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SYNDEMICS AND SOCIAL FACTORS: INFECTIOUS DISEASE PATTERNS WITHIN THE
POPULATION OF PEOPLE EXPERIENCING HOMELESSNESS IN THE UNITED STATES

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Abstract

Individuals experiencing homelessness are at increased risk of suffering from infectious diseases. This is due to a number of social factors and healthcare disparities, as well as the idea of syndemics, by which diseases cluster together to worsen disease burden. Current intervention strategies approach treatment from a post-infection perspective, but reducing transmission rates of infectious diseases within the population of people experiencing homelessness will require a shift in the healthcare framework. The issue of people experiencing homelessness must be viewed through a biosocial lens, focusing on preventative care and treatment. I provide an overview of the social factors governing infectious diseases patterns within this population, as well as a discussion of syndemics, and some of the most prevalent infectious diseases.

Key words: Syndemics, Infectious Diseases, Homelessness, Biosocial Approach, Disease Burden, Health Disparities

Introduction

The population of people experiencing homelessness in the United States, despite decreasing in size since the early 2000s, is still a significant portion of the entire population (Duffin 2023). The National Alliance to End Homelessness (2022) reports that 22 men out of every 10,000 are experiencing housing insecurity. Not only this, but there was a notable increase between 2015 and 2020 in the number of people without housing who also did not have access to shelter in the form of shelters or transitional housing. This trend has many causes, including a shift towards permanent housing solutions and failure to keep up with the growing number of members. The difficulty of obtaining shelter was further exacerbated by the COVID-19 pandemic, as shelters saw decreased capacity due to social distancing guidelines (CDC 2020). Increasing numbers of people without access to shelter has wide-reaching effects on the entire population of people experiencing homelessness, including one very dangerous and potentially life-threatening consequence - the spread of infectious diseases.

Compared to people with housing, people experiencing homelessness are more susceptible to infectious diseases for a plethora of environmental and social factors. People experiencing homelessness frequently experience a higher-than-average stress level and are more likely to already be immunocompromised or experience mental illnesses. All these factors can affect the body such that it becomes a host to diseases more readily (Strehlow and Amos-Jones 1999). Without access to shelter, people are often subject to unhygienic conditions that promote the spread of disease (Pestorius 2008). People experiencing homelessness do not have access to the same resources that allow others to protect themselves from disease, such as soap and warm water for handwashing. What should be a quick and easy recovery can become a lifelong fight for survival.

Infectious disease patterns in the population of people experiencing homelessness are closely related to the concept of syndemics, or two or more health problems that are linked in some way (Singer et al. 2017). A syndemic view of health analyzes how social and environmental factors may exacerbate the negative impacts of the diseases involved, and analyzes the way in which diseases may cluster to increase the disease burden (Singer et al. 2017). Syndemics can occur as a result of poverty, stress, or other social causes, and their intersection with pre-existing or emerging health issues. Additionally, diseases can interact with each other to create a syndemic in a variety of ways, such as co-infection or increased virulence. As mentioned previously, people experiencing homelessness frequently suffer from chronic conditions or are immunocompromised, therefore they are greatly affected by syndemics. The increased burden of disease brought by syndemics introduces even more stress and contributes to an unfortunate cycle (Singer et al. 2017).

To address this growing issue, many different intervention strategies have been proposed and implemented. These include programs like “snapshot” interventions, by which people experiencing homelessness are surveyed and treated at a specific time and place once a year. Based on the results of this single survey, screening procedures to improve the quality of care and reduce strain on emergency medical services may be implemented (Badiaga, Raoult, and Brouqui 2008, Hans et al. 2022). These intervention strategies, while somewhat successful, focus primarily on ongoing outbreaks (Badiaga, Raoult, and Brouqui 2008). However, preventing the spread of infectious diseases in the population of people experiencing homelessness will require a biosocial approach that addresses the social conditions that promote the spread of disease in the first place. Improvements made to shelter facilities would reduce the proliferation of infectious disease. Establishing a healthcare culture that is friendly and welcoming to people experiencing

homelessness would also help to decrease social stigma and distrust that prevents people experiencing homelessness from seeking care and would allow healthcare facilities to allocate resources more efficiently to stop the spread of disease. Barriers to healthcare due to fear of judgment or being surprised with a hefty medical bill are barriers that could be removed with the proper approach.

