

IMPACT OF THE OPIUM POPPY (*PAPAVER SOMNIFERUM*) IN THE UNITED STATES

ABSTRACT

One of the oldest known medical treatments, the opium poppy (*Papaver somniferum* L.), has played a major role in shaping societies across time and space. The purpose of this paper is to examine the ways in which both legal and illegal opioids and opium derivatives, such as morphine and heroin, affect the United States of America today at the start of the twenty-first century. Opioids have directly and indirectly affected almost every facet of modern life. In the medical field, they have dramatically changed the treatment of acute pain and chronic pain management. Their economic impacts are in the range of billions of US dollars. Illegal opioid use has been linked to increased crime rates, higher rates of incarceration, decreased productivity, and a greater spread of diseases like HIV/AIDS and Hepatitis C. The international trade of opium poppy has even affected foreign policy, particularly with Southeast Asia, China, and Afghanistan. Given the wide range of effects and considering the rapid increase of opioid use within the last decade, research and review of the opium poppy and its derivatives is essential.

INTRODUCTION

The opium poppy (*Papaver somniferum* L.) has been used since the neolithic era approximately 8,000 years ago by civilizations across the globe (Husain, 1983, p. 1). The historical volume of opium consumption in China alone has been said to “beggar comparison with any other item in their history with the exception of tea” (Brook, 2000, p. 1). It has gone by many names including Afyun, A-fu-yong, and Ya-pien in the east (Scott, 1969, p. 9). Europeans nicknamed it the “garden poppy” in reference to the “kitchen garden rather than the flower garden” because they cultivated it for seeds without opium production (United States, 1944, p. 5). Nonetheless, the effects of opium cultivation, consumption, and distribution have had lasting impacts, and the continued study of *P. somniferum* is therefore an important topic in ethnobotany.

The opium poppy is an annual, herbaceous dicot of the Papaveraceae family in order Rhoeadales (Husain, 1983, p. 29). Although some believe it to have originated as a cultivar of *Papaver setigerum* — selectively bred into existence for its medicinal properties — most scholars agree it originated in the wild, and merely improved upon by cultivation (Scott, 1969, p. 1). Its origins lie in Asia minor and the Mediterranean coastal region, but its modern range extends north to 60° and south almost to the tropics (Husain, 1983, p. 4).

Five other species exist within the same genus: *rhoeas*, *dubium*, *argemone*, *hybridum*, and *alpinum* (“The Opium Poppy,” 1953). The only one containing morphine, other than *P. somniferum*, is *P. setigerum* (“The Opium Poppy,” 1953). For this reason, only these two species are monitored by the United Nations Office on Drug and Crime (“The Opium Poppy, 1953).

The plant itself can vary considerably in appearance. Figure 1 shows the basic structure and anatomy of *P. Somniferum* L. (“Opium Poppy Cultivation,” 2001). The pod portion of the plant produces the relevant alkaloids; none of the other plant parts are harvested for use (“Opium Poppy Cultivation,” 2001). Under ideal conditions, it can reach a height of 3-4 feet (United States, 1944, p. 2). The flowers measure 3-4 inches across and vary in color from white to red or dark violet with shades in-between. Even the number of petals can vary, although the typical poppy has four (United States, 1944, p. 7). The overall plant is described as “glaucous” which is a whitish, dull green color (United States, 1944, 2).

