes.

In addition to improving the available access and quality for medical care, there are public health concerns that do not require medical doctors. One of these areas is providing a solution to the malnutrition crisis. Several reports echo a United Nations Security Council statistic that twenty-five times more Afghans die as a result of malnutrition and poverty than violence (Loewenburg). Over one million women and children are severely malnourished, and another 15 million people sit on the borderline of food insecurity. While the United States must guard its image against becoming an occupying force, it is conceivable that many Afghans could simply care less about an American presence because of their dire personal circumstances. It is recognized that extremists are able to recruit individuals by taking rescuing them from the circumstances of poverty. It only makes sense that the United States could win hearts and minds of Afghan citizens in the same manner.

There are a number of factors contributing to the widespread malnutrition. The most obvious factor is poverty. Over forty-two percent of the country lives under the poverty line with over twelve million people living off of less than fifty cents per day (Loewenburg). In addition to poverty, the access to food is declining. Recently, droughts have driven prices of wheat up by fifty percent while cutting a third of its production (Loewenburg). The final two crucial factors are violence and education. Violence seals off regions from humanitarian aid, making it difficult to highlight the extent of the problem on a policy-making level; violence also overshadows the strategic opportunity for addressing the poverty problem, because the lives of our troops will always outrank the living conditions of a third-world child. It may be difficult to completely restructure our priorities at this point in time, but there is a definite education gap that can be addressed in the meanwhile. For example, educating pregnant mothers to eat larger quantities of food and how to breastfeed properly can help eliminate some of the root causes of malnutrition in young children (Loewenburg). The malnutrition problem is just one example of several public health areas that can be improved with education.

Another area of concern is clean water. Forty-eight percent of districts reported that their population's primary source of drinking water was contaminated, polluted, or degraded in 2003 (Nojumi 126). For over half the country, a surface water source, such as an irrigation ditch or river, served as the primary drinking source (Nojumi 126). The sources of degradation are both human and environmental. In Jawzjan, Herat, and Saripul provinces, natural gas and oil refineries are polluting the water because of a lack of environmental regulations (Nojumi 128). Additionally, bombs have left metal fragments in certain springs and wells that ultimately contaminated the water. Another consequence of the drought has been the desertification of surface water sources. As certain wetlands dry up, winds blow sedimentary particles into these sources that make the water non-potable after certain concentrations are reached (Nojumi 128). Similar to the case of malnutrition, the clean water problem demands a complex solution. The Afghan population needs water for survival, and they will use whatever source they can get regardless of its cleanliness. However, American efforts can provide education to determine if the primary source is potable as well as methods of purifying the water available. Similar to the

USDA efforts in agriculture, a suggested mechanism for solving the problem is a regional integration effort. This would allow for flood control and dry-season supply to downstream regions and could double as a means to finance large irrigation and power projects (qtd. in Rotberg 128). Once again, the United States should ultimately empower its tactical military commanders and personnel that interact with the Afghan people with this valuable knowledge.

A final area of concern is general health practices and reproductive health. As with nutrition and clean water practices, basic hygiene skills are an important area for education of the Afghan people and a means to empower rural women. The statistics on rural Afghans with access to reproductive healthcare are abysmal. As seen in the table below, few women can access reproductive healthcare and its quality is certainly not heralded (Nojumi 75).

Province	Cannot Access Reproductive Health Care (%)	Cannot Access Care during Pregnancy/Birth (%)	Can Access Reproductive Health Care (%)	Quality of Reproductive Health Care
Badghis	78	90	22	Poor
Herat	59	34	39	Poor
Kabul	75	75	25	Good
Kandahar	46	29	53	Poor
Nangarhar	43	34	57	Poor

**Figure 2. Rural Afghans Who Can and Cannot Access Reproductive Health Care, 2003**

The reasons for this typically include female patients only being allowed to see female doctors, which are generally very limited in number. Additional reasons include male physicians requiring women to wear full Islamic coverings and restrictions on which part of the woman could be touched. While some of the problems exist within the system, access to birth control in rural areas will lower infant and maternal mortality rates and empower women by giving them a voice in family planning that they often lack (Nojumi 77). Once again, allocating resources to provide soldiers with birth control could cause a significant change in the overall state of reproductive health, especially in the rural provinces.

From the totality of information presented, it should be clear there are many areas for improvement in Afghanistan. The primary topics of agriculture, medicine, and public health are three examples where the application of some baseline biological science can truly make a difference in the United States' overall strategy. The paper framed issues in terms of financial costs, comparison to the systems in the United States, and how Afghan citizens perceive U.S. efforts. Obviously there are political concerns, security concerns, and international perspectives that are also very valuable when assessing the strategy for Afghanistan. However, creating the infrastructure and cultivating the knowledge that will empower the Afghan population with sustainable opportunities to improve living conditions in these scenarios does not require a massive strategic shift. In many cases, the gaps between the current norms and the desired state are well documented and understood. An emphasis from policy-makers through our commanders can effectively influence troops on the ground to apply the basic biological knowledge they possess to further the Afghan living condition. The creation of reference materials and intelligent allocation of funds from company-grade officers will help ensure that a shift occurs in how the basic needs of Afghans are being met. The end result will be the coveted victory of hearts and minds within the Afghan population. By caring for the basic biological

needs of individuals and advancing the living conditions in their society just a few steps, American forces will transform from an occupying force to an auxiliary force that helps establish an improved standard of living for Afghans.

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