Journal of Health Systems and Policies, Vol. 1, No:3 2019
Submission Date: October 10, 2019 *Acceptance Date: November 29, 2019*

Syndemics or Synergistic Epidemics

Osman Hayran[1]
Ömer Ataç[1*]

ABSTRACT

Syndemic refers to two or more epidemics of diseases or health-related problems which come together in the context of social-environmental conditions that enhance their mutual impact and interactions and increase the burden of disease. Synergistic relationship is a dynamic interaction which could not be explained by previously used terms such as epidemic, endemic, pandemic and comorbidity. It refers to a complex, multivariate, and different type of an interaction as in the concepts of ecosystems, biopsychosocial and psychoneuroimmunology. The three essential features of syndemic are clustering, interaction and increase in the burden of disease.

The findings obtained from the studies regarding some well-defined syndemics are important to understand the emergence, causality relations, and the required approach for the control of the problems they cause. Some examples are Substance Abuse-Violence-AIDS (SAVA), Metabolic Syndrome, Violence-Immigration-Depression-Diabetes-Abuse (VIDDA) Syndemic, Chronic Kidney Disease and Tuberculosis Syndemic, Tuberculosis-Diabetes Syndemic, Childhood Anemia and Stunting (CHAS) Syndemic Obesity, Undernutrition And Climate Change Syndemic.

Instead of approaching to syndemics as a subject of theoretical debate, it is necessary to consider it as a new approach for understanding the causation of many public health

[1] Istanbul Medipol University, Faculty of Medicine, Department of Public Health, Istanbul, Turkey
*Corresponding author: O. Ataç, oatac@medipol.edu.tr

problems. The concept of syndemic demonstrates the importance of the need for social sciences in medical education. This is a well-known fact, but highly neglected due to admiration for technology. Facing with the basic sciences at the beginning of medical education, medical students are usually interested in genetics, biochemistry and physiology, and in the following years, they are fascinated by the opportunities that are provided during clinical and surgical applications. They have no or very limited time to learn the social determinants of the health and diseases.

It is important to treat syndemic diseases with holistic care approach as a whole rather than the individual treatment of the disease. In this sense, the understanding of syndemic care needs to be developed and disseminated. Physicians generally think that social problems of patients are not in the professional area of their own and this mindset should be changed. The aim of medicine is to improve the quality of life and treating the patient rather than fighting against the disease. Community based medical practices and the provision of integrated primary health care services are a must for the health of the societies.

Keywords: Syndemic, Syndemogenesis, VIDDA, SAVA, Social Determinants of Health

INTRODUCTION

Syndemic refers to two or more epidemics of diseases or health-related problems which come together in the context of social-environmental conditions that enhance their mutual impact and interactions and increase the burden of disease (Singer and Snipes, 1992; Singer, 1996; CDC, 2007). It was first defined by Merill Singer in the mid-1990s. The word consists of a combination of the Ancient Greek words ‘’synergos’’, which means two or more factors come together to cause a greater impact than their sum and ‘’demos’’, which means people.

This synergistic relationship is a dynamic interaction which could not be explained by previously used terms such as epidemic, endemic, pandemic and comorbidity. It refers to a

complex, multivariate, and different type of an interaction as in the concepts of ecosystems, biopsychosocial and psychoneuroimmunology.

SAVA (Substance Abuse, Violence and AIDS) is the first defined syndemic in the literature and it can be seen as a typical example in terms of these features. SAVA syndemic emphasizes the interrelatedness of substance abuse, violence, and AIDS (Singer, 1996). According to syndemic approach, AIDS is a complex situation beyond being a single disease. Many conditions including poverty, unemployment, and violence are closely related to the increase in risk-taking behaviors such as substance abuse and interpersonal violence. Such individual interactions result in the emergence of SAVA syndemic at the community level. Although the interactions occur on individual level, the burden of disease is an important problem that is closely related to the social conditions which affects the society as a whole (Singer, 1996; Singer, 1994; Mendelhall, 2015).