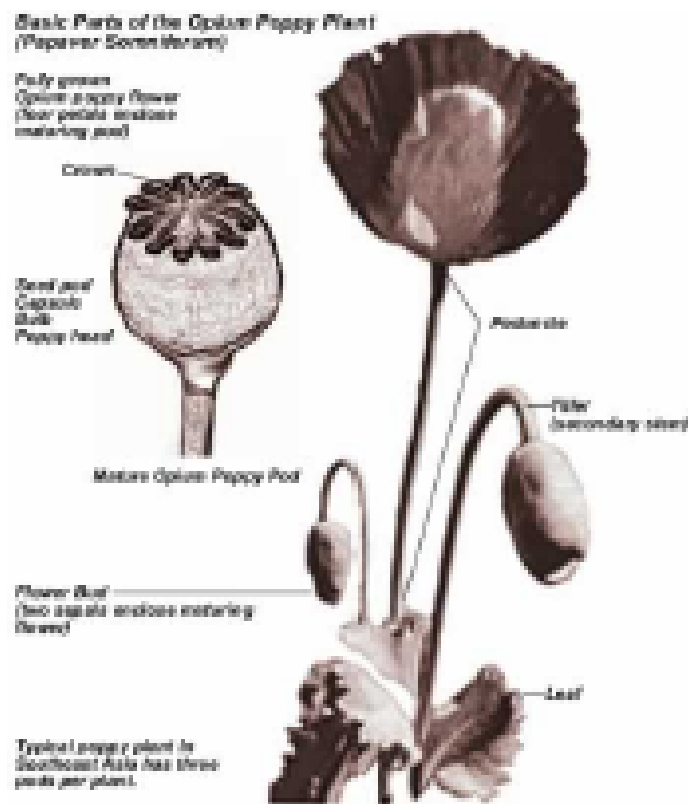


Figure 1 Retrieved from “Opium Poppy Cultivation and Heroin Processing in Southeast Asia,” 2001

P. somniferum can grow at almost any altitude where other crops grow. Furthermore, it has been successfully grown in both rich and poor soils. In areas with poor soils, the opium poppy can be the most profitable crop (United States, 1944, p. 9).

The opium poppy has a long, complicated history. The exact beginning of its use is unclear, but evidence suggests it was used as a medicine in Mesopotamia at least 4,000 years ago (Husain, 1983, p. 23). Early civilizations possibly first cultivated *P. somniferum* for its edible and oil-producing seeds and later discovered its medicinal properties (United States, 1944, p. 3). Egypt's Therapeutic Papyrus of Thebes (circa 1550 BC), more commonly known as the Ebers Papyrus, listed it as a treatment to quiet crying children (Scott, 1969, p. 109). The Egyptians also used the opium poppy to treat abdominal tumors (Husain, 1983, p. 24). In the seventh century AD, the Arab empire spread cultivation of the opium poppy east to China and west to Greece (Kapoor, 1995, p. 3).

When it reached China, it was initially cultivated ornamentally (Husain, 1983, p. 27). Due to opium's "acrid, nauseating taste" it did not have widespread appeal until people began to smoke it (Scott, 1969, p. 11). From there, the opium's popularity exploded. In 1729, however, the Chinese government enacted its first edict against opium which stated that anyone who assisted opium trafficking, including boatmen, neighbors, soldiers, and shop owners, would be "given a hundred

strokes of the bamboo, and three months in prison followed by a banishment to a distance of 1,000 miles” (Scott, 1969, p. 12). This marked a shift in opium politics as the first-time opium was outlawed, a policy which would come to be adopted by nations globally. However, by the early 20th century, somewhere between 3/10ths and 4/10ths of Chinese citizens reportedly still smoked opium, so the effectiveness of the edict is debatable (Merwin, 1908, p. 9). Opium remains a major product of China to this day.

Meanwhile, in the United States, opium became a staple medical treatment. As one of the only treatments that wasn’t “extremely unpleasant, painful, and debilitating,” opium was used to treat everything including cholera, dysentery, diarrhea, tuberculosis, bronchitis, menstrual pains, hysteria, mental illness (Aurin, 2000, p. 418). This meant opium products were widely available at general stores, markets, groceries, and even by mail-order (Aurin, 2000, p. 417). Things changed in 1909, when the US government implemented its first ban against opium – Smoking Opium Exclusion Act – which criminalized opium smoking. This had the largest effect on Chinese immigrants who were the primary smokers of opium. Then in 1914, the Harrison Narcotics Tax Act banned all opiates except as prescribed by licensed physicians (Aurin, 2000, p. 425). Although largely superseded by the Controlled Substance Act of 1970, the Harrison Act is, at least in substance, still in effect today.

To understand the history of opium derivatives, we must rewind a bit to 1804 when J.F. Dorosne isolated the first alkaloid from *P. somniferum* L.: a mixture of morphine and narcotine (Kapoor, 1995, p. xiii). This led to further isolation of opium alkaloids which had a significant impact on medicine and pharmacology. So far, 42 alkaloids have been isolated from the opium poppy (Kapoor, 1995, p. xiv). Of these, only six exist in significant concentrations: morphine, codeine, thebaine, papaverine, narcotine, and narceine. Many of these alkaloids, especially morphine and codeine, are used directly in medicine. However, many more substances have been further derived from the poppy alkaloids. These include pethidine, methadone, morphinane, dithienyl butylamine, and hexamethylenimine (Husain, 1983, p. 133). But the most famous is heroin ($C_{21}H_{23}NO_5$) which is 4 to 5 times stronger than regular morphine (Husain, 1983, p. 133). Heroin was first produced in 1898 by Bayer as an over-the-counter medicine. It was officially discontinued only 15 years later pushing its manufacture and trade underground (Aurin, 2000, p. 420).

