HHS Public Access

Author manuscript

Lancet. Author manuscript; available in PMC 2017 September 04.

Published in final edited form as:

Lancet. 2017 March 04; 389(10072): 951–963. doi:10.1016/S0140-6736(17)30402-6.

Non-communicable disease syndemics: poverty, depression, and diabetes among low-income populations

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Abstract

The co-occurrence of health burdens in transitioning populations, particularly in specific socioeconomic and cultural contexts, calls for conceptual frameworks to improve understanding of risk factors, so as to better design and implement prevention and intervention programmes to address comorbidities. The concept of a syndemic, developed by medical anthropologists, provides such a framework for preventing and treating comorbidities. The term syndemic refers to synergistic health problems that affect the health of a population within the context of persistent social and economic inequalities. Until now, syndemic theory has been applied to comorbid health problems in poor immigrant communities in high-income countries with limited translation, and in low-income or middle-income countries. In this Series paper, we examine the application of syndemic theory to comorbidities and multimorbidities in low-income and middle-income countries. We employ diabetes as an exemplar and discuss its comorbidity with HIV in Kenya, tuberculosis in India, and depression in South Africa. Using a model of syndemics that addresses transactional pathophysiology, socioeconomic conditions, health system structures, and cultural context, we illustrate the different syndemics across these countries and the potential benefit of syndemic care to patients. We conclude with recommendations for research and systems of care to address syndemics in low-income and middle-income country settings.

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Contributors

EM conceptualised, wrote, and edited the article; BAK conceptualised and edited the article; SAN, DN, and DP drafted panels and commented on the article.

Declaration of interests

We declare no competing interests.

Introduction

This Series paper investigates syndemics involving non-communicable diseases (NCDs) to show the complexities through which social, psychological, and biological factors come together to shape emergent and pervasive global health problems. Syndemic refers to the clustering of two or more diseases within a population that contributes to, and results from, persistent social and economic inequalities. [1] The concept focuses on instances in which multiple health problems interact, often biologically, with each other and the sociocultural, economic, and physical environment. [12] For example, in the mid-1990s, the anthropologist Merrill Singer [23456] explored how substance abuse, violence, and AIDS cluster together and affect one another among an impoverished inner-city population in the USA; he coined the term SAVA syndemic to describe this process. By recognising how these mutually interacting factors promote adverse health outcomes, the syndemic framework moves beyond disease-specific or multimorbidity models to evaluate how social and economic conditions foster and exacerbate disease clusters. [78] Syndemics provide a tool for empirically evaluating how health statuses of multi-morbidity arise in a population, and what health interventions might be most effective for mitigating them.

We focus on type 2 diabetes and discuss how mental illness and infectious disease can cluster with metabolic conditions in both high-income countries (HICs) and low-income and middle-income countries (LMICs). As obesity and other NCDs such as diabetes, hypertension, and heart disease escalate in LMICs, these conditions become more prevalent among low-income populations, shifting from the affluent to the less affluent. [9] Although there are recognised global transformations in obesity, food practices, and activity patterns, [10] this does not ensure that universal one-size-fits-all interventions will be effective across populations. We argue that contextual factors matter, because people experience diabetes differently across social contexts, and this affects how diabetes becomes syndemic. This framework is exemplified in scholarship on syndemic suffering that has employed empirical analysis of individual-level experiences of syndemic interaction to show how social problems that cluster with diabetes and depression differ across contexts. [71112] For instance, immigration-related stress is central to the mental health of many Mexican immigrant women with diabetes who have undocumented family members or are themselves undocumented. [7] This mental stress differs from women residing in the same communities with different ethnic and legal statuses, such as Puerto Ricans and African Americans. [8] A syndemic approach can then be applied to design integrated chronic care that can be locally relevant and most effective at mitigating the root causes of co-occurring conditions in public health and medicine. [13]

Our goal is to examine how syndemic approaches previously limited to socially and economically disadvantaged populations in HICs could be expanded to apply to conditions in LMICs. We triangulate research from medicine, public health, and anthropology to illustrate how poverty, depression, and diabetes cluster in the low-income populations in HICs, and we illuminate the various facets of their interaction. We bring this discussion to LMIC contexts and discuss diabetes comorbidity with HIV in Kenya, tuberculosis in India, and depression in South Africa. Considering how social and health problems cluster together and mutually exacerbate one another differently across contexts is an indispensable way in

which we can frame, understand, and treat NCDs. Through a syndemic orientation, global health practitioners can recognise in their clinical practice and community-based intervention how social, cultural, and political factors facilitate disease clusters and escalate morbidity and mortality.

Principles of syndemic theory

Syndemic theory provides a framework to advance medicine, health systems, and human rights by bringing multiple fields together to recognise, describe, and appropriately intervene in the complex multiple disease burdens that afflict susceptible populations. We describe how syndemic theory enables us to: recognise biological interactions between co-occurring conditions that can belie the true interaction of two or more conditions; describe under what circumstances two or more medical conditions interact and what can be done to intervene; and intervene in ways that address social and medical conditions that interact, and promise to offset the burden of their interaction.

