

**Analyzing the Effects of Double-Barreled Syringe Device Technology on Drug Abuse within
the United States**

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Introduction:

The basis of this thesis is the technical project of a new design for a double-barreled syringe. Clinicians would use this to quickly dispense two drugs sequentially to a patient. One of the larger concerns about syringes in general is that they are actors in the larger network of drug users. Syringes can be used for healthcare but can also be used by recreational drug users. Using a syringe as a way to do harm to oneself would be an unexpected outcome to the original inventor of the syringe. However, the design of a double-barreled syringe could plausibly cause both positive and negative outcomes such as listed above.

In this thesis, I explore the evolution of recreational drug use in the United States of America and its correlation with the advent of the syringe and other syringe-like innovations. This will help me analyze the potential social ramifications that a successful double-barreled syringe design could have to society at large.

A successful design from the technical portion of this project could cause social ramifications such as people injecting a higher volume of drugs at a faster rate to get a stronger high. Other possibilities include discovering harmful combinations of drugs to be used within the syringe, or creating new drug cocktails inspired by the alternative delivery method. These potential abuses would have larger effects on communities.

It is important to explore the ramifications of this new technology as it could affect the health of members of both rural and urban communities as well as indirectly affecting crime rates, economics, and drug education.

STS Methodology:

I will tackle this research through a combination of STS methodologies. In current literature, there is much reference to the HIV/AIDS epidemic when it comes to the association between needles and the propagation of disease. I believe this can serve as an actor-network model for correlating the use of syringes with recreational drug use. The instrument in this case would be syringes and the advent of a double-barrel syringe created in the aforesaid technical project. This innovation would act on the already complex existing network of recreational drug use which influences public healthcare policy, economics, and individual public safety. I will use a case-study approach to analyze how previous healthcare issues involving syringes and injecting drug users have occurred. I can apply this existing research in the field of medicine and public healthcare policy to draw conclusions as to the possible ramifications of a widely used double barrel syringe on drug use.

Injecting Drug Users:

The biggest complication to this technology is the users who will choose to experiment with it at the risk of their own and others' safety. A study analyzed how injecting drug users in India cope with needle and syringe use when dealing with exposure to HIV/AIDS. Given the large population density in urban centers in India, logistical information about syringe sharing culture can be applied to the United States. The model of syringe and needle sharing in this community compares to sharing in the United States and can be considered in how it could apply to a double-barreled syringe potentially being misused for recreational drug use purposes. (Chakrapani et al., 2011). Another study analyzing syringe exchange programs in the United States found that the rehabilitation and planning services that these programs provide can be beneficial to at-risk populations. With this information one will be better able to understand and be able to design rehabilitation programs for drug users who might be using double-barreled

syringes for drug use. (*Syringe Exchange Programs -- United States, 2008: Consumer Health Complete - Powered by EBSCOhost*, n.d.)

An interesting case study is of a peer-based syringe program in Vietnam (Ngo, 2009). Although participants in this program are doing their best to safely utilize needles and syringes for those who suffer from drug addiction, they are being persecuted by the police. Police follow people who partake in these programs and try to arrest them and sometimes even embellish or create faux reasons for arrest. Understanding the culture of drug use will better the understanding of how current governments and individuals view those suffering from drug addiction.

Contrastingly, there could be avenues in which the double-barreled syringe design alleviates certain problems among injecting drug users (IDUs). HIV infection is still a looming threat when IDUs do not use sterile syringes. A study based in the United States utilized mathematical modeling to estimate that an increase in access to sterile syringes could prevent costs to the U.S. in terms of future medical costs for treating newly acquired HIV infections. The analysis from the study indicates that “ for each year without increased IDU access to sterile syringes in the United States, as many as 12,350 persons will become infected with HIV, leading to an estimated \$1.3 billion U.S. in future medical costs for these persons” (Holtgrave et al., 1998). Thus, the surplus of sterile syringes that could alleviate HIV infection rates in IDUs could be provided with the introduction of double-barreled syringes to healthcare systems as well as pharmacies and syringe exchange programs.

