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ORIGINAL PAPER

The Twin Epidemics of Poverty and Diabetes: Understanding Diabetes Disparities in a Low-Income Latino and Immigrant Neighborhood

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Abstract In the United States, low-income immigrant groups experience greater health disparities and worse health-related outcomes than Whites, including but not limited to higher rates of type 2 diabetes (T2DM). The prevention and adequate management of T2DM are, to a great extent, contingent on access to healthy food environments. This exploratory study examines "upstream" antecedent factors contributing to "downstream" health disparities, with a focus on disparities in the structural sources of T2DM risk, especially food environments. Our target group is Latino immigrants receiving services from a non-profit organization (NGO) in Northern California. Methods are mixed and data include focus groups and surveys of our target group, interviews to NGO staff members, and estimation of the thrifty food market basket in local grocery stores. We find that while participants identify T2DM as the greatest health problem in the community, access to healthy foods is severely restricted, geographically, culturally, and economically, with 100% of participants relying on formal or informal food assistance and local food stores offering limited variety of healthy foods and at unaffordable prices. While this article is empirical, its goal is primarily conceptual—to integrate empirical findings with the growing literature underscoring the sociopolitical context of the social determinants of health in general and of T2DM disparities in particular. We propose that interventions to reduce T2DM and comparable health disparities must incorporate a social justice perspective that guarantees a right to adequate food and other health-relevant environments, and concomitantly, a right to health.

Keywords Type 2 diabetes · Poverty · Social determinants of health · Food environments · Right to health

Introduction

Type 2 diabetes mellitus (T2DM) afflicts over 23 million children and adults individuals living in the United States, with annual costs exceeding $174 billion [1]. Major clinical trials have demonstrated that diabetes risk can be significantly reduced through lifestyle changes [2]. However, and despite some successes with culturally competent T2DM prevention or treatment programs geared to achieving those changes [3], rates of T2DM and its complications remain stubbornly high among people living in poverty [1]. Poverty imposes multiple barriers to health [4], including limited access to healthy nutrition [5], and is a strong predictor of diabetes [6]. The relationship between poverty and T2DM is mediated through a variety of biological/behavioral pathways, such as fetal exposure to the mother's risk factors (e.g. pre-diabetes) [7] and restricted access to adequate amounts and quality of food, i.e. food insecurity [8], the latter leading to stunting in early childhood or overconsumption of calorie-dense, cheap food over the life course [9]. However, our work in the field of poverty and T2DM has shown that poverty is rarely targeted for investigation or intervention, even as it is continuously acknowledged as a modifiable risk factor [10]. Thus, and despite the millions of dollars spend annually in attempts to reduce the societal burden of T2DM [11], the Healthy People 2010 goal of eliminating health disparities [12],

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expanded in Healthy People 2020 goals to include achieving health equity [13], remains all but elusive concerning this disease.

This pilot exploratory study examines "upstream" antecedent factors—the social determinants of health—contributing to "downstream" health disparities, with a focus on disparities in T2DM risk. Our target group is Latino immigrants, a high risk group for T2DM, who receive services from a local non-profit organization (NGO) in Northern California. While our study examines multiple social determinants of health, we concentrate on one of them, key to T2DM risk: food environments. Following description of our findings, we discuss the socioeconomic and physiological relationships between poverty and T2DM disparities and between poverty and health disparities more generally, and their implications for public policy and social justice.

Methods and Data

To assess social determinants of health in our target group, we interviewed all but one staff members at the NGO ($N = 6$) and conducted surveys and two focus groups of a purposive sample of clients ($N = 15$). We inquired about income, housing, employment, workplace environment, neighborhood safety, immigration experience, and overall quality of life.

To assess community food resources we asked whether participants could purchase adequate amounts of nutritious foods from the stores available to them, and answered this question using the Food Store Survey instrument developed by the Economic Research Institute, and designed to estimate the price of the Thrifty Food Plan market basket (TFB). The Thrifty Food Plan (TFP) was developed by the US Department of Agriculture to provide the standard for a nutritious diet at a minimal cost and is used as the basis for food stamp allotments. In June of 2010, the time period when we conducted our study, the TFP was estimated in $117.10 per week for a family of four with two children between the ages of 2 and 5, and in $134.50 per week for a family of four with two children between the ages of 6 and 11. We used the latter for our estimations and surveyed four stores, including two local groceries, one convenience store, and one chain supermarket. We also recorded the price of selected food items at two additional locations, a local Farmers' Market and a local Flea Market, for comparative purposes (for items like fruit, vegetables, and eggs). We did not attempt to estimate the TFB price in these two locations because we anticipated, correctly, that these outlets, by their very nature, would not carry many items needed for this estimation (especially canned, frozen or other packaged products). We selected which stores to survey on the basis of what staff or clients reported as usual places of purchase.

We quantitatively analyzed the surveys with SPSS, performed a thematic analysis of the interviews and focus groups aided by Atlas Ti, and estimated the cost of the TFB through store surveys. Participants were informed about the aims and purpose of the study in writing and reassured that they could withdraw from it at any time without offering a reason. The study was approved by the Committee on Human Research at the University of California in San Francisco.