First, we must recognise biological interactions between two diseases for a syndemic to occur (figure). This interaction can occur because of common risk factors, whether genetic or environmental, and iatrogenically through biological effects of treatment on other physiological systems. Depression and diabetes co-occurrence exemplifies this interaction. Epidemiological studies show a two-times increase in depression in people with diabetes compared with the general global population, resulting in adverse effects on morbidity and mortality. [141516] Evidence dating back to 1993 [17] and 2001 [18] shows that the two conditions maintain a bidirectional relationship, [192021] by which diabetes contributes to depression [22] and depression in those with diabetes is associated with non-adherence to diabetes treatment, [1623] increased diabetes complications, [24] and poor glycaemic control. [25] Depression and diabetes also share biological origins, [21262728] particularly the activation of innate immunity that leads to a cytokine-mediated inflammatory response, alterations in glucose transport, and potentially through dysregulation of the hypothalamic-pituitary-adrenal axis, [2729] as well as behavioural patterns, including consumption of high-caloric foods, low engagement in physical activity, and use of antidepressants that enhance weight gain, [20] and social factors that promote stress, eating, and reduced physical activity. [19]

Moreover, there is ongoing debate about the role of antidepressants increasing the risk of type 2 diabetes, with diverse causal pathways that require further research. [293031] In the short term, use of selective serotonin reuptake inhibitors can improve glycaemic control. [31] Long-term observational studies have mixed outcomes, with some meta-analyses suggesting increased lifetime risk of type 2 diabetes. [3032333435] The increased use of second-generation antipsychotic augmentation for depression treatment poses risks for diabetes given the metabolic changes associated with these medications when used as adjuvants. [36] Numbers of prescriptions for second-generation antipsychotics tripled between 2000 and 2010 in the USA, with one in eight adults with depression being prescribed a second-generation antipsychotic. Rates of second-generation antipsychotic augmentation were higher among adults with diabetes. [37] Untreated depression is a risk factor for diabetes through behavioural pathways including poor diet, limited exercise, and other vulnerability behaviours. Psychological treatments of depression, such as cognitive behavioural therapy, improve

glycaemic control in patients with diabetes [2931] and reduces risk factors for type 2 diabetes in people with depression in general.

Second, we can describe under what circumstances diseases interact. For example, socioeconomic factors such as poverty, migration, discrimination, exposure to chronic and acute trauma, including violence, and drivers of social and economic marginalisation are associated with mental health, diabetes, or both. Trade policies that promote big food corporations, and economic or social marginalisation processes that limit primary food staples to highly processed, high sugar, high carbohydrate diets, create an obesogenic environment that increases risk of obesity and diabetes when combined with livelihood factors that limit opportunities for physical activity. [38394041] Chronic exposure to interpersonal violence affects hypothalamic-pituitary-adrenal axis processes that alter metabolism, food preferences, and protection from disease. [42] Results from studies investigating adverse childhood experiences show that these experiences increase the risk of physical and mental health disorders. [4344] Differential clustering of risk factors, from local food practices to exposure to violence, combined with variation in access to risk reduction and protective factors, will contribute to different syndemic emergence across settings. Furthermore, the health system in which diseases are treated affects how the diseases interact, including detection, types of treatment, such as the influence of pharmacological therapies on other health conditions, and the economic burden of gaining access to health services (figure).

Anthropological research shows that unique social factors cluster with depression and diabetes within specific populations and social contexts to produce syndemic suffering. This was documented by the VIDDA syndemic that revealed how violence, immigration, and abuse clustered with depression and diabetes in Mexican immigrant women in Chicago, USA. [2] VIDDA reveals how being a woman and an immigrant or migrant leads to certain patterns of exposure to structural violence, immigration-related stress, and interpersonal abuse and marginalisation within the health system. [45] The anthropological study not only illustrated how poverty and subjugation influence psychological distress and diabetes, but also how internalised emotion, associated with past abuses and feelings of grief and longing for family displaced by migration and documentation, can influence illness. Also, there was evidence that misdiagnosis of grief for psychosis in one Mexican immigrant woman resulted in her admission to a psychiatric hospital, rapid weight gain due to the administration of psychotropic medication, and the onset of diabetes. [46] These conclusions emerged from empirical analysis of life-history narrative, and from psychiatric and biological data that revealed associations between specific sources of social suffering and health outcomes, and therefore have major implications for both mental health and diabetes care. Although it is common for epidemiological studies to measure how economic burden of health care worsens health outcomes, measuring the syndemic suffering of individual lives can be extrapolated to address population-level health outcomes. [7]

Poverty is an established contributor to increased depression and diabetes in HICs, [4748] with growing evidence for increased prevalence of diabetes among middle-income and low-income populations in LMICs. [49] Yet the potential for adverse interaction of these two diseases is even greater in LMICs, where social and economic hardship further increase the

risk of concurrent depression in diabetes. [50] Measuring depression and diabetes in low-income populations is more difficult because of delayed care-seeking, and thereby diagnosis, due to social and financial constraints in LMIC contexts. [51]

Third, we must intervene in ways that address social and medical conditions that interact, and promise to offset the burden of their interaction. This intervention is important because diseases that interact as a result of social, environmental, or political factors might require intervention that extends beyond the health system, and could be detected or mitigated by routine engagement with the health system. [52] This can be realised by a health system that promotes high quality or integrated health services. For example, there would be lower incidence of tuberculosis and opportunistic infections in patients with HIV in settings with early detection and access to and effective delivery of antiretrovirals. [53] Moreover, integrating comprehensive screening for co-occurring conditions, such as screening for metabolic disorders among those who routinely take antiretrovirals, [54] would promote detection and control of NCDs that are traditionally marginalised within the health system. [55] The most relevant integration of health services for syndemic depression and diabetes is of mental health services into primary care settings. [565758] Mental disorders are often under-diagnosed in primary care settings because there is no screening or treatment, and because mental distress can present in different ways across contexts. In LMICs, unrecognised depression can be as high as 40% among people with diabetes or hypertension. [495059] In health systems that integrate mental health into primary care, early detection and treatment leads to lower comorbidity of common mental disorders with other NCDs, [5760] as well as fewer complications.

