Time in the United States and diabetes among Mexican immigrant women: The moderating role of culture

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ABSTRACT

Mexican immigrants in the U.S. show high incidence of type 2 diabetes, and increased risk is associated with longer duration of residency. This study considers the impact of culture over time for Mexican immigrant women in a southern U.S. city. Using cultural consensus analysis to empirically derive the substance and structure of a cultural model for *la buena vida* (the good life) among Mexican immigrant women in Birmingham, Alabama, we assess the extent to which respondents are aligned with the model in their everyday lives. This measure of 'cultural consonance' is explored as a moderating variable between length of time living in the U.S. and level of Hemoglobin A_{1c}. Results demonstrate that for those with more time in the U.S., those with lower consonance are more likely to have diabetes, while those who are more aligned with *la buena vida* are at lower risk.

1. Introduction

Mexican Americans in the United States are at particularly high risk for developing type 2 diabetes compared to non-Hispanic whites (Schneiderman et al. 2014; Juarez et al. 2018), and this risk is associated with greater length of residency for those born in Mexico (Tsujimoto et al. 2016; Anderson et al. 2016). Acculturation has become the predominant analytical framework by which social scientists attempt to explain this trend (Lara et al. 2005; Abraído-Lanza et al., 2016), though the reliance on proxy measures does little to clarify how this experience leads to poor health outcomes. Instead, it is merely assumed that as immigrants adopt the dietary habits and common activities characteristic of mainstream American culture, health status will decline (ibid). This explanation might be more satisfying if diabetes prevalence for Mexican immigrants came to reflect that of the general U.S. population. Instead, even after adjusting for age, socioeconomic status and other factors known to influence diabetes risk, the data reflects a striking health disparity that worsens over time (Schneiderman et al. 2014; Anderson et al. 2016).

While "culture" is the root word of acculturation, definitions and measurements of culture in acculturation studies tend to be loose and untested. Broesch and Hadley (2012) highlight the need to ground acculturation studies in an operational theory of culture and suggest using Cultural Consensus Analysis (CCA) to more precisely measure culture as shared knowledge. Once a salient cultural domain is identified in a particular community, CCA can be used to infer the substance and structure of a cultural model for that domain. A cultural model serves as the best estimate of how a reasonably culturally competent individual is likely to think about the elements of a particular domain of life as well as the processes that link those elements together (Dressler et al., 2015). The construct of cultural consonance – defined as the "degree to which individuals approximate, in their own beliefs and behaviors, the prototypes for belief and behavior encoded in cultural models" (Dressler, 2018: 2) – can then be used to measure how well individuals live up to these shared expectations within their community. This study uses CCA to better understand the cultural model of *la buena vida* (the good life) for Mexican immigrant women living in Birmingham, Alabama, and cultural consonance is used to explore the moderating role of culture on the relationship between length of time living in the U.S. and type 2 diabetes. This approach takes culture seriously in the study of acculturation by operationalizing the construct in order to better understand its relationship with health outcomes. Rather than theorizing in the abstract as to why length of residency is associated with declining health for Mexican immigrants, these methods more precisely locate individuals in a space of collective meaning and provide an empirically satisfying way of assessing what is happening during that time, specifically, whether or not these newcomers are living the life they set out to live. This approach integrates culture as an analytic variable into social

scientific research on diabetes and acculturation, providing a clearer understanding of how lifestyle changes and the social, political and economic constraints imposed on Mexican immigrants may limit their ability to achieve what is collectively regarded as *la buena vida* and why this matters in terms of health.

2. Mexican immigration: duration of residency in U.S. and diabetes

Numerous studies have considered the impact of acculturation on health status, and many have found a statistical link between acculturation and health status along several indicators, with many showing an inverse effect (see Lara et al., 2005 and Gorman et al., 2010 for reviews). However, non-standardized methods and inconsistent findings leave the research inconclusive (Abraído-Lanza et al., 2016, Thompson and Hoffman-Goetz, 2009, Hunt et al., 2004). Further, while culture is the root word of acculturation, research that attempts to link the acculturative process and health outcomes typically relies on proxy variables – primarily age at arrival and length of time living in the host country – that actually tell us little about cultural positioning or lived experience (Broesch and Hadley, 2012). The concept is used uncritically as there are no standardized methods to measure individual aptitude to a new cultural setting (Escobar and Vega, 2000), and there is little effort to describe how that cultural landscape takes shape or how immigrants navigate this experience. This static view of culture and the focus on behavioral changes in diet and lifestyle promote victim-blaming and obscure how structural inequities and institutionalized hostility—particularly toward Mexican immigrants—serve to impede personal agency, limit choice and movement, and restrict access to public services for those who come to the U.S. in search of a better life (Mendenhall, 2012, Horton, 2016).

