

Socioeconomic Position and Health among Persons with Diabetes Mellitus: A Conceptual Framework and Review of the Literature

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Abbreviation: SEP, socioeconomic position.

There has been a resurgence of interest in the relation between health and socioeconomic position (SEP). SEP encompasses two important notions: the influence of the structural location of individuals and groups in a society and the cumulative effects of time. It addresses the context in which health-damaging exposures and health-protective resources act at different stages of the life course to influence adult health (1, 2). Such an approach provides a broad framework in which to think about and understand how both recent and remote socioeconomic factors interact to affect adult health. A substantial body of literature demonstrates that in the general population, material and social deprivation are directly related to disease incidence and prevalence and inversely related to health status (1, 3–8). Various studies have addressed the relation between lower SEP and mortality (9) or the development of chronic conditions (10–13) such as diabetes mellitus, cardiovascular disease, and cancer. Although some compelling evidence exists for an association between low SEP and adverse health outcomes for persons with diabetes and other chronic conditions, the pathways through which SEP and health are related in persons with chronic illness are poorly understood.

Because type 2 diabetes is common in all populations in industrialized nations but disproportionately affects socially and materially disadvantaged adults (14–24), it may serve as a model condition for evaluating the associations between

SEP and health among persons with chronic disease (25, 26). Although effective therapies are available for managing diabetes and preventing or treating its complications, these therapies are underutilized, particularly among persons of low SEP (27–29). For someone with diabetes, SEP may influence access to and quality of care, social support, and community resources. It may also influence diabetes-related knowledge, communication with providers, ability to adhere to recommended medication, exercise, and dietary regimens, and treatment choices. Correspondingly, the reduction of socioeconomic disparities in health may have a profound impact on the morbidity and mortality associated with diabetes.

In this paper, we present a conceptual framework for the mechanisms linking SEP to the health of persons with diabetes (figure 1). We present findings from a review of the literature characterizing the association between SEP and health in persons with diabetes and discuss the main mechanisms posited to influence this relation: health behaviors, access to care, and processes of care, which we refer to as proximal mediators/moderators. We then discuss more distal mediators and moderators of the relation between SEP and health outcomes that often act through their relations to health behaviors, access, and process. Among these distal mediators and moderators are characteristics of persons with diabetes, their health care providers, their communities or

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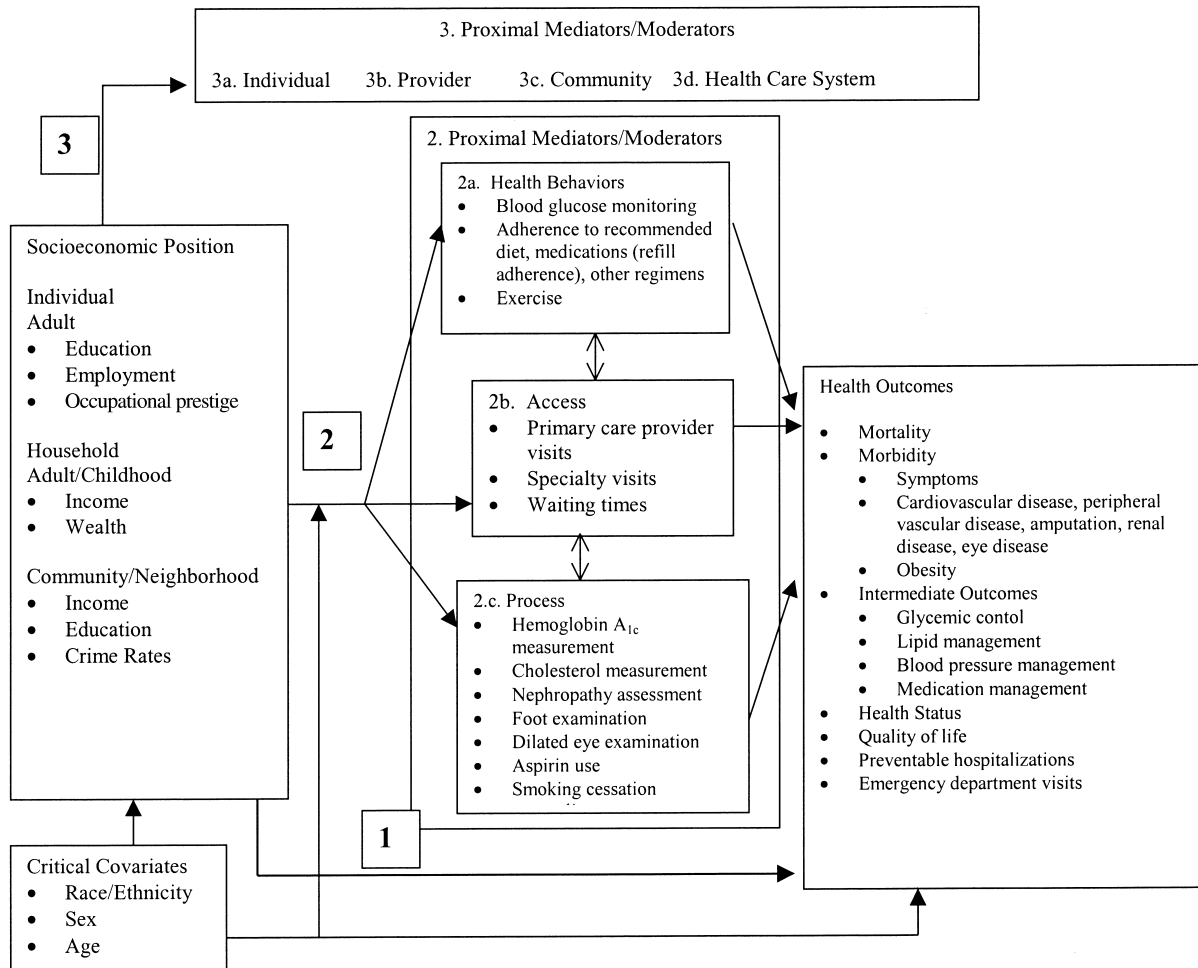


