

*Review*

# Syndemics theory and its applications to HIV/AIDS public health interventions

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Accepted 29 December, 2015

Medical anthropologists have recently introduced the term “syndemic” to explain the synergistic interaction of two or more diseases and the social situations in which these diseases develop (Singer 2003). The term syndemic is a portmanteau of “synergy” and “epidemic”, “pandemic” and “endemic”. Human immunodeficiency virus (HIV), one of the leading causes of morbidity and mortality globally, lends itself to examination using the syndemics framework. In this paper, the concept of syndemics were defined and the importance of this concept was demonstrated. Next, examples of syndemics were outlined and the application of the concept to studying HIV was highlighted. The advantages and limitations of this theoretical framework were also explored. The integrity of the concept of syndemics was examined as it has been applied to varying HIV syndemics. Finally, the utility and applicability of HIV syndemics theory was examined in the context of HIV prevention programs and public health practices. All of these serve to highlight the importance of syndemics theory as a valuable and underused perspective with which to tackle the global problem of HIV.

**Key words:** Syndemics, HIV, public health, diseases, biological synergism.

## CURRENT UNDERSTANDINGS OF HIV SYNDEMICS

Syndemics theory is a valuable but underused tool in the public health fight against HIV. To establish this claim, we will first define syndemics. We will then outline this theory's applicability to HIV public health interventions and establish both its values and limitations in these contexts. By doing so, we hope to highlight the value of syndemics to HIV public health interventions.

### Defining Syndemics

To study HIV using the syndemic framework, the concept of syndemics must first be examined. Until recently, health care systems were chiefly concerned with identifying and diagnosing diseases, which as Singer argues “imposes order on the chaos of sickness” (Singer 2003). This emphasis on disease identification spawned the field of nosology, the study of disease classification, which consequently resulted in the conceptualization of diseases as discrete entities. Cholera, polio and paranoia were all considered objective conditions (Good 1994).

Within this framework, there is an underlying assumption that diseases, and thereby health and wellness, exist within social vacuums; social, political or economic processes have no effect on health. However, it is now understood that human social environments contribute enormously to disease and disease interactions (Singer 2011). This understanding requires that we reconceptualize diseases as bio-social processes. The syndemic framework offers us this opportunity; it represents a holistic approach to studying diseases and health disparities (Halkitis 2013). According to Singer, syndemics are “the concentration and deleterious interaction of two or more diseases or other health conditions in a population, especially as a consequence of social inequity and the unjust exercise of power” (2011). Singer offers us the most detailed, explicit and rigorous definition of syndemics. He outlines that three facets of the syndemic framework must therefore be considered: populations of interests, social contexts shaping disease and biological synergism.

At the population level, the Centre for Disease Control (CDC) defines syndemics as two or more epidemics, a notable increase in rates of specific diseases, “interacting synergistically which as a result of their interaction contribute to excess burden of disease” (Singer 2003). This requires that two or more diseases cluster in the same population to provide an opportunity for co-infection and ultimately, synergism. For example, rates of asthma are closely associated with socioeconomic status, which results in the clustering of asthma in populations living in substandard housing. This clustering then provides opportunities for interaction with other diseases like influenza (Singer 2003).

The second aspect of the syndemic concept encompasses the social conditions that influence individual and population health. As evidence on this topic accumulates, it increasingly suggests that social conditions are closely related to health outcomes, as Currie outlines, “people who live in disadvantaged social circumstances are more prone to illness, distress and disability (Currie 2012). Singer often refers to the social conditions, which result in diseases as “social vulnerabilities” (Singer 2009). The primary social causes of syndemics include, but are not limited to: socioeconomic status, geographical location, gender, race, ethnicity, age, diet, water, sanitation, residence, access to health care, discrimination, stress, violence and criminal justice systems (Currie 2012). Social conditions also include structural relationships like inequality and injustice (Singer 2009). Farmer explains that we cannot “understand TB’s marked patterns occurrence, afflicting those in homeless shelters and prisons – without understanding how social forces, ranging from political violence to racism, come to be embodied as individual pathology” (1999). Social contexts shape not only the spread of disease, but also affect access to resources for coping with disease burdens and are therefore implicated throughout the disease course.