Acculturation models predict that as immigrants adopt the diet and lifestyle of the host country, their health status should reflect that of the mainstream, and yet diabetes prevalence among Mexican Americans is nearly twice that of non-Hispanic Whites (CDC, 2020). Contextual factors such as stigma (Wutich et al., 2014) and socioeconomic positioning (Carter-Pokras et al., 2008) have also been proposed to account for declining health status, and while these findings have empirical validity, they do not fully account for the underlying pathways by which these experiences of psychosocial stress act on the body (Dressler et al., 2015). In a review of studies exploring the link between stress and diabetes, Lloyd et al. (2005) identified research showing associations between the onset of diabetes and several experiential factors, including family loss (Mooy et al., 2000), family chaos (Thernlund et al., 1995), workplace stress, and feelings of defeat or helplessness (Bjorntop, 1997). Based on these findings, scholars have suggested that in some individuals, negative experiences activate the hypothalamus-pituitary-adrenal axis, which may lead to endocrine abnormalities that contribute to insulin resistance and may trigger the onset of diabetes (Lloyd et al., 2005).

As all of these experiences will be to some extent culturally informed, the question remains how culture may be linked to diabetes. In the vast research on acculturation and health, few studies have attempted to delineate which cultural values are purportedly being lost and which are being gained, how individuals internalize and act on these collective understandings within the constraints imposed by the social structure, or why this process might be associated with declining health outcomes. As a result, explanatory models of immigration, culture and health are not well developed. Scholars have called for more methodological clarity in testing mediating mechanisms in the associations between acculturation and health (Abraído-Lanza et al., 2016).

3. Theoretical orientation: cultural consonance

It has long been suspected that when individuals are denied meaningful participation in the wider society and are unable to adequately fulfill the social roles set forth by communal expectations this activates the stress responses of the body (Wilkinson and Pickett, 2011). In an epidemiological analysis of the health implications of culture change, Cassel and colleagues (1960) called for the development of more adequate theoretical models that integrate cultural processes and health, including "social adjustment," which they defined as the "adequacy with which a person fulfills his social roles in terms of community expectation." In a paper on relative deprivation, Townsend (1979: 31) defined poverty not as the absence of material necessities but as lacking the resources to "obtain the types of diet, participate in the activities and have the living conditions and amenities *which are customary, or are at least widely encouraged or approved*" (emphasis added) by members of the society to which one belongs. The inability to obtain these material goods and participate in these valued social activities may be experienced as a failure to live up to the standards set forth by one's community, which may lead to the feeling that life has not worked out the way it is supposed to. This inability to align oneself with a shared understanding of how to think and behave with regard to non-material domains of life (i.e., family life, national identity) may also lead to the same feeling of invalidation. This "sense of incoherence" (Antonovsky, 1996) is reinforced in social interaction in which individuals who are not aligned with the cultural model are marginalized, an experience that triggers the hypothalamus-pituitary-adrenal axis and the sympathetic nervous system (Dressler et al., 2017). Over time, these repeated assaults weaken the body's natural defenses and lead to poor health.

While these studies were arbitrary in their determination of what was important to the individuals in these communities (Dressler et al., 2015), a cultural consonance approach is oriented around what really matters to people in their everyday lives, how they go about pursuing these goals, what limitations are imposed on them during this process, and ultimately, how this comes to bear on their health. Grounded in a theory of cultural models (D'Andrade, 1995; Quinn and Holland 1987) and methods that enable the quantification of those models through cultural consensus analysis (Romney et al., 1986), cultural consonance assesses the extent to which an individual's beliefs and behaviors align with a shared model in a particular domain of life for members of a cultural group. Broesch and Hadley (2012) suggest using consensus analysis to clarify how cultural information is socially transmitted and differentially shared among members of a community that are undergoing culture change. "By grounding the study of acculturation in the examination of cultural models," the authors explain (2012:376), "we are forced to examine specific domains that are plausibly related to the outcome of interest, instead of focusing on general markers of ethnic identity or other variables which are used to proxy for acculturation, such as time in residence."

Rooted in cognitive anthropology, this approach relies on a definition of culture as the knowledge one needs to function adequately as a member of a particular social group (Goodenough, 1956). This knowledge about how to live and be is encoded in a series of cultural models, which are stripped-down, skeletal representations of particular domains of life (for example, lifestyle or family life) that include the elements that make up the domain as well as the mechanisms by which the elements are linked together in comprehensive ways (Dressler, 2018). Inferring the presence of a cultural model in a salient domain of life involves eliciting knowledge about a particular domain of life from individuals and then measuring the degree to which that knowledge is shared among community members. If knowledge about a particular domain of life is widely shared within a community, it can be inferred that individuals are drawing from that model to structure their understanding of that domain. Individuals internalize idiosyncratic versions of these models as they operate in the world and engage in social interaction over the course of their lives. What makes the models cultural is the fact that they are, at least to some extent, shared among members of the group.