Derivatives of opium, including isomers, esters, ethers, and salts, with a few exceptions are classified by the U.S. Food and Drug Administration (FDA) as Schedule 1 drugs, indicating it has a (A) “high potential for abuse” (B) “no currently accepted medical use in treatment in the United States” and (C) “lack of accepted safety for use of the drug or other substance under medical supervision” (“Controlled Substance Act,” 2009). This means production and distribution of opioids outside of a medical setting is highly illegal. Within a medical setting, such as with morphine and oxycodone, the use is heavily monitored and controlled. Nonetheless, illegal use of opioids, especially heroin, remains prevalent.

The poppy can be used in ways other than narcotics. The seeds in particular are especially versatile and have numerous uses. For one, the seeds are edible and have been used globally to prepare foods like pastries and nougat, as well as provide a quality oil suitable for consumption

(“The Opium Poppy”, 1953.). The extracted fruit juices are usable in of varnishes, soaps, and perfume, using the seeds as an emulsifier (“The Opium Poppy,” 1953).

This was only a brief overview of the poppy and its long history to provide context for the political, economic, medical, and cultural effects it’s caused within the United States today.

MATERIALS & METHODS

Due to the Single Convention on Narcotic Drugs (1961) as amended by the 1972 Protocol, national governments are required to report their opioid consumption data to the International Narcotics Control Board (INCB) yearly who publishes it annually in a technical report. This data was used to determine the opioid consumption in morphine equivalence (ME) for the United States from 1980 to 2012 (“Opioid Consumption Data,” n.d.).

The method for determining the cost of illegal opioid use in the United States involved combining two studies: one on nonmedical prescription opioid use (Hansen et al., 2011) and one on heroin use (Mark, 2001). For nonmedical prescription opioid use, data was acquired from the National Survey on Drug Use and Health (NSDUH) from the years 2004-2006 (Hansen et al., 2011, p. 195). For heroin use the estimates were based off the most recent year for which data is available, which is 1996, and were acquired from the Journal of Drug and Alcohol dependency (Mark, 2001, p. 195).

The NSDUH already codifies their data into four categories, and so the heroin-use data was simply added to this based on NSDUH category definitions. These categories are (Hansen et al., 2011, p. 194):

- (1) Abuse treatment includes costs from general hospital inpatient, general hospital outpatient, substance abuse facilities, physicians and other professionals.
- (2) Medical complications include costs from HIV/AIDS, chronic hepatitis C, and neonatal problems.
- (3) Productivity loss includes costs from mortality, incarceration, and unemployment / subemployment.
- (4) Criminal justice costs include those from policing, legal, incarceration, and cost to crime victims.

The indirect psychosocial costs, such as decreased quality of life, were excluded due to the difficulty of defining and evaluating them (Mark, 2001, p. 195). Improved methods of data collection and statistical analysis are required before proper research can be conducted in this area.