Contributing Factors: Stress

Although many effects of experiencing homelessness are outwardly visible, there are also causes and outcomes that lie under the surface, such as stress. Stress is defined as a physical or physiological challenge that threatens to disturb homeostasis (Tsigos et al. 2020). People experiencing homelessness have numerous potential stressors, probably the most significant being financial stress (Elbogen et al. 2021). There can also be stress accumulated from the living conditions themselves, witnessing violent acts, and a general lack of safety (Bissell Centre 2016). Stress can dramatically affect an individual's physical health (Mariotti 2015). Though some amount of stress can actually be beneficial to the body, the type of chronic stress observed in people experiencing homelessness wears down the body in a significant way.

Dr. Hans Selye, a scientist and endocrinologist, developed the General Adaptation Syndrome (GAS) theory, a three-stage model that describes how the human body responds to stress. In the first stage, the alarm stage, the body initially reacts to the stressor by gathering all of its resources to release elevated levels of cortisol and other stress hormones (Neville 2021). During this stage, the sufferer may experience symptoms such as high blood pressure, weight loss, and suppressed immune system leading to increased risk of infectious disease, which can be indicated by things like more frequent illnesses or slower healing of wounds (Neville 2021). This

is the stage most closely related to the “fight or flight” concept (Lee, Kim, and Choi 2015). The brain then sends ‘danger’ signals to the immune system which causes it to be on alert and enter a protective state. Since the immune system is already engaged in fighting what the brain considers to be a threat, it is less effective at fighting the variety of infectious diseases that people experiencing homelessness are susceptible to (Mariotti 2015).

The second stage is called the resistance stage. This is when the body tries to repair any damage that has been done by the alarm stage. To do so, it makes an attempt to stabilize the heart rate and blood pressure (Higuera 2018). The body still produces cortisol, but in lower levels. The individual may feel irritable and frustrated, but the approach towards homeostasis may give a sometimes incorrect impression that the body is tolerating the stress well (Higuera 2018). The third stage occurs if the body has not been able to return to homeostasis, or if the initial stressor was overwhelmingly great (Rice 2012). During the exhaustion stage, the body begins to secrete high levels of cortisol once again, reminiscent of the alarm stage, but this is unhealthy to maintain for long periods of time (Rice 2012). The body begins to wear itself out, resulting in a deficiency in nutrients, hormones, antioxidants, and many others (Neville 2021). The patient may feel hopeless, depressed, anxious, and/or extremely fatigued (Higuera 2018). This stage is of the greatest concern as it pertains to the spread of disease, because the body may be lacking in chemicals or nutrients that are useful to the immune system as it fights infection. This is unfortunately the stage that many people experiencing homelessness find themselves in, given that their condition may be prolonged.

Under conditions of constant stress, many may turn to unhealthy coping mechanisms such as drugs or alcohol. This leads to an increase in diseases transmitted through behaviors like needle sharing. Additionally, people experiencing homelessness are statistically more likely to

engage in risky sexual behaviors, which increases the risk of sexually-transmitted diseases and infections (Badiaga, Raoult, and Brouqui 2008, Kanwalgeet et al. 2022).

Further, these stressors contribute to greater proportions of mental illness within the population of people experiencing homelessness compared to the general population. This could possibly precede homelessness if mental illness leads to the loss of a job or isolation from friends and family, mental illness could be brought on or exacerbated by living conditions and the aforementioned stressors associated with it, or, more likely, it is a combination of the two (Lippert and Lee 2015). According to the *American Journal of Public Health* (2013), veterans have a greater risk of experiencing homelessness for a number of different reasons. Veterans suffering from post-traumatic stress disorder (PTSD) are more likely to fall into negative patterns, and thus, experience negative effects like substance abuse, unemployment, and depression, all of which can contribute to the probability of experiencing homelessness (Donovan and Shinseki 2013). Studies show that many other people experiencing homelessness have experienced some sort of trauma in their life that could also lead to PTSD, such as childhood sexual abuse (Lippert and Lee 2015).