Once a cultural domain of interest is identified and the elements that make up that domain are gathered, cultural consensus analysis can be used to quantify the degree to which this knowledge is shared among members of a community (Romney et al., 1986). This yields an "answer

key," which serves as the best estimate of the substance and structure of a shared cultural model in its aggregate form (Weller, 2007). Importantly, especially in the context of cultural adjustment by way of migration, consensus analysis also reveals patterned ways in which subgroups of the sample deviate in their understanding of the model (Andrews et al., 2022 forthcoming, Dressler et al., 2015). Operationalizing culture in this way avoids the problem of relying on untested assumptions about what people know and value and instead allows for an empirically-grounded description of a cultural space of meaning.

Consensus analysis quantifies what people know; cultural consonance analysis is used to locate individuals in a cultural space by assessing the extent to which they integrate the ideals set forth by the collectively valued model in their actual lives. In general, it is expected that individuals seek to live in accordance with the models that define life within a particular context (Bourdieu, 1984; Berry, 1997; Marmot 2004). The ability to do this, however, will be constrained by circumstances often beyond an individual's control. Failure to effectively act on these shared understandings can be a function of structural and economic constraints and social pathologies that devalue individuals on the basis of skin color (Gravlee, 2005), ethnic identity (Fisher et al., 2014), and low socioeconomic positioning (Carter-Pokras et al., 2008). While this inability should not be regarded as the fault of the individual but rather of the unequal distribution of power and wealth that characterizes modern society, it will likely contribute to negative health outcomes. Additionally, this applies to non-material domains of life as well as to situations where an individual has chosen to defy certain cultural expectations.

Viewed in this way, the construct of cultural consonance provides an operational way to measure the extent to which an individual's beliefs and behaviors align with shared values and expectations set forth by an important cultural model in a particular community of reference while not ignoring the constraints imposed on them by their positioning in the social structure. It is well documented that low cultural consonance is associated with negative health outcomes, including higher blood pressure (Dressler et al., 2005), more depressive symptoms (Dressler et al., 2017) and lower immune response functioning (Dressler et al., 2016). For example, Dressler et al. (2005, 2016, Dressler, 2018) found that consonance with a cultural model of lifestyle in Riberao Preto, Brazil - which included possession of basic household items as well participation in leisure time and social activities - was associated with lower blood pressure and fewer symptoms of social distress. This correlation remained significant and strong even while controlling for socioeconomic status (income, employment status, and education), suggesting that consonance exerts a more direct effect on health status than other demographic variables. With regard to Mexican immigrants in a southern town, Read-Wahidi and DeCaro (2017) found that immigrants who were more consonant with a cultural model of devotion to the Virgin of Guadalupe (a highly salient form of devotion in Mexico) were buffered from the effects of immigration stressors on psychological distress. These studies suggest that individuals who are unable to reproduce the shared expectations of what a person should be or should achieve (with respect to a particular cultural model) are at greater risk for poor health outcomes. Lack of cultural consonance is reinforced in mundane social interaction in a way that may activate a stress response in the body, which over time may lead to chronically poor health.

4. Research setting

This research was carried out in Birmingham, Alabama, a town that has witnessed tremendous growth in the Mexican immigrant population over the past 20 years. It is estimated that 25 percent of Mexican immigrants in Alabama live in poverty, and they face a significant amount of institutional and interpersonal hostility from their reluctant hosts (Mohl, 2016). In Birmingham and surrounding areas, Mexican women tend to work in cleaning, cooking and other service jobs. Many work outside of the formal labor economy, making them more vulnerable to exploitation and mistreatment by employers. In 2011, the Alabama state legislature passed one of the most restrictive anti-immigrant laws in the country, restricting public services for individuals who could not provide authentic documentation of their legal status and punishing private individuals and institutions who offered these individuals any form of assistance (White et al., 2014). As a relatively new destination for Mexican immigrants, little research has studied the needs and health outcomes of this population (see Hidalgo et al., 2012 and White et al., 2014 for exceptions).

5. Methods

This study is situated in a biocultural perspective, which views health as a social production and analyzes culture at both the individual and the group level within the broader context of socio-political forces that inflict structural violence and limit access and agency for certain people (Mendenhall, 2012). An "ethnographic critique of theory" (Dressler, 1995) ensures that the research process, analysis, and interpretation of results are instantiated within the overarching themes that characterize daily realities for Mexican immigrant women in Alabama.