Findings

Social Determinants of Health: A Quantitative Assessment

Overall, household income was very low. Pretax income among over 60% of households was either at or below $25,000 per year (33.3%) or at or below $19,450 per year (33.3%). Twenty percent of participants earned between 30,000 and 36,700 per year per household. The maximum income bracket, reported by 13.33% of participants, was $45,351 to $53,750 (Fig. 1). In 2009, the median income for a family of four in the State of California was $60,422 [14].

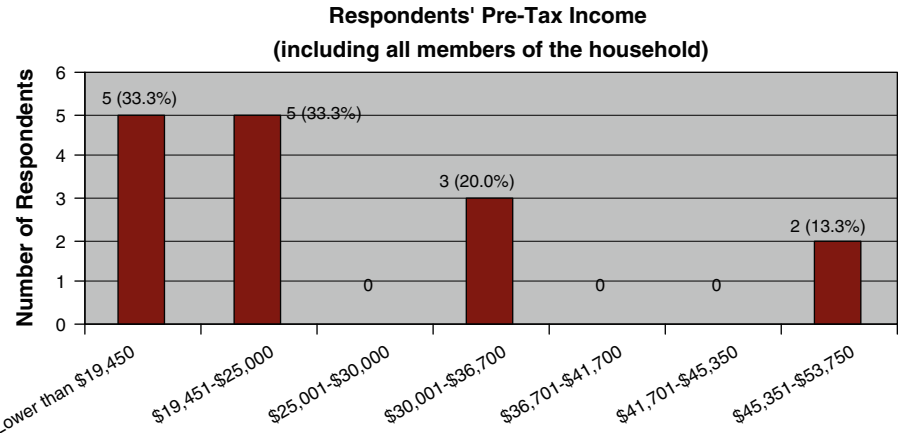

Fig. 1 Respondents' pre-tax income (including all members of the household)

In our sample, the size of respondents' household ranged between 3 and 7 individuals. Twenty per cent lived in three-person households, 13.3% in four-person households, and 66.7% in households of 5–7 individuals. In all cases, all individuals in the household depended on one or two sources of income. The median household size was 5 and the mode was 6 (Fig. 2).

Sixty percent of participants (9 out of 15) lived at or below the poverty line, and the remainder at or below 170% of the poverty line (Fig. 3). We calculated these percentages using the poverty guidelines provided by the Department of Health and Human Services and computed participants' income using the midpoint of the range they chose when reporting it (the same range used to estimate food stamps eligibility) [15]. These percentages contrast to nationwide estimates for the year 2009, with 14.3% of the US population then living at or under 100% of the poverty line (25.3% of Hispanics) [16], and to state (California) level ones, with 13.2% living at or under 100% of the poverty line [14].

Jobs were frequently not forthcoming and work environment was often stressful. While 46% of participants reported they could find work whenever they so desired, over 53% could find work only sometimes (23.1%) or rarely (23.1%), or were too discouraged and were no longer looking for work (7.7%) (Fig. 4). This compares to national unemployment rates, which as of January 2011 stand at 9.0% [17], and unemployment rates in California, that in December of 2010 stood at 12.5% [18].

Concerning the work social environment, 40% of respondents reported that they were always treated with dignity, whereas the remainder reported that sometimes (50%) or often (10%) they were not treated with dignity (Fig. 5). We found no comparative measures to assess these percentages.

Educational attainment was overall low. Of ten respondents, fewer than 7% had completed a Bachelor's degree and fewer than 14% an Associate degree or its equivalent. Of the remaining 80%, 26.7% had completed high school, 13.3% elementary school, and over 33% only had some elementary school, whereas 6.7% had pursued educational paths that did not quite fit any of the categories. All participants had achieved their highest level of education in their countries of origin (Mexico or El Salvador) (Fig. 6). These figures contrast with national and state