Lack of Accessibility

As a result of their living conditions often being outdoors or in isolated areas, people experiencing homelessness frequently live in areas described as “deserts.” A desert is defined in this context as a region without ready access to a particular resource. Though most often applied to food, there can also be deserts for other things such as healthcare, also known as medical deserts (Chakraborty 2022). One such desert that may not initially come to mind is an information desert. People experiencing homelessness typically have limited access to television,

internet, newspapers, and other sources that would inform them of a present or potential disease outbreak (National Health Care for the Homeless Council 2016). Even when they are made aware of a disease outbreak, there is often little they can do to protect themselves without access to clean water, hygiene products, and affordable medical care (National Health Care for the Homeless Council 2016). For example, during the height of the COVID-19 pandemic, social distancing was highly encouraged to prevent the spread of disease; however, this was nearly impossible for people living in crowded housing facilities.

In addition to information regarding infectious diseases, people experiencing homelessness may not have access to nutritious foods. A study from the *Journal of Nutrition Education* (Derrickson and Gans 1996) assessed the diets of families with children experiencing homelessness in Hawaii. The majority of the diet consisted of breads and cereals, which are relatively inexpensive and don't require cold storage. One of the commonalities they found was that the diets were low in the recommended intake of calcium and vitamin A, which is consistent with a diet low in fruit and vegetable consumption (Derrickson and Gans 1996).

There are a number of limitations associated with programs that provide food to people experiencing homelessness. Fresh fruits and vegetables are often expensive and in certain geographical areas may be difficult to obtain (Derrickson and Gans 1996). Additionally, many families involved in the dietary study reported not having access to a freezer, cooler, sink, or significant dry storage (Derrickson and Gans 1996). Due to this, programs typically focus on providing canned or other dry goods, which often have less nutritional value.

The impact of diet on chronic diseases, such as diabetes, has been well characterized (see Khazrai et al. 2014 and Weickert and Pfeiffer 2018), but studies show that diet also has a significant impact on an individual's susceptibility to infectious disease (Richard and Sokol

2019). One class of diseases highly impacted by diet is that of enteric infectious diseases, or diseases in the gastrointestinal system. Having a diverse gut microbiome, or microorganisms colonizing the digestive tract, is key to the prevention of many enteric diseases (Richard and Sokol 2019). Dietary components help to supplement the body's immune response to enteric pathogens. A deficiency in any one component or vitamin may lead to detrimental effects on the immune system and an increased susceptibility to infection (Farhadi and Ovchinnikov 2018). Overconsumption of a particular nutrient can also have negative effects on the immune system. For example, a study performed on mice with a diet high in fat and cholesterol found that they experienced greater intestinal permeability to pathogens as well as increased burden of disease and epithelial damage when exposed to disease (Valdes et al. 2020). The body's immune response to infection is a precise mechanism, and any shortcomings in diet can potentially throw it off its game.

Contributing Factors: Hygiene

One of the factors most significantly affected by the condition of homelessness is hygiene. Hygiene encompasses the conditions that impact an individual or community's health and the prevention of disease, particularly as it pertains to cleanliness, as defined by the World Health Organization (WHO) (2021). The Center for Disease Control and Prevention (CDC) (2022) suggests various hygiene practices to help prevent the spread of disease, but the majority of them require extra materials that many people experiencing homelessness would not be able to afford or obtain otherwise. In communities where people experiencing homelessness gather, the conditions are notoriously unsanitary. Rats, bodily fluids, and garbage have been known to be present in certain outdoor encampments (Gorman 2019). Indoor shelters are not much better, as

people have no option but to gather en masse, creating an optimal breeding ground for the spread of infectious diseases.

Improving hygiene in this community will require several steps. Firstly, increasing the number of indoor shelters or expanding the space allocated to indoor shelters would reduce the prevalence of infectious diseases that are a result of mostly “outdoor” vectors such as rodents or unsanitary trash. Additionally, establishing a service to provide people experiencing homelessness with personal hygiene products so that they may take the suggested precautions, may elicit a decrease in infectious illnesses that are best prevented by techniques such as hand washing or sneezing and coughing into tissues. For people who menstruate, this would also include having access to clean sanitary pads and other menstrual products. Indoor housing facilities should also ensure that residents have access to a sink with clean water.