Women over the age of 18 who were born in Mexico and living in Birmingham, Alabama, were eligible to participate in this study. The study was limited to first generation immigrants because the primary independent variable of interest was length of time living in the U.S. and to women because of the important ways that gender shapes the immigrant experience (Hondagneu-Sotelo, 1994) and the differences in health outcome patterns between men and women (Mendenhall and Weaver, 2014, Gorman et al., 2010). Participants were recruited primarily through word of mouth, as well as through flyers at Hispanic interest agencies, grocery stores and churches. Interviews were conducted in Spanish and took place in the homes of participants and at two organizations that provide legal support and other services to the Hispanic community in Birmingham. All respondents were asked to provide demographic and background information, including age, marital status, occupational status, household income, and educational level, as well as age at arrival in the U.S., number of years living in the U.S., and level of proficiency in English. The research took place from May 2016 to June 2017. The Institutional Review Board at the University of Alabama approved this study and the sampling procedures used to recruit participants (IRB protocol #15-OR-292-R2).

This study used a sequential four-stage sampling design – the first three stages were designed to infer the presence and the substance of the cultural model of *la buena vida*, and the fourth stage was used to measure individual consonance with this model and consider the impact on diabetes risk as well as the interactions between consonance and length of time living in the U.S. In the first phase, cultural domain analysis was used to identify a salient domain of life within this community, to explore how meaning is constructed within that space, and to empirically capture how the domain is cognitively organized in individual minds (Borgatti, 1994).

In early discussions and interviews, it was clear that respondents use the term *la buena vida* to talk about a desirable life and the components that are necessary to achieve it. In the first sample (n=31), semistructured interviewing and free-listing were used to elicit the kinds of things women believe are important or necessary to achieve *la buena vida*. This generated a long list of items that we reduced to a set of the most frequently mentioned terms as well as some infrequently mentioned terms to capture the full range of the semantic space. In the second sample ($n = 31$), respondents were asked to sort the selected terms (written on notecards) into piles based on similarities or like qualities. Using multi-dimensional scaling (Sturrock and Rocha, 2000), this data was analyzed to better understand the principal dimensions of meaning along which respondents organize the domain. A third sample (n=41) was then asked to rank order the items in terms of their importance, and this was analyzed to get a sense of how the attributes of the domain are prioritized in women's lives. Cultural consensus analysis

evaluates the amount of sharing between respondents regarding their rankings. The first factor loadings generated by consensus analysis estimate the cultural competence of each individual, or the extent to which her rankings line up with the average rankings of the whole sample. This is used to calculate an "answer key" that provides the best estimate for how a reasonably culturally competent individual would likely rank the items in the domain (Weller, 2007). The second factor loadings measure residual agreement, or patterned deviations in agreement between subsets of respondents beyond that accounted for by the first factor (Dressler et al., 2015).

In the final phase of the research, the ranked terms were incorporated into a cultural consonance survey that assessed possession of the material goods as well as alignment with longer term goals and desirable character traits. In a series of yes/no questions, respondents (n=70) were asked about possession of basic household items like refrigerator and cell phone. Items that depended on the respondent's personal interpretation of her life circumstances or her personal character were asked in a series of Likert-response statements with which respondents could agree not at all, a little, more or less, or definitely. For example, a question related to financial resources read: "I have enough money to buy the things I need." These responses were recoded as dichotomous variables in the final analysis. In addition to demographic variables, a measure of glycated hemoglobin was collected through a bloodspot sample using an A1cNOW+ kit, which evaluates the average blood glucose concentrations over the previous eight to twelve weeks (Boltri et al., 2005). The normal range is 4–5.6%, while 5.7–6.3% is considered at risk, and greater than 6.4% is considered full-blown diabetes (Tsujimoto et al., 2016). Multiple regression analysis (SPSS v.23) was used to test for associations between the variables of interest and levels of HbA_{1c} while controlling for other factors.

6. Results

Demographics for all four samples are presented in Table 1, and profiles are similar for each sample. The average age for all participants was 37, and the average age at arrival in the U.S. was 24. The average number of years living in the U.S. was 13. Most women identified as *ama de casa* (housewife), meaning they did not work outside the home, closely followed by women who worked in low skill jobs such as house cleaner or dishwasher at a restaurant. The average weekly salary for households was between $300 and $600. Most respondents had some secondary education, and a few had high school or university education. The average self-reported English proficiency ranged between "a little" and "good." In sample four, only two women had been diagnosed with type 2 diabetes by a medical doctor.

6.1. Phase one: inferring a cultural model of 'la Buena Vida'

In response to a questions about what kinds of things are necessary to achieve *la buena vida*, sample 1 ($n = 31$) generated a list of items that included both material goods that characterize a modern, middle-class lifestyle (e.g., house, car, refrigerator, cell phone) as well as non-material items such as positive character traits (e.g., being positive, helpful to others) and long-term migration goals (e.g., good education for children, access to healthcare). This list was reduced to a set of the most frequently mentioned terms as well as some infrequently mentioned terms to capture the full range of the semantic space.

