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**Combating Cardiovascular Disease: How North Carolina  
Policymakers Can Change Human Health Behavior**

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## EXECUTIVE SUMMARY

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Cardiovascular disease (CVD) kills more people in the United States than any other cause or non-communicable disease, and North Carolina exhibits higher-than-average CVD mortality rates as a southern state in the “stroke buckle.” However, the population can prevent CVD through healthy behaviors related to diet and physical activity. NC policymakers can influence these human health behaviors and reduce the prevalence of CVD in the state through three primary channels: campaign interventions, food and soda taxes, and environment and infrastructure changes. After conducting research across nine case studies, three within each category, and interviewing NC health policy experts, I synthesized the lessons learned and best practices from both sources and developed a policy recommendation for the state.

### *Policy Recommendation:*

North Carolina policymakers should execute a campaign intervention and enforce new environment and infrastructure policies to begin changing population norms about health. The campaign intervention should focus on a single, simple message, communicated through multiple media outlets. Campaign leaders should also partner with local faith leaders to increase legitimacy in church communities across NC. Simultaneously with the campaign intervention, policymakers should alter state environment and infrastructure by changing zoning laws, WIC and food stamp programs, and increasing access to free public transportation. In the long-term, policymakers should implement a soda and junk food tax once the state’s cultural and political climates have evolved and allow for more radical changes.

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## **CHAPTER I: INTRODUCTION**

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### **1.1 Research Question**

What lessons can North Carolina policymakers learn from international and national case studies concerning an effective health policy approach to change human health behavior in NC and decrease the prevalence of cardiovascular diseases in the state?

### **1.2 Cardiovascular Disease in North Carolina**

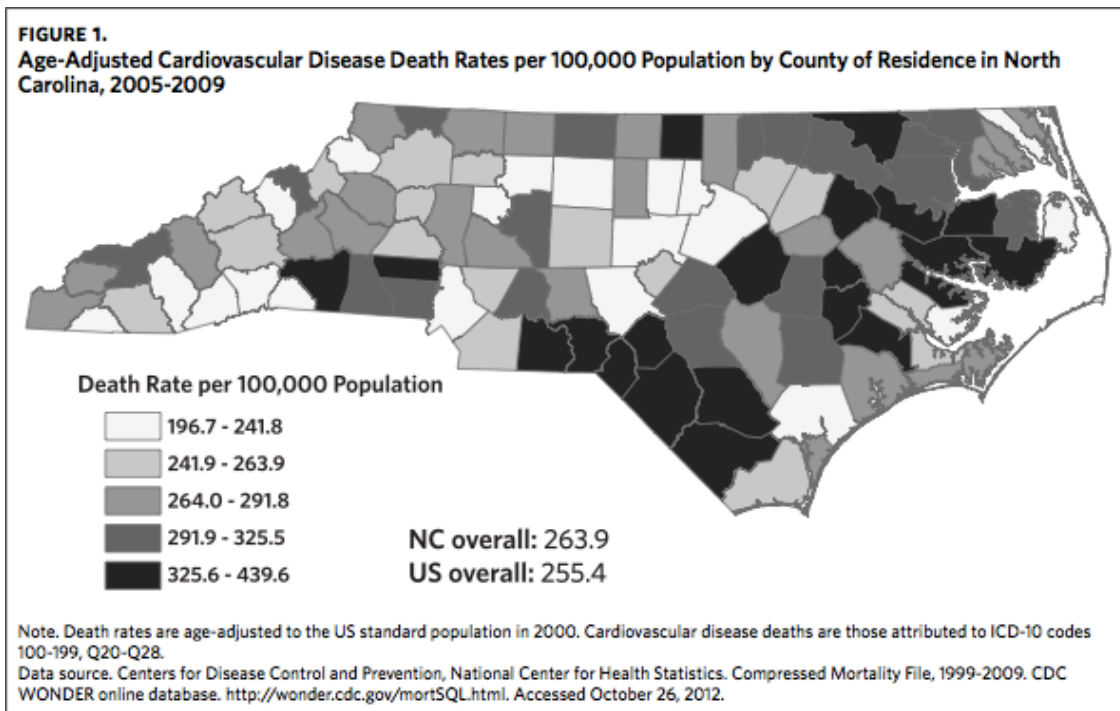
Cardiovascular diseases (CVD) cause a quarter of all deaths in the U.S. every year, making chronic CVD the leading cause of mortality across the country. (Center for Disease Control 2014) CVD refers to a class of diseases involving the heart and blood vessels, including coronary heart disease and stroke. These deaths can be prevented through individual health behavior changes – improving diet and exercise have proven effective in preventing heart attacks, strokes, and related illnesses. Preventing CVD not only improves individuals' health but also provides healthcare cost savings of over \$108.9 billion annually. (Center for Disease Control 2014) Policy can influence human health behaviors and work to prevent the individual and state-level consequences of CVD.

Nestled in the “stroke belt” of Southeastern states, NC demonstrates CVD morbidity and mortality rates slightly higher than national averages. Researchers dubbed North Carolina, South Carolina, and Georgia the central “stroke buckle” within the link of “stroke belt” states as a result of the states' unusually high rates of heart disease and stroke. These states share three characteristics that may cause higher rates of CVD. First, the SE states have a large rural population. Rural areas tend to lack easy access to healthcare and healthy food sources, resulting in poor health and higher risk for CVD. Second, these states have higher unemployment rates and lower minimum wages than other states in the U.S. Similar

to obstacles caused by rural living situations, lower socioeconomic populations encounter more challenges when seeking out regular healthcare and healthy food options, especially as fast food places offer cheaper and faster food alternatives. Finally, the southern traditions ingrained into these states' cultures involve fried and fatty foods – a diet that contributes to high CVD rates. (Howard et al 1997, Go et al 2014)

For NC, these risk factors of the “stroke buckle” result in an additional \$4.5 billion hospital costs alone – a high fiscal and health cost for the state. Eastern NC exhibits the highest rates of CVD deaths, correlating to the concentration of the majority of the NC's rural population.

