

# Understanding barriers and facilitators of fruit and vegetable consumption among a diverse multi-ethnic population in the USA

MING-CHIN YE<sup>1,3\*</sup>, SCOTT B. ICKES<sup>2</sup>, LISA M. LOWENSTEIN<sup>2</sup>, KEREM SHUVAL<sup>3</sup>, ALICE S. AMMERMAN<sup>2</sup>, ROSANNE FARRIS<sup>4</sup> and DAVID L. KATZ<sup>3,5</sup>

<sup>1</sup>Nutrition and Food Science, Urban Public Health Program, Hunter College, School of Health Sciences, 425 East 25th Street, New York, NY, USA, <sup>2</sup>School of Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA, <sup>3</sup>Yale Prevention Research Center, Derby, CT, USA, <sup>4</sup>Centers for Disease Control and Prevention, Division for Heart Disease and Stroke Prevention, Atlanta, GA, USA and <sup>5</sup>Yale University School of Medicine, New Haven, CT, USA

\*Corresponding author. E-mail: myeh@hunter.cuny.edu

---

## SUMMARY

A diet high in fruits and vegetables (F&V) has been associated with a decreased risk of certain cancers, reduced morbidity and mortality from heart disease, and enhanced weight management. Yet to date, most of the US population does not consume the recommended amount of F&V despite numerous interventions and government guidelines to promote consumption. Research has found various impediments to F&V consumption, such as high costs, an obesogenic environment and low socio-economic status. However, studies have not sufficiently focused on barriers and enablers to F&V intake among adult multi-ethnic populations. The present qualitative study examines 147 focus group participants' perceptions of impediments and enablers to F&V consumption. Twelve focus groups were conducted among African American, Hispanic and Caucasian men and women in North Carolina and Connecticut. Focus groups were audiotaped, transcribed verbatim and entered into QSR NVivo Software. Text data were systematically analyzed by investigators to identify recurrent themes

both within and across groups and states. Focus group results indicate that most participants were aware of the health benefits associated with a diet rich in F&V. Yet many admitted not adhering to the Health and Human Service's recommendations. Individual impediments consisted of the high costs of F&V and a perceived lack of time. Early home food environment was perceived as affecting F&V consumption later in life. Other barriers reported were ethnic-specific. The African American participants reported limited access to fresh produce. This finding is consistent with numerous studies and must be addressed through health promotion intervention. Both the church and primary care clinics were described by African Americans as appropriate settings for health behavior interventions; these findings should be considered. Hispanic participants, mostly immigrants, cited inhibiting factors encountered in their adopted US environment. There is a need to improve the availability and access to fresh F&V commonly available in the home countries of Hispanic immigrants.

**Key words:** fruit and vegetables; barriers and facilitators; qualitative

---

## INTRODUCTION

Ample research has indicated that nutritional factors contribute substantially to the burden of preventable illnesses and premature deaths in the USA and worldwide (Beaglehole and Yach, 2003). A balanced diet has been shown to promote overall well-being and health (USDA, 2000). Dietary patterns with higher fruit and vegetable (F&V) intake are associated with treating and preventing metabolic syndrome (Feldeisen and Tucker, 2007) and promoting a variety of health benefits; including decreased risk for certain cancers (Lee *et al.*, 2006), reduced morbidity and mortality from heart disease (Feldeisen and Tucker, 2007), enhanced diabetes prevention (Hodge *et al.*, 2007) and improved weight management (Bazzano, 2006). Recent studies indicate that the US population is not meeting the recommended levels of F&V consumption (Casagrande *et al.*, 2007; Larson *et al.*, 2007). While Casagrande *et al.* (Casagrande *et al.*, 2007) found no statistically significant increase in F&V intake among adults between the years 1988–1994 and 1999–2002, Larson *et al.* (Larson *et al.*, 2007) actually found a mean daily decrease in consumption among adolescents.

Numerous interventions, such as social marketing, printed educational material and environmental approaches, aim to increase the intake of F&V by targeting both the general population and at-risk subgroups (Marcus *et al.*, 1998, 2000; Havas *et al.*, 2000; Langenberg, 2000). Results of the National Cancer Institute's (NCI) 5-a-day Program were found to have modest success (Baranowski and Stables, 2000).

Studies have found numerous correlates inhibiting the consumption of F&V, such as low socio-economic status, inaccessibility to fresh F&V and lack of self-efficacy (Kratt *et al.*, 2000; Siega-Riz and Popkin, 2001; Pomerleau *et al.*, 2005). Yet research has not sufficiently focused on the impediments to F&V consumption among adult multi-ethnic populations (Hill *et al.*, 1998; Campbell *et al.*, 1999; Cullen *et al.*, 2003). The present qualitative study attempts to illuminate the barriers and facilitators to F&V consumption among African American, Hispanic and Caucasian populations and provide suggestions for program planners when developing future intervention programs.