Diabetes syndemics in rapidly transitioning economies

Syndemics provide an important alternative to NCD epidemiology because the framework addresses how social conditions affect the emergence and medical outcomes related to NCDs such as diabetes, cancer, stroke, and mental illness. Broadly, epidemiologists have shown that rapid economic growth has contributed to demographic, nutrition, and health transitions that have extensively shaped the incidence and prevalence of obesity. [961] Such transitions come together through technological innovations, labour opportunities, rural-to-urban migration, access to education, and social mobility, which greatly transform how people think, move, and nourish their bodies. For example, the influx of highly processed and high-caloric food, sugar-sweetened beverages, cheap oil, and mechanisation of tools and transport, fuelled the escalation of obesity and other related NCDs, including diabetes, in LMICs. [3962] Economic transitions have also had an effect on the increase in NCD prevalence among low-income populations (table 1); [41] since they carry a larger portion of the NCD burden, understanding the role of local social contexts in disease incidence and management—derived from ethnographic and mixed-methods research—becomes crucial for designing effective prevention and treatment modalities.

Epidemiological transition of NCDs to low-income populations in LMICs poses a complex medical context in which NCDs interact with infectious chronic diseases, such as HIV/AIDS and tuberculosis. [97] Although such diseases were considered emergencies two decades ago, today HIV/AIDS and tuberculosis are effectively controlled and managed in many contexts

with practices resembling clinical and public health efforts for chronic conditions. [98] Indeed, a small number of health delivery programmes, such as Academic Model Providing Access to Healthcare (AMPATH) and Partners in Health, [99100] have shown that infectious chronic diseases programmes also can integrate chronic NCD care for those living with HIV/AIDS. Despite the growing body of research showing the effect of NCDs on low-income populations, [49] and the negative effect that NCD–infectious chronic disease convergence has on people with low income in LMICs, [101102] more traditional global health priorities, including HIV/AIDS, tuberculosis, and malaria, continue to receive the majority of development assistance. [59] There is evidence that by overlooking the looming economic and biological repercussions of NCDs, global health financing lags behind the epidemiological burden of disease, [103] with the consequence of overburdening health systems with people seeking care for diabetes when their diabetes is in advanced stages. Yet, by incorporating measures for NCDs—including tobacco use and prevalence of cardiovascular disease, diabetes, cancer, and chronic respiratory diseases among adults aged 30–70 years—in the Sustainable Development Goals, there is potential for more political and financial attention to be directed to NCDs.

Local contexts influence syndemic interaction of diabetes with diseases of poverty and must be recognised in the design and implementation of interventions. For example, structural factors influence the emergence of NCDs by affecting not only what people eat, [39] but also how people move securely in the world, [104] addressing issues from unemployment to laws surrounding immigration and personal securities; these factors have been closely linked to obesity [105] and diabetes. [42] Sociocultural factors, such as gender inequality, racism, and social networks, also influence stress, mental health, and incidence and experience of NCDs. [106107] Anthropological research on syndemics reveals that diabetes interacts differently with one or two diseases of poverty across contexts. [8108] Although depression commonly occurs with diabetes, [109] social experiences vary based on social, cultural, and economic variance within and between populations. [848] For example, the legacy of the HIV/AIDS epidemic has had a profound impact on how people experience living with diabetes; research from Kenya and South Africa underscores the social consequences of caring for AIDS-orphaned grandchildren in the lives of middle-aged patients with diabetes. [11110] In these contexts, the social cost of the epidemic (as opposed to the biological effect) mediates their ability to dedicate social and financial resources to managing their chronic illness. Recognising what social forces interact with the comorbidity within and between populations is important, because although biological interactions are similar between depression and diabetes, social interactions could have a differential effect on biological outcomes. This point relates both to the social and financial cost of the AIDS epidemic, as well as how living with both HIV and diabetes changes the way in which diabetes is experienced. Heterogeneity of designing care packages for syndemic clusters then occurs at the local level and underscores the idea that one-size-fits all treatment modalities hinders productive dialogue about local social and medical needs. We next discuss diabetes comorbidity with depression, HIV, and tuberculosis in LMIC settings that are undergoing rapid socioeconomic change.

Syndemic poverty, diabetes, and depression in LMICs

A syndemic model is crucial to understand how context contributes to the experience and epidemiology of depression and diabetes co-occurrence between HIC and LMIC settings, and how it varies within countries. Globally, diabetes intersects with chronic depression more frequently in low-income populations because of the strong relationship between depression and poverty [111] and the stresses linked to poor access to, and extraordinary costs of, diabetes care. [49] We have already outlined how the co-occurrence of diabetes and depression has received extensive biomedical attention, [19] often highlighting an underlying biological interaction, [27] bi-directionality, [109] and economic effects of comorbidity. [112] Depression also increases risk for morbidity and mortality in those with diabetes [113] and this is common among socially and economically disadvantaged populations. [49114] Therefore, there is substantial evidence that the interactions and outcomes of depression and diabetes are mediated by social contexts, [8115] and therefore are particularly devastating among low-income populations in HICs [116] and LMICs. [49]

Clear epidemiological evidence shows that depression presents more commonly among those with diabetes compared with the general population in LMICs, [50] and increasingly in low-income populations in LMICs. [49] However, only a few studies have provided in-depth analysis of how the cluster of these two diseases materialises within these populations. Anthropological research from India addresses how diabetes and depression are experienced differently among the affluent and the poor, with different social factors contributing to mental illness in those with diabetes, on the basis of socioeconomic status; [117] for example, social isolation affects wealthy Indian mothers, and financial insecurity in low-income mothers causes extreme stress and psychological distress, including depression. [117]