Metabolic syndrome is another typical example, which is also called as supersyndemic. Although it is defined under some conditions such as obesity, diabetes, insulin resistance, hypertension, or increased triglycerides; the problem is triggered by some factors such as the use of fossil fuels instead of human muscle as the main energy source, urbanization, social inequalities, and the emergence of global warming, in which all these factors clustered together and gave rise to the problem (Prentice and Jebb, 2006).

The three essential features of syndemic are listed as follows: (Singer, 1996; Tsai et al., 2017)

- **Clustering**

  Two or more diseases or health problems which already exist in a society are clustered together

- **Interaction**

  The worsening of the health status of the individuals because of the mutual interactions between social conditions and disease characteristics.

- **Increase in the Burden of Disease**

  Adverse interactions of clustered problems increase the burden of disease more than expected.

Despite the fact that syndemic was first introduced in the mid-nineties and only 2 articles were published in PubMed journals in 2003, the number of publications on this subject have increased rapidly reaching to 466 articles in October-2019, which shows the increasing interest of researchers over the past 16 years

The terms that can be confused with syndemic are comorbidity and multimorbidity, which refer to the presence of two or more diseases at the same time (Milstein, 2001). Syndemic refers to a significant increase in the burden of disease in the community, as a result of the interaction between diseases in comorbidity with adverse social conditions.

In fact, the relationship between diseases and social factors has a long history. It is known that many diseases and health problems have several social determinants and they are closely related to economic and/or cultural variables. The thing what is new with the concept of syndemic is the fact that the interaction of social conditions with the epidemics of disease causes increase in the burden of diseases above the expected level. It is necessary to clarify this complex relationship between them in order to solve the problems. However, the interaction mechanism between psychosocial factors and structural features of syndemics has not yet been fully clarified. Almost all of the studies regarding syndemics are descriptive studies and no cohort or interventional studies were conducted to understand the causation mechanisms and dynamics of syndemic relationships. Current discussions and explanations are all done at theoretical level. There are several variables for explaining the role of various

social factors in the formation of syndemics and there are some efforts to develop algorithms, but it has not reach to an adequate level yet (Tsai et al., 2017; Tsai and Venkataramani, 2016).

The Formation of Syndemics: Syndemogenesis

All processes, ways, and stages which lead to the occurrence of syndemic through interactions of disease-disease and disease-social conditions are called as syndemogenesis. (Lerman, 2018) The content of this term, which was defined by Merill Singer, was developed over time. Existing literature shows that there may be three ways for syndemic interactions as summarized in Figures 1, 2 and 3 (Tsai, 2018).

- **Mutual Causality**

  Problems that constitute a syndemic can be related with each other in a mutual causality. For example, A and B, or B and C, or A and C can be cause of each other as it is seen in Figure 1. In other words, the existence of each one can be both the cause and the result of the other at the same time.

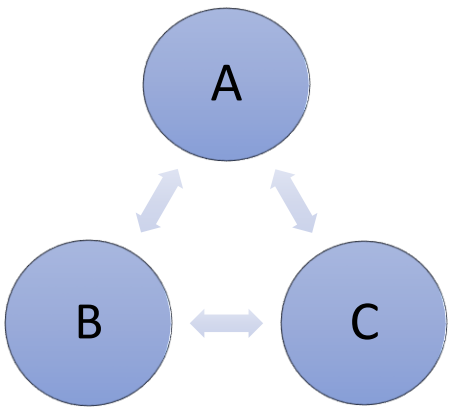

Figure 1: Mutual causality

- **Synergistic Interaction**:

  Each of the two problems can lead to an increase in the third one. That means, as shown in Figure 2, both A and B are effective on C separately and can cause an increase in the burden of the disease. However, the amount of the increase in C is greater than the sum of increases A and B would cause alone.