The final facet of the syndemic framework is the biological synergism that occurs between two diseases within the body of the individual. It should be noted, however, that syndemic is not synonymous with comorbidity or co-infection; these concepts refer only to concurrent diseases without synergistic, interactive effects (Singer 2011). Within a syndemic, actual biological synergism must occur between the two diseases, resulting in excess disease burden (Singer 2003). There are seven broad ways in which syndemic diseases may interact within the body: enhanced contagiousness, accelerated virulence, greater expression of symptoms, physical alterations of the body – especially in terms of immunology and biochemistry, alteration of emotions, gene assortment between pathogens and iatrogenic interactions, where medical treatment of one disease facilitates infection by a second pathogen. It is important to understand however, that interactions among diseases are much more complicated

than simple biological synergisms. The syndemic framework goes beyond examining biological synergisms to understand why health problems cluster by person, place or time (Singer 2003).

### **The Importance of the Concept of Syndemics**

The first decade of the twenty-first century is notable for outbreaks of infectious diseases, severe acute respiratory syndrome (SARS), avian flu, swine flu and most recently, Middle Eastern respiratory syndrome (MERS). This has contributed to the growing sense of vulnerability and uncertainty surrounding infectious diseases and places greater emphasis on disease outbreak and surveillance (Reitmanova 2011). The syndemic approach allows for an exploration of social structures and risk environments that converge to produce disproportionate disease outbreaks and burden particular members of society.

The syndemic framework also challenges the reductionist discourse of disease. Classical epidemiology can lead to the “essentialization of health risk”, producing negative views of populations commonly associated with specific diseases (Reitmanova 2011). Syndemic theory reaches beyond simple associations between diseases and populations to understand the connections between health and society, examining routes of transmission and interrelated health problems, which result in excess disease burden (Singer 2010). Syndemic theory shifts the blame for disease from individuals to power and inequality (Singer 2011).

Syndemic theory also addresses one of the greatest barriers to health improvements, the failure to examine linked phenomena. As Barlett argues, even though TB and HIV are commonly associated within populations and individuals, “experts in TB and HIV live in different worlds” (Singer 2011). Syndemic theory focuses on the processes that create clusters of diseases, the upstream social conditions, and not simply the proximate biological causes. This shift in focus draws attention to the lack of resources and structural inequalities for underprivileged groups, explaining how health and well-being are so strongly linked to social conditions (Buttram 2013). Preventing syndemics requires not only prevention and control of each disease respectively, but also necessitates understanding and controlling the forces that tie these diseases together (Singer 2003). Syndemic theory highlights this need and suggests that medicine, health care and public health shift their focus from individual risk factors and behaviors to relationships, context and processes (Singer 2010). Syndemic theory therefore, allows for a more holistic, comprehensive and multi-dimensional response to disease, addressing disease at the level of populations, social groups and individuals. This rich understanding of disease allows for syndemics to be studied historically, but perhaps more importantly, allows researchers to fundamentally understand current syndemics and anticipate future out-

breaks (Herring 2007).

### **Syndemics Theory and HIV**

The Joint United Nations Programme on HIV/AIDS (UNAIDS) reported that in 2012, 35.3 million people worldwide were living with HIV. There have been 25 million deaths associated with HIV/AIDS to date (UNAIDS 2013). HIV is known worldwide as one of the deadliest epidemics in human history and remains one of the leading causes of mortality globally. HIV has had such a profound effect due to its syndemic interaction with other diseases.

HIV specifically targets CD4+ memory T cells, resulting in an acute and massive depletion of the cells responsible for coordinating the body's response to pathogens (Grossman 2006). This leaves the immune system vulnerable to opportunistic infections; bodies and populations therefore, become susceptible to co-infections and consequently, to syndemics. According to the CDC's definition of AIDS, the confirmation of HIV infection, CD4+ T cell count fewer than 200 cells/ul and an opportunistic infection, AIDS is a syndemic condition (Singer 2009). It has long been recognized that HIV/AIDS is not distributed evenly throughout populations across the globe. The rates of HIV infection and clustering of cases are determined largely by social processes. The distribution of HIV is affected by structural factors such as militarization and structural violence, social factors such as social capital and social networks, as well as individual factors such as ethnicity, gender and income (Poundstone, 2004).