In the second sample ($n = 31$), respondents were asked to sort the selected terms (written on notecards) into piles based on similarities or like qualities. This data was analyzed to better understand the principal dimensions of meaning along which respondents organize the domain. Multidimensional scaling (MDS), which arrays the terms at relative distance from one another depending on how often they are grouped together, indicated that participants tended to organize the domain along two primary dimensions – (1) daily needs versus long-term goals and (2) material necessities or desirables versus non-material aspirations. Hierarchical cluster analysis in ANTHROPAC verified that the more immediate, daily necessities clustered into two subgroups, one consisting of a place to live, a car, and basic household items such as electricity, refrigerator, washing machine and hot water, and the other consisting of modern technology items and communication devices, such as cell phone, internet access, TV and computer. The non-material items can be broken down into long-term goals and leisure time activities. The items associated with long-term improvement of one's station in life included getting a good education for the children, learning English and gaining access to healthcare, as well as items related to being a good person, such as being patient and positive, going to church and helping others. The final cluster consisted of leisure time activities such as rest, exercise, listening to music, being outside and spending time with friends. For further verification that respondents are not sorting the cards randomly but are indeed drawing from a shared understanding of how the terms should be logically grouped together, Borgatti (1994: 275) suggests using cultural consensus analysis to analyze the pattern of agreement among respondents to ensure that the pattern is "consistent with a single culture, rather than two or more conflicting groups." If the ratio of the first to second eigenvalue is greater than three, this indicates that there is single pattern of responses (see Weller, 2007). Consensus analysis on the unconstrained pile sort data yielded an eigenvalue ratio of 10.4, indicating that participants were largely in agreement with one another about how to categorize the various terms associated with *la buena vida*.

A third sample ($n = 41$) was asked to rank order the items in terms of their importance, and this was analyzed to get a sense of how the attributes of the domain are prioritized in women's lives. Consensus analysis on the full rank ordering of the items yielded an eigenvalue ratio of less than three to one, indicating that there was no overall agreement regarding the importance of the elements (and rendering the competence values from the first factor loadings irrelevant). However, analysis of the second factor loadings indicated that two subgroups of individuals did seem to agree more with one another than with the overall group. Dividing the sample into two subsets based on their proximity in the second factor loadings, each subgroup did yield eigenvalue ratios greater than three. As an aggregate, both groups

Table 1
Descriptives for samples 1–4.

	Sample 1 ($n = 31$)	Sample 2 ($n = 31$)	Sample 3 ($n = 41$)	Sample 4 ($n = 70$)
Age	36.52 (19–70, 12.73)	40.13 (27–58, 9.09)	34.81 (19–54, 8.27)	37.44 (19–66, 10.07)
Age at Arrival	25.03 (10–60, 11.06)	27.03 (12–51, 8.69)	20.68 (6–48, 8.29)	23.43 (2–48, 9.69)
# of Years in U.S.	12.39 (2–40, 7.12)	12.87 (2–36, 8.09)	13.83 (2–29, 4.50)	13.31 (2–29, 5.02)
Occupational Status*	0.74 (0–3, 0.81)	0.29 (0–2, 0.59)	0.56 (0–3, 0.91)	0.61 (0–3, 0.91)
Household Salary**	1.26 (0–3, 0.86)	1.26 (0–3, 0.73)	1.12 (0–3, 0.64)	1.11 (0–3, 0.94)
Education***	1.58 (0–3, 1.21)	1.55 (0–3, 1.03)	1.36 (0–3, 0.96)	1.29 (0–3, 1.00)
English Proficiency****	1.29 (0–3, 1.24)	1.16 (0–3, 0.82)	1.29 (0–3, 0.99)	0.94 (0–3, 0.92)

*Occupational status measured as (0) does not work outside home, (1) unskilled worker, (2) skilled worker, (3) professional/business owner
**Average weekly salary of household measured as (0) <$300, (1) $300–600, (2) $600–1000, (3) >$1000
***Highest level of education measured as (0) no school or primary school, (1) secondary school, (2) preparatory school, (3) university
**** Self-assessed English proficiency reported as (0) none, (1) a little, (2) good, (3) very good[a]
[a] Note: Descriptive statistics are mean, range, and s.d.

ranked having a good job and having food to eat very high, though they differed in their prioritization of material items, particularly modern technology devices. The break down in agreement occurred over the prioritization of material goods versus long-term goals and self-improvement. One group (n=27) deemed the material goods less important, assigning higher rankings to things like better opportunities for children and positive character traits. This group tended to rank spending time with family, good education for the children, learning English, going to church and being positive as important, while items like television, computer, internet access, and cell phone were ranked towards the bottom. On the other hand, the second group (n=14) tended to be more concerned about the immediate needs of daily life, such as household goods, transportation and technological devices, as opposed to the more future-oriented aspects of improving one's (and one's family's) position in life and being a good person. Table 2 shows how the two groups broke down by covariates. The subgroup with higher socioeconomic status and more proficiency in English clustered together in prioritizing basic household items and technological devices, and the subgroup with lower socioeconomic status and less English proficiency clustered together in their prioritization of items related to self-improvement and fulfilling familial and social obligations.