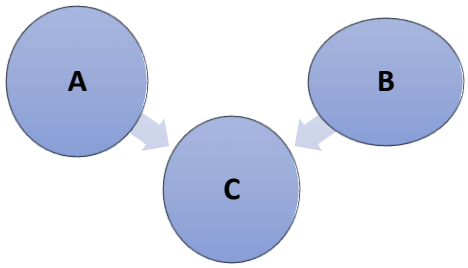

Figure 2: Synergistic interaction

- **Serially Causality**

  As shown in Figure 3, A causes B and B causes C, and so the increase of A and B can lead to an excessive increase in C.

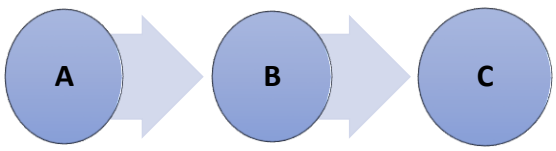

Figure 3: Serial causality

Each of the models mentioned above is based on the traditional mechanistic or Cartesian approach. However, the syndemics are complex events and the newly-emerging methods of Complexity Science and System Theories should be used to explain the dynamics

of the syndemic relationship. It is more plausible to describe syndemics as an "emergence" that is ''unpredictable'' or "difficult to predict".

Syndemics are associated with some variables such as social inequalities, discrimination, poverty, exposure to violence, and substance abuse which offers us that these problems cannot be solved one by one. At this point, it is necessary to develop and use new concepts such as the ''syndemic approach" and ''syndemic care" in Public Health practices (Mendenhall et al., 2017).

The findings obtained from the studies regarding some well-defined syndemics are important to understand the emergence, causality relations, and the required approach for the control of the problems they cause. Some examples are summarized below.

A Typical Example of Syndemogenesis: VIDDA

VIDDA syndemic is a combination of violence, immigration, abuse, depression, and type-2 diabetes (VIDDA: Violence, Immigration, Depression, Diabetes, Abuse), which is defined by Mendenhall among the first and second-generation Mexican migrants who lived in Chicago. It is a typical example of syndemics indicating the ''pathological reality and social aspects'' of syndemics (Mendenhall, 2012; Weaver and Mendenhall, 2014). Scholars argue that depression and diabetes tend to create a biosocial feedback cycle in terms of stressful life and increase the burden of each other within VIDDA syndemic. According to the epidemiological studies, the prevalence of depression among diabetic patients is two times higher than the other groups (Schmitz et al., 2014; Anderson et al., 2002; Gonzalez et al., 2008).

Our knowledge of the coexistence of depression and diabetes is not new and approved by the studies conducted in recent decades. It is not clear whether diabetes causes depression or vice versa, or if they are both caused by some common components. According to the available information, it is understood that the relationship between the two diseases is

bilateral. In other words, patients with type-2 diabetes are more susceptible to depression, and patients with depression have serious compliance problems with diabetes treatment. The two diseases also have common biological origins (Knol et al., 2006; Talbot and Nouwen, 2000; Moulton et al., 2015). In addition, both diseases are related to similar behavior problems, such as high-calorie nutrition habits and a sedentary lifestyle, which aggravate the clinical picture. It is also a matter of debate that the medicines used in the treatment of depression have negative effects on type-2 diabetes (Moulton et al., 2015; Kivimäki et al., 2011; Deuschle, 2013). There is no doubt that social and environmental factors are the most important factors that trigger the coexistence of these two diseases. Social conditions such as poverty, social inequality, exposure to violence, and abuse are closely related to the occurrence and frequency of both depression and diabetes. Especially the role of poverty in the formation of syndemic was conspicuously demonstrated in a study that has recently been conducted by Mendenhall et al., 2017. On the other hand, there are findings that the frequency of undiagnosed depression among diabetes patients in low and middle-income societies may be as high as 40% (Leone et al., 2012).

The causality model in Figure 4 was developed by using the data obtained from a comprehensive study in Brazil (n=60 202 adults) (Diderichsena and Andersena, 2019). According to this model, both problems develop on similar social backgrounds including low income, low level of education, and have a close relationship with obesity and exposure to violence. The main reasons are the lack of adequate education and income, and a low level of human development index. These factors, as seen in Figure 4 (arrow 5), have direct effects on diseases as well as preparing some grounds for specific causes such as obesity, exposure to violence (arrows 4), and these specific causes interact with both disease occurrences (arrows 3). Synergetic interaction between the two diseases (arrows 2 and 1) causes an increase in the burden of the disease.