## METHODS

### Study design and study participants

Twelve focus groups, ranging from 9 to 16 participants, 90 min each, were conducted, involving African American, Hispanic and Caucasian men and women representing the primary ethnic groups in the USA. These focus groups were conducted both in North Carolina ( $n = 81$ ) and Connecticut ( $n = 66$ ) to account for possible differences between rural and urban environments. Within each of the aforementioned states, two focus groups were conducted for each of the three ethnicities. Focus groups were held separately for Caucasian and African American participants between the ages of 18 and 50 and participants  $\geq 50$  years to account for potential age-related differential perceptions. Hispanic groups, however, consisting primarily of immigrants, were divided by degree of acculturation rather than age. The rationale behind this decision was that acculturation was more likely to yield a more accurate or valid picture than would age (Larsen *et al.*, 2003).

Participants were recruited through advertisements at local churches, schools and a community-based cooperative extension service in North Carolina and Connecticut. Focus groups were conducted in four North Carolina counties (mostly rural areas) and three Connecticut counties (mostly urban areas), to represent different regions of the respective states.

### Development of focus group guide

Prior literature was searched regarding determinants and barriers related to F&V consumption and draft questions were compiled. An expert panel of health educators and public health researchers with training in cultural competency was recruited to review the questions and to provide a rigorous focus group guide (Ickes *et al.*, 2005). Focus group questions regarding fruit and vegetable consumption were divided into: (i) general determinants, (ii) perceived barriers, (iii) enablers, (iv) knowledge and (v) attitudes.

### Data collection

Five trained research staff moderated the focus groups, with the same moderator conducting

both groups for each ethnicity within each state. Moderators were matched to participant race, except for the two African American groups in Connecticut which were led by the same Caucasian moderator who also moderated the two Caucasian groups. The four Hispanic focus groups were conducted in Spanish. The interviews were first transcribed verbatim in Spanish and then translated into English prior to analysis. All focus group interviews were tape-recorded. All participants were compensated \$25 at the end of the sessions. This project received approvals from the UNC and Yale University Institutional Review Boards. Tables 1–5 illustrate the questions used during the focus group sessions.

### Data analysis

All focus groups were transcribed from audio recordings and then entered as text and coded using QSR NVivo Software (QSR NVivo, 2000). Text data were carefully read by investigators and systematically analyzed to identify recurrent themes both within and across groups and states. Researchers read all transcripts individually and then convened to discuss themes and patterns. Two researchers (S.B.I. and L.M.L.) concurrently coded all text data to ensure consensus and consistency. Data coded under the nodes were organized into three major categories relating to F&V consumption: (i) general determinants, (ii) barriers and (iii) facilitators. General determinants were defined as factors that had an inconsistent effect within and across groups, that is, they promoted and inhibited F&V consumption. Facilitators were defined as factors that promoted consumption, and barriers were defined as factors that ultimately inhibited consumption. A matrix-based approach using rich text was used to analyze text from all focus groups (Pope *et al.*, 2000). This method reduces the possibility of selectively reading the data, and allows for direct comparison of nodes and categories between all participant groups so that both the presence and absence of comments are noted.

## RESULTS

The following results present barriers, facilitating factors and general determinants for F&V consumption in the context of ethnicity

**Table 1:** Questions used by facilitator about ‘General Determinants’ of fruit and vegetable consumption

1. When you go to the grocery store what affects the kinds or amount of fruits and vegetables you buy?
2. What do you think causes you to eat more or less vegetables when you eat in a restaurant?
3. How do other people in your life impact how many fruits and vegetables you eat? Who influences how many fruit and vegetables you eat?
4. Do you think people eat more or less fruits and vegetables as they get older?
5. Let’s think about the kinds of fruits and vegetables we eat now, and try to see if we think there is a connection with what we learned as children from the people around us, or just where we grew up and the things we were exposed to. How do you think this affects the kinds of fruits and vegetables you eat now?
6. How do you think your background influences the way you prepare your fruits and vegetables now?
7. Are you more likely to eat fruits and or vegetables at breakfast, lunch or dinner?
8. When you go to the store or market to shop, what are the things that affect the type and/or quantity of fruits and vegetables that you buy?
9. Why do we eat more or less fruits compared to vegetables?
10. Are you more likely to eat some fruits and vegetables during certain times of the year? If yes, why do you think this is so?
11. How do the people you live with influence what you buy?

(African American, Hispanic and Caucasian) and the age (<50 versus ≥50) of participants. No substantial differences by degree of acculturation for Hispanics or regional differences were found and therefore results are not presented.