6.2. Phase two: cultural consonance and diabetes

Cultural consonance with *la buena vida* was assessed using two different scales based on the residual agreement analysis, one that weighted material items and particularly technology devices more heavily and one that gave more weight to the long-term goals and abilities necessary to fulfill communal and familial duties expected of women in this community. Despite the apparent divergence in the articulation of priorities, cultural consonance tended to extend across both assessments, indicated by the fact that the two sets of consonance scores had a very strong significant correlation ($r = 0.997$). This suggests that both the materialistic items and the more idealistic items related to self-improvement and long-term objectives are encompassed in the culturally salient model of achieving *la buena vida*. Further, while respondents may be diverging in the ways they articulate which items in the domain should be emphasized or prioritized in order to achieve *la buena vida*, those who are consonant tend to be consonant with both versions of the model. Another way of looking at this is that women who have managed to acquire the indicators of a middle-class lifestyle are more likely to see themselves as good in a moral sense, while women who do not have access to these material desirables are more likely to see themselves as unable to fulfill their familial and social duties as women. This is an intriguing finding, a discussion of which is beyond the scope of this paper (see Andrews et al., 2020), but we mention the strong correlation between the two differentially weighted scales as a justification for using a composite scale of cultural consonance that aggregated the two.

Bivariate analysis showed a significant inverse correlation between cultural consonance and level of HbA$_{1c}$ ($r = -0.44$, $p = 0.000$), meaning the lower the consonance the greater likelihood of developing diabetes. More years living in the United States was positively associated with higher HbA$_{1c}$ ($r = .303$, $p = 0.011$), which is consistent with other research (Anderson et al. 2016), though the strength of the effect was moderate. Age and socioeconomic status were significantly correlated with diabetes risk as well, such that the older and less well positioned, the greater the risk of developing diabetes ($r = 0.539$, $p = .000$ for age and $r = -.319$, $p = .007$ for SES).

The next step was to determine if the ability to live within a shared set of cultural expectations (higher cultural consonance) moderates the relationship between number of years living in the U.S. and HbA1c. The regression analysis (see Table 3) is presented in terms of model progression. In the first model, both age and SES are significantly associated with HbA1c. In the second model, however, the addition of cultural consonance absorbs the effect of SES on HbA1c and explains an additional 4% of the variance. The addition of number of years living in the U.S. in the third model does not add any explanatory power to the model, again suggesting that consonance exerts a more direct effect on diabetes risk. However, time living in the U.S. is not inconsequential—the final model shows that the interaction effect between cultural consonance and number of years living in the U.S. does register as significant ($p = 0.02$) and explains an additional 5% of the variance. In other words, the longer one lives in the United States, the greater the difference in HbA$_{1c}$ levels depending on the individual's consonance with *la buena vida*. This moderation effect is represented graphically in Fig. 1Fig. 2, and it shows that those who have lived in the United States the longest and who have the highest consonance are at the lowest risk for developing diabetes, while those who have lived in the U.S. the longest but have low levels of consonance are at the greatest risk. Thus, our data suggests that it is not time in the U.S. alone that is associated with higher levels of HbA1c but the interaction between time in the U.S. and cultural consonance that most significantly impacts diabetes risk.

6.3. Limitations

Due to the small sample size of this study, only the most important variables of interest were included. Despite the strong association with diabetes, we did not include a measure of body mass index (BMI). This was primarily because of the variable settings in which the interviews were conducted, some of which would not have been conducive to taking weight and height measurements. We were concerned that in some cases self-reported weight and height would not be accurately represented and that with such a small sample, this might be a confounding factor in the analysis. Further, in U.S. Latinx populations, BMI and age are highly correlated, meaning BMI is likely at least partially controlled for by age in this analysis (Abraído-Lanza et al., 2005). Further, the increase in BMI with increased number of years in the U.S. is well-documented (Goel et al., 2004). In future studies, larger samples

Table 2
Sample 3 cultural consensus analysis by subgroup.