As can be seen from the figure, instead of taking precautions for a single disease or a single cause, all of the essential and specific causes should be considered together. Such a syndemogenic approach may be useful to understand the causation mechanisms of many communicable and non-communicable problems.

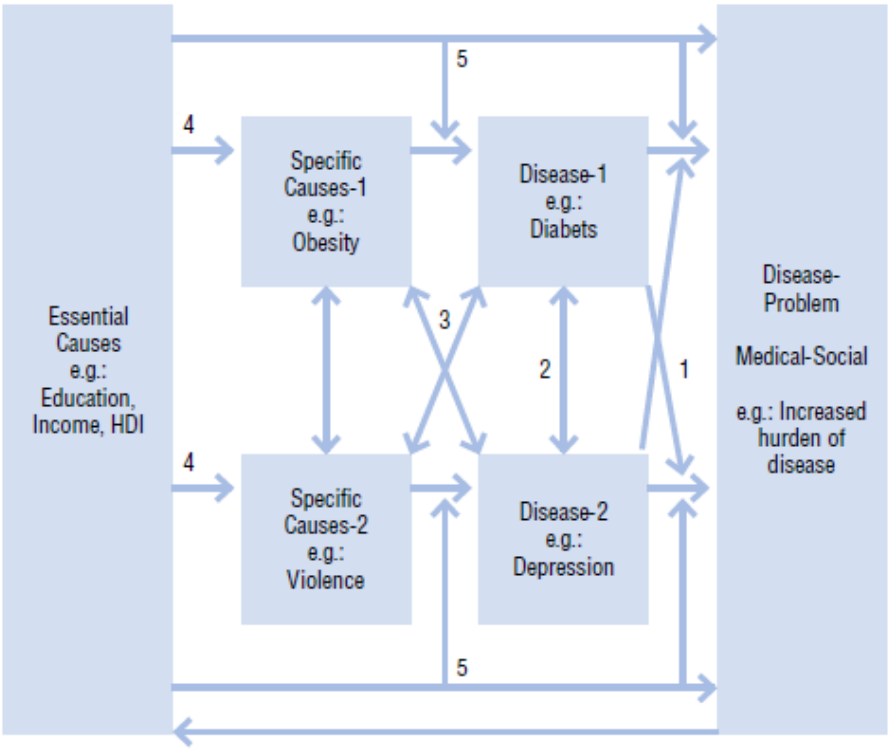

Figure 4: Causality model for the syndemics of diabetes and depression (Kivimäki et al, 2011)

Tuberculosis Diabetes Syndemic

The co-occurrence of tuberculosis and diabetes is a typical example of a syndemic with poverty. The prevalence of diabetes is 2-3 times higher in patients with tuberculosis (Chachra and Arora, 2014). It is known that tuberculosis impairs blood sugar control, and the interaction between two diseases is known to be mutual (Editorial, 2014). Diabetes is a more common problem in patients with tuberculosis, and the opposite can also be true (Pearson et al., 2019). For example, it has been shown that the prevalence of tuberculosis increases threefold in people with diabetes (Jeon and Murray, 2008).

Chronic Kidney Disease and Tuberculosis Syndemic

In a recent study on 444.356 adult refugees, the prevalence of tuberculosis was significantly higher in patients who also have chronic kidney disease (Bardenheier, 2019). Our knowledge about the co-occurrence of two health problems has a long history and chronic kidney disease is more prevalent, especially in middle and low-income countries where the prevalence of tuberculosis is also high. This result among refugees is also observed after the standardization process according to all other risk factors, which may be related to tuberculosis. These findings suggest that there may be a syndemic relationship between two diseases and social conditions of refugees.