The common facilitators of fruit and vegetable consumption across all groups included family traditions, health benefits and advice by physicians. The predominant barriers among all groups included inaccessibility, cost and time. A review of findings by ethnicity and age groups shows some variations that are described in the following sections.

### Ethnicity

#### Barriers

Many of the factors that negatively influenced F&V consumption were common across ethnic groups. The high cost of F&V was the most prevalent concern regardless of ethnicity: ‘I just don’t have the money . . . . You get the basics: meat, milk, and maybe vegetables. Fruit is an

**Table 2:** Questions used by facilitator about 'Barriers' to fruit and vegetable consumption

- 
1. What do you believe is the main reason people do not consume fruits and vegetables?
  2. What makes it hard to eat more fruits and vegetables?
  3. What kinds of things might keep you from buying more fruits and vegetables?
  4. Think about when you are at home; is there anything that prevents you from eating fruits and vegetables?
  5. What do you think causes you to eat more or less vegetables when you eat in a restaurant?
  6. What do you think are the reasons Latinos do not eat the quantity of fruits and vegetables that they should? Remember, when we say fruits, this includes juices, and when we say vegetables, this includes the vegetable juices and salads.
  7. What things keep you from purchasing fruits and vegetables?
  8. When at home, what prevents you from reaching for an apple instead of the Oreo cookie?
- 

extra (African American, Connecticut- CT). Lack of energy and preparation-time was commonly mentioned barriers: 'I just don't have the time . . . I don't get home until 5:30 or 6:00 . . . who wants to cook a meal that late? . . . (Caucasian, North Carolina-NC).' Moreover, the convenience of pre-packaged foods and the high spoilage rate of F&V were regarded as impediments to F&V intake. Media advertising was cited as having a negative impact on consumption as well: 'If you go home and turn on the TV, they're selling McDonalds, Wendy's and Pizza Hut. . . . You don't see fruits or vegetables in commercials (Hispanic, CT).'

Several reported factors were unique to specific ethnic groups. African Americans most commonly described a high-fat, high-sodium preparation style where meat fat was used for seasoning. 'We doctor up vegetables so much with fat back and pork that there is no nutrition left (African American, CT).' Inaccessibility to

**Table 3:** Questions used by facilitator about 'Enablers' to fruit and vegetable consumption

- 
1. What are the most important reasons people eat fruits and vegetables?
  2. Are you more likely to eat fruits and or vegetables at breakfast, lunch, dinner, or as a snack or desert?
  3. What would make it easier for you to eat fruits and vegetables on a daily basis?
  4. If you could change one thing that would make you eat more fruits and vegetables, what would it be?
  5. What do you think are the most important reasons that make people eat fruits and vegetables?
- 

**Table 4:** Questions used by facilitator about 'Knowledge' of appropriate fruit and vegetable consumption

- 
1. How many servings of fruit and vegetables do you think people should eat each day to stay healthy?
  2. How many fruits and vegetables do you eat a day?
  3. How many fruits and vegetables a day do you think most people eat?
  4. Does consuming certain kinds of fruits and vegetables prevent certain diseases or colds?
  5. Have you heard the slogan '5-a-day for better health'? What does this mean to you?
  6. What do you think equals a serving of fruit or vegetable?
  7. How is the food pyramid related to fruit and vegetable consumption?
  8. What do you think are the most important reasons for people to eat fruits and vegetables?
  9. Could you tell us which cooking methods are healthy and which are unhealthy?
  10. Why do you think people need to eat fruits and vegetables?
- 

grocery stores was also a barrier described by the African American group. In some cases, due to the infrequency of grocery store visits, F&V were consumed quickly and would not be replenished for several days. On other occasions, F&V would perish before they were consumed; this was perceived as frustrating and caused some members to purchase other foods with a longer shelf life: 'When you live in the city . . . some people have to travel great distances to get fruits, plus they don't have the economic resources to get to the fresh fruit (African American, CT).' Additionally, many African American participants discussed a decrease in home gardens and agricultural-based households: 'My father loved to plant and grow things in the back yard . . . . It was more

**Table 5:** Questions by facilitator about 'Attitudes' towards fruit and vegetable consumption

- 
1. How do other people in your life impact how many fruits and vegetables you eat?
  2. For those who immigrated, how do you think your fruit and vegetable eating habits have changed (if at all) since you came to this country?
  3. What is the connection (if at all) between your current or past surroundings and the way you were brought up to your fruit and vegetable intake today?
  4. Do you think the fruit and vegetable consumption depends on the place you reside in?
  5. What would people say in if a meal at church would consist of fresh fruits and vegetables (with no added meat)?
-

accessible back then ... I don't have this luxury nowadays (African American, NC).'