As cardiovascular disease causes the most deaths on a national and state level, health officials search for effective initiatives to change human health habits and behavior to save populations from a preventable disease. NC policies must prioritize the state's population health, develop programs to permanently change individuals' diets and health behavior, and as a result lower CVD mortality rates.



*North Carolina's number of CVD-related deaths is higher than the national average. Rural Eastern counties in NC have the highest mortality rates, leading researchers to conclude that rural populations are at higher risk for CVD.*

## **Chapter II: METHODOLOGY**

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### **2.1 Case Study Selection**

Literature on changing community health behaviors categorizes initiatives into three broad classifications: campaign interventions, soda and junk food taxes, and environment and infrastructure. (Active Living By Design, Borut 2011) These categories are not mutually exclusive and collectively exhaustive, but they provide a general structure and understanding when researching health initiatives on a global scale.

Within each category, I examined three case studies—one from the U.S. and two from other countries—for a total of nine case studies. I identified my initial case studies through discussions with professors and found case studies within the same categories through citations and references within the initial articles. Within each category, I chose case



studies from diverse regions of the world in order to have a more varied sample. While I have been as comprehensive as possible in selecting the most prominent and major projects within each category, a self-selecting bias may exist due to my case study selection methods. However, a bias does not undermine the lessons drawn from each study, and therefore these methods should not negatively impact my conclusions. I will now walk through my process for selecting the case studies within each category.

For the campaign intervention category, I learned about the North Karelia Project from Professor Siri Teller in my Health Beyond Borders class while abroad in Copenhagen. Her lecture was on non-communicable diseases in Scandinavia. When completing my initial research on NKP, the project director Pekka Puska referenced the Stanford Three-City Project in Northern California in his original report on NKP, demonstrating his research's international impact. Then I researched the Stanford project in American health journals. After developing an understanding of the initiative and reading about its expansion into five cities in 1985, I chose the Stanford Five-City Project as my national case study within the campaign category. After fulfilling two of the three case studies for the campaign interventions category, I researched the World Health Organization, knowing that WHO is the most prominent global health organization. On their website, I found information about its Countrywide Integrated Non-communicable Diseases Intervention (CINDI), a collaborative intervention that coordinates countries' programs combating NCDs. Currently 33 countries participate in the CINDI network, but I selected Canada's specific CINDI-related initiative, called the Alberta Healthy Living Network project (AHLN). I chose Canada as my third and final campaign intervention case study because the country's social and political context most closely mirrors that of the U.S., especially with the recent

implementation of Obamacare, so I could easily translate a Canadian health program into a U.S. context.

For the soda tax category, I was familiar with ex-New York Mayor Michael Bloomberg's attempts at implementing a soda tax through news sources. Next, I learned about the Mexican soda tax from discussions with my thesis advisor, Professor Whetten. Therefore, I identified the Bloomberg and Mexican soda taxes as my national and international case studies within the tax category early in the research process. When reading Basham and Luik's "Kicking the Soda Can" article discussing soda tax in the U.S., they referenced a Danish tax study. Smed et al's study led me to conduct general research about soda taxes in Denmark, and I learned that Denmark actually had the first-ever soda tax in 1930 and just eliminated this tax last year, so I selected the Danish soda tax my third soda tax case study.

For the environment and infrastructure category, I learned about the Neighborhood Quality of Life Study (NQLS) in the U.S. during a discussion with Perry Foley about her obesity prevention research with the Duke Global Health Institute. Dr. James F. Sallis PhD leads NQLS. I researched his work further on his personal website and found publications associated with a larger umbrella initiative called the International Physical Activity and the Environment Network (IPEN), which includes similar studies from multiple countries. IPEN is an umbrella network for all studies conducting environment and infrastructure related health research in the same way CINDI is an umbrella network for all studies conducting campaign intervention health research. From the IPEN studies all over the world, I chose the Belgium study to represent Europe and the PLACE study to represent Australia. Although all studies are a part of the IPEN network, they have different locations, scopes, and focuses while using the same metrics and methods, so each provided a unique

perspective on health policy related to environment and infrastructure while allowing me to compare results and techniques across different cultures.

	<b>International case study</b>	<b>International case study</b>	<b>National case study</b>
<b>Campaigns</b>	North Karelia Project	Alberta Healthy Living Network (Canada)	Stanford Five-City Project
<b>Taxes</b>	Mexican soda tax (2014 – present)	Danish soda tax (1930 – 2014)	Soda tax attempts in U.S. (Bloomberg)
<b>Infrastructure</b>	Australia PLACE Study	Belgium IPEN study	Neighborhood Quality of Life Study (U.S.)

## 2.2 Case Study Research and Sources

Focusing on the qualitative lessons learned from the case studies, I did not generate or collect specific quantitative data. Some of the articles included data showing the change in blood pressure, cholesterol levels, or CVD mortality rates, and that information was taken into account when evaluating a specific program’s efficacy.

I used medical and health journals as my primary source for data and information. I chose journals based on relevance to cardiovascular disease, Impact Factor ratings, and general reputation. The following journals were used for research: The Lancet, British Medical Journal, American Journal of Public Health, Journal of the American Heart Association, and American Journal of Epidemiology. I also used news articles to research soda taxes, especially the recent soda tax passed in Mexico, including the following news sources for research: Bloomberg News, Forbes, NBC News, The New York Times, POLITICO, and The Wall Street Journal.

Once I collected all of my sources for a case study, I read through them