FIGURE 1. Conceptual framework for the relation between socioeconomic position and health among persons with diabetes mellitus. Numbers and letters refer to pathways mentioned in the text.

neighborhoods, and their health care systems. We conclude this paper with a discussion of unanswered questions about relations between SEP and health in persons with diabetes and a research agenda for clarifying these associations.

MECHANISMS THROUGH WHICH SEP INFLUENCES HEALTH AMONG PERSONS WITH DIABETES

SEP and diabetes outcomes

Pathway 1 in figure 1 illustrates the relation between SEP and health outcomes in persons with diabetes. Research on the relation between SEP and health has often focused on individual characteristics such as income, wealth, education, and occupation. However, SEP encompasses not only current individual socioeconomic status but also social relationships (30), community-level characteristics (31, 32), and gradients of SEP at the individual and community levels (33), and it can be conceptualized and measured over the life

course (34). Use of this broader framework may provide greater insights into the relation between SEP and health. For example, because the progression of both type 1 diabetes and type 2 diabetes can be influenced by behavior over the life course, SEP in childhood may have profound consequences for long-term health, even if SEP changes during adulthood. In addition, neighborhoods or communities may play an instrumental role in the health status of their residents through the availability of health care services, neighborhood characteristics that promote health (e.g., access to stores that sell healthy foods and places to exercise) or disease (e.g., toxic environments), and the prevailing attitudes toward health and health behaviors in those communities (32). The strengths and limitations of using present, childhood/life course, and community measures of SEP have been described elsewhere (35–37) and will not be a focus of this paper; however, a fuller picture of the relation between SEP and health will require studies that use different approaches to the measurement of SEP.

The health outcomes included in the model are both general and diabetes-specific. Among the general outcomes are health status, quality of life, and mortality. The diabetes-specific outcomes include intermediate outcomes (such as blood pressure management, hemoglobin A_{1c} and lipid concentrations, and the presence of proteinuria or microalbuminuria) and their long-term consequences (such as cardiovascular disease, retinopathy, nephropathy, cerebrovascular disease, and peripheral vascular disease).

Proximal mediators/moderators: health behaviors, access, and process

SEP may influence health outcomes through individual health behaviors, access to care, and processes of care (see pathways 2a, 2b, and 2c in figure 1). These factors are called mediators if they are the means through which SEP influences health outcomes (or, in other contexts, access, quality, or health behaviors); they are called moderators if the effect of SEP differs according to levels of the factor.

A complex set of personal health care behaviors is critical to diabetes control (38). Among the behaviors of particular importance are self-monitoring of blood glucose concentrations, adjustment of insulin and oral antidiabetic agents in response to blood glucose readings and intercurrent illnesses, management of comorbid medical conditions (e.g., hypertension and hyperlipidemia), dietary adherence, exercise, and smoking.

“Access to care” encompasses the availability of health care services (potential access) and use of those services by patients (realized access). In managed care systems and health care systems that provide “universal coverage,” realized access may still be constrained by financial and organizational barriers to the use of benefits, such as required copayments, restrictions on specialty referrals, or lack of proximity to health care facilities (39). Access to care can be measured by identification of a regular source of care and the number of primary care visits, ease of specialty referrals and the number of specialty visits, travel time to appointments, and appointment waiting times.