Hispanic immigrants to the USA have found F&V to be less accessible than in their country of origin. Others lament the rarity of specific items such as plantains, or complain about poor quality: 'I try to keep my Mom's tradition of preparing native vegetable soups and many salads. But unfortunately in this country you can't buy the same tropical fruits that we had in our country (Hispanic, CT).'

Another participant living in North Carolina noted: 'In our countries, although we do not have much, we live on farms, this makes eating fruits and vegetables easy.' Lack of familiar F&V and tools for traditional preparation styles also limited consumption: 'The customs of where we came from affect this a lot, our parents gave us the fruit that they chose, and then we arrived here and we saw other fruits and we say, I don't know how it tastes, I won't buy it, this has a big repercussion in the fruits that we consume, perhaps, we don't consume anything more than what we know how it tastes, and the others (Hispanic, NC).'

A specific impediment among some Caucasian participants was the fear of an adverse health effect from consuming F&V that might be contaminated with pesticides: 'There is a problem with apples, using pesticides. For the pesticide is illegal to use in the US but not to make, so they ship it overseas, spray the apples, and ship them back. This is directly linked to breast cancer in women ... You think you are eating something good, but you're eating something that is killing you (Caucasian, CT).'

Another participant noted that: 'The fertilizer spray, the whole business, I don't trust it. The total chemical uses on it. So you don't think washing it (helps) ... no, no (Caucasian, NC).'

### *Facilitators*

The key enabler to F&V intake reported across all ethnic groups was knowledge level about the health benefits of fruits and vegetables (F&V). Although many participants admitted to not eating enough F&V, it was well understood that these foods are an essential part of a healthy, balanced diet and that fast food was generally an unhealthy food source. Furthermore, participants recognized that preparing F&V with added fat, salt and sugar was unhealthy.

Another prominent enabler to purchasing and consumption, common to all racial groups, was a concern over children's health: 'The family habit ... is one very important factor, because if you have young ones, you keep a basket of fruit, the kids get used to that. If you keep a basket of cookies, they get used to those cookies (African American, CT).'

All groups preferred fresh F&V over canned or frozen ones.

Despite lamenting certain familial and cultural shifts away from ample consumption, African Americans and Hispanics made frequent comments about the importance of 'growing up' eating F&V and 'developing a taste for them.' Several African American participants noted healthy changes in their preparation style, while some Hispanics described their preference for fresh F&V over frozen or canned and noted that they steam their vegetables or eat them raw because 'cooking longer wastes a lot of vitamins (Hispanic, NC).'

Among African Americans, family physicians were perceived as the most important source of information on diet and healthy lifestyle: 'We know what we are supposed to eat, but we just don't do it until we go to the doctor and he tells us (African American, NC).'

'My doctor told me my cholesterol was borderline, and I never thought I'd hear that and that I would have to change my diet (African American, CT).'

African Americans described their church communities as a good setting for educating and motivating healthy eating, despite many of the unhealthy traditional foods that are served at these functions. One North Carolina woman remarked: 'Just trying different things too, because at this church we have feedings from time to time, well a whole lot, (laughter) and we could try some different things at those times, but I guarantee you that most of the time it is basically the same thing, because a lot of people like the greens and peas and they are highly seasoned and that is just tradition ... but to try different things like fruits and salad in the place of some of the other things ... it probably wouldn't get eaten (African American, NC).'

### *General determinants*

Familial influence was a central determinant reported by all three ethnic groups. In general, women served as the nutritional gatekeepers for their families. One North Carolina man noted:

'My wife cooks differently than my mother ... She don't use the seasoning my mother did cause I try to eat healthier and stay in shape (African American, NC).' This man's wife (also a focus group participant) went on to talk about her adherence to a healthier cooking style: 'I really made the decision that I was going to change when the doctor told me that he had high blood pressure. Matter of fact, the doctor told him that he had to change, so by him changing I changed along with him (African American, NC).'

Negative influences of spouses and families were also reported. One male participant from North Carolina noted: 'My son and my wife don't like vegetables, so she doesn't cook them, and I don't cook, so I just don't get them. I eat what she cooks (Caucasian, NC).' An African American mother from North Carolina described her husband as a negative influence on the family's diet: 'In my home that is why I do not invest in a lot of fruits, because cost wise they are as expensive as meats and other things, and my children would waste them, and I would be the only one-not even my husband ... it isn't because he is not informed, it is because of his desires and tastes. And it has trickled right down to the children (African American, NC).'

## Age

### Barriers

While both age groups identified cost as a major barrier, the under 50 group simply noted that F&V cost more than other food items, while the  $\geq 50$  group witnessed a transition from free, homegrown F&V to high-priced produce in the supermarkets: 'When I go to the grocery store and I see the price tags on certain things, I cannot gear myself up to get a grocery bag full of them because of the cost, what I would love to buy would cost half of what my groceries cost in a week (African American, NC,  $\geq 50$ ).'