As Singer explains, syndemic is defined as a clustering of mutually enhancing epidemics in a community involving disease synergism at the biological level as a result of social inequality (Singer, 2011). Other scientists have however defined syndemics theory more broadly when applying the concept to HIV. Gonzalez-Guarda et al., defined syndemics as the clustering of HIV and other health disparities, not referring to any biological synergism (Gonzalez-Guarda et al., 2010). This theoretical approach was applied in order to elucidate the interconnected relationships among study variables, namely substance abuse, violent, risk of HIV and depressive symptoms. This definition of syndemics was also used to examine psychosocial health problems in urban centers among men who have sex with men (Stall). In this view, these conditions are seen as mutually interacting which allowed researchers to examine the social conditions that lead to disadvantageous health conditions. This type of examination of HIV also facilitates the exploration of resource distribution. The core requirement for this theoretical perspective is interacting social/medical conditions; therefore an increased range of conditions would fall under the classification of syndemics and allow for a more broad examination of HIV using syndemics theory. This definition would be especially

useful for examining social processes surrounding HIV risk behavior as they are embedded in social processes. In another study of HIV, syndemics were interpreted to mean co-occurring factors that increase the risk of HIV infection (Jie, 2011). In this study in particular, researchers found that syndemic factors, including depression and trauma, increased the risk of acquiring HIV infection. In this implementation of syndemics theory, syndemic aspects act as risk factors to increase the likelihood of acquiring HIV. This particular line of study is especially useful for predicting and identifying those at increased risk of acquiring HIV by examining concurrent social, psychological and medical conditions that may act synergistically as a syndemic to mediate a person's risk of acquiring HIV. The study of HIV evidently demonstrates many of the varying facets of syndemics theory and is therefore ideally suited to examination using this framework as a theoretical guide. Syndemics theory provides an opportunity to holistically examine the global burden of HIV.

### **The SAVA Syndemic**

The concept of syndemics was first applied in 1996 to the clustering of substance abuse, violence and AIDS, dubbed SAVA by Singer (Singer, 2006). This co-aggregation, which Singer described as a set of "closely interrelated complex of health and social crises" was first described in the Puerto Rican communities in Hartford, Connecticut (Singer, 2006). In this study, Singer outlines three relationships between these crises. The first relationship is between AIDS and drugs; at that time, preliminary research found strong links between AIDS and drug use, including HIV transmission via drug paraphernalia, HIV transmission via sex for drugs exchanges and AIDS diagnoses leading to increased drug use. The second relationship is between drugs and violence; strong links had already been established between these two factors, including bad drug deals, social hierarchy of drug users, intimidation and rivalry. Finally, there is a relationship between violence and AIDS; research at the time found rape and sexual abuse as a potential sources of HIV transmission. For example, drug users being raped by drug dealers and HIV prevention strategies subjecting women to violence, for example, suggested condom use resulting in inter-partner violence.

There are several distinct SAVA syndemics based in different populations, social conditions and structural relationships (Singer, 2009). Substantial research suggests that childhood abuse, both sexual and emotional, is linked to drug use later in life, which in turn fuels the childhood abuse-SAVA syndemic. Moreover, women are much more likely to be victims of intimate partner violence and thereby suffer from the partner violence-SAVA syndemic (Singer, 2009). Compromising the highest absolute number of HIV infections in North

America and Europe, MSM are also especially more negatively affected by the SAVA syndemic (Singer, 2009). Street drug users and sex workers are also especially burdened by the SAVA syndemic; these populations are at increased risk of violence, substance dependence and ultimately, HIV.

Not only has research shown that the three facets of the SAVA syndemic synergize and exacerbate each other, but the SAVA syndemic also leads to a cascade of negative health outcomes. To illustrate, the SAVA syndemic has been shown to increase sexual risk taking (Meyer, 2002). As well, this syndemic has been shown to negatively impact mental health, especially in women from low income, urban areas (Illangasekare 2013). SAVA has also been shown to be a significant barrier to HIV-specific treatment adherence (Lichtenstein, 2006).