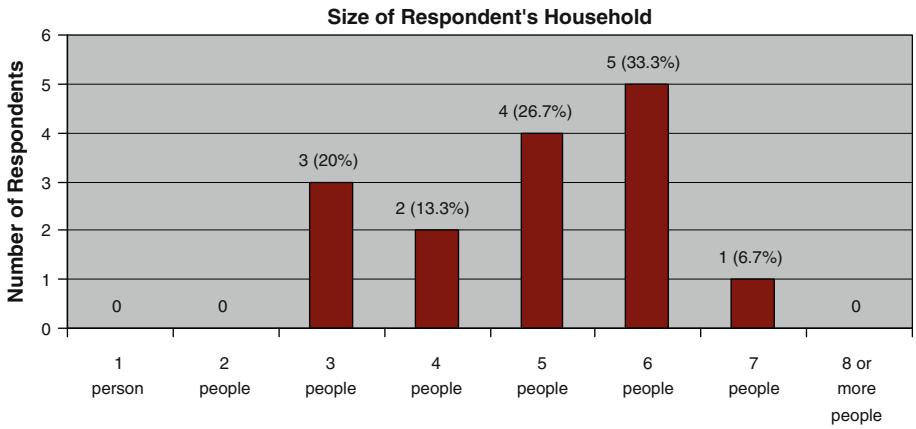

Fig. 2 Size of household

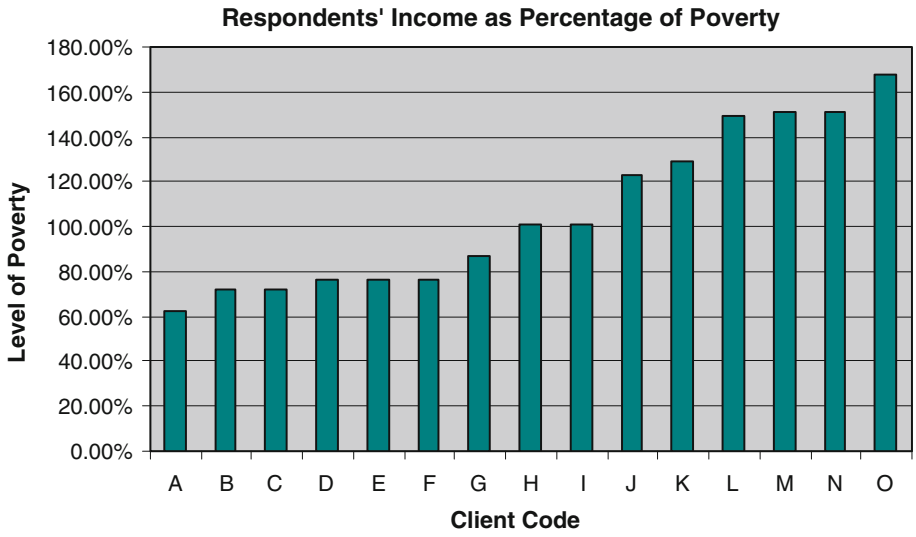

Fig. 3 Respondents' income percentage of poverty

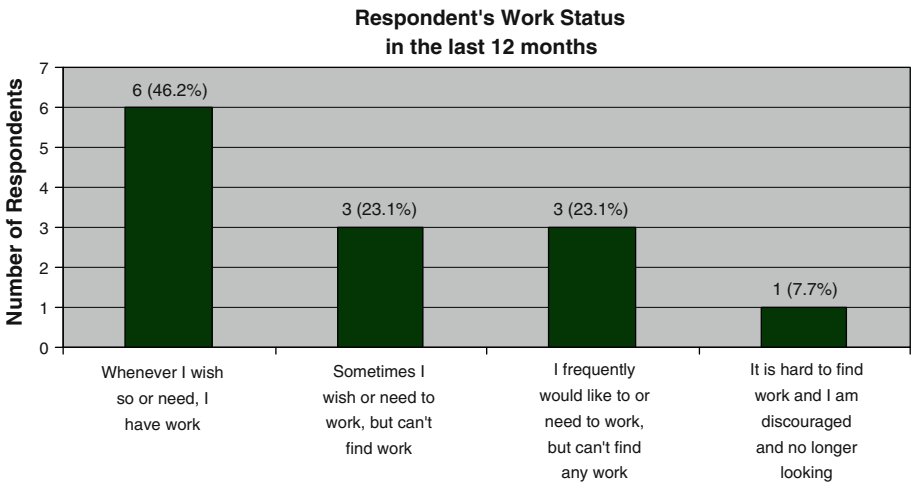

Fig. 4 Employment status in the past 12 months

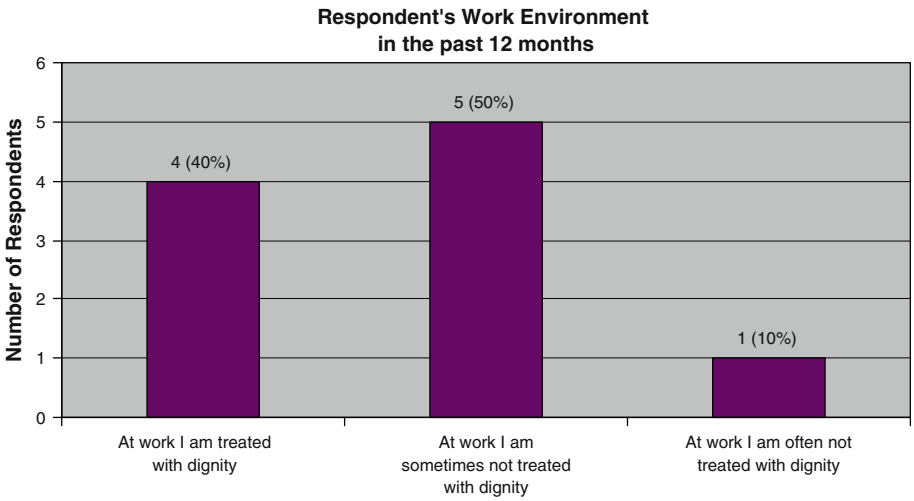

Fig. 5 Work environment in the past 12 months

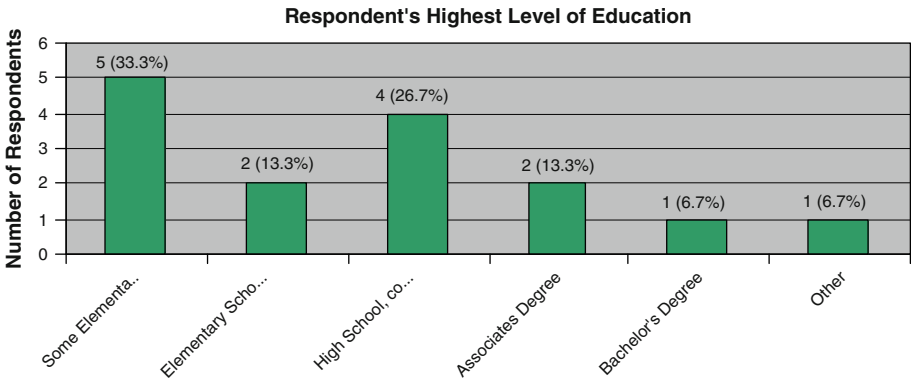

Fig. 6 Educational attainment

(California) high school completion rates, which in the 2008/2009 period were 89.9% [19] and 78.6% [20], respectively. They also contrast with nationwide percentage of 25–29-year-olds in 2009 that completed some college (59.9% for all ethnicities, 34.5% for Hispanics) or rates of completion of a bachelor's degree (30.6% for all ethnicities, 12.2% for Hispanics) [21].

Finally, access to proper nutrition was severely restricted, and while we did not evaluate participants with the standardized tools to assess food insecurity, 100% of them reported relying on food assistance, whether charitable (e.g. food pantries) or public (e.g. food stamps), to meet their food needs, regardless of their specific response in our survey. Thus thirteen percent reported that they always had

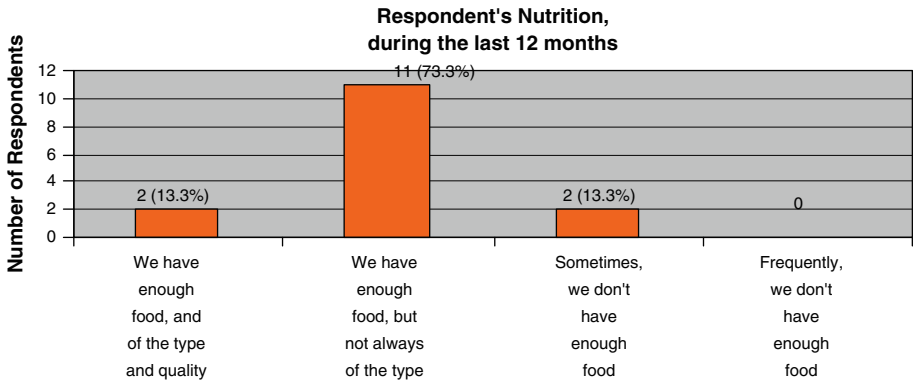

Fig. 7 Met/unmet food needs in the past 12 months

access to the type and quantity of food they desired, whereas over 80% reported that they had access to the amount, yet not the quality, of food they desired (73.3%), or that they frequently did not have enough food (13.3%) (Fig. 7). These figures contrast with national rates of household food insecurity, of 14.6% in 2009—an equivalent of 50.2 million adults and 17.2 million children [22].

Community Food Security Assessment