The under 50 age group identified fast food as a more prominent barrier than their older counterparts: 'I think people in my generation were raised in an era of convenience (African American, CT,  $< 50$ ).' The younger group identified fatigue after a long day of work as a barrier to preparing F&V. They noted that if vegetables came with a meal at a restaurant, they would be more likely to eat them than if

vegetables were offered *à la carte*. Furthermore, only the under 50 group mentioned that a lack of cooking skills hindered their ability to prepare vegetable dishes.

### Facilitators

While both age groups recognized the health benefits of F&V, the  $\geq 50$  group cited more proximal health reasons for consumption. For instance, a female participant recalled, 'In my family, we have a lot of heart disease on my mother's side ... As a result I've changed the way I eat ... I cut a lot of the grease out of my diet and I eat lots of vegetables (Caucasian, NC,  $\geq 50$ ).' The younger generation demonstrated a more distal concern over health and change in dietary habits: 'If I want to lose weight, I would probably stick more to fruits, salads, and things like that. I wouldn't change ... 'til I was forced to.. . but my body doesn't ask for it, so I kind of get into what I want, but I'm not saying that's good. If I wanted to watch my weight for a while, I would do that. I would commit to it.'

Yet some members of the younger generation made a conscious effort to develop healthier dietary habits than their parents: 'I'm becoming the opposite of the way my mom cooked. When we were growing up it was a lot of butter, but now I don't cook that way ... (Caucasian, CT,  $< 50$ ).' The presence of children in the younger group's household had a positive influence on the purchasing and consumption of F&V: 'Now that I have kids I'm a lot more careful about what I eat ... I want to set a good example so I buy a lot more fruits now (Caucasian, CT,  $< 50$ ); 'For me, my children's health is the most important thing in the world. I believe plenty of vegetables are really important for them (Hispanic, NC, acculturated).'

### General determinants

Both upbringing and family influence were described by older and younger participants alike as having a paramount impact on their F&V consumption: 'In my case I keep on reproducing the salads, and almost the same vegetables that my mom used ... as a habit (Hispanic, CT, non-acculturated).' Another participant added: 'I think my cooking is probably very similar to my mother's. Now, do I like new recipes? Yes, but when push comes to shove and I got to get a meal on the table quick I fall

back on what I learned from my mother (Caucasian, NC,  $\geq 50$ ).’

Early family eating patterns were described as having a major influence on dietary practices later in life: ‘I’ll never eat broccoli, we ate corn-bread and beef . . . . That’s what I’m used to (Caucasian, CT,  $\geq 50$ ).’; ‘Some kids have never been exposed (to fruit and vegetables) . . . . They get frozen food and fast food all of the time. They don’t never eat it and don’t really like it (African American, CT,  $< 50$ ).’

## DISCUSSION

Although the health benefits of a diet rich in F&V are well known, most of the US population does not integrate a sufficient amount of fruit and vegetables (at least 5 a day) into their daily diet (Serdula *et al.*, 2004; Guenther *et al.*, 2006; Casagrande *et al.*, 2007; Larson *et al.*, 2007; Vitolins *et al.*, 2007). Most studies thus far have primarily focused on barriers to F&V consumption among children (Hill *et al.*, 1998; Campbell *et al.*, 1999; Cullen *et al.*, 2003). The present study examines barriers and enablers to F&V consumption among a multi-ethnic, multi-age-group population from two regions in the USA (urban Northeast vs. rural South). The results of the study might provide insight for program planners when attempting to ameliorate diets in the adult population.

Findings from the focus groups indicate that most participants, regardless of ethnicity, associated a diet rich in F&V with positive health benefits. However, most admitted not adhering to the Department of Health and Human Services and USDA’s recommendations regarding F&V intake. The primary individual impediment was a perceived lack of time due to long working hours and extensive preparation time required for cooking vegetables. This barrier was more prevalent among the younger ( $< 50$ ) age group. Additionally, the high-cost and high-spoilage rates of F&V deterred many participants from consuming F&V on a daily basis. Darmon *et al.* (Darmon *et al.*, 2002), Pollard *et al.* (Pollard *et al.*, 2002), Dibsall *et al.* (Dibsall *et al.*, 2002) findings are consistent with the present study emphasizing that the high cost of F&V is an impediment to sufficient consumption. Additional barriers common to all ethnicities were the convenience of purchasing pre-packaged foods and the adverse impact

of the media on F&V intake by promoting ‘fast-food’. These results are consistent with the literature (French *et al.*, 2001; Katz, 2003). Moreover, the findings of the study indicate that the home food environment has a paramount effect on F&V consumption later in life. Children who grew up consuming abundant F&V at home continue this practice in adulthood. Similarly, studies by Kratt *et al.* (Kratt *et al.*, 2000) and Campbell *et al.* (Campbell *et al.*, 2007a,b) have found that the home food environment impacted what the family unit (i.e., parents, children or adolescents) ate.