The “process of care” is the technical and interpersonal care provided to patients within the health care setting (40). Among the processes important for persons with diabetes are regular measurement of blood pressure, hemoglobin A_{1c}, and cholesterol levels; assessment of nephropathy; regularly conducted dilated eye and foot examinations; and counseling on smoking cessation. The process of care may directly influence health outcomes (41). A causal pathway between lower socioeconomic status and poor health care outcomes has been postulated that includes poorer access to care (resulting in inadequate treatment and increased risk of complications), poorer quality of care, and worse self-care behaviors (such as diet and exercise behaviors), which may contribute to other diseases and further decreased function (42).

Distal mediators/moderators

Distal mediators and moderators potentially explain the relation between SEP and access, process, health behaviors, and health outcomes for persons with diabetes. Figure 2

highlights some of these important potential distal mediators and moderators.

Critical covariates

Age, sex, and race/ethnicity are important covariates that should be considered in any analysis of the relation between SEP and health. Evidence suggests that although many of the observed age, sex, and racial disparities in health may be explained by differences in SEP, each of these demographic characteristics may exert an independent influence as well (2, 34, 43). Although they are not the focus of this paper, we highlight findings on these covariates, where appropriate, from studies that evaluated their relation to SEP among persons with diabetes.

Endogeneity or reverse causality

An underlying assumption of our model is that low SEP leads to poorer health outcomes. However, just as absolute or relative material or social disadvantage may lead to worse health outcomes, poorer health may result in lower SEP. We recognize that endogeneity, or reverse causality, is an important concern in studies of SEP and health (44), but it should be less of a problem in studies that define SEP by measures determined early in life (e.g., education), before the onset of most health problems. Our decision to examine how SEP might influence health is strengthened by empirical evidence from longitudinal (45) and instrumental-variables (46) analyses which reveals that at least part of the strong association between SEP and health can be attributed to the causal effects of SEP. Thus, our emphasis in the discussion below is on the mechanisms through which SEP might influence health.

EVIDENCE ON THE PROXIMAL PATHWAYS

SEP and diabetes outcomes

We have considerable evidence that the social status of persons with diabetes and the characteristics of their communities or neighborhoods may determine their risk of mortality and diabetes-related complications such as cardiovascular disease, retinopathy, end-stage renal disease, and amputation, as well as their quality of life (see pathway 1 in figure 1). Lower individual SEP, as measured by individual or household income, education, employment, occupation, or living in an underprivileged area, has been associated with poorer physical or emotional health (47–50), all-cause mortality or higher rates of fatal and nonfatal cardiovascular disease (50–56), poorer glycemic control (57–60), and increased risk of microvascular disease (58, 61–63). However, some US studies have found no association between SEP and glycemic control (64, 65).

SEP, health behaviors, and diabetes outcomes

Among persons with diabetes, factors such as low income, less education, and living in a high-poverty area have been associated with higher rates of smoking (23, 57, 58), lower