In these cases, social and economic factors contribute to psychological distress, and depression continues to have a negative effect on their diabetes. This negative biofeedback loop underscores the importance of recognising how social conditions influence medical conditions. [57111] As diabetes increases among low-income populations in LMICs, structural and social factors play an important part in what diseases of poverty become syndemic with diabetes, in addition to depression. In South Africa, care for diabetes and depression are separated within the health-care institution so that if someone presents with depressive symptoms during routine diabetes care, structural barriers impede their ability to seek mental health care (panel 1). [118]

Panel 1

Syndemic care in Soweto, South Africa—the case of diabetes and depression

Clinical vignette

A 45-year-old woman presents with frequent urination and foot soreness. A finger prick was taken to establish that she has type 2 diabetes. She has not previously received routine medical care for this condition.

Of the 40–50-year-old female population in Soweto, 14·3% are diabetic and 50% will not know they have diabetes. [85] We do not know what percentage have depression. The likelihood that this woman has depression is high. Individuals with symptoms like those described will often go to a clinic, since health-service access in South Africa is good. Those with diabetes, depressive symptoms, or both, will be referred to a tertiary hospital.

Current care system

Often, patients do not know they have diabetes because limited community prevention or screening campaigns exist. Once symptoms become severe, patients will seek care initially at a clinic and then at a tertiary hospital, where they will be diagnosed and have a treatment regimen identified. They can receive check-ups and medicines (particularly metformin) at the community level. Common mental disorders are rarely diagnosed at community clinics or tertiary hospitals.

Most people with depression who seek medical care at a community clinic will be undiagnosed with depression. If symptoms are severe, patients might be referred to a tertiary institution that has a psychiatric clinic to screen, diagnose, and assign treatment. The tertiary institution will manage mental health medication and management.

In this system, chronic care for diabetes and depression would be completely isolated to different clinics, doctors, and treatment plans. Clinics can capture clinical information. But the system will not identify the patient as someone with two chronic conditions and will not share information with clinics providing concurrent care. The social cost of this system requires patients to seek chronic medical care and medicines from two clinics.

Often, adherence to treatment regimens is compromised because diabetes, depression, or both, are not well managed. Barriers from going to two separate places will affect one or both diseases. This is further complicated if people have more than two morbidities, including tuberculosis or HIV. [118]

Syndemic care system

Syndemic care in South Africa would align with current restructuring of health systems that involves a four-pronged approach for comprehensive health-care coverage, including a primary health-care package, ward-based outreach teams, school health services, and an integrated chronic disease management model. Such an approach would view patients as one unit as opposed to diseases as one unit. Syndemic care would provide a clinic where, even if you go there for testing for one disorder, such as HIV or diabetes, clinicians would employ a holistic approach. This would include testing for major comorbidities, including HIV, tuberculosis, hypertension, and diabetes, alongside a general mental health assessment. One’s mental health has a direct effect on how people adhere to long-term treatment regimens. Because physical diseases are most likely to be chronic, mental health states will affect other chronic care conditions. Once comorbidity profiles are formulated, then the treatment of that patient would be holistic.

Syndemic care would ensure task-sharing across the health system. Nurses would prioritise mental health screening and multi-morbidity screening. After the general health assessment screening, each patient would meet with a counsellor and clinician as they set up their care plan. The clinic would serve as a place of diagnosis, treatment, and receipt

of medicine. Community-based support over the course of one's illness would involve assignment of a community health worker to provide long-term syndemic care that addresses social and medical problems, such as social support, accessing and taking medications, and identifying any risk for complication or further problems.

Syndemic poverty, diabetes, and HIV in LMICs

HIV comorbidities, typically with tuberculosis and opportunistic infections, have undergone extensive research and have been the topic of clinical guideline development. However, comorbidities of HIV with NCDs have received considerably less attention. NCD-HIV syndemics emerge in LMICs as a result of global reduction of infectious diseases, [98] broad management of HIV as an infectious chronic disease, [101] and escalation of NCDs in low-income populations. [102] Economic growth, international investment, and effective antiretroviral therapy have profoundly shaped the incidence and prevalence of HIV/AIDS in the most affected countries, as well as longevity of those living with HIV. [54] Increasingly, there is epidemiological evidence of syndemic clustering of HIV and diabetes within the same communities; this is possible today because people with HIV are living a decade longer than they did two decades previously. [119] For instance, 14·3% of 1251 adult women residing in Soweto, South Africa, a township of Johannesburg, have diabetes, [85] and in the same community one in four people is HIV-positive. [120] Similarly, in Nairobi slums, an estimated 12% of urban adult low-income Kenyans have HIV/AIDS [78] and 10% of adults aged between 40 and 54 years have diabetes. [76] Cohort studies in Uganda and South Africa document HIV-NCD convergence; [121122123124] psychological distress increases among those with multiple conditions and NCDs are lower among older adults without HIV, which might result from routine antiretroviral therapy. [125] More epidemiological studies are needed that document the co-occurrence of diabetes and HIV within the same individuals; however, anthropological research shows that people with HIV are developing diabetes and this poses complex medical issues, including the prioritisation of HIV care over diabetes care because of international donor stipulations on AIDS funding. [11] Since diabetes clusters with infectious chronic diseases, social conditions—such as living in close quarters, food security, and feeling safe—and affordable and accessible medical care become syndemic co-factors that create the potential for disease clustering and adverse interactions.