Though many barriers were prevalent among all ethnic groups, others were ethnic-specific. For example, African American participants reported limited access to fresh produce which consequently inhibited their F&V intake. Numerous studies have shown that predominantly minority and racially mixed neighborhoods had significantly less supermarkets and more grocery stores than Caucasian neighborhoods, thus limiting F&V intake among low income populations (Zenk *et al.*, 2005; Algert *et al.*, 2006; Moore and Diez Roux, 2006). African American participants saw their church communities as a good setting for health education, yet the nutritional practices at gatherings consisted of foods rich in saturated fats. The African American church community has been previously explored as a setting for health behavior interventions (Campbell *et al.*, 2000; Resnicow *et al.*, 2001, 2005; Ammerman *et al.*, 2003). The cultural influence of the church should be utilized in future interventions to further promote a process of positive dietary change among its members. Additionally, African American participants discussed the role primary care physicians play in facilitating behavioral change. Specific interventions should be tailored utilizing the primary care physicians’ impact to increase this populations’ F&V consumption.

Hispanic focus group participants, mostly immigrants, noted the negative effects of the US culture on their health: a busy and stressful work environment, persuasive and prevalent advertising for unhealthy foods and a reduction in the quality coupled with an increase in the price of fresh F&V. Therefore, there is a need to improve the availability and access to fresh F&V that are commonly available in the native countries of Hispanic immigrants. Consistent with the findings of the present study,

Larsen *et al.* (Larsen *et al.*, 2003) found that second generation American Hispanics' F&V consumption is significantly lower than first generation American Hispanics, in part because of TV-viewing and poor dietary habits acquired in the USA.

The risk of developing lifestyle-related chronic diseases among most focus group participants of the younger generation did not appear to be a strong motivator for dietary change. Diseases were perceived as events that might occur later in life; hence many younger participants did not consider a low intake of F&V a health threat. The combination of low perceived threat and low perceived benefit coupled with high perceived barriers (e.g., high cost of V&F), as conceptualized by the Health Belief Model (Janz and Becker, 1984), could explain why younger participants in this study did not think eating more F&V was a priority for them now. Therefore, a combination of strategies aimed at enhancing individual awareness (Cues to Action) of the health benefits of F&V consumption together with increasing self-efficacy and decreasing perceived barriers might have a positive impact on the younger segment of the population.

There are limitations to this study. The Spanish-speaking groups were likely to have different ethnic origins across region as most Hispanics in North Carolina were from Mexico or other Central/South American countries, whereas most Hispanics in Connecticut were from Puerto Rico or Dominican Republic. Our study contained two focus groups from each study site, and may have insufficient variability to draw in-depth comparisons between the many different Hispanic groups in the USA. Furthermore, Hispanic groups were divided by acculturation status rather than by age. This made the direct comparisons of findings among Hispanic, Caucasian and African American difficult. Additionally, it is possible that some of the questions in the focus groups guide might have led participants to conceive of perceived barriers and facilitators to F&V consumption they would not have otherwise thought of.

## FUNDING

This study was funded by a grant from the Centers for Disease Control and Prevention (CDC), grant number U48-CCU115802.

This CDC funded study is a joint collaboration between the Yale Prevention Research Center and the Center for Health Promotion and Disease Prevention of the University of North Carolina at Chapel Hill (UNC).

## ACKNOWLEDGMENTS

We acknowledge the important contribution of the following expert panellists to this project: Ms Mary Adams (Connecticut Department of Health), Dr Desiree Backman (California Department of Health Services, Public Health Institute), Ms Diane Beth (Physical Activity and Nutrition Branch, North Carolina Division of Public Health), Dr Kelly Brownell (Yale University), Dr Marci Campbell (University of North Carolina-Chapel Hill), Ms Melinda Colindres (University of North Carolina-Chapel Hill), Dr Isobel Contento (Columbia University), Dr Alan Kristal (Fred Hutchinson Cancer Research Center), Dr Susan Mayne (Yale University), Dr Kim Pham (Yale University), Dr Peter Salovey (Yale University) and Dr Carmen Samuel-Hodge (University of North Carolina-Chapel Hill). Additionally, we thank focus group participants both in North Carolina and in Connecticut for participating in this study.