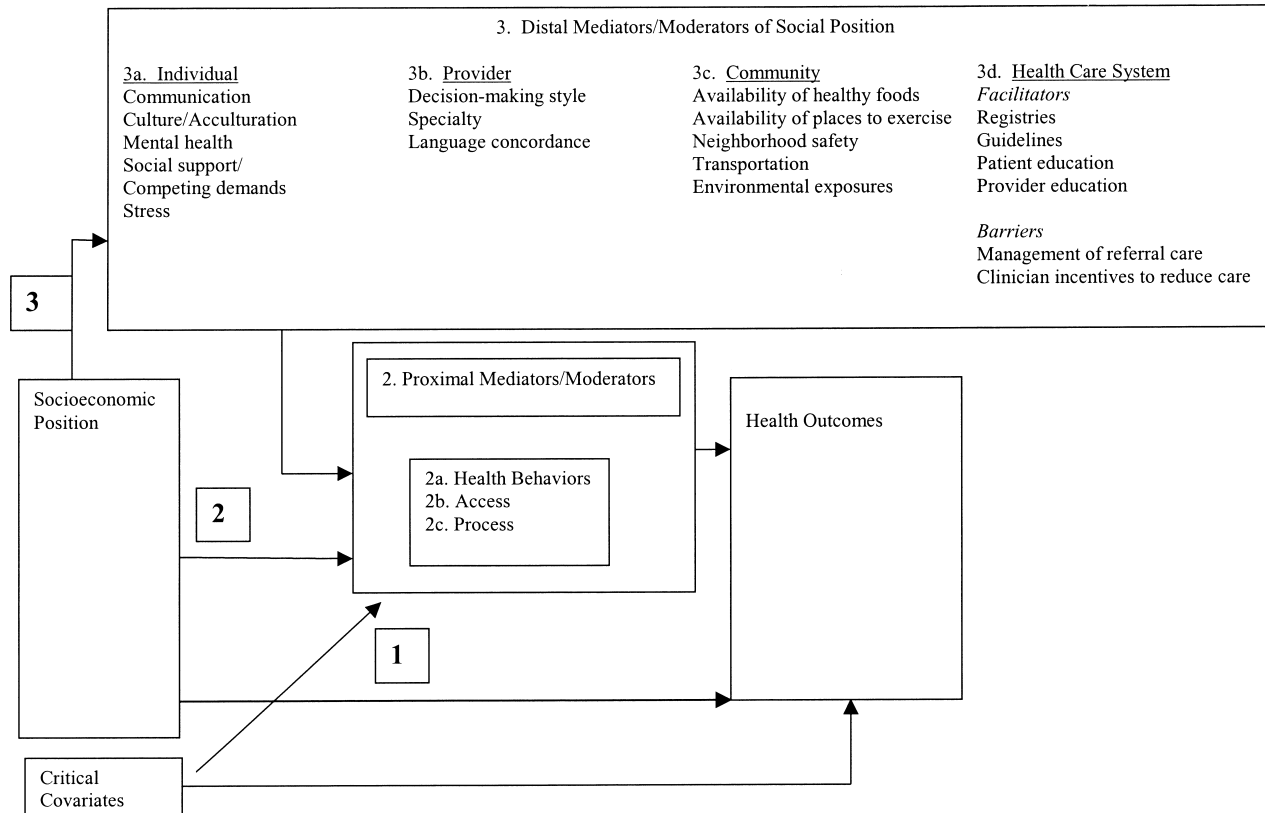


FIGURE 2. Distal mediators and moderators of the relation between socioeconomic position and health behaviors, access to care, processes of care, and health among persons with diabetes mellitus.

rates of blood glucose monitoring (29, 66–68), and lower rates of vigorous exercise (23, 57) (see pathway 2a in figure 1). Unfortunately, no studies have evaluated the complex range of self-management behaviors required to control blood sugar and to manage lipid levels, blood pressure, and associated chronic conditions among persons with diabetes. These behaviors include not only blood glucose monitoring, examination of the feet, dietary restrictions, and regular exercise but also management of multiple medications, dosing schedules, and the maintenance of glycemic control during intercurrent illness.

SEP, access to care, and diabetes outcomes

The relation between higher socioeconomic status and better health outcomes is partly explained by better access to primary and specialty care (see pathway 2b in figure 1). Observational studies suggest that improved access, measured by a greater number of primary care providers in a region or the availability of facilities that provide high-quality primary care, may reduce the negative association between income inequality and self-reported health (69–71). For persons with diabetes, access to health insurance is also important for the receipt of high-quality care (68, 72–75). Compared with the uninsured, insured adults with diabetes

have been shown to have three times the odds of having undergone a dilated eye examination (68). Those without insurance receive fewer foot examinations and preventive health care services (68), have poorer glycemic control (75), and have almost seven times the odds of having diabetic eye disease (73). Studies of patients with diabetes in managed care (76–78) indicate that socioeconomic disparities are reduced in settings of improved access. The mechanism is probably multifactorial; however, one study suggests that educational barriers may be reduced in managed care settings (79). Nonetheless, there is also evidence from managed care (80) and from countries with universal health insurance coverage (53, 59–61, 66, 81–85) that some socioeconomic disparities in health persist despite improved access to care.

SEP and the process of care

Although there have been exceptions (65, 86, 87), reports from diverse settings indicate that the process of diabetes care for persons of low SEP is inferior to that of more affluent persons (59, 66, 68, 88–91) (see pathway 2c in figure 1). Income (59, 88–91), education (68, 73, 92), and area of residence (88) have all been associated with gradients in the process of care. Having less education has been asso-

ciated with lower rates of hemoglobin A_{1c} and lipid measurement, fewer ophthalmologic visits, and lower rates of preventive services such as influenza shots and mammograms (92). Less educated persons also have less understanding of hemoglobin A_{1c} testing (68) and receive fewer foot examinations and dilated eye examinations (73).