The SAVA syndemic has emerged as a stable pattern across a variety of social and structural relationships and amongst a range of populations. As Russell suggests, research stemming from this framework highlights the need to develop interventions for HIV that target psycho-social health and general well-being. This again reinforces the need for holistic perspectives, which recognize the links between health and social problems.

## **CRITICAL ANALYSIS OF HIV SYNDEMICS THEORY**

### **Advantages of HIV Syndemics Theory**

Syndemics theory was created through recognition of the limitations of the biomedical definition of disease and one of the main strengths of syndemics theory is its ability to move beyond this biomedical definition. The reductionist biomedical framework conceives each disease as a “discrete entity; an objective, clinically identifiable boundable entity” (Singer 2003). This view informs the study, diagnosis, treatment and perception of a disease. Underlying this conceptual framework is the assumption that diseases are stable, uniformly expressed and experienced across social contexts. We now know irrefutably that this is not the case. Social factors have a substantial influence on the shaping of diseases and health conditions (Currie, 2012). To illustrate, the HIV epidemic among injection drug users in North American urban centres is vastly different than the HIV epidemic in rural farmers in sub-Saharan Africa.

Disease experiences go beyond the biological manifestation of parasites and the accompanying physical pathology. Social, political and economic forces shape a range of factors, from immune responses to health care access. The reverse is also true; disease burden and vulnerability influence social processes. The syndemic framework allows researchers to understand diseases holistically, by examining them as syndemics-biological synergisms concentrated within a particular social group because of injurious social conditions. Necessarily, diseases are understood at the level of

cellular interaction to macro structural processes. This generates a rich understanding of disease that extends beyond the biological symptoms.

Furthermore, syndemics theory offers explanation into the more nuanced and unclear aspects of disease. Certain disease distributions are relatively straightforward to unravel and understand. For example, the geographic distribution of an infectious disease can be accounted for by pathogen exposure, vectors for transmission as well as access to health care resources. However, in the case of tuberculosis (TB) in New Zealand, ethnic groups experience very different TB diseases despite living in the same urban location, utilizing the same health care system and being exposed to the same pathogen (Singer, 2010). Genetic variations between ethnic groups play an inconsequential role in TB susceptibility; therefore attention must be directed towards examining social and economic inequality as sources for TB vulnerability (Kwan, 2011). Syndemics theory offers insight into this phenomenon, examining conditions that lead to increased susceptibility and thereby elevated disease burden among social groups. Syndemics theory can be used to explain disease distributions and experiences, like the ethnic disparity in TB, which cannot be accounted for by classical epidemiology.

Syndemics theory also provides an opportunity to avoid the “essentialization of health risks” associated with HIV (Reitmanova, 2011). The reductionist discourse and classical epidemiology have contributed equally to producing negative views and stereotypes of populations commonly associated with certain diseases. HIV has been blamed on various groups, men who have sex with men, injection drug users, hemophiliacs and sex workers. This blame stems in part from the epidemiological association of these groups with higher rates of HIV infection. Syndemics theory seeks to attribute disease distributions to power and inequality and shift the blame from individuals and vulnerable populations (Singer, 2010). Another attractive aspect of syndemics theory is its broad applicability to HIV and concomitant diseases. Syndemics theory has been applied to study HIV and transmissible disease syndemics, HIV and chronic disease syndemics as well as HIV and mental health syndemics (Gupta, 2005). It enables researchers to examine many facets and formulations of HIV (Treisman, 2001). Insights gained in one field of HIV syndemics research can then be transferred and applied to other HIV syndemics.

Finally, syndemic theory allows researchers to address one of the greatest barriers to health improvements: the failure to examine linked phenomena (Bartlett, 2007). This compartmentalization applies to research, training as well as clinical care. Syndemic theory allows researchers to move beyond understanding the proximate causes of HIV infection, namely the transmission of the virus, and draws attention to the processes that creates “clusters of disease and noxious living conditions for particular populations” affected by HIV (Singer, 2009).