## REFERENCES

- Algert, S. J., Agrawal, A. and Lewis, D. S. (2006) Disparities in access to fresh produce in low income neighborhoods in Los Angeles. *American Journal of Preventive Medicine*, **30**, 365–370.
- Ammerman, A., Corbie-Smith, G., Marie, D., St George, D.M., Washington, C., Weathers, B., *et al.* (2003) Research expectations among African American church leaders in the PRAISE! Project: a randomized trial guided by Community Based Participatory Research. *American Journal of Public Health*, **93**, 1720–1727.
- Baranowski, T. and Stables, G. (2000) Process evaluations of the 5-a-day projects. *Health Education and Behavior*, **27**, 157–166.
- Bazzano, L. (2006) The high cost of not consuming fruits and vegetables. *Journal of American Dietetic Association*, **106**, 1364–1368.
- Beaglehole, R. and Yach, D. (2003) Globalisation and the prevention and control of non-communicable disease: the neglected chronic disease of adults. *Lancet*, **362**, 903–908.
- Campbell, M. K., Reynolds, K. D., Havas, S., Curry, S., Bishop, D., Nicklas, T., *et al.* (1999) Stages of change for increasing fruit and vegetable consumption among adults and young adults participating in the National

- 5-a-day for Better Health Community Studies. *Health Education and Behavior*, **26**, 513–534.
- Campbell, M. K., Motsinger, B. M., Ingram, A., Jewell, D., Makarushka, C., Beatty, B., et al. (2000) The North Carolina Black Churches United for Better Health Project: intervention and process evaluation. *Health Education and Behavior*, **27**, 241–253.
- Campbell, K. J., Crawford, D. A. and Hesketh, K. D. (2007a) Australian parents' views on their 5-6- year-old children's food choices. *Health Promotion International*, **22**, 11–18.
- Campbell, K. J., Crawford, D. A., Salmon, J., Carver, A., Garnett, S. P. and Baur, L. A. (2007b) Associations between the home food environment and obesity-promoting eating behaviors in adolescence. *Obesity*, **15**, 719–730.
- Casagrande, S. S., Wang, Y., Anderson, C. and Gary, T. L. (2007) Have Americans increased their fruit and vegetable intake? The trends between 1988 and 2002. *American Journal of Preventive Medicine*, **32**. Doi: 10.1016/j.amepre.2006.12.002.
- Cullen, K. W., Baranowski, T., Owens, E., Marsh, T., Rittenberry, L. and de Moor, C. (2003) Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children's dietary behavior. *Health Education and Behavior*, **10**, 615–626.
- Darmon, N., Ferguson, E. L. and Briend, A. (2002) A cost constraint alone has adverse effects on food selection and nutrient density: an analysis of human diets by linear regression. *The Journal of Nutrition*, **132**, 3764–3771.
- Dibsdall, L. A., Lambert, N., Bobbin, R. F. and Frewer, L. J. (2002) Low income consumers' attitudes and behavior towards access, availability and motivation to eat fruit and vegetables. *Public Health Nutrition*, **6**, 159–168.
- Feldeisen, S. E. and Tucker, K. L. (2007) Nutritional strategies in the prevention and treatment of metabolic syndrome. *Applied Physiology, Nutrition, and Metabolism*, **32**, 46–60.
- French, S. A., Story, M. and Jeffery, R. W. (2001) Environmental influences on eating and physical activity. *Annual Review of Public Health*, **22**, 309–335.
- Guenther, P. M., Dodd, K. W., Reedy, J. and Krebs-Smith, S. M. (2006) Most Americans eat much less than recommended amounts of fruits and vegetables. *Journal of American Dietetic Association*, **106**, 1364–1368.
- Havas, S., Anliker, J., Greenberg, D., Block, G., Block, T., Blik, C., et al. (2000) Final results of the Maryland WIC Food for Life program. *Preventive Medicine*, **37**, 406–416.
- Hill, L., Casswell, S., Maskill, C., Jones, S. and Wyllie, A. (1998) Fruit and vegetables as adolescents food choices in New Zealand. *Health Promotion International*, **13**, 55–65.
- Hodge, A. M., English, D. R., O'dea, K. and Giles, G. G. (2007) Dietary pattern and diabetes incidence in the Melbourne Collaborative Cohort Study. *American Journal of Epidemiology*, **165**, 603–610.
- Ickes, S. B., Yeh, M. C., Ammerman, A. S., Farris, R., Katz, D. L. and Lowenstein, L. M. (2005) *Cultural and age related determinants of fruit and vegetable intake in a tri-ethnic population*. American Public Health Association 133rd Annual Meeting, Philadelphia, PA. December 10–14.
- Janz, N. K. and Becker, N. H. (1984) The Belief Model: a decade later. *Health Education and Behavior*, **11**, 1–47.
- Katz, D. L. (2003) Pandemic obesity and the contagion of nutritional nonsense. *Public Health Review*, **31**, 33–44.
- Kratt, P., Reynolds, K. and Shewchuk, R. (2000) The role of availability as a moderator of family fruit and vegetable consumption. *Health Education and Behavior*, **27**, 471–482.
- Langenberg, P., Ballesteros, M., Feldman, R., Damron, D., Anliker, J. and Havas, S. (2000) Psychosocial factors and intervention-associated changes in those factors as correlated of change in fruit and vegetable consumption in the Maryland WIC 5-a-day promotion program. *Annals of Behavioral Medicine*, **22**, 307–315.
- Larsen, P. G., Harris, K. M., Ward, D. S. and Popkin, B. M. Acculturation and overweight-related behaviors among Hispanic immigrant to US: the National Longitudinal Study of Adolescent Health. *Social Science and Medicine*, **57**, 2023–2034.
- Larson, N. I., Neumark-Sztainer, D., Hannan, P.J. and Story, M. (2007) Trends in adolescent fruit and vegetable consumption, 1999–2004: Project EAT. *American Journal of Preventive Medicine*, **32**. doi:10.1016/j.amepre.2006.10.011.
- Lee, J. E., Giovannucci, E., Smith-Warner, S. A., Spiegelman, D., Willet, W. C. and Curhan, G. C. (2006) Intakes of fruits, vegetables, vitamin A, C, and E, and carotenoids and risk of renal cell cancer. *Cancer Epidemiology Biomarkers and Prevention*, **15**, 2445–2452.
- Marcus, A. C., Heimendinger, J., Wolfe, P., Rimer, B. K., Morra, M., Cox, D., et al. (1998) Increasing fruit and vegetable consumption among caller to the CIS: results from a randomized control trial. *Preventive Medicine*, **27**, S16–S28.
- Marcus, A. C., Heimendinger, J., Wolfe, P., Fairclough, D., Rimer, B. K., Morra, M., et al. (2001) A randomized control trial of a brief intervention to increase fruit and vegetable intake: a replication study among callers to the CIS. *Preventive Medicine*, **33**, 204–216.
- Moore, L. V. and Diez Roux, A. V. (2006) Associations of neighborhood characteristics with the location and type of food stores. *American Journal of Public Health*, **96**, 325–331.
- Pollard, J., Kirk, S. F. L. and Cade, J. E. (2002) Factors affecting food choice in relation to fruit and vegetable intake: a review. *Nutrition Research Reviews*, **15**, 373–387.
- Pomerleau, J., Lock, K., Knai, C. and McKee, M. (2005) Interventions designed to increase adult fruit and vegetable intake can be effective: a systematic review of the literature. *The Journal of Nutrition*, **135**, 2486–2495.
- Pope, C., Ziebland, S. and Mays, N. (2000) Analysing qualitative data. *British Medical Journal*, **320**, 114–116.
- QSR NVivo. (2000) Qualitative Data Analysis Program. QSR International Pty Ltd, Melbourne, Australia.
- Resnicow, K., Jackson, A., Wang, T., De, A. K., McCarty, F., Dudley, W. N., et al. (2001) A motivational interviewing intervention to increase fruit and vegetable intake through black churches: Results of the Eat for Life Trial. *American Journal of Public Health*, **91**, 1686–1693.
- Resnicow, K., Taylor, R., Baskin, M. and McCarty, F. (2005) Results of go girls: a weight control program for