EVIDENCE ON THE DISTAL PATHWAYS

Individual-level pathways between SEP and health for persons with diabetes

The health inequalities observed for persons with diabetes at different levels of the socioeconomic hierarchy may be explained by differences in one or more individual-level characteristics, including patient-provider communication, culture and acculturation, mental health, social support, and stress (see pathway 3a in figure 1).

Patient and provider communication. Effective communication between patients and providers (93, 94) and shared decision-making (95, 96) influence health behaviors and the process and outcomes of care for persons with diabetes. Communication barriers may significantly decrease a patient's ability to appropriately obtain health care and may inhibit the degree to which the patient benefits from such care.

Less effective communication (as measured by agreement between patients and clinicians on symptoms, test results, therapy, and prognosis) has been observed among patients of lower occupational status (97) and may pose a significant barrier to good care. Physicians are more likely to adopt a more directive approach with less-educated patients, who are then less likely to have their expectations met (98). Provider communication style has also been shown to influence diabetes outcomes. Patients who interact with less controlling, more informative physicians (99) and nurses (100) achieve better metabolic control. Indigent patients whose physicians facilitate participation in decision-making are more satisfied with their care (101). Moreover, satisfaction with both the effectiveness of the provider's communication and participatory decision-making styles are important predictors of diabetes self-care behavior, an outcome that appears to be mediated by enhanced patient understanding of his/her diabetes care and confidence in his/her self-management skills and knowledge (102).

In one study, diabetic patients who were more assertive, who expressed more emotion during health care encounters, and who were more adept at obtaining information from health care providers also had better metabolic control than persons who were less assertive or expressive (94). Another small study, however, found no association between a patient's behavior during health care visits and metabolic control and only a nonsignificant reduction in blood sugar levels among persons who more frequently elicited information from providers, though power may have been inadequate to detect clinically important differences between the groups (103). There is some evidence suggesting that efforts to enhance communication may mitigate the observed detrimental effects of low SEP. In a randomized trial designed to increase patient participation in medical-care decision-

making, intervention patients were more effective at eliciting information from physicians and had significantly lower hemoglobin A_{1c} levels than control patients (93).

Additional communication barriers of particular importance for persons with diabetes are inadequate functional health literacy and language discordance.

Health literacy. Functional health literacy, "the ability to read and comprehend prescription bottles, appointment slips, and the other essential health-related materials required to successfully function as a patient," may mediate the relation between low SEP and health (104, p. 552). Lower educational status is strongly associated with worse health literacy (105, 106), and inadequate health literacy has been linked to poorer health status (100) and more hospital admissions (107). Persons with diabetes who have inadequate or marginal literacy are less likely to know the symptoms of hypoglycemia (108), and they have higher hemoglobin A_{1c} levels and higher rates of retinopathy even when exposed to traditional diabetes education (109).

Language barriers. Like health literacy, language barriers appear to influence self-care behaviors and outcomes specific to diabetes. Patients with type 2 diabetes who report difficulty with English monitor their blood sugar levels less frequently than persons with no language barriers (29). Spanish-speaking Latinos are less likely than those who speak English to have a regular source of health care, and they receive less screening, report lower rates of use of preventive services (110–112), and are less satisfied with their health care (113) than Whites and English-speaking Latinos. In another study, among persons with diabetes or hypertension, language concordance between patient and provider was associated with greater physical and emotional well-being, better health perceptions, and less pain (114). Two other studies observed no difference in glycemic control between English-speaking and Spanish-speaking Latinos (115, 116). In one study, however, patients had established primary care providers, and interpreters were consistently and widely used (115), while in the other study, patients appeared to self-select Spanish-speaking providers (116); this suggests that the impact of language barriers may be attenuated by either language concordance or the availability of translators in the setting of an established primary care relationship.

Culture and acculturation. In the United States, medicine and medical care have a strong cultural context that has been inadequately explored in the medical literature. Cultural factors that represent shared norms, values, and attitudes of an ethnic or racial group may influence health beliefs, treatment preferences, and health behaviors and ultimately health outcomes. Although little work has been done on the association between culture, acculturation, and health among persons with diabetes (117), research in the general population suggests that cultural factors have a profound impact on health, including conditions that may worsen diabetes outcomes, such as obesity, depression, and cardiovascular disease. Moreover, there is evidence that these effects vary by place of origin, gender, and SEP. For example, among Japanese-American men in Hawaii, acculturation to a Westernized lifestyle was associated with higher rates of obesity and cardiovascular disease in addition to diabetes (118–120).