RESULTS

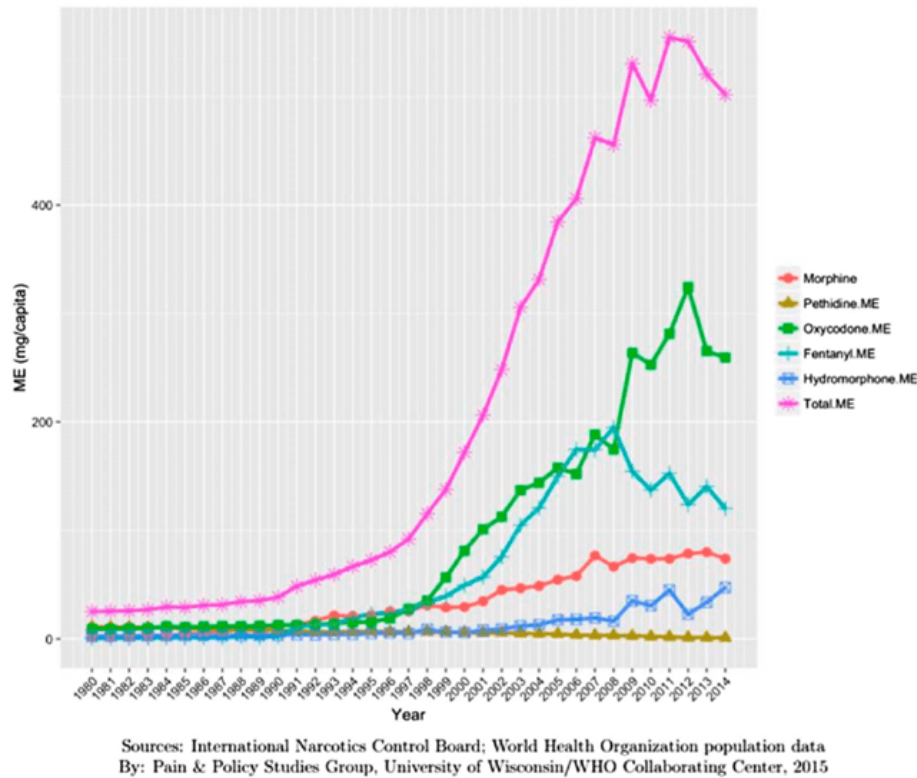


Figure 2 Opioid Consumption in Morphine Equivalence (ME) minus methadone, mg per person

Figure 2 shows the combined data from the International Narcotics Control Board for the United States from 1980 to 2012. Since roughly 1997, total opioid consumption has been rapidly increasing. The single largest contributor to this was oxycodone which was consumed at roughly twice the rate of the second largest contributor, fentanyl. The third most consumed was morphine, followed by hydromorphone, and finally pethidine. Although each narcotic has seen slight rises and falls in consumption over the years, in 2008 fentanyl peaked sharply at 200 morphine equivalence milligrams per capita (ME mg/capita). Total legal opioid consumption per capita peaked in 2011 at 749.786 morphine equivalence milligrams per capita (“Opioid Consumption Data,” n.d.). Despite this, overall trends suggest opioid use will continue to rise with popularity of particular derivatives shifting from year to year.



Figure 3 International trade routes of illicit opiates.
 Retrieved from Khaled, 2013, p. 23.



Figure 4 "Golden Triangle"
 Retrieved from UN Office on Drugs and Crime

Figure 3 shows the results of a study determining the trade route of illegal narcotics. It revealed that the United States receives opium imports from all continents. Notable routes include those from Mexico and South America. The largest portion of US imports, however, originates in the "Golden Triangle" of Southeast Asia (Khaled, 2003, p. 23). Figure 4 shows a closer view of the "Golden Triangle" which includes Burma, Vietnam, Laos, and Thailand ("Opium Poppy Cultivation," 2001). The biggest harvest happens in Northeast Burma along the Chinese border

(“Opium Poppy Cultivation,” 2001). Afghanistan is also a key player in production and cultivates the most opium for global distribution of any single country. It should also be noted that areas in close proximity to major cities report no significant opium poppy cultivation. Instead, it’s limited to rural, low-income areas. The farmers are often of oppressed groups or ethnicities who depend on its trade for survival (“Opium Poppy Cultivation,” 2001).

| | Nonmedical Prescription Opioids | Heroin |
|------------------------------------|--|---------------|
| Addiction treatment | 2.2 | 1.241 |
| Medical complications | 0.944 | 3.569 |
| Health Insurance Administration | (No data) | 0.229 |
| Productivity Costs | 42 | 11.513 |
| Crime Costs | 8.2 | 5.219 |
| Social Welfare Costs | (No data) | 0.099 |
| Total Costs in Billions USD | 53.4 | 21.870 |

Table 1 Economic Cost of Opioid and Heroin Abuse in the US.

Nonmedical Prescription Opioids Data from Hansen et al., 2011, p. 199. Heroin Use Data from Mark et al., 2001, p. 196

Data collected on the economic costs of nonmedical prescription opioid and heroin use in the United States, as outlined in Table 1, estimates a combined total cost of 75.27 billion USD. Of this, 53.4 billion USD came from nonmedical prescription opioid use. The largest contributor to this was in lost productivity (US\$42B), distantly followed by crime costs (US\$8.2B), addiction treatment (US\$2.2B), and medical complication costs (US\$0.944B) (Hansen et al., 2011, p. 199). Two-thirds, or 35.6 billion USD, of the economic burden from nonmedical prescription opioids came from only five drugs: OxyContin, oxycodone, hydrocodone, propoxyphene, and methadone (Hansen et al., 2011, p. 200).