Many, albeit not all, clients lived close to the NGO where we conducted our study, and shopped in its proximity. Thus the distance between the center and the retail outlets was our standard to assess the convenience of food stores location. This location varied between 0.6 and 3.1 miles (Table 1), including the Flea Market, that as mentioned above, we report for comparative purposes, and because some participants reported shopping in there occasionally.

Table 1 Distance to grocery stores

Starting point: community center	Using Google maps
Store	Distance (in miles)
QM	0.6
LE	0.6
HM	0.8
Farmers market	0.8
Chain supermarket	1.7
Flea Market	3.1

In only one of the four stores fully surveyed were we able to calculate the TFB price and compare it to the TFP cost estimated by the USDA. This one store was the chain supermarket, which had all but one of the food items listed in the TFP, typically at the lowest prices, yet was the least accessible store, geographically and culturally. In the other three local stores surveyed, geographically closer to the neighborhood and where residents reported finding culturally adequate staples or Spanish-speaking staff, numerous items were missing—between 18.39% ($N = 16$) and as many as 26.44% ($N = 23$) (Fig. 8).

For food items that were available in the neighborhood stores, there was often only one brand per item. This means that items that are deemed necessary must be purchased at whatever price they are offered because there is no competition among brands, or no so-called "house brand". The TFP indicates that the TFB can be calculated using the average price of food items to fill for missing items, but in our case the chain supermarket was the only store where all but one of the food items were present, so strictly speaking there was no average to calculate. We still chose to calculate the cost of the TFB in all stores, substituting the low prices in the chain supermarket for the missing food items in the other stores. However, even when the low priced