Cultural Factors:

The study by Chakrapani in 2011 studies the culture of injecting drug users in India. This study is about how injecting drug users in India cope with needle and syringe use when dealing

with exposure to HIV/AIDS. The study compiled a list of risk factors increasing the unsafe conditions of many drug users: lack of syringe programs, fear of prosecution from the government, drug dealers not allowing products to leave their house unused. These factors increased the stress and danger surrounding drug use. The psychological damage done by the environment in which drugs are being used can represent dangers unforeseen before. This damage could be compounded with biological damage wrecked by the misuse of drugs. Paired with unstable living conditions and a constant fear of harm, injecting drug users are perpetually in a stressed state of being. This would make it harder for them to seek help or maintain safe living conditions independently. The model of syringe and needle sharing in this community can be seen and used to analyze syringe sharing in the United States and how it could apply to a double-barreled syringe potentially being misused for recreational drug use purposes. The cultural factors dividing citizens of India and the United States are vast and varied. Narrowing down a subpopulation of the United States to relate to the culture of India is the safest form of appropriating and normalizing this cultural data.

Being terrorized and living in a constant state of fear can lead to traumatized people who cannot largely control their daily tasks as well as long-term goals (Ngo, 2009). This kind of stigma surrounding syringe programs does not help those that are suffering get the help they need. Building empathy for all the users in a culture of drug use will allow current governments and individuals to view those suffering from drug addiction with a more solution-oriented lens. Many aspects of the universal human experience in Vietnam's syringe using community can be applied to the United States. Feeling of shame, guilt, and pride can be combated with legislation regulating the proper codes of conduct of syringe exchange programs. These protocols can then

be applied to how double-barreled syringe designs can be included in the distribution of sterile and safe materials.

A study by Broz and Ouellet in 2008 studied the changing differences in racial and ethnic groups who use heroin over the years in the United States. This study looks at the racialization of injecting drug users throughout the United States. Racialization among injecting drug users is more common than gender bias in the majority of literature. Racial/ethnic disparities in HIV infection in the United States are greatest in cases attributed to drug injection. In 2005, non-Hispanic (NH) Blacks and Hispanics respectively constituted 55% and 23% of HIV cases but only 12% and 15% of the US population. The racialization of injecting drug users sheds light on how race negatively affects the ability for people to seek help from community health programs such as syringe exchange programs that could potentially house double-barreled syringes. It is clear that minorities of lower socioeconomic status in the United States are at a higher risk of HIV infection and it can be extrapolated that improper syringe use is a contributing factor. The reform of sterile syringe exchange programs could be useful for inhibiting the flow of illegal substances to the marginalized communities that are at highest risk. Double barreled syringe designs could act as a needed surplus of sterile equipment for these syringe exchange programs. This understanding will allow researchers to build up stronger links with communities with the help of the double-barreled syringe.

Economic Factors:

A study by Holtgrave and colleagues in 1998 analyzed cost-effectiveness of increasing access to sterile syringes and equipment for those with HIV/AIDs. A study based in the United States utilized mathematical modeling to estimate that an increase in access to sterile syringes

could prevent costs to the U.S. in terms of future medical costs for treating newly acquired HIV infections. Treatment for HIV/AIDs is often chronic and involves expensive treatments and life-long care. The analysis from the study indicates that “ for each year without increased IDU access to sterile syringes in the United States, as many as 12,350 persons will become infected with HIV, leading to an estimated \$1.3 billion U.S. in future medical costs for these persons” Thus, the surplus of sterile syringes that could alleviate HIV infection rates in IDUs could be provided with the introduction of double-barreled syringes to healthcare systems as well as pharmacies and syringe exchange programs. This study provides a basis upon which the benefits of a double-barreled syringe can rest. The benefits of the double-barreled syringe here would not only help the overall health and wellbeing of injecting drug users, but also stimulate the American economy. Without hundreds of millions of dollars being spent on chronic illness alleviation, more money could be spent on giving equity to other hard-hit populations and institutions.

Syringe exchange programs are an already existing force that could be used to help regulate the distribution of double-barreled syringes. A study in 2008 analyzed the major syringe exchange programs across the United States and logged how many people they served. With this information, people could understand the underserved populations and regions of the United States and start providing more infrastructure to those who need it. This study is a report on syringe exchange programs in the United States. It analyzes the demographics of those people that use the programs as well as the spread and density of these programs throughout the United States. Researchers hope to analyze the rehabilitation and planning services that these programs provide. With this information researchers will better understand and be able to design rehabilitation programs for drug users who might be using double-barreled syringes for drug use.