The estimated cost of heroin use, however, was less than half that of the nonmedical prescription opioids or roughly 21.870 billion USD. Lost productivity was the largest contributor at an estimated 11.513 billion USD. This was followed by cost from crime (US\$5.219B), medical complications (US\$3.569B), treatment (US\$1.241B), health insurance administration (US\$0.229B), and social welfare (US\$0.099B) (Mark et al., 2001, p. 196).

DISCUSSION

The use of the opioids is vital to the American health care system. These narcotics play a major role in pain management and are prescribed legally by licensed physicians. The effectiveness of opioids in treatment is reflected by the drastic increase in consumption shown in Figure 2.

Clearly, opioids have become an ingrained part of the United States health care. Many people, however, including doctors and scientists, fear the addictive nature of opioids. Some doctors may refuse to prescribe it under the belief that it contradicts the physicians' code to "do no harm" by creating addicts (Maccallum, 2012, p. 50). Maccallum argues that there is a "modern-day opium war" in which doctors argue over opium's ability to treat and manage chronic pain versus its potentially addictive and destructive natures (Maccallum, 2012, p. 50). If so, the data from the International Narcotics Control Board suggests the pro-opium campaign is winning out ("Opioid Consumption Data," n.d.).

In addition to legal prescription opioids, derivatives of the opium poppy have gained widespread use in illegal markets. Heroin in particular has become a popular street drug. The use of heroin has steadily increased over the years from an estimated 400,000 users in 2002 to an estimated 600,000 users in 2010 (Jones, 2013, p. 95). Similarly, deaths from heroin overdose have increased since 2007 (Jones, 2013, p. 95). Illicit heroin use is a significant topic because of the effects it has not just on users but entire communities. Heroin use is correlated with an increased transmission of diseases like HIV, loss of productivity, and high crime rates (Jones, 2013, p. 99).

Heroin also has political impacts. Aside from federal laws prohibiting its production, distribution, and use, international trade of illicit substances affects foreign policy. For example, during the middle of the 19th century, Britain engaged in an "opium war" with China wherein British merchants continually flooded the Chinese black-market with illicit opioids to the annoyance of the Chinese government. This caused further unrest between the two nations and dissuaded the Chinese government from all foreign trade (Aurin, 2000, p. 428). Yet at the same time, the US attempted to utilize China's anti-opium stance to garner goodwill and trade concessions by similarly denouncing the opium trade on moral and economic grounds (Aurin, 2000, p. 429). Despite not actively engaging in opium trading — largely due to Britain's monopoly on the market — the opium poppy still significantly impacted US foreign relations.

Today, similar international political problems are likely to occur involving the United States. As shown in Figure 3, opioids are illegally imported from several sources, a majority originating in Mexico and the "Golden Triangle" of Myanmar, Laos, and Thailand in Southeast Asia. Notably, it is the ethnic minorities, such as the Wa, Pa-O, Palaung, Lahu, Lisu, Hmong, and Akha, in these areas who cultivate the poppies ("Opium Poppy Cultivation," 2001). This has the potential to influence foreign policy with these countries.

For example, Afghanistan is the leading producer of the opium poppy, producing 92% of the world supply in 2006. The opium trade comprises approximately 1/3rd of the Afghan economy ("A world awash," 2007). The economist reports that "[i]n a country as poor as Afghanistan, opium rots any institution it touches" and has led to the government, from high-ranking officials to low-level policemen, being supported, controlled, and influenced strongly by many of the largest drug barons ("A world awash," 2007). It's even suspected that much of the drug money is used to fund the Taliban ("A world awash," 2007). Despite Afghan's distance from North America, the opium produced there still makes it stateside. Additionally, the Taliban is a known enemy of the US, so it

is beneficial to reduce their income from opium trade. For these reasons, the United States, along with Britain, has attempted to eradicate Afghan opium poppy cultivation. The opioid poppy is a critical piece in international relations between the United States and Afghanistan.

It should be noted, however, that the major suppliers of the world's *legal* opium products are India, Turkey, and Tasmania ("Opium Poppy Cultivation," 2001). The United States relies on these countries to support its high level of prescription use ("Opium Poppy Cultivation," 2001).