Financing of health systems has a fundamental role in modelling syndemics because it determines which diseases are prioritised, tested, and treated in primary care settings. An exemplar of this is how global HIV funding shapes health systems and practices. In contexts where the international donors provide free HIV testing and treatment, prioritisation of HIV has historically overshadowed other diseases that afflict low-income populations, including NCDs such as diabetes and depression. Although it is clear that investment in the HIV/AIDS platform has a positive effect on other areas of global health, [55] there is competing evidence that such exclusive priorities displace other diseases [126] and derail strategic partnerships for building health systems and strengthening community health. [127] Therefore, recognising the role of health systems and the delivery of primary health care to low-income populations holds an important position in syndemics. This is particularly true in countries that do not have universal health coverage to assure accessible care for all members of the population.

In Kenya, diseases are individuated into specialty clinics—such as a diabetes clinic, HIV clinic, and tuberculosis clinic—that are devoid of a coordinated person-centred medical care model that addresses individual patients' unique needs (panel 2).

Panel 2

Syndemic care in Nairobi, Kenya—the case of diabetes and HIV/AIDS

Clinical vignette

A 40-year-old woman with HIV presents with thirst and frequent urination. She receives antiretroviral therapy weekly. She reports that she is feeling tired and cries most of the day and is referred to a counsellor in the HIV clinic.

In Kibera slum in Nairobi, Kenya, 12% of the population has HIV and 10% of middle-aged adults have type 2 diabetes. [128] More than half of primary care patients suffer from one or more of the following: anxiety (31%), depression (26%), and somatoform disorder (13%), [129] but rarely are they evaluated for mental distress unless they are HIV-positive. Blood tests for diabetes require out-of-pocket payments so they are rarely conducted in public clinics.

Current care system

The patient goes to the public clinic and receives free voluntary counselling and testing for HIV. If the individual is HIV-positive, then they enrol in an HIV care pathway that is completely free for the patient (funded primarily by international donor funding). If the patient is diagnosed with HIV at a small facility, then they will be referred to a tertiary hospital to begin medical treatment. If they are diagnosed at a tertiary hospital, then the patient will be scheduled for comprehensive care at that facility. All costs for antiretroviral treatment as well as tuberculosis treatment, a common opportunistic infection, are provided free of cost. There are high compliance rates for HIV and tuberculosis medication. A patient with HIV who presents with depressive or anxious symptoms will be referred to a counsellor associated with the HIV clinic where they could receive treatment. However, patients who are not HIV-positive will rarely be examined for common mental disorders, and only in the most extreme cases will they be referred to a social worker associated with the outpatient clinic or to a counsellor in the HIV clinic. Individuals who present with symptoms of type 2 diabetes, such as frequent thirst and urination, will only be tested if symptoms become extreme; these tests require out-of-pocket payments for patients who do or do not have HIV. If a physician diagnoses one disease, then rarely are they examined for comorbidities, including diseases that commonly cluster together, such as depression, hypertension, and diabetes. Patients will pay out-of-pocket for any medications associated with non-communicable diseases.[11]

Syndemic care system

Syndemic care in Kenya requires a reorientation of priority diseases. Currently, the prioritisation of infections such as HIV/AIDS and tuberculosis marginalises other diseases that might cause adverse health alone or together with infectious diseases. Syndemic care requires common conditions, including HIV, tuberculosis, malaria, diabetes, hypertension, depression, alcoholism, and smoking, to be evaluated when

individuals first enter a triage clinic. This would include a standard medical history, standard evaluation of blood pressure, a symptom checklist for tuberculosis (and sputum test for those with a cough), screening for psychiatric and behavioural conditions, and a blood test for HIV and type 2 diabetes.

Syndemic care involves comprehensive health evaluation provided free-of-charge as preventive care. This requires investment in the health system and eventual provision of testing and medication for these common diseases. This care is important for people with HIV and other common conditions that might go undiagnosed; a modified list of priority diseases could be used in rural areas.

Syndemic care requires community-based follow-up to evaluate health outcomes and modification of treatment regimens. This would be carried out by community health workers as opposed to requiring patients to return to the primary health centre, which would contribute to decreased cost and improved medical outcomes.

Syndemic poverty, diabetes, and tuberculosis

Living in close quarters and high rates of tuberculosis, including drug-resistant tuberculosis, pose complex medical problems. The re-emergence of tuberculosis in response to the emergence of HIV/AIDS, and resultant co-infection, has been a priority in global health as evidenced by funding and treatment guidelines. With increasing rates of diabetes among low-income communities, there is a need to consider how diabetes increases risk of active tuberculosis. Diabetes unidirectionally triples the risk of active tuberculosis, particularly among the impoverished. [130] Although this comorbidity has only recently received international attention, [131132133] the number of studies examining syndemic interactions of diabetes and tuberculosis has increased in recent years, drawing from evidence in Indonesia, [134] India, [135] and among Hispanic people in the USA. [136137] Diabetes-tuberculosis interactions produce biological, social, and economic confluence among populations, not only because of demand for chronic care for both diseases, but also the propensity for spreading tuberculosis from or to those with diabetes. Biological vulnerability for tuberculosis infection when someone has diabetes poses a greater environmental risk, especially when living in close quarters with someone with active tuberculosis. Even more, tuberculosis can exacerbate or even initiate diabetes by predisposing individuals to impaired glucose tolerance, and tuberculosis drugs (eg, rifampicin) can make it more difficult to control diabetes. [138] Recognising biological and social vulnerability for infection among those with diabetes shows how important a syndemic understanding can be—particularly in syndemic interactions between NCDs and infectious chronic diseases in people living in high residential-density environments. With population health models that are focused on causation, the assumption that you can intervene in disease-specific pathways, as opposed to syndemic-based prevention and treatment, would clearly overlook the diabetes-tuberculosis syndemic because they are viewed as having distinctly different origins and disease progression. panel 3 describes the growing challenge of diabetes and tuberculosis in India, and the public health and clinical responses.