The unhygienic conditions in these areas have led to a resurgence of so-called “Medieval” diseases — those that were highly prevalent in the Middle Ages, when living conditions were very poor and unsanitary (Gorman 2019). That conditions today would be comparable to the Middle Ages is a tragedy, considering how far health and medicine have come. On the streets, outbreaks of diseases like typhus, spread by infected fleas, as well as other diseases spread by feces and body lice are common. Indoor shelters are more likely to see outbreaks of airborne diseases, such as tuberculosis, due to close contact. These outbreaks can become so large that they have effects beyond the population of people experiencing homelessness. In 2019, part of City Hall in Los Angeles, CA was shut down due to a rodent infestation originating from an outdoor encampment (Gorman 2019) of people experiencing homelessness nearby. What is most unfortunate is that the vast majority of these diseases are preventable and treatable, but many people in the affected population do not receive healthcare

due to financial reasons or a distrust of medical professionals, or simply do not have access to the necessary materials to take preventative measures (Davies and Wood 2018).

For most people, the body can fight off these diseases to allow a relatively quick recovery. But for many people experiencing homelessness, the body has a more difficult time, because the individual is likely immunocompromised from other diseases or afflictions (Strehlow and Amos-Jones 1999). This can include things like mental illness or substance abuse. People living in these environments often also experience sleep deprivation and suffer malnutrition, which only serves to worsen the effects of disease (Gonzalez and Tyminski 2020, Seale, Fallaize, and Lovegrove 2016). A woman living in a shelter was quoted as saying “Everyone is always sick, no matter what precautions they take.” (Gorman 2019 para. 31). As much as people experiencing homelessness try to protect themselves against disease and infection, disease continues to proliferate as a result of their living conditions.

Case Study: Tuberculosis

One of the infectious diseases most associated with homelessness is tuberculosis. Tuberculosis often acts syndemically with other infections, such as HIV, or with negative social conditions, such as those characterizing homelessness (Zvonereva et al. 2019). Taking advantage of risk factors such as substance abuse as a result of chronic stress, infection with prior diseases such as HIV which result in a weakened immune system, and overcrowding and poor ventilation in indoor shelters, tuberculosis takes an especially large toll on people experiencing homelessness (CDC 2023) Tuberculosis first appeared around 10,000 years ago, and, as of 2022, is the 13th leading cause of death globally (World Health Organization 2022). After its heyday in the 1700s to 1800s, the prevalence of tuberculosis saw a drastic decrease due to the development

of a vaccine and antibiotics in the 1940s (CDC 2023). If treatments for tuberculosis exist, why is it still one of the leading causes of death? The answer all comes down to social factors.

At the time of its emergence, the disease proliferated due to the conditions in the crowded European cities, and as a result of the Industrial Revolution (Bates and Stead 1993). This overcrowding and unhygienic environments indicative of Industrial European cities is echoed in the spaces where people experiencing homelessness gather today. As mentioned previously, the airborne nature of tuberculosis makes indoor shelters in which people are grouped closely together the perfect center for an outbreak. Tuberculosis cases have been on the rise since around the 1980s, and in 1993, the World Health Organization declared tuberculosis a global emergency, leading to what some are calling the “new” tuberculosis (Grange and Zumla 2002). Having at one point been thought to potentially be eradicated, tuberculosis could also be classified as one of the aforementioned “medieval diseases.”

The prevalence and resurgence of tuberculosis in developing countries could likely be attributed to not having access to affordable care or preventative treatment. The resurgence of tuberculosis in developed countries proves a greater challenge to interpret. Although some resurgence may be accredited to the emergence of drug-resistant tuberculosis strains, there is still a much higher rate of infection than this alone would suggest (Kaluarachchi 2018). Given that we have developed affordable treatment for this disease, it points to the need for an intervention deeper than just furthering our medical knowledge – reducing the spread of tuberculosis will require addressing systemic healthcare inequalities.

People experiencing homelessness are among the most vulnerable populations to the resurgence of tuberculosis, for many reasons that have already been discussed. What may be easy and affordable to treat for most can become challenging for people experiencing

homelessness, because they may either be unable to afford healthcare or are distrusting of the healthcare system. From June 2002-July 2003, an outbreak of pulmonary tuberculosis among seven men experiencing homelessness took place in Portland, Maine (CDC Morbidity and Mortality Weekly Report 2003). Five of the men were residents of the same shelter, and one was found to have had a latent infection with tuberculosis. This event encouraged local health-care providers to work towards better early-detection strategies. If this was applied on a national or global scale, it may well result in a decline in transmission rates.