Given the estimated costs of non-prescription opioid and heroin use, roughly 75.27 billion USD annually, the use of opioids is not an insignificant economic force. The costs of treating addiction and medical complications along with loss of productivity is money that could have been put to use elsewhere. Additionally, the strong positive correlation between rates of illegal opioid use and criminal activity may be indicative of a causative relationship, i.e., opioid use directly results in criminal activity. A sample conducted in Sydney Australia in 2000 found that half of people arrested tested positive for heroin use (Reuter, 2005, p. 926). As such, a reduction in heroin use could mean a reduction in crime rates. Of course, this is only speculative as studies have yet to adequately meet the requirements to make a causative claim with reasonable confidence.¹

In general, further research is needed in all areas of opioid use. Much of the data is outdated and surveys frequently exclude persons at highest risk for drug abuse, such as vagrant or incarcerated individuals. Furthermore, continued repeated sampling will allow for the observation of trends, which is necessary in evaluating effectiveness of counter measures. Based on the observed economic costs of illegal opioid use, reducing the prevalence of it would benefit all of American society.

Many questions related to the opium poppy, its cultivation, and its impact on societies, American and abroad, still remain. In the medical field, specialists continue to argue about the use of opioids. Does opium's effectiveness as a narcotic warrant its use given its highly addictive nature? To what extent should it be prescribed? How can the industry be improved to reduce the risk of opioid dependence?

Socially, programs are needed to discourage the use and sale of illegal, non-prescription opioids. Treatment programs are also needed to help those already addicted. Programs of these nature exist, but given the data examined in this paper, they are not effective enough as they currently stand. Improvement in this area will benefit everyone, not just those using illicit drugs.

According to the US Drug Enforcement Administration "The conversion of morphine to heroin base is a relatively simple and inexpensive procedure. The necessary chemicals for conversion to heroin are commonly available as industrial chemicals. The equipment is very basic and quite portable. Heroin conversion laboratories are generally located in isolated, rural areas due to the telltale odors of the laboratory's chemicals," ("Opium Poppy Cultivation," 2001). The simplicity of this process and the ease of which even rural and impoverished citizens can produce large quantities of heroin, is cause for concern because it makes it easy for anyone to become a manufacturer. For third-world countries and rural regions, like those in the "Golden Triangle", the lure of opium cultivation as an accessible revenue stream can outweigh the fear of legal

punishment. Figure 4 shows how no cultivation occurs in the areas surrounding major cities, but instead in the rural, more isolated country sides ("Opium Poppy Cultivation," 2001). Areas closer to the Chinese border in Burma, Laos, and Vietnam are the greatest producers of the poppy ("Opium Poppy Cultivation," 2001). This suggests China has some influence on poppy cultivation, and further research is needed in this area.

Additionally, in certain areas, like those in Southeast Asia that produce a significant portion of the world supply, the opium poppy does not require irrigation, fertilization, or insecticides ("Opium Poppy Cultivation," 2001). This makes it an ideal cash crop for farmers. They can produce high yields with minimum effort and make a high profit. A typical five-to-ten-person household in these countries can grow and harvest approximately one acre of opium poppy each year, and a single fertile field can be harvested repeatedly for ten years or more without becoming depleted and without the use of fertilizers or insecticides ("Opium Poppy Cultivation," 2001). New fields are created using the slash-and-burn method in which "virgin land is prepared by cutting and piling all brush, vines, and small trees in the field...After allowing the brush to dry in the hot sun for several days, the field is set afire" ("Opium Poppy Cultivation," 2001). The benefit to this method, in addition to being easy and cost-effective, is the ash from the fire makes a natural fertilizer ("Opium Poppy Cultivation," 2001). However, the widespread burning of fields creates a large level of air pollution, in which "A fog-like yellow haze hangs over the area for weeks, reducing visibility for hundreds of miles. In the mountains, the density of haze can block out the sun and sting the eyes," ("Opium Poppy Cultivation," 2001). The fog can get so bad that nearby airports can be closed due to poor visibility ("Opium Poppy Cultivation," 2001).

The opium poppy played an important role in shaping American society. Hospitals across the country utilize opioids on a daily basis, and they are some of the most widely used narcotics available. Even the illegal derivative heroin, has shaped society. Opiates have direct and indirect economic impacts that total over a billion USD. The transnational trade of opioids also influences foreign policy. Because of this broad range of impact at all levels of society, it continues to be a significant topic in the field of ethnobotany. Further research on opium's long-term effects is paramount to American success.

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1. it's possible they never will as any attempt to fulfill requirements in regard to a potentially dangerous substance will almost certainly break basic ethical guidelines ↵