A syndemics approach to examining HIV requires that researchers not only examine the biological synergism but that researchers understand and address the social, structural factors that lead originally to disease vulnerability. As Paul Farmer explains “we cannot understand its marked patterned occurrence without understanding how social forces, ranging from politics to racism, come to be embodied in the individual pathology” (Singer, 2003). Syndemic theory links the cellular pathology and structural forces of the HIV epidemic.

### Limitations of HIV Syndemics Theory

Despite these advantages, the syndemics theory may interestingly be limited by one of its purported strengths; studying and responding to HIV syndemics necessitates interdisciplinarity. To address both the biological synergism and structural forces influencing disease spread requires “successful collaboration across not only disciplinary boundaries but also conceptual worlds” (Singer, 2003). The framework does not yet exist for sociologists, immunologists, clinicians, public health officials and social workers to communicate and work in concert. As well, there are no formal training programs, which would prepare an individual professionally to tackle this magnitude and scope of study. The institutional structure to examine HIV syndemics does not yet exist, although this need has been highlighted through the proliferation of syndemics theory.

The scope of syndemics theory may also lead to conflicting conclusions about how to best address HIV syndemics. Recommendations to address the biological synergisms of HIV may diverge from recommendations made at the population level. For example, research has shown that for people living with HIV, a mid-range viral load increases the likelihood of transmission (Fraser, 2007). At the individual level, a lower viral load is preferable, however according to public health standards, which cite the reduction of transmission as the ultimate aim, a lower or higher viral load may be preferable as it reduces the likelihood of transmission. The perspectives of both population and individual health must be addressed and reconciled using HIV syndemics theory and this can prove incongruous.

Moreover, one of the central aspects of syndemics theory is that disease synergism results in excess disease burden. Unfortunately, the idea of “excess burden of disease” remains unclear. Classical measure of disease burden include morbidity and mortality, however, syndemics theory seeks to understand disease experiences beyond these simplistic measures to understand social suffering and more nuanced repercussions of HIV syndemics. More sophisticated composite measures like the Healthy Life Years (HeaLY) and the Disability Adjusted Life Years (DALY) have been developed to quantify the impact of a specific disease on a population (Hyder 1998). The HeaLY and the DALY

measure healthy life years and disability adjusted life years respectively, lost to morbidity and mortality. These composite measures have not been formulated to measure the impact of a syndemic on a population; the standard “impact” of HIV does not apply during an HIV syndemic because of the biological and social synergism. Consequently, the tangible impact of an HIV syndemic on a population remains hard to quantify and thereby understand.

### The Integrity of HIV Syndemics Theory

The aforementioned limitations can be traced in part to the integrity of syndemics theory, which has been compromised by loose and sometimes inaccurate applications to HIV. There are three central facets of syndemics theory. Firstly, there must be a clustering of two or more epidemics, a notable increase in rates of specific diseases within a population. As well, social factors must shape this distribution of the disease. Finally, there must be a biological synergism between the two diseases in the body of the individual (Singer, 2003). In order to be classified and treated as an HIV syndemic, these three conditions must be met and clearly explained. The co-occurrence of diseases seems to be the most consistent and salient aspect of syndemics theory. In many cases, an HIV syndemic simply indicates the correlation of HIV and another adverse health condition (Stall, 2003). A syndemic however, is not synonymous with comorbidity or co-infection; these are only concurrent diseases without synergistic interactions (Singer, 2009).

Of the three facets, biological synergism is the most contentious and contestable aspect of HIV syndemics theory because it is often neglected. To be classified as a syndemic, there must be biological synergism occurring between HIV and the concurrent disease. There are seven distinct ways diseases can interact in the body of the individual: enhanced contagiousness, accelerated virulence, more severe symptoms, physical alterations, alterations of emotions, gene assortment between pathogens and iatrogenic interactions (Singer, 2003). Although the syndemic framework goes beyond examining biological synergisms, this disease interaction must be present. In many examples of HIV syndemics, there is only a presumed biological interaction. Take for example, the childhood sexual abuse, substance use and HIV/AIDS syndemic (Singer, 2009). There is no clear explanation of the biological synergism between sexual abuse and HIV infection. HIV could possibly exacerbate and be exacerbated by the stress response induced by sexual abuse. However, if there is no biological interaction, sexual abuse becomes a risk factor for HIV and not a synergism. It is important that syndemics remain distinct from risk factors, as these two concepts are not interchangeable. The integrity of syndemics theory is called into question when the theory is applied

to situations in which one of the three fundamental principles is not explained, understood or present.