	Group 1 Priority: Long-term goals (range, s.d.)	Group 2 Priority: Material goods (range, s.d.)
# of Respondents	27	14
Age[+]	36.74 (22–54, 8.34)	32.07 (19–43, 6.78)
Age at Arrival[+]	22.52 (9–48, 8.62)	17.77 (6–28, 6.31)
# of Years in U.S.	14.26 (6–29, 4.39)	13.14 (2–21, 4.93)
English Proficiency*[++]	1.93 (1–3, 0.78)	2.86 (1–4, 1.03)
SES**[++]	4.00 (2–6, 1.21)	5.31 (4–7, 1.12)
# of Negative Competence Scores	1	2
Average Competency	0.50 (-0.36–0.87, 0.26)	0.54 (-0.21–0.90, 0.36)
Eigenvalue ratio	3.06	3.01

*Self-assessed English proficiency reported as (0) none, (1) a little, (2) good, (3) very good **SES measured as average weekly salary of household (0–3) and highest education level completed (0–3)

[+] $p < .10$ [++] $p < .05$ (t-tests comparing subgroups)

Table 3
Interaction effect of time in U.S. and cultural consonance on HbA$_{1c}$.

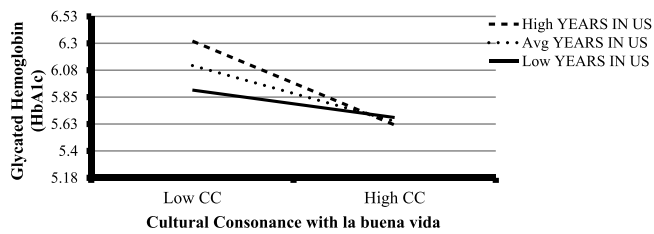|	Model 1	Model 2	Model 3	Model 4
Age	0.51*	0.47*	0.433*	0.38*
SES	-0.27*	-0.29	0.01	-0.06
Cultural Consonance	- - -	-0.32*	-0.34*	-0.35*
Years in U.S.	- - -	- - -	0.13	0.13
Years in U.S. x Cultural Consonance	- - -	- - -	- - -	-0.23*
	R²=0.34; p=0.00	R²=0.38; p=0.03	R²=0.38; p=0.21	R²=0.43; p=0.02

$n = 70$ *significance <0.05

Fig. 1. Interaction effect of cultural consonance and years in U.S. on levels of HbA$_{1c}$.

will make the inclusion of more covariates, including BMI, cortisol and leptin levels, blood pressure, and psychiatric measures more tenable.

7. Discussion and conclusions

The results described here suggest that living in congruence with a collectively held and socially valued standard for *la buena vida* among Mexican immigrant women in Alabama is associated with lower levels of HbA1c and that consonance is a better predictor of diabetes than length of time living in the U.S. Further, the interaction between consonance and time in the U.S. yields additional explanatory power in predicting diabetes, lending credence to the notion that the longer one is unable to successfully act out culturally valued ideas about how life ought to be lived, the greater risk to her health. To borrow the terms from Brown and Harris (2012), the moderation effect shows that cultural consonance acts as a "provoking agent" that exerts a direct effect on diabetes risk, while time living in the U.S. serves as a "vulnerability factor" that makes certain bodies more or less susceptible depending on their level of cultural consonance. This analysis captures the interplay between cultural factors and length of time living in the U.S., improving our understanding of what role culture plays in diabetes outcomes for Mexican immigrants. Rather than relying on time in the U.S. as a proxy measure of acculturation, the analysis used here attempts to flesh out a cultural space of meaning that is formed as immigrants attempt to find their place in a new socio-political landscape. Evaluating how effectively individuals are able to enact the cultural standards and expectations defined within their own communities brings more clarity to cultural positioning than using length of time to determine how acculturated one is.

As Weller (2007) reminds us, consensus analysis provides a summary of what people know and how they articulate their understandings of how one ought to believe and behave, but it is not necessarily reflective of what people do or how they actually live their lives. Cultural consonance provides a way to measure the continuity between knowledge and practice. Acculturation scholars assume that individuals seek to act in ways that correspond to cultural influences and expectations (Berry, 1997); however, what goes unaccounted for in acculturation research is what those socially-defined expectations are as well as the limiting factors that impede achieving coherence with these expectations (Mendenhall, 2012). While some individuals may intentionally rebuke or refuse to conform to cultural expectations, it is often the case for marginalized communities that this is not a matter of pure agency but of low status and lack of knowledge or resources. For Mexican immigrants in the U.S. and especially in the South, the ability to act on these shared understandings will likely be compromised by the sociopolitical and economic context that devalues them. Cultural consonance theory suggests that this discontinuity causes stress and matters a great deal in terms of health in the short and long term (Dressler, 2005). The theory and methods used here provide a more conceptually and empirically precise approach to understanding and utilizing culture as an operational variable in health research and may provide practitioners with a more nuanced way of addressing health disparities, particularly for immigrant populations. Simply put, the longer individuals experience a lack of consonance, the greater the risk for poor health. This research sheds light on the social and cultural dimensions of diabetes for Mexican immigrant women in the U.S. and better accounts for diabetes as a manifestation of social suffering that has physiological consequences over time.