In contrast, acculturation among Mexican Americans in Texas has been associated with lower rates of diabetes (120, 121), obesity (122), and depression (123) and higher rates of leisure-time physical activity (124). The relation between acculturation and health for Mexican Americans appears to be strongest among women and to be closely linked to socioeconomic status. Among Mexican-American women, residence in more affluent and more acculturated neighborhoods is associated with higher rates of regular exercise and lower rates of obesity in comparison with women in less acculturated and poorer neighborhoods (120, 121). In the studies that have examined how acculturation may influence the process of care, acculturation among Latinos was not associated with use of or receipt of preventive care (125, 126).

It is not clear whether the associations observed in the general population are the same for persons with diabetes, since there have been few studies of the impact of culture or acculturation on health among persons with diabetes. However, one small study of Latino and White veterans suggested that a number of sociocultural factors, including religiosity and family structure, may play a more important role than ethnicity per se in use of health care services and quality of life (117). In persons with diabetes, culturally appropriate interventions that address dietary, language, and social norms and health beliefs have been associated with better glycemic control among Mexican Americans (127) and enhanced physical activity among African Americans (128, 129). There has been little research on the roles that the cultural norms and backgrounds of clinicians play in their decision-making.

Mental health. Persons with diabetes are more likely than the general population to have depression (130–132), eating disorders (133), and other psychological conditions (132). Of these problems, depression is the most common and the one most extensively studied (131, 134–138). Persons with diabetes have double the odds of depression of the general population (136, 137), and in the general population there is a consistent inverse relation between income and depression (139). Finally, adults with diabetes who have relatively less education have significantly higher unadjusted rates of depression (138).

Depression may influence communication with health care providers, self-management behaviors, use of health care services, and metabolic control. Among patients with diabetes in one study, those with more depressive symptoms were found to have higher rates of nonadherence to oral antidiabetes medications than those with the fewest symptoms—15 percent versus 7 percent (134). These behaviors may translate into worse glycemic control, greater use of health care services, and higher costs. A meta-analysis demonstrated a positive association between depression and hemoglobin A_{1c} levels (135). However, it is not known whether treatment of depression is associated with better management of diabetes. Depressed persons with diabetes also report more primary care and emergency department visits, more hospitalizations, and higher costs of care, and their total costs were found to be over four times those of persons with diabetes who were not depressed (134, 137).

Social support, social integration, and competing demands. Evidence is strong for a relation between supportive social ties and better physical and mental health (140–142) and, conversely, between social isolation and greater morbidity and mortality (143, 144). Poorer persons are at higher risk of social isolation and of having fewer supportive social ties (145, 146), and among persons with diabetes, low SEP may have a larger negative effect for people with lower levels of social support. Researchers in one small study found that under conditions of high stress, which tend to be more prevalent among people of lower SEP, persons with less social support had higher hemoglobin A_{1c} levels than persons with more social support; however, under low-stress conditions, level of social support was not associated with differences in glycemic control (147).

In the aggregate, among persons with diabetes, higher levels of social support have been associated with better self-management, including adherence to recommended diet and exercise regimens and better glycemic control (148–153). Although empirical data on how social support influences health outcomes in persons with diabetes are sparse, better self-management skills and improved access (through the health-seeking behaviors of the patients themselves or through their social networks) and quality (due to better communication with physicians) probably play a role.

However, certain kinds of social ties, such as obligations that entail financial expenditures, demands on one's time, and criticism from social contacts, may have detrimental effects (154–158). The health care needs of persons who are caregivers for disabled elders often compete with the physical and emotional needs of their dependents (159), and the caregivers often fail to obtain adequate health care for themselves (160, 161). Adults with diabetes who are the primary caregivers for young children or dependent adults may have worse access to care, a lower quality of care, and worse health behaviors because they lack the time to obtain care or look after themselves. A study of African-American adults with diabetes suggests that the caregiver role is not uncommon: 29 percent had a dependent child at home and 13 percent were caring for an ill person at home, and almost 20 percent of their visits to a case manager or community health worker addressed family responsibilities such as child care or elder care (162). Competing demands for time may also exacerbate the negative effect of low SEP on health care access, quality, and behaviors for these persons, who are less able to purchase child care or elder care, prepared meals, and other goods and services that could reduce the demands on their time.

There is contradictory evidence on whether even satisfactory social relationships may have detrimental effects on diabetes management. One small study found that greater satisfaction with social relationships was associated with better glycemic control among diabetic women but worse control among diabetic men (163). Although another small study did not support this finding (164), the influence of the content of social relationships on health among persons with diabetes deserves further study.