The slippage in the literature of HIV syndemics may be traced to the application of syndemics theory to conditions not typically classified as diseases. This list includes but is not limited to: violence, sexual abuse, drug use and sex work (Singer, 2009). A syndemic was originally defined as the interaction of two or more “intertwined and mutually enhancing epidemic diseases” (Singer 2003). This definition was later expanded to include “other disorders” and “adverse health conditions” (Singer, 2003). To retain the integrity of the concept of HIV syndemics, these disorders and health conditions must have biological manifestations; otherwise biological synergism is not possible. Perhaps the more the concept of HIV syndemics is applied to conditions not defined as diseases in the classical sense, either transmissible or chronic, the more challenging it becomes to define these interactions as syndemics.

Very few applications of syndemics theory fully explore and develop the three aspects of the theoretical framework. To illustrate, infectious disease and HIV syndemic studies focus mainly on the biological interaction between co-infections (Albalak, 2007). In contrast, more social syndemics like sexual abuse, violence and HIV focus on the co-occurrence of these conditions rather than examining the biological interactions that take place (Singer, 2013). The inconsistency of the application of syndemics theory to studying HIV detracts from the original value of the concept of syndemics. As well, the varying degrees to which syndemics theory is accurately implemented may provide barriers to operationalizing syndemics-based interventions. The essence of what classifies an HIV syndemic must be clearly understood before interventions based on this framework can be implemented.

## **APPLICATION OF HIV SYNDEMICS THEORY TO PUBLIC HEALTH INTERVENTIONS**

### **Interventions Using Syndemics Framework**

Despite these limitations, one of the greatest appeals of the syndemic theory is its ability to inform prevention and treatment programs. As Singer explains, “addressing syndemics requires public health, biomedical and health development models that move beyond individual risk, individual disease and individual behavior change” (2003). A syndemic approach would be “holistic but theoretically focused” aiming to develop a richer understanding of disease prevention using broad public health-based initiatives. These syndemics interventions can be broadly categorized into two distinct approaches: programs to address and lessen the impact of syndemics currently affecting populations and programs designed to predict

and prevent the emergence of future syndemics. The latter would be based on surveillance of social stressors and patterns of previous HIV syndemics emergence (Singer, 2003).

As has been highlighted, there are varying definitions of syndemics; therefore, a syndemics-based intervention may take several forms. The definition of syndemics as mutually reinforcing epidemics would generate an intervention to tackle the social determinants and pathways that lead to disease susceptibility (Stall, 2003). Similarly, the view of syndemics as concomitant epidemic-risk factors would also address the social determinants and risk behaviors that would lead to syndemic suffering (Singer, 2009). The most restrictive and rigorous implementation of a syndemic intervention would address the three fundamental aspects of syndemics theory as originally outline by Singer (2003). It would focus on the population disproportionately affected, address the social conditions that lead to this burden and target the biological synergism that contributes to the syndemic.

Each interpretation of syndemics theory presents benefits and costs when used to inform a public health intervention. The definition of syndemics as mutually reinforcing epidemics is especially useful for examining social processes that lead to burden and vulnerability. The definition of syndemics as concomitant epidemic risk factors is well suited to examining HIV risk and risk behavior. Broadly, these interpretations inform interventions addressing the social forces influencing HIV. These definitions do not, however, generate interventions aimed at treating coinfections or epidemics influencing the bodies of individuals. They do not address the biological presentation of HIV. In comparison, the more rigorous definition of a syndemic, as outline by Singer, may be more holistic in the sense that it encompasses the biological and social factors of HIV. This definition unfortunately, may exclude from study and intervention programs, HIV disease burdens, which may have been otherwise classified as syndemics. This stringent definition may limit the scope of syndemics interventions.