Panel 3

Syndemic care in Delhi, India—the case of diabetes and tuberculosis

Clinical vignette

A 51-year-old man presents with a cough that has persisted for 2 weeks. After initial treatment with a private practitioner he is referred to a centre that has facilities to diagnose tuberculosis. Once diagnosed after sputum examination and chest radiograph, he is assigned treatment for tuberculosis. When the treatment did not work after 1 month, the patient is identified with multidrug-resistant tuberculosis and assigned a new course of treatment. A finger stick blood sample is then drawn to test for type 2 diabetes.

For the 40–65-year-old population in Delhi, around 1·3% have tuberculosis (compared with less than 0·4% in total in India; see table). Those who present with tuberculosis are 2–3-times more likely to have diabetes. [139] In Delhi, 12·6% of people with tuberculosis have diabetes and 9% are undiagnosed with diabetes. Depression is also a common comorbidity with diabetes and tuberculosis but is rarely tested. Patients seeking public care will be cared for at the primary care clinic.

Current care system

Most likely the patient will present at the primary care centre with a cough. The patient will be advised to go home and return if the cough persists for 2 weeks. If the cough persists then the patient will begin standard treatment for tuberculosis, which is a 1-month course of direct observed therapy, short-term, in which the patient returns to the primary care centre every day, where the drugs are administered. If the patient does not respond to these drugs, then the patient is diagnosed with multidrug-resistant tuberculosis and a revised treatment plan is administered. It is at this point that the patient will be tested for diabetes. The patient is never evaluated for depression, anxiety, or alcohol use.

The patient might report symptoms of thirst, hunger, and frequent urination when seeking care for a cough. When a patient with tuberculosis also has diabetes, they are commonly referred to a diabetologist in a secondary care centre, where they will receive diabetes treatment and follow-up. Some patients seeking care at primary health-care centres or private practitioner-led clinics will return every 3 months for monitoring of blood glucose. Diabetes care will continue after tuberculosis treatment is complete, although there is not any modification of diabetes treatment regimens for people with concurrent tuberculosis compared with those without tuberculosis.

Low-income populations are most likely to seek medical care from public clinics located in the community. Tuberculosis and diabetes rates are much higher than previously suspected in low-income populations; people with diabetes are more likely to acquire active tuberculosis and have poorer tuberculosis treatment outcomes. Tuberculosis also worsens blood sugar control, revealing a bidirectional relationship. [133] But there are no guidelines for current glucose testing alongside tuberculosis treatment regimens, and no management protocols.

Syndemic care system

Syndemic care views patients as one unit as opposed to having discrete diseases. Syndemic care would provide a triage clinic where all patients are tested for diabetes, hypertension, depression, alcoholism, HIV, and frequency of smoking. Other diseases would be screened for on the basis of a symptoms checklist (eg, those with a cough would have a sputum test).

Syndemic care would require community-based follow-up to evaluate health outcomes and modification of treatment regimens. This would be carried out by community health workers as opposed to requiring patients to return to the primary health centre. Syndemic care thus would treat the whole patient as opposed to on a case-by-case or disease-by-disease basis. Syndemic care would further contribute to the avoidance of multiple visits to specialists and reduce costs. Syndemic care should have a very important role for care of elderly people because of the common role of multimorbidity and effect of social factors on mental and physical health outcomes in older people.

Application of syndemic models to improve global health

The syndemic framework can have a measurable effect on health care and quality of life when applied to public health and clinical medicine. Syndemics render prevention and intervention programmes more successful when addressing the multiple disorders and specific contextual vulnerabilities holistically, rather than viewing the disorders individually or as extractable from the context in which they occur (as shown by models for syndemic care, panels 1–3). [5] Indeed, there are many models of effective integrated health care delivery and critiques of how clinical interventions neglect social or non-medical problems. [140] Many physicians simply believe that structural and social interventions are “not our job”, [141] a belief that points to how clinical training explicitly focuses on diagnosis and treatment without considering how social problems affect medical problems. [142] Moreover, with increasing complexity of patient care, there is increased risk of negative sequelae for both patients and health-care providers. [143]

There is an obvious need for integrated chronic care that addresses the negative feedback loop between structural and social problems, diabetes, and co-occurring conditions such as depression, HIV, and tuberculosis. While this approach might seem outside the purview of clinical medicine, there is a precedent, such as the work of Rwanda’s Ministry of Health with Partners in Health and the Clinton Foundation. [99] Together, Rwanda’s Ministry of Health was able to design NCD care for those living with HIV and AIDS in a largely rural and decentralised health-care delivery system. This model moved forward the extensive work of Partners in Health that has traditionally recognised that addressing structural and social problems is central to mitigating the effects of social and economic marginalisation and improving community and individual health. [141] The model illustrates how instead of focusing on behavioural or lifestyle factors for HIV prevention (which have been the standard for clinical treatment in the USA), attention should be given to the aspects that make HIV a social disease, such as poverty, gender inequality, and racism. [144] Other integrative programmes, such as AMPATH, [145] and a growing body of research on global mental health, [135758] similarly show a measureable improvement in morbidity and mortality outcomes through integrative primary health care that bring together interventions for social,

psychological, and physical problems. South Africa provides another example of national-level integration of services that result from political priorities within transformation of the health system and primary health-care re-engineering. [146] Tuberculosis was integrated alongside HIV in 2009 and a joint HIV, tuberculosis, and sexually transmitted infection national strategic plan was developed. These integrative services have shown improvements in health outcomes and management of patients, but little has been done regarding the diagnosis and management of NCDs among people living with or without HIV/AIDS. [147] It appears that integration at these levels tends to depend on individuals rather than systems.