Sudden Infant Death Syndrome and Social Injustice Syndemic

Sudden infant death syndrome (SUID/SID) is more common in poor and marginalized regions of developed countries, and the USA has the highest prevalence of SID. When the studies about the causes of this problem are examined, it can be seen that there are some risk factors such as smoking, excessive use of alcohol, preterm births, lack of prenatal care, insufficient antenatal care, sleeping positions and bed-sharing. It is noteworthy that the countries with the lowest prevalence of SIDs have the lowest unfair distribution of income, relatively higher wealth levels and the highest percentages of bed-sharing. All findings indicate that the SID problem is clustered with social conditions such as poverty, social justice, discrimination, bed-sharing in which syndemic approach becomes necessary (Bartick and Tomori, 2019).

Childhood Anemia and Stunting (CHAS) Syndemic

In a study that analyzed the data of 193.065 children between 6-59 months from 43 countries with medium and low income level, it was found that there was an association between anemia and stunting, and this association was closely related with social conditions such as the lack of education of mothers and the poverty of the families (Tran et al., 2019). It

is emphasized that this relationship network should be defined as Childhood Anemia and Stunting Syndemic (CHAS).

Obesity, Undernutrition and Climate Change Syndemic

It is suggested that the co-occurrence of the obesity, undernutrition, and global warming epidemics, which are seen as three of the leading global health problems, should be approached as a Global Syndemic (Boyd et al., 2019). The main variables that constitute and improve this global syndemic are changes in food and agriculture, transportation conditions, urban designs and land use. According to the Global Hunger Index, there was a significant decline in the mortality rates of children under 5 years of age between 1992 and 2017, however a similar decline was not observed in the rates of wasting and stunting (von Grebmer et al., 2017). So, undernutrition is still an important problem. Obesity has increased rapidly especially after 1980, and currently 2 billion people are facing this problem. Obesity is known to be an important risk factor for cardiovascular disease, type-2 diabetes, and some types of cancer. The rapid and irregular urbanization leads to reduction of agricultural lands and increases feeding needs of a denser population. When these two changes come together, global climate change and food security problems tend to increase. These factors trigger nutrition problems as well. Changing transportation conditions as a consequence of rapid urbanization result in an inactive life and this is another important factor that increases the problems. The problems caused by obesity are estimated to cost 2 trillion dollars per year globally (2.8% of the world GDP), that is equal to the losses caused by wars and armed violence (Boyd et al., 2019).

The concept of syndemic seems to be more than a repetition of our classical knowledge about how health and disease issues are closely related to social factors. Unlike in the past, syndemics are the problems of a period when existing social inequalities are perceived more intensely by means of increased communication channels. Today's people

now become interested in what is not in their hands rather than what is in their hands as a result of the influence of multi-channel TV broadcasts, internet, smart phones, increased exhibitionism provoked by social media, and changing consumption habits. The manipulation of the "fear of missing out (FOMO)" is one of the most important tools among current marketing methods. All these factors seem to increase the negative effects of the perception of poverty and social inequalities.

Why Syndemic Approach is Important and What Should be Done?

The most prominent characteristics of this concept can be summarized as follows:

- It reminds us the important role of psychosocial determinants of health and disease once again and in a strong way.
- It shows the importance and necessity of a wholistic approach to public health problems in the hyper-specialization age of medicine.
- It indicates that no solution can be produced without considering the public characteristics of some health problems.
- It emphasizes the need for a new paradigm of disease causation based on complexity science.

Instead of approaching to syndemics as a subject of theoretical debate, it is necessary to consider it as a new approach for understanding the causation of many public health problems. The concept of syndemic demonstrates the importance of the need for social sciences in medical education. This is a well-known fact, but highly neglected due to admiration for technology. Facing with the basic sciences at the beginning of medical education, medical students are usually interested in genetics, biochemistry and physiology, and in the following years, they are fascinated by the opportunities that are provided during clinical and surgical applications. They have no or very limited time to learn the social determinants of the health and diseases. They have confidence issues due to the overloaded

technical information given to them and try to specialize at the first opportunity. This understanding of medicine and medical education needs to be changed.