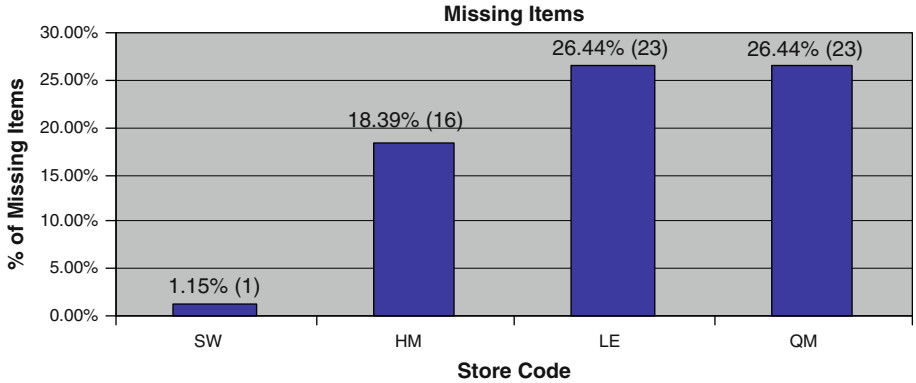

Fig. 8 Missing items

Table 2 Thrifty food plan calculations

Store	Chain supermarket	LE	HM	QM
Cost of TFP	$129.69	$153.37	$159.36	$176.54
USDA % difference	3.58% lower	14.03% higher	18.48% higher	31.26% higher

item of the chain supermarket was used to replace the missing items in these stores, it resulted in TFB costs that were substantially higher than the USDA TFP cost, from 14% to as much as 36% higher. In conclusion, assuming the USDA TFP cost as standard, the actual TFB available in our target community was for all intents and purposes unaffordable (Table 2). "Appendix" provides details on individual food item prices (Table 3).

Finally, some participants reported shopping, albeit occasionally, at a Flea Market. Reasons offered were the generally affordable cost of produce, and its high quality. When we ourselves visited the site we found that many vendors sold the same or similar food items, thus offered competitive prices. Also, because the Flea Market is open Friday through Sunday, it offers a pleasant venue for families with school age children, or that do not own a car, to take the time needed to comparative shop. However, the location of the Flea Market was inconvenient—3.1 miles away from the center, a particular barrier for participants who do not own a car (all but one couple)—and admission was $2.50 per person, with no indication that children were allowed free. Therefore, especially for large families with children, the relatively high cost of admission of this Market would cancel out the advantages of its lower prices (Table 3 offers a list of prices for selected items and the average computed for that same item for the TFB for comparison).

The local Farmers' Market, in contrast, did not have an admission fee and was located very close, under one mile away (0.8), from the NGO. However, this advantage was cancelled out by the Market's higher prices, and the fact that it only opened once a week (weekday). It was also cancelled out by the difficulties to use the EBT (food stamps) card in this Market. As we found out, customers wanting to purchase fresh produce and meat with this card cannot do so at each individual stand because vendors lack the card processing equipment. Therefore, EBT card holders must exchange their credit for wooden tokens closely resembling poker chips and valued at a dollar a piece. As customers swipe their card at the EBT stand, they can get as few or as many tokens as they want. The downside, however, is that vendors do not give change for amounts in-between whole dollars. So if the total comes to, for instance, $5.50, the customer must still give 6 tokens, or $6 dollars. Thus the system forces people to either pay more, or purchase more, than they otherwise would, or else their money goes to waste. This is very inconvenient for those on a limited budget, for whom every penny counts (Table 4 offers a list of prices for selected items and the average price computed for that same item for the TFB, for comparison).

Table 3 Flea market (FLM) vs. TFB

Item	FLM	TFB avg
Apples	$1.25/lb	$1.36/lb
Grapes	$1.25/lb	$2.74/lb
Melon	$3.00/ea	$1.66/ea
Onions	$0.50/lb	$0.95/lb
Tomatoes	$0.40/lb	$1.29/lb

Table 4 Farmers market (FSM) vs. TFB

Item	FSM	TFB avg
Ground beef	$5.50/lb	$2.49/lb
Onions	$1.00/lb	$0.95/lb
Eggs	$8.00/doz	$2.32/doz
Melon	$3.00/ea	$1.66/ea
Grapes	$3.00/lb	$2.74/lb

Trapped by Poverty: A Qualitative Assessment of the Social Determinants of Health

As we expanded these quantitative findings through interviews and focus groups, the most salient finding, contextualizing all other social determinants of health, was clients' lack of access to income and intergenerational wealth—they were trapped by poverty. Poverty was reproduced through precarious employment, unsafe work conditions, substandard housing, low educational attainment, and unhealthy food environments. Following are the major themes.

"They Don't Have Money to Save": Income, Wealth, and the Intergenerational Reproduction of Poverty

As clients and staff reported repeatedly, income was not enough to make ends meet or lead healthy lifestyles, even as clients emphasized that for them, taking care of their health was important to having a good quality of life. Nor

was it possible for clients to save to improve their situation in the future. As one staff person explained, most clients don't have a bank account because they do not have any money to set aside. She noted,

> They don't have the money to save. It doesn't matter… Because they pay minimum wage 8 dollars an hour and they have a family of 7 or 5, to pay rent… that's all you work for, to pay rent [and] sometimes, you know, they don't have any, any money. Zero.

Similarly, lack of intergenerational wealth prevented clients from seeking family or other forms of assistance during particularly hard periods. As another staff member pointed out, her clients' relatives or acquaintances are, for the most part, simply trying to "put food on the table". In the most extreme case, we discovered that adult children attending college often hand their financial aid checks to their families, or take out student loans to hand to their families, to make up for the lack of family income to pay for rent or other basic necessities.