Ethics approval

The Institutional Review Board at the University of Alabama approved this study and the sampling procedures used to recruit

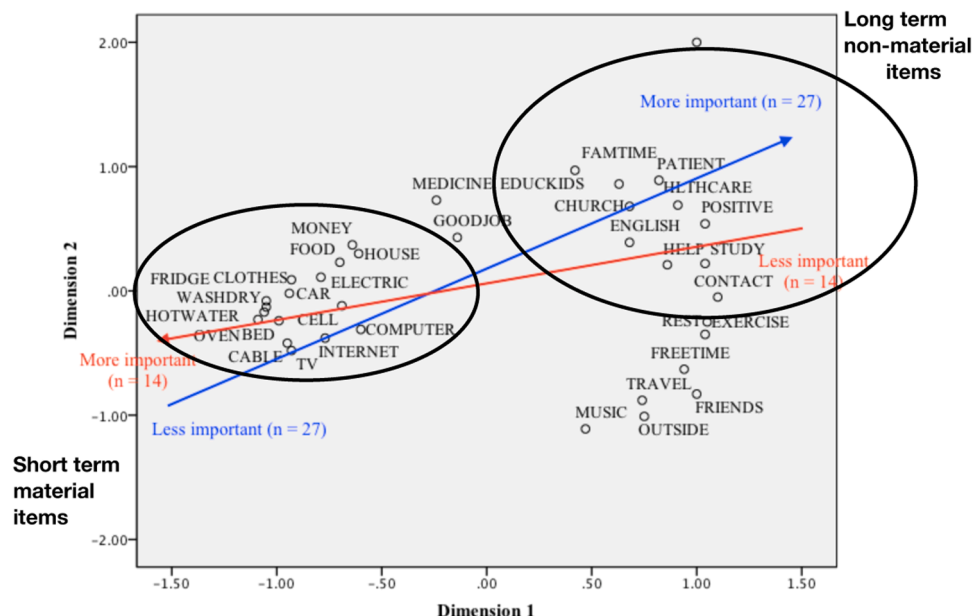**Fig. 2.** PROFIT analysis of subgroup answer keys on original MDS map (R^2=0.65)

participants. See IRB protocol #15-OR-292-R2.

Free List of la buena vida (the good life)

Term	Frequency	Average Rank	Salience
Casa (House)	17	2.35	0.47
Tiempo con familia (Family time)	17	4.12	0.37
Coche (Car)	16	2.94	0.40
Positiva (Be positive)	13	6.77	0.14
Buen trabajo (Good job)	10	2.60	0.27
Dinero (Money)	9	4.33	0.19
Comida (Food)	8	5.13	0.15
Tiempo para estudiar (Study time)	6	6.17	0.09
Ropa (Clothes)	5	7.00	0.06
Aprender inglés (Learn English)	5	5.00	0.09
Educación para niños (Education for children)	5	7.6	0.05
Refrigerador (Refrigerator)	5	5.2	0.10
Internet (Internet)	4	3.00	0.09
Acceso a medicina (Affordable medicine)	4	9.75	0.02
Cuidado de salud (Health insurance)	4	6.75	0.05
Amigas (Friends)	4	6.50	0.05
Ayudar a otros (Help others)	4	6.50	0.04
Ser religiosa (Be religious)	4	4.50	0.08
Rezar (Pray)	3	9.67	0.02
Humilde (Modesty)	3	6.33	0.05
Horno/estufa (Oven/stove)	3	4.00	0.07
Tiempo libre (Free time)	3	5.67	0.06
Televisor (Television)	3	6.33	0.05
Ejercicio (Exercise)	3	6.67	0.03
Celular (Cell phone)	3	4.33	0.06
Ser amable (Be kind)	2	8.00	0.02
Luz (Electricidad)	2	4.50	0.04
Cama (Bed)	2	6.00	0.04
Ir a la iglesia (Go to church)	2	6.00	0.02
Ser saludable (Be healthy)	2	5.50	0.03
Ser simpática (Be nice)	2	8.50	0.01
Tiempo para relajarse (Time to relax)	2	5.50	0.03
Viajar (Travel)	2	5.00	0.04
Computadora (Computer)	2	2.50	0.05
Tiempo con amigas (Time with friends)	1	7.00	0.02
Ser espiritual (Be spiritual)	1	5.00	0.02
Música (Music)	1	4.00	0.02
Cable (Cable)	1	5.00	0.02
Ser paciente (Be patient)	1	2.00	0.03

$n = 31$

Average response length = 8.74 ; Range = 5 -13

Total items listed = 85

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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