As mentioned previously, the integrity of the syndemics concept may compromise the implementation of syndemics-based approaches. The concept of syndemics has been variously applied to studying HIV, which may lead to confusion and uncertainty when designing and implementing a syndemics-based approach. It may also lead to a misunderstanding as to what a true syndemic intervention entails. Is it an intervention to address the co-occurrence of diseases? Is it an intervention to address the biological synergism of co-infection? Understanding the essence of an HIV syndemic may facilitate the operationalization of syndemic-based interventions. Conversely, a more fluid and open definition of syndemics theory may open avenues for investigation previously unexplored.

To date, there are no intervention programs that use an

explicitly understood and explained syndemics approach to tackle the three aspects of an HIV syndemic. The best example of a syndemic-based approach to HIV is likely the Partners In Health Clinical Treatment Model, created by Paul Farmer and Jim Yong Kim (Farmer 2001). This model aims to remove clinical and community barriers to care, treatment and prevention, respect the structural realities patients face by modeling treatment plans to the realities of patients' lives, deliver community-based care and address health related social conditions including the provision of food and housing support. This program is also characterized by a comprehensive approach to address comorbid conditions like drug addictions and mental health.

Another approach that closely resembles a syndemics-based intervention is the "bundling" of HIV prevention and treatment services (Ickovics 2008). Bundling refers to the aggregation of HIV services with the aim of increasing their combined effectiveness. To illustrate, a program that bundles HIV and STI prevention and prenatal care proved effective in preventing mother-child transmission and more effective than either HIV and STI prevention or prenatal care alone. This program and the idea of bundling more broadly, exemplify the potential of syndemic interventions for addressing and preventing HIV.

Theoretically, syndemics-based interventions should embody the benefits of both proximal and structural HIV interventions. Proximal interventions are exemplified by evidence-based interventions (EBI) that attempt to address behavior in risk populations heavily affected by HIV (Rotheram-Borus 2008). These programs have been shown to decrease HIV risk behavior between 25% and 50%. Biomedical interventions also fall under the umbrella of proximal programs. These include but are not limited to: vaccines, testing, male circumcision, condoms, microbicides as well as pre and post exposure prophylaxis. There are also many well-documented randomized controlled trials (RCT), which have examined the most effective biomedical treatment for people living with HIV. These proximal intervention programs are characterized by their individual approach, addressing HIV at the level of the person affected. In comparison, structural interventions address the contexts in which health disparities are produced and sustained. These programs typically function to address the availability, acceptability or accessibility of preventions or treatment

services and behaviors (Rotheram-Borus 2008). Interestingly, structural interventions are not designed to replace but rather compliment more proximal interventions to create "comprehensive, multilevel and multi-sectoral responses" to HIV (Rotheram-Borus 2008). This facet of structural interventions seems congruent with a syndemics-based approach.

### **Disconnect Between Syndemics Theory and Current Public Health Practices**

Despite the promise of syndemics-based interventions, current practices in disease research do not provide a framework in which to study or implement syndemics-based approaches. For example, randomized control trials, which have served as the basis for much of our understanding of disease treatment, often do not account for comorbidities

and thereby syndemics (Fortin 2005). In fact, comorbid conditions are often used as exclusion criteria for these trials. This leaves few resources committed to and capable of studying syndemics.

The lack of attention paid to syndemics is also evident at the level of public health. Departments or initiatives in public health are commonly compartmentalized and organized around specific diseases, health issues or populations. Admittedly, the population based health programs most closely resemble a syndemics-based approach, however, they lack the theoretical focus of a true syndemics intervention program. Public health programs have been characterized as "semi-independent silos"; proponents of syndemic theory have argued that these organizations must move from "silos to systems" (Singer 2009- Introduction). Within public health, there are few collaborative programs to tackle interconnected health and social problems or syndemic diseases.

The narrow application of clinical control trials and the compartmentalization of public health practices exemplify the persistent view that diseases exist in a "pathological vacuum" (Singer 2009). Perhaps this is related to the requisite reconceptualization required to fully implement a syndemics-based framework. The development of a public health system requires that public health practitioners and researchers discard reductionist ideas and reconceptualize health and disease as biosocial processes. The biosocial model of disease has been discussed more fully elsewhere in this project, however it will again be emphasized as a crucial step in the implementation of syndemics theory to public health practices.