It is important to treat syndemic diseases with holistic care approach as a whole rather than the individual treatment of the disease. In this sense, the understanding of syndemic care needs to be developed and disseminated. Physicians generally think that social problems of patients are not in the professional area of their own and this mindset should be changed. The aim of medicine is to improve the quality of life and treating the patient rather than fighting against the disease. Community based medical practices and the provision of integrated primary health care services are a must for the health of the societies.

REFERENCES

Anderson, R., Grigsby, A., Freedland, K., De Groot, M., McGill, J.B., Clouse, R.E., Lustman, P.J. (2002). Anxiety and poor glysemic control: A meta-analytic review of the literature. The International Journal of Psychiatry in Medicine, 32,235-247.

Bardenheier, B.H., Pavkov, M.E., Winston, C.A., Klosovsky, A., Yen, C., Benoit, S., Gravenstein, S., Posey, D.L., Phares, C.R. (2019). Prevalence of Tuberculosis Disease Among Adult US-Bound Refugees with Chronic Kidney Disease. Journal of Immigrant and Minority Health, 21, 1275-1281.

Bartick, M., Tomori, C. (2019). Sudden infant death and social justice: A syndemics approach. Maternal & Child Nutrition, 15,12652.

National Cancer Institute. (2007). Greater than the sum: Systems thinking in tobacco control. Tobacco Control Monograph, 06,6085.

Chachra, V., Arora, V. (2014). Study on prevalence of diabetes mellitus in patients with TB under DOTS strategy. The Indian Journal of Tuberculosis, 61,65-71.

Deuschle, M. (2013). Effects of antidepressants on glucose metabolism and diabetes mellitus type 2 in adults. Current Opinion in Psychiatry, 26,60-65.

Diderichsena, F., Andersena, I. (2019). The syndemics of diabetes and depression in Brazil – An epidemiological analysis, Population Health, 7.

Editorial. (2014). Diabetes and tuberculosis-a wake-up call. Lancet Diabetes Endocrinol, 2,677. https://www.thelancet.com/action/showPdf?pii=S2213-8587%2814%2970192-5

Gonzalez, I.S., Peyrot, M., McCarl, L.A., Collins, E.M., Serpa, L., Mimiaga, M.J., Safren, S.A. (2008). Depression and diabetes treatment nonadherence: A meta-analysis. Diabetes Care, 31,2398-2403.

Hays, J. N. (2000). The burdens of disease: Epidemics and human response in western history. Rutgers University Press.

Jeon, C. Y., Murray, M. B. (2008). Diabetes mellitus increases the risk of active tuberculosis: a systematic review of 13 observational studies. PLoS medicine, 5,152.

Kivimäki, M., Batty, G., Jokela, M., Ebmeier, K.P., Vahtera, J., Virtanen, M., Brunner, E.J., Tabak, A.G., Witte, D.R., Kumari, M., Singh-Manoux, A., Hamer, M. (2011). Antidepressant medication use and risk of hyperglycemia and diabetes mellitus: A noncausal association? Biol Psychiatry, 70,978–984.

Knol, M.J., Twisk, J.W., Beekman, A.T., Heine, R.J., Snoek, F.J., Pouwer, F. (2006). Depression as a risk factor for the onset of type 2 diabetes mellitus: A meta-analysis. Diabetologica, 49,837-845.

Leone, T., Coast, E., Narayanan, S., De-Graft Aikins, A. (2012). Diabetes and depression comorbidity and socio-economic status in low and middle income countries (LMICs): A mapping of the evidence. Global Health, 8,39.

Lerman, S. (2018). The syndemogenesis of depression: Concepts and examples. Medicine Anthropology Theory, 5,56–85.

Mendenhall, E. (2012). Syndemic suffering: Social distress, depression, and diabetes among Mexican immigrant women. Walnut Creek, CA: Left Coast Press Inc.

Mendelhall, E. (2015). Beyond comorbidity: A critical perspective of syndemic depression and diabetes in cross-cultural contexts. Medical Anthropology Quarterly, 30.462-478.