We argue that the concept of syndemic care [11] can actualise coordinated, patient-centred medical visits that involve comprehensive testing and treatment and routine diagnosis for infections and NCDs, from HIV to tuberculosis, typhoid, diabetes, hypertension, anxiety, and depression. Once diagnosed, care for these medical concerns should be administered from one medical centre and caregiver so that individuals do not need to seek care from multiple, disease-specific centres. Community health workers visiting homes in urban slums can help ensure that patients attend clinic visits, access essential medicines, and manage their multiple morbidities; however, community-based care must recognise how social problems impede mental and physical health. The Philips Foundation is currently piloting such programmes through Community Life Centers in Kenya. If development aid were committed to such an approach, it would foster opportunities to confront the dynamic social–medical interactions that complicate people's social and medical lives.

Syndemic care should be available at the primary care level as well as the community level through integrated health care and the strengthening of health systems. Task-sharing has been used by health workers across the health system, from provision of HIV care [148] to mental health care. [149] Task-sharing, also called task-shifting, is when tasks that are often conducted by specialists, such as diagnosis and management of disease or distribution of medications, are transferred to less-skilled health workers with specific training. [150] Task-sharing provides an exemplar system through which syndemic care is delivered; however, it requires training for holistic health models as opposed to singular diseases (as is traditionally delivered). Therefore, instead of one community health worker for malaria, and another for mental health, community health workers would receive syndemic care training. There are increasing numbers of examples of mental health interventions being integrated into maternal and child health services given the strong link between the two domains. [151152153]

A syndemic approach for community health workers would incorporate a standard checklist of myriad symptoms, to evaluate priority social and health conditions—from tuberculosis to nutrition, smoking, overcrowded living conditions, and strong or weak social networks. Once the general screening identifies or negates these priority diseases, then individuals will undergo extensive evaluation and set up an integrated treatment plan in the primary health centre with recognition of the complex social and medical conditions that coexist. Comprehensive, people-centred healthcare delivery will enable community health workers to identify a more complex array of social, psychological, and physical symptoms that affect overall health. Indeed, this approach builds on existing arguments for the integration of health services and strengthening of health systems in LMICs that are feasible and cost-effective, [154] especially in response to increasing incidence of NCDs and infectious chronic

diseases. [52155] Nevertheless, a syndemic care model must be comprehensively implemented to prevent overburdening community health workers with extra tasks. With increasing distribution of tasks to community health workers, there is growing concern about the economic burden, lack of compensation, and contribution to personal physical and mental health problems. [156157] This is especially problematic given that the majority of community health workers are women and thus bear the greatest burden of uncompensated or undercompensated labour. [158159]

Indeed, a syndemic care model is meant to enhance capabilities of community health workers by increasing the number of health problems they see but reducing the geographical region they survey. Moreover, syndemic care is intended to simplify care at the community level by having integrated treatment protocols rather than separate algorithms for diabetes, mental health conditions, maternal and child health, and aspects of social services.

Recommendations and steps forward

We recommend that a syndemic framework be adopted as a tool for recognising, researching, testing, evaluating, and implementing integrated health programmes, especially those dealing with multiple chronic conditions. First, researchers and care providers must recognise how social and medical problems cluster and interact within certain populations. Understanding what social problems affect certain disease clusters across geopolitical contexts and within specific regions and populations is imperative. Second, funding institutions must provide opportunities for research and data that use a syndemic framework. This requires that the syndemic framework is clearly operationalised, based on ethnographically grounded research, and measurable so that researchers can explicitly propose what social and health problems are concurrent and interacting. Indeed, showing statistically how syndemics can improve health outcomes and the cost-effectiveness of the health systems is imperative. Third, more evidence for the effectiveness of integrative care and task-sharing across health workers is needed to detect syndemic problems and deliver syndemic care. Models for the delivery of integrating mental health care into primary care provide a foundation for this approach. [62] Fourth, randomised controlled trials will need to evaluate the syndemic model as a tool for improving outcomes and to determine if the syndemic (re)orientation is effective. Fifth, on the basis of the aforementioned steps, policy change will be necessary to move beyond singular disease models and incorporate more integrative syndemic frameworks of disease emergence, interaction, and subsequent adverse outcomes. Finally, implementation of syndemic care will provide people-centred medical care that does not align health-care delivery with international donor politics (thereby prioritising one disease, such as HIV, tuberculosis, or malaria, more than diseases marginalised by aid funding, such as NCDs). Instead, a syndemic orientation will ensure that the clusters of diseases that emerge among impoverished populations are recongised as complex and contextually situated. This approach will advance global health policy and outcomes among the most socially and economically disadvantaged populations.

Acknowledgments

This paper discusses research conducted in India, Kenya, South Africa, and the USA funded by the following institutions: National Institutes of Health Fogarty International Center (R24 TW007988), Georgetown University's

School of Foreign Service, the South African Medical Research Council, the National Science Foundation, and Northwestern University's Cells to Society. BAK is funded by the US National Institute of Mental Health (NIMH) through Reducing Barriers to Mental Health Task Sharing (K01MH104310-01). SAN is supported by the UK MRC/DfID Africa Research Leader Scheme. This research study would have been impossible without the hundreds of people with diabetes willing to share their life stories and health-care experiences with us; we are grateful for their time, patience, and openness. This study would also be impossible without the institutions and especially research assistants who hosted, facilitated, and accompanied these projects, including the Public Health Foundation of India and Centre for Chronic Disease Control in New Delhi, India; Africa Mental Health Foundation in Nairobi, Kenya; MRC/Wits University's Developmental Pathways for Health Research Unit in Johannesburg, South Africa; and John H. Stroger, Jr. Hospital of Cook County in Chicago, USA. We thank H Stowe McMurray for assistance with the table.