Case Study: Body Lice

Whereas airborne diseases like tuberculosis may be commonly associated with homelessness, conditions that are typically a direct result of personal hygiene, such as body lice, may not be initially considered. Body lice are small parasites that live in clothing, feed on the host's skin, and spread disease (CDC 2019). It is often spread as a result of close body-to-body contact (Bonilla et al. 2013). The CDC suggests preventative measures such as bathing and changing clothes regularly, washing and drying infested materials with hot water, and not sharing clothing or other items with others, but many people experiencing homelessness may not have the luxury of being able to take these steps. Cold weather is also known to support the proliferation of lice (CDC 2019), which increases the risk of an individual residing outdoors for long periods of time becoming infested. Body lice can also transmit bacteria causing other diseases (CDC 2019), thereby increasing the disease burden and creating a syndemic.

A study (Broqui et al. 1999) performed in Marseilles, France, tested the body lice and blood of people experiencing homelessness for the presence of antibodies for *B. quintana*, a bacteria carried by body lice that is best known for causing trench fever. Trench fever, so named

for its prevalence among armies, is characterized by symptoms such as headache, sudden fever, and muscle weakness. Researchers found that those individuals who were positive for *B. quintana* were positively associated with having been exposed to lice (Broqui et al. 1999). This study came after a reported outbreak of bacteremia, or bacteria in the bloodstream, caused by the *B. quintana* bacteria, and has notable results. Several of the patients involved in the study were found to have chronic bacteremia. Not only can this result in frequent fever and chills, but it also symbiotically promotes the spread of other diseases (Broqui et al. 1999).

Similar to tuberculosis, body lice can generally be easily and quickly treated. In many cases, the most effective treatment is simply to improve the personal hygiene of the patient. Preventing the spread of body lice could be accomplished by providing people experiencing homelessness with the necessary resources to improve their personal hygiene.

Syndemics

A discussion of infectious disease patterns within the population of people experiencing homelessness would be remiss without considering it in the context of syndemics. Syndemics centers around social and environmental factors involved in disease transmission in order to better understand how diseases interact and cluster together (Singer et al. 2017). The biosocial factors associated with infectious disease patterns in people experiencing homelessness lend themselves perfectly to an analysis with a syndemic model. An article published in *The Lancet* (Singer et al. 2017) describes syndemics as “the aggregation of two or more diseases or other health conditions in which there is some level of deleterious biological or behavior interface that exacerbates the negative health effects of any or all of the diseases involved” (p. 941). As discussed with the condition of homelessness, any infectious diseases acquired are exacerbated

by inadequate access to medical care, unsanitary living conditions, compromised immune systems, and a number of other biosocial factors.

Conditions of poverty increase the likelihood of exposure to infectious disease, such as the bacteria causing tuberculosis (Singer and Clair 2003). Shelters become a hotbed for the spread of this infection. Many people in shelters are also likely to have been previously exposed to the bacteria causing tuberculosis, which can cause the bacteria to transition from dormant to active (Singer and Clair 2003). Additionally, the immune system may already be compromised due to other infections they have acquired as a result of experiencing homelessness. One of the disease intersections characteristic of syndemic homelessness is the interactions between mental illness, human immunodeficiency virus (HIV), and substance abuse (Singer and Clair 2003). It is unclear which of these conditions would have been the first, and possibly the cause of the others, but it is certain that the burden of disease is worsened by homelessness itself.

Conclusion

While medical and scientific advancements have been made globally, attention must now be directed to rectifying healthcare disparities and breaking down barriers to care for our vulnerable populations. Intervention strategies should be aimed at providing people experiencing homelessness with resources that can be used to take preventative measures against infectious diseases, such as soap, access to clean water, personal hygiene products, and nutritious foods. Additionally, the healthcare system itself should be remodeled such that people experiencing homelessness are encouraged and welcomed to receive both preventative screenings as well as affordable treatment for diseases they incur. Syndemics take a disproportionately high toll on people experiencing homelessness. By addressing the root problems of stress, accessibility, and

hygiene through programs that support improvements in these areas, the burden of disease may be reduced. A healthcare system is only beneficial if it is beneficial to every individual. Medical care that is open and accepting of everyone would improve the overall health of not just people experiencing homelessness, but health globally.

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