Stress. Control of blood glucose levels has been closely linked to stress in studies of type 1 and type 2 diabetes (165–169). The mechanisms for this association are probably

multifactorial (170–172), but they remain poorly understood. It has been suggested that stress may impair glucose control through two different pathways: behaviors, such as a reduction in medication adherence, and neurohumoral pathways, notably the counter-regulatory hormones (170). Allostatic load, the cumulative biologic burden associated with the body's adaptation to chronic stress, may be a particularly important mechanism through which low SEP affects health outcomes for persons with diabetes (173). There is evidence from one small study that stress management can result in modest but sustained reductions in glycemic control that are not associated with changes in health behaviors such as diet or exercise (174).

Stress may be a common mechanism through which SEP and several other individual-level variables influence health. However, the specific biologic markers of stress among persons with diabetes and the relation between health behaviors and the biologic mediators are not well characterized. Additionally, much prior research has focused on the acute effects of stress on diabetes management and glycemic control, while the long-term impact of sustained exposure to socioeconomic deprivation and its association with detrimental health behaviors and biologic mediators remains poorly understood.

Provider characteristics

Social influences on clinician decision-making include the clinician's relationship with the patient and characteristics such as clinician specialty and decision-making style (175), as well as the SEP of the patient and the patient's community (176, 177) (see pathway 3b in figure 1). SEP has been shown to influence physicians' perceptions of the intelligence and personality characteristics of patients with coronary heart disease (178). These perceptions may influence the provider's willingness or ability to provide counseling on healthy behaviors and disease management, which in turn would reinforce the tendency of patients of low SEP not to engage in these behaviors.

Persons of low SEP who have diabetes have been shown to have lower rates of seeing an endocrinologist for their care (67 percent of endocrinologists' patients, as compared with less than 50 percent of generalists' patients, had 12 or more years of education) (179), and diabetes specialists were more likely to provide indicated components of care (180–182). Only one study did not find such a difference between generalist care and specialty care (183).

Characteristics of communities or neighborhoods

Characteristics of communities or neighborhoods, such as the availability and accessibility of health services, infrastructure deprivation, prevailing attitudes toward health, levels of stress and social support, and environmental conditions, may influence general health outcomes (32, 184, 185) (see pathway 3c in figure 1). The SEP of a community may determine the educational, employment, and income opportunities of community residents, and it may also directly influence the social environment (e.g., crime rates, social

capital, social organization, social isolation), the types of services provided, and the physical environment (31).

Analyses that incorporate data at both the individual level and the community level (e.g., multilevel modeling) may provide some assessment of whether communities and neighborhoods exert an independent contextual effect on individual health, health behaviors, access to care, and processes of care. Although some research has found no independent effect of the community on health and mortality after adjustment for individual socioeconomic characteristics (186–192), several studies have used multilevel models to demonstrate an independent influence of communities' socioeconomic context on the health of their residents (5, 12, 22, 35, 187, 189, 193–204).

Poor persons are more likely to experience multiple dimensions of poor environmental quality, including higher-priced yet poorer-quality foods, high crime rates, poor-quality housing and schools, and toxic environments (205–207). Perhaps it is the accumulation of exposures, rather than any one exposure, that explains the SEP-health gradient at the community level (208).

Availability and accessibility of healthy foods. A lack of access to healthy foods may contribute to disparities in health care by SEP. Barriers to healthy eating are greater for poorer persons (209–214), and there are neighborhood effects on the purchase and consumption of healthy foods. For example, price disincentives to eating healthy food are greater in poor neighborhoods than in wealthier neighborhoods (211), and low-income communities have one third the number of supermarkets found in more affluent neighborhoods (215). This means that residents of low-income communities must purchase food in smaller stores that tend to have higher prices and a more limited selection of products (212, 216).

Access to places to exercise and neighborhood safety. Access to parks and recreational facilities is often described as an important domain in the social environment at the community level (32, 184), but this variable has rarely been incorporated into multilevel studies (185, 195, 217). Neighborhood safety may be an important element in people's ability or willingness to engage in exercise, and it may affect stress levels, which have been implicated as a cause of poor health outcomes among the disadvantaged (32, 43, 184, 197, 198, 218, 219).

Transportation. Lack of transportation is an important barrier to receipt of appropriate health services (220–223), and it may influence other environmental factors, such as access to food, health care, and social networks (224). The care of persons with diabetes, who are asked to use numerous health services, may be very sensitive to the provision of transportation. To our knowledge, no US studies have characterized barriers to transportation and evaluated their influence on health outcomes. How the results of studies conducted elsewhere might apply to US settings and people with diabetes is not clear (201, 217, 224).