On a broad level, this reconceptualization requires, as Paul Farmer has outlined, the "resocialization" of medicine and public health (Farmer 2013). The social determinants of health have an increasingly evident effect on disease burden. Unfortunately, the majority of health researchers and practitioners are not trained to consider and understand these processes. This resocialization will require the inclusion of disciplines like anthropology, sociology, history and political science. Farmer explains, "all fields have myopias, the restricted gaze of each discipline can illuminate certain health problems; but only when they are taken together with a fully biosocial approach can we build" (2013). The biosocial analysis of health breaks down the barriers separating disciplines and highlights the importance of syndemic theory.

### **Limitations of HIV Syndemics-Based Interventions**

The application of a syndemic-based program may lead to extremely complicated treatment regimens; HIV and Hepatitis B serve as an exemplary case. Interferon alpha (IFN- $\alpha$ ) is important in the treatment of Hepatitis B (Soriano 2005). The effectiveness of IFN- $\alpha$  however is compromised by HIV co-infection, especially in patients severely immunocompromised. Difficult decisions must therefore be made. Which disease requires more immediate treatment? What side effects can be tolerated? How will these drugs interact? The diagnosis of a syndemic amplifies the challenges of designing an

effective treatment program.

It may also be the case that HIV risk behavior is more unpredictable than health researchers have anticipated. As of 2009, of 31 RCTs testing biomedical interventions for HIV, including vaccines, circumcision and HIV testing, only 4 have shown to significantly reduce the risk of HIV transmission (Rotheram-Borus 2008). The reasons people choose to use or not use an intervention or program may change from individual to individual or from day to day. All of this begs the question as to whether HIV risk behavior is over-determined. How effective is syndemics theory for predicting future syndemics or understanding current HIV syndemics?

The logistics of syndemic interventions should be inspected. Is it logical for a program to address both biological synergism and structural inequalities? This would require a detailed and wide ranging understanding of disease. As previously outlined, there are few formal training programs that provide the requisite education that syndemics theory requires. It may be practically infeasible to tackle both issues with a single program.

The cost effectiveness of HIV syndemics programs may also be questioned. Budgets and grants are finite and are often distributed based on the established or supposed effectiveness of the proposed study. The dearth of syndemic interventions as well as the lack of proven effectiveness could limit the available funding. As a result, researchers would be forced to prioritize spending, begging questions as to which aspect of the HIV syndemic is most important- the biological synergism or the structural inequalities that lead to HIV vulnerability? HIV syndemic-based interventions may not be cost effective enough to earn funding.

## CONCLUSION

### Concluding Remarks

In this paper, the concept of syndemics has been introduced. The broad applicability of this concept as well as its particular applicability to examining HIV has also been discussed. Much of the work thus far surrounding syndemics has focused on the way in which social situations affects syndemics, yet the way in which syndemics shape social situations has not been explored. Although the syndemic framework advocates for a holistic approach to studying disease interactions, many studies focus only on certain aspects of these interactions. For example, work surrounding the SAVA syndemic focuses mostly on populations at risk, whereas examinations of the HIV-TB syndemic focus mostly on the biological synergism. There are many facets of the syndemics already under examination that require further inquiry. However, now that we understand diseases more holistically, the most pressing question is how do we target interventions at the level of populations, social groups and individuals? How will these interventions

shape the perceptions of people living with syndemics? What changes will this new understanding require of health professionals?

It is well understood and documented that adverse social conditions leading to HIV vulnerability must be addressed. These conditions include marginalization, poverty, and stigmatization, among others. The goal of addressing these conditions requires long-term, political economic and social action. There is, however, a pressing need to prevent HIV transmission and to mitigate the effects of HIV illness immediately, not in time. The cost-benefit analysis must be calculated to weigh the advantages of immediate versus long-term impact. How syndemics theory and syndemics-based interventions fit into this analysis is yet to be determined. Despite the limitations previously outlined, the concept of HIV syndemics applied to public health interventions offers researchers new and novel strategies to tackle HIV.

## ACKNOWLEDGEMENTS

The author would like to graciously thank Dr Adam Green for his invaluable insight and guidance in the creation of this work.

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