- overweight African-American adolescent females. *Obesity Research*, **13**, 1739–1748.
- Serdula, M. K., Gillespie, C., Kettel-Khan, L., Farris, R., Seymour, J. and Denny, C. (2004) Trends in fruit and vegetable consumption among adults in the United States: Behavioral Risk Factor Surveillance System, 1994–2000. *American Journal of Public Health*, **94**, 1014–1018.
- Siega-Riz, A. and Popkin, B. (2001) Dietary trends among low socioeconomic status women of childbearing age in the United States from 1977 to 1996: a comparison among ethnic groups. *Journal of the American Medical Women's Association*, **56**, 44–48, 72.
- United States Department of Health and Human Services. (2000) *USDA Home and Garden Bulletin No.232. Dietary Guidelines for Americans*. 5th edition, Washington, D.C. (2) USDA, ARS. Data Tables: Results from USDA's 1994-96 Continuing Survey of Food Intakes by Individuals and 1994-96 Diet and Health Survey. Beltsville Human Nutrition Research Center, Riverdale, MD, 1997.
- Vitolins, M. Z., Tooze, J. A., Golden, S. L., Arcury, T. A., Bell, R. A., Davis, C., *et al.* (2007) Older adults in the rural South are not meeting healthful eating guidelines. *Journal of the American Dietetic Association*, **107**, 265–272.
- Zenk, S. N., Schulz, A. J., Hollis-Neely, T., Campbell, R. T., Holmes, N., Watkins, G., *et al.* (2005) Fruit and vegetable intake in African Americans: income and store characteristics. *American Journal of Preventive Medicine*, **29**, 1–9.