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Key messages

1. Non-communicable diseases share common risk factors resulting in escalation of comorbidities, especially among low-income, marginalised populations worldwide
2. The clustering of social and health problems is often overlooked in social epidemiology and other models of epidemiological transition
3. Syndemic care requires that we recognise how social problems cluster with and affect medical problems, and that co-occurring diseases can present differently than singular disorders

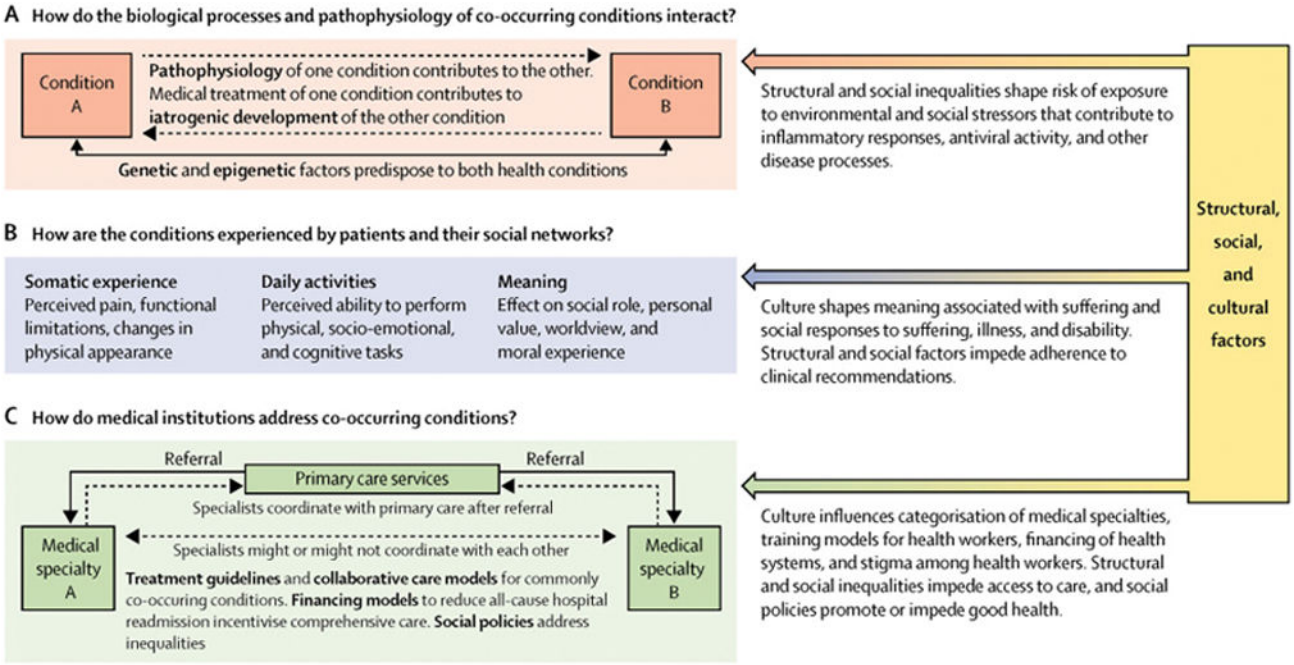

Figure 1. Model for syndemic approaches to health

(A) Example: depression contributes to pro-inflammatory responses and reduces glucose tolerance. Conversely, inflammatory cytokines associated with diabetes contribute to depression. Treatment of a depressed patient using an atypical antipsychotic adjuvant could contribute to metabolic syndrome, increasing the risk of diabetes. (B) Example: a patient might not perceive diabetes and depression as separate conditions. Instead, the patient focuses on functional limitations such as fatigue and poor concentration. (C) Example: patients diagnosed with diabetes could be provided with health promotion interventions to reduce risk of depression. Patients with both conditions could be enrolled in a collaborative care treatment programme. Social policies should address common risk factors for diabetes and depression (eg, diet and exercise constraints, financial insecurity, interpersonal violence, and social cohesion).

Table 1

Prevalence of type 2 diabetes, HIV/AIDS, tuberculosis, and depression in India, Kenya, South Africa, and the USA

	Diabetes (type 2)	HIV/AIDS	Tuberculosis	Depression
India				
Population	8·6–15·5% [506364]	0·31% [65]	0·2–0·4% [6667]	4·5–15% [686970]
Low-income urban population	11–12% [6471]	0·35% [65]	0·46–1·1% [6667]	19·3% [69]
Kenya				
Population	3·6% [6372]	6·0% [73]	0·3% [74]	7–66% [75]
Low-income urban population	4·8–10% [7677]	10·6–12% [7879]	0·7% *[80]	30% [75]
South Africa				
Population	7·1–8·3% [6372]	11–20% [8182]	0·8% [82]	5–10% [688384]
Low-income urban population	12·1% [8586]	22–30% [8788]	1–5·5% [89]	9·0% [83]
USA				
Population	9–11% [6390]	0·4–0·9% [91]	0·003% [92]	6·6% [93]
Low-income urban population	10% [94]	2·1% [95]	0·97% †[92]	15·4% [96]

*Cause of death data from urban slum populations.

†The data reported are from New York City only.