"They Are Afraid to Rock the Boat": Employment, Work Conditions and the Immigration Experience

Lack of good jobs paying living wages or intergenerational wealth turned many clients to pursuing occupations they would otherwise reject, and are arguably hazardous to health, particularly in the case of youth. For instance, one client explained that her friend turned to selling drugs because she was unable to find stable employment. She pointed out that, "the moment she finds a job, she stops". In addition, several staff members reported that instability of wages caused instability of family life, especially for school-age children, as immigrant families are forced to move back and forth between the United States and their country of origin in search of sources of income.

Importantly, the fear stemming from merely being an immigrant, whether or not documented, both caused family instability and impaired access to the types of jobs that would have contributed to improving the socioeconomic position of families and ameliorate this instability. While undocumented immigrants are openly afraid of deportation, this is also true for documented ones, as they believe that if they are perceived as "problems", they may be stripped from their rights of living and working in the United States, or even living with their children, many of them American-born. As one staff person noted,

> So it all goes back to […] you can't access a livable wage because they don't have the immigration status to that. Therefore [they're] forced to live in situations that are not healthy. Also they put up with a lot… because they are afraid to rock the boat.

The constraints of precarious employment were not limited to low pay, but extended to the overall desirability of such jobs. Only half of NGO clients were employed in jobs they were satisfied with, while the other half struggled to find a semblance of continuity in seasonal and precarious jobs in agriculture or tourism. Additionally, and regardless of duration of employment, most participants mentioned needing to take multiple jobs to meet their bare necessities. As one focus group member put it,

> My husband has three jobs. Part-time jobs… but he has *three* jobs. He gets up early and goes to the first one, comes back for lunch, and goes to another job, and comes back at 11 pm, takes a shower, and it's midnight and he goes to another job. So he doesn't rest a lot. And that's what I think affects his health.

The majority of the clients reported that if they didn't have multiple jobs, they must at least work long hours. Many clients reported working 7 days a week for up to 14 h a day, while others reported working evenings or nights so that they could care for their children during the day. Many reported being forced to take jobs far from their homes and involving up to 3 h of travel time per day. They also reported that while at work, breaks are extremely uncommon, even for meal times. One staff member expanded on this issue,

> Our clients are abused, a lot. And taken advantage of, a lot. So, you know, they may not get paid minimum wage, they may not get paid for, you know, they may not get a lunch break, or any kind of break….they are expected to work through.

Thus fear is compounded by abuse and colors the whole of the immigration experience, providing the background for jobs where abusive practices are rampant. As noted by one staff member,

> Most of the jobs they are doing is services at restaurants, and hotels, housekeeping, dishwashers, and they say… "we worked 10-12 hours a day, or depending on the season, we work just 4 hours, we didn't have breaks, we didn't have lunch time, we work straight hours, because the places need it." Sometimes they [say] "they didn't pay me, the business closed and they owe me this amount of money, they didn't pay me for one week"… those kind of situations.

Two staff members reported cases where their clients were seriously injured on the job and were forced to continue working. In addition, many jobs were reported to be chemical laden environments and unsanitary. As one participant noted,

> My housemate, he works in the fields… it's very dirty and he doesn't eat. And he's very hungry… and they

> are under the hot sun. And it's very dirty because they have to sit, anywhere, whenever it's time to eat… so they don't eat, and they get sick. They faint […] because it's so hot.

Most importantly, opportunities for employment appear to be directly related to immigration status. Many clients believed that if they spoke English, their chances for employment would increase. Furthermore, several participants held degrees in their country of origin, but were unable to validate this educational attainment in the United States and therefore were forced to start entirely new careers. However, overall, it was primarily fear in relation to immigration status that appeared to drive clients to poor working conditions. Last, even when work conditions were overall satisfactory and had achieved a certain degree of dignity, this did not necessarily translate into higher pay. According to one participant,

> My employers have always treated me well, but they don't reflect it when it comes to paying me. For instance, when I was in construction I was paid 9 to 10 dollars an hour, but then some youngster arrived, and even if he wasn't as competent he would get paid 15 an hour. And it's no use to be told, "I appreciate you, I appreciate you"… when I would rather they show it by paying me what I deserve.

"That's the Only Way to Save Money": Housing Conditions and Neighborhood Environment

Substandard housing was a very common theme and directly related to income and immigration status. Thus, several staff members explained how clients cram families into small living spaces as a tactic for saving money. As a staff person explained,

> I have stories…of families with sometimes…7-8 people in the house…With two bedrooms. I have seen people sleeping underneath the sofa area, the living area…All the people sleeping in the bedrooms, all the people sometimes underneath the stairs. Everywhere…That's the only way to save money.

In turn, substandard housing tends to coexist with unsafe neighborhood environments, which clients considered too dangerous for children to play or simply be outdoors by themselves, filled as they are with drug trafficking and violence. And changing neighborhoods for safer ones involve trade-offs against other basic needs that are difficult to reconcile. For instance, one participant explained how she must choose between a safe neighborhood or healthy food,

> If your housing is good, you will have a tighter budget for food and if you choose a place where they will give you a lower rent, you will buy better food, but you will run the risk of living in a more dangerous neighborhood, in less space and less comfort.