Mendenhall, E., Kohrt, B.A., Norris, S.A., Ndetei, D., Prabhakaran, D. (2017). Non-communicable disease syndemics: poverty, depression, and diabetes among low-income populations. The Lancet. 389,951-963.

Milstein, B. (2001). Introduction to the syndemics prevention network. Atlanta: Centers for Disease Control and Prevention.

Moulton, C.D., Pickup, J.C., Ismail, K. (2019). The link between depression and diabetes: the research for shared mechanisms. Lancet Diabetes Endocrinol, 3,461-471.

Pearson, F., Huangfu, P., McNally, R., Pearce, M., Unwin, N., Critchley, J.A. (2019). Tuberculosis and diabetes: bidirectional association in a UK primary care data set. J Epidemiol Community Health, 73**,**142-147.

Prentice, A., Jebb, S. (2006). TV and inactivity are separate contributors to metabolic risk factors in children . PLoS Medicine, 3,2197-2198.

Schmitz, N., Garepy, G., Smith, K.J., Clyde, M., Malla, A., Boyer, R., Strychar, I., Lesage, A., Wang, J. (2014) Recurrent subtreshold depression in type 2 diabetes: an important risk factor for poor health outcomes. Diabetes Care, 37,970-978.

Singer, M. (1994). AIDS and the Health Crisis of the US Urban Poor: The Perspective of Critical Medical Anthropology. Social Science and Medicine, 39,931–948.

Singer, M. (1996). A Dose of drugs, a touch of violence, a case of AIDS: Conceptualizing the SAVA Syndemic. Free Inquiry in Creative Sociology, 24,99-l 10.

Singer, M., Snipes, C. (1992). Generations of suffering: experiences of a treatment program for substance abuse during pregnancy. Journal of Health Care for the Poor and Underserved, 3, 222-34.

Swinburn, B.A., Kraak, V.I., Allender, S., Atkins, V.J., Baker, P.I., Bogard, J.R., Brinsden, H., Calvillo, A., De Schutter, O., Devarajan, R., Ezzati, M., Friel, S., Goenka, S., Hammond, R.A., Hastings, G.A., Hawkes, C., Herrero, M., Hovmand, P.S., Howden, M., Jaacks, L.M., Kapetanaki, A.B., Kasman, M., Kuhnlein, H.V., Kumanyika, S.K., Larijani, B., Lobstein, T., Long, M.W., Matsudo, V.K.R., Mills, S.D.H., Morgan, G., Morshed, A., Nece, P.M., Pan, A., Patterson, D.W., Sacks, G., Shekar, M., Simmons, G.L., Smit, W., Tootee, A., Vandevijvere, S., Waterlander, W.E., Wolfenden, L., Dietz, W.H. (2019). The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report. The Lancet, 393,791-846. http://dx.doi.org/10.1016/S0140-6736(18)32822-8

Talbot, F., Nouwen, A. (2000). A review of the relationship between depression and diabetes in adults: is there a link? Diabetes Care, 23,1556-1562.

Tran, T., Biggs, B., Holton, S., Nguyen, H., Hanieh, S., Fisher, J. (2019). Co-morbid anaemia and stunting among children of pre-school age in low- and middle-income countries: A syndemic. Public Health Nutrition. 22, 35-43.

Tsai A.C. (2018). Syndemics: A theory in search of data or data in search of a theory? Social Science & Medicine, 206, 117–122.

Tsai, A.C., Mendenhall, E, Trostle J.A., Kawachi, I. (2017). Co-occurring epidemics, syndemics, and population health. The Lancet. 389,978-982.

Tsai A.C., Venkataramani A.S. (2016). Syndemics and health disparities: A methodological note. AIDS Behav. 20, 423–430.

Von Grebmer K, Bernstein J, Hossain N, Brown T, Prasai N, Yohannes Y. (2017). 2017 Global Hunger Index: The inequalities of hunger. International Food Policy Research Institute.

Weaver, L.J., Mendenhall, E. (2014). Applying syndemics and chronicity: Interpretations from studies of poverty, depression, and diabetes. Medical Anthropology, 33, 92–108.