Innovation in Syringe Misuse:

A study by Allen and colleagues in 2021 analyzes risk factors of syringe coverage in rural communities in West Virginia (Allen et al. 2021). This study analyzes the coverage of clean syringes available to rural communities of persons who inject drugs in West Virginia, USA. 37% of drug users reported having adequate syringe coverage. Factors inversely associated with adequate syringe coverage included having recently (within the past 6 months): engaged in transactional sex work, shared syringes, and injected fentanyl. Having exclusively acquired syringes from a syringe services program was associated with increased odds of adequate syringe coverage. It is clear that injecting fentanyl and other drugs introduces more risk factors to general health only using one type of drug. This shows that mixing drugs and developing newly concocted addictions through the misuse of double-barreled syringes would increase risk to users. Researchers can use this information to affirm the strategy of community health programs using syringe exchange programs to alleviate unsafe practices. Paired with safe double-barreled syringes, this is a viable strategy within rural communities.

A study by Jose, Benny, and colleagues in 1993 depict a new method of drug injection that can affect populations of drug users. Innovation in the field of illegal substances can be dangerous not only for individuals but for larger communities. Jose and colleagues' study focuses on the phenomenon of backloading, which is the process of using syringes to mix drugs and then sharing that mix with other injecting drug users by transferring drug solution from one syringe to another. This behavior is associated with increased risk of HIV infection. If drug mixing already exists with current syringes, potential dangers could be extended with the use of two barrels of drug solution. This phenomenon calls for the increased need to reform syringe exchange programs to better care for injecting drug users in their community.

Syringe Disposal:

A study by Coffin and colleagues in 2007 analyzed the process of safe syringe disposal to safe syringe redistribution. This study analyzes the relationship between safe syringe disposal and safe syringe access. It asserts that those who receive sterile syringes from syringe exchange programs or other safe sources are more likely to dispose of syringes properly. Other factors include injecting with an HIV positive partner and having friends who also inject drugs. It seems that social norms and peer pressure are highly involved in safe syringe disposal. This study shows the importance of not only improving the design of the double-barreled syringe but also improving the design of cultural institutions that will allow the double-barreled syringe to flourish. This involves active community education and discourse.

A study by McCoy in 1994 depicts the attitudes of populations to cleaning syringe protocols. This study analyzes the level of compliance over time that injecting drug users have for understanding and implementing a bleach cleaning routine for used syringes. The results found that basic steps for rinsing were met after 6-12 months, however advanced and repetitive techniques needed for quality cleaning were not met and proficiency decreased as the number of steps increased. Thus, it was determined that the use of one-time use sterile syringes was safer than relying on bleach cleaning compliance. This directly supports the argument for an increase in the supply of sterile syringes in syringe exchange programs. An alternative would be for cleaning techniques to only be carried out by professionals in healthcare settings and not left up to users. Updated cleaning methods could be useful in syringe exchange programs in which syringes are designed for multiple uses. Syringes that are designed for single use can still be misused and be reused multiple times. A potential solution to this is to create a syringe that becomes functionally useless after it has been used one time. For example, once a syringe has

been drawn back to take up a fluid, it would not be allowed to do so again. Building this fail-safe into the syringe design could be a beneficial way to prevent multiple uses from a single-use double-barreled syringe.

A study by Springer in 1999 analyzes a community perspective of safe syringe disposal. This study used surveys to gauge community perspectives for preferred syringe disposal options. Groups of injecting drug users and non-injecting drug users were included in the study. Both groups supported syringe exchange programs to act as syringe disposal interventions, but noninjecting community members favored a one-way drop box. Injecting drug users' fear of arrest for possession of syringes was identified as the largest barrier to safe syringe disposal. This study supports my argument for bolstering syringe exchange programs, with positive opinions from drug users and non-drug users. It also brings to light cultural fears stigmatizing drug paraphernalia and how those fears lead to unsafe syringe disposal.

Conclusion:

The double-barreled syringe design will have benefits and drawbacks. With the information presented above, societal strategies can be utilized to minimize the drawback while allowing the benefits of the technical design to minimize patient discomfort and make clinician's actions more efficacious. It is important for the design to be distributed through syringe exchange programs and other community programs. The greatest threat to IDU populations would be for unregulated distribution of the syringe paired with novel drug-injecting innovation that could cause harm to potential users. The greatest potential for proper use of the double-barreled syringe design is the reform of syringe exchange programs.

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