The financial barriers to poor housing appeared to be compounded by legal ones, resulting from clients' immigration status, which often led not merely to poor housing but to outright homelessness. For instance, one staff member reported that several families had received 3-day eviction notices, and afraid of seeking help due to their immigration status had been forced into shelters, or overcrowded shared housing.

"Un problema de dinero" (A Money Problem): Food Environment and Diabetes Risk

Unsurprisingly and given the socioeconomic context laid out thus far, the food environment observed was less than adequate, even when clients continuously expressed a strong desire to improve their nutrition as a way to improve their health or prevent the disease that affected them the most, T2DM. As one client pointed out,

> Almost everybody has it […] there was a group of 4 or 5 ladies and we started talking and we said. "I'm diabetic" and the other ones said "I'm also diabetic"…

However, the cost of food was arguably the greatest barrier to a healthy nutrition that could help prevent T2DM. As the same client put it bluntly,

> [We] often we don't buy quality food so that we can pay the rent, because rent is very expensive. And we first need to secure money for rent… and if there's any money left, then you buy healthy food.

Unaffordable prices were compounded by the distance to, and cost of, transportation to outlets that offer healthy options at the lowest cost. As clients reported, they chose where to shop according to proximity to retail outlets, and expressed that if they had access to a vehicle, their options would be very different, yet because they don't own one, they are forced to shop close to home. Whenever they chose otherwise, for reasons of price or quality, they reported traveling long distances on buses with multiple bags, taking up several hours of time.

Healthy food options were also importantly limited by language barriers in non Hispanic outlets. As one staff member explained, a family would not go to the Farmers' Market unless they had a bilingual member, which is most often a child. We found options to be also limited by the cumbersome nature of the process of cashing food stamps at local markets, which substantially undermines the positive lessening of the classical stigma associated with

food stamp use by the introduction of an EBT card that is virtually indistinguishable from a debit or credit card.

In addition to cost, distance, and cultural factors, legal ones such as immigration status appeared as an important barrier to accessing food stamps. The application process for food stamps is lengthy and includes legal documentation—undocumented immigrants and many documented ones are simply not eligible, whatever their unmet food needs. As one staff member pointed out, 100% of clients were eligible according to poverty level, but only 50% were actually able to receive the foods stamps because of immigration limitations. Further, several staff members reported that even for those who received food stamps, food stamp allotments simply were not enough to feed their families, for several reasons, including that families often have eligible and non-eligible members, yet when food is served at the table families will not fail to feed the non-eligible member simply because they are not eligible.

Another structural barrier compounding sheer lack of money appeared to be changes related to the "American way of life" and the easy availability of calorie-dense, cheap food, changes that clients experienced upon their arrival in the country and which often undermined their intentions to eat healthfully. As one participant put it,

> Among Latino's, nutrition is good…we eat rice, and chicken, we add vegetables, tuna, carnitas [but] when you arrive in this country you start rushing… to work, to take our kids to school, clean the house […] and so because you get hungry, you eat fast… and whatever is there [and] if you don't have a lot of money there's whole pizza for as little as 4 dollars.

Many clients expressed an interest in menu labels as a way to improve their food choices, yet believed that taxing fast food as a policy measure to discourage their consumption was not useful so long as healthy ones remained unaffordable. As one participant stated,

> Taxes could help if they were used to help us buy better quality food.

Lastly, and as mentioned above, all participants were forced to rely on informal forms of food assistance, such as emergency soup kitchens or food pantries, to supplement whatever foods they were able to purchase, with or without the help of food stamps. One staff member explained,

> If they didn't have the food pantry and food stamps, I don't know what they'd be eating.

Still, pantries are far from being a solution to the problem of food insecurity. Indeed, one important limitation, aside from the question of affront on individuals' dignity associated with dependence on a food pantry, is that these offer the same amount of food per family, regardless of how many members it holds. As one staff member explained,

> The thing is…we don't give a week's worth of groceries. None of us do [referring to other pantries]. This is emergency food….to see you through the day. [T]here is probably enough pasta or tuna that you could stretch it out for a couple of days. But we are not the solution. Pantries, Second Harvest [referring a program supplying emergency food] were never meant to be the solution.

Discussion

The goal of our study was to examine "upstream" antecedent factors contributing to "downstream" health disparities, with a focus on disparities in T2DM risk among low-income Latino immigrants in Northern California. While we surveyed multiple social determinants of health, we concentrated on one social determinant: food environments. We chose T2DM because Latinos in the US are disproportionately affected by it [23], because the medical literature emphasizes individual factors such as lifestyle choices and genetic endowment when explaining this phenomenon, yet neglects structural ones [24], and because there is a well documented relationship between adequate nutrition and T2DM risk [25]. Our analysis indicates that the major barriers to health and the source of T2DM disparities in our target population are structural, by which we mean that they are embedded in the living conditions within which individuals live, work, and play [26].

In the case of our study participants, their living conditions were extremely precarious because, as our analysis indicates, they were trapped by poverty. Their poverty status appeared to be the product of precarious employment, low-wages, and very importantly, a marginal legal status that leads to political disempowerment. Poverty in turn prevented participants and their families from having access to proper housing, equitable educational opportunities, and a healthy and culturally adequate nutrition, rather than one limited to whatever public or institutionalized charity may afford. Indeed, our study participants were well aware of the importance of eating healthfully, ate as healthfully as their circumstances allowed, and seemed eager to learn ways to improve their eating and even exercise and other health-relevant practices. However, their living conditions make their personal efforts unlikely to succeed, let alone be sustained, in the long run.