Environmental exposures. Toxic environmental exposures have been linked to poor-quality housing, as well as proximity to industrial centers and landfills (225). Several toxic exposures have been associated with the incidence of diabetes (226–230) or with health outcomes associated with

diabetes, such as cardiovascular disease, renal disease, and hypertension (230–233). However, toxin levels in a given area can be difficult to quantify systematically, and very few studies have incorporated such measures into multilevel analyses (217).

Health care organizations

Several characteristics of health care organizations have been shown to influence diabetes outcomes (see pathway 3d in figure 1). These characteristics include the practices of health care providers or the organization of diabetes care (234), identification of persons with diabetes and the tracking of their care (180, 181, 235–252), and patient education and empowerment training (38, 66, 245, 253, 254). However, it is not known whether the impact of these interventions varies by SEP.

Although health care organizations can promote access (for example, by reducing financial barriers to care), other characteristics of these systems have the potential to negatively affect access, process, and health behaviors and worsen health outcomes. One of these is the management of referral care. Although management of specialty referrals may lead to more appropriate referral patterns (255–257), restrictions on referrals to specialists that are differentially applied to poorer or less-educated persons may adversely influence health in this patient cohort. Physicians practicing in managed-care settings report that financial incentives in the form of bonuses limit care (258, 259), and they express concern about compromising patient care when bonuses are linked to the volume of referrals, hospitalizations, or the use of expensive tests or procedures (258).

Because persons of low SEP may be clustered in certain health care systems (80), the gradient of the relation between SEP and health may be explained by the kinds of systems in which less affluent persons receive care. These relations can become quite complex. In one study carried out among hospitalized Medicare beneficiaries, poor patients received worse care than wealthier patients in all hospitals, but because they were more likely to be hospitalized in better-quality hospitals (urban teaching facilities), their aggregate level of care was comparable to that of more affluent patients (260).

Some financial and organizational arrangements may pose greater obstacles for persons of lower SEP. Patient copayments have been the most closely studied, and low-income persons are particularly sensitive to cost-sharing issues, since they spend a greater proportion of their income on out-of-pocket expenses than do higher-income patients (261). A reduction in the use of essential medications among Medicaid beneficiaries was observed after a copayment increase of only 50 cents (262, 263). Physician financial incentives in managed care may also have a differential impact on low-SEP patients, since clinicians may be influenced by the patient's income or education. More educated patients and those who do not face language barriers may be more effective at negotiating with clinicians or health insurers to get their needs met in the face of potential disincentives to provision of care, and wealthier patients have a greater ability to purchase alternate health care.

CONCLUSIONS

Inequalities in health are a major challenge for the US health care system, yet we have a very limited understanding of the mechanisms by which social gradients are related to health disparities. Attempts to reduce these disparities should be guided by an understanding of the individual and contextual factors that may influence health outcomes and the associations between these factors. In the model presented here, we have attempted to integrate the many dimensions that might explain how SEP influences diabetes outcomes. The mechanisms proposed are likely to be complementary rather than competing and to vary at different levels of the social hierarchy rather than act uniformly across social strata.

Many questions remain, and many issues need further exploration:

- Is the gradient in health outcomes for persons with diabetes consistent across levels of SEP, or is there a threshold above which additional income has less of an impact on health and well-being?
- In health care systems in which access to care is comparable or uniform, is there substantial marginal benefit to be obtained by targeting interventions toward socioeconomically disadvantaged groups?
- Are the relations observed between different measures of SEP and health the same in developing nations and industrialized nations?
- What are the greatest socioeconomic influences on diabetes-related health behaviors? Are there certain periods during the life course when people are particularly sensitive to socioeconomic factors that may influence the development and course of diabetes?
- How might neighborhood characteristics be altered to improve health and health care for persons with diabetes and other chronic conditions?
- Does reducing financial or psychosocial strain improve health outcomes for persons with diabetes?
- What are the biologic markers associated with stress in persons with diabetes? Through what physiologic mechanisms do these markers exert their influence? Do they differ by SEP?
- Are there unrecognized financial and social costs to the adoption of healthy behaviors?

These questions have direct implications for the types of interventions that might be developed to reduce health inequalities among persons with diabetes and other chronic conditions, the populations that should be targeted by these interventions, and the barriers to their successful implementation. Critical to the success of such efforts is the realization of the multifaceted nature of socioeconomic influences on health and the need to examine individual, system-level, and area-level factors and their relation to access to care, health behaviors, and quality of care. We have attempted to simplify and focus the discussion by concentrating on diabetes, but we believe that our framework is broadly applicable to many other chronic conditions and is a step toward reducing inequalities in health for all of the chronically ill.

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