Policy Implications

Elsewhere we have proposed that health disparities among population groups and diabetes disparities in particular provide an excellent lens through which to assess the equity in the distribution of benefits and burdens in a society, thus are symptomatic of social injustice [5]. We have also proposed that the biology of diabetes and related conditions such as obesity is a "biology of poverty", resulting from the inequitable distribution of social goods and power whose cumulative effects on human biology begin as early as conception and are produced and reproduced by a structure of social exclusion. While our study did not document disease indicators such as Hemoglobin A1C, to assess T2DM risk, the disproportionate risk borne by Latinos in the US is well documented [25], and was reaffirmed by both staff members and clients, for whom T2DM had become an inevitable part of their lives. We propose once again that this disproportionate risk is caused by the living conditions we observed in our study participants. Because living conditions are not natural facts but rather the product of political and policy decisions distributing societal benefits and burdens, much like obesity [27] T2DM in our day has become a byproduct of social and economic injustice.

Our analysis also indicates that health and lifestyle education interventions may be useful for particular individuals or communities for a limited amount of time, yet they will not reduce health and diabetes disparities at the population level in a sustainable way. This is so because those population subgroups who bear these disparities disproportionately find themselves trapped by poverty, however much they may be aware and willing to lead healthy lifestyles. Public health interventions premised on the assumption that health disparities can be reduced through helping poor persons adapt to their constrained living circumstances through behavioral or other changes are unlikely to succeed in the long run unless accompanied by broader policies that target the socioeconomic foundation of these disparities and their intergenerational reproduction. In the case of Latino immigrants and similarly marginalized communities, adequate living conditions such as guaranteed affordable housing, job security, living wages, and health care should be accompanied by a legal structure that enables them to live without fear and to integrate into American society with self-respect and dignity.

Poverty reduction is both right from a social justice perspective and good from the perspective of population health, as it can alleviate the unnecessary suffering that comes from preventable conditions like T2DM. Poverty reduction can also benefit the economy, by increasing workforce productivity and decreasing expenditures from preventable disease. Public health and other health professionals are well positioned to advocate for policy changes that reduce poverty, as individuals and as members of professional organizations. Collaboration among professional organizations and civil society groups around the goal of poverty reduction can maximize the impact of advocacy work [28]. All this can help reduce disparities in T2DM and other disease conditions more generally rather than merely treat the symptoms [5].

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Appendix

See Table 5.

Table 5 Cost of key food items, by category and averages

Fresh fruit		
Apples, per lb		
	$0.99	HM
	$1.09	LE
	Missing	QM
	$1.99	SW
Average	$1.36/lb	
Fresh vegetables		
Onions, per lb		
	$0.99	HM
	$0.33	LE
	$0.99	QM
	$1.49	SW
Average	$0.95/lb	
Canned fruit		
Peaches, per 26 oz cans		
	$3.39	HM
	$2.32	LE
	$3.39	QM
	$1.78	SW
Average	$2.72/26 oz	
Canned vegetables		
Tomato sauce, per 8 oz		
	$0.36	HM
	$0.49	LE
	$0.69	QM
	$0.50	SW
Average	$0.51/8 oz	
Frozen vegetables		
Green beans, per 23 oz		
	Missing	HM
	Missing	LE
	$3.11	QM
	$2.16	SW

Table 5 continued

Average	$2.64/23 oz	
Fresh breads		
Whole wheat, per 16 oz		
	$1.59	HM
	$1.59	LE
	$1.69	QM
	$0.99	SW
Average	$1.47/1 lb	
Dry breads		
Cereal, corn flakes, per 18 oz		
	$4.99	HM
	$7.19	LE
	$5.70	QM
	$1.99	SW
Average	$4.97/18 oz	
Fresh dairy		
Whole milk, per gallon		
	$4.99	HM
	$3.49	LE
	$3.99	QM
	$2.45	SW
Average	$3.73/gal	
Dry dairy		
Evaporated milk, per 12 oz		
	$2.13	HM
	$1.59	LE
	$1.59	QM
	$0.99	SW
Average	$1.58/12 oz	
Meat and alternates		
Eggs, per dozen		
	$2.99	HM
	$2.29	LE
	$1.99	QM
	$1.99	SW
Average	$2.32/doz	
Canned/frozen meat		
Canned tuna, per 12 oz		
	$3.58	HM
	$3.34	LE
	$2.55	QM
	$1.90	SW
Average	$2.84/12 oz	
Fats and oils		
Salad dressing, per 6 oz		
	$2.06	HM
	$1.87	LE
	$1.87	QM
	$0.92	SW
Average	$1.68/6 oz	

Table 5 continued

Sugars and sweets		
Jelly, per 8 oz		
	$2.30	HM
	$1.65	LE
	$1.20	QM
	$1.00	SW
Average	$1.54/8 oz	
Other items		
Chili powder, per 3 oz		
	$4.59	HM
	$1.98	LE
	$2.67	QM
	$1.99	SW
Average	$2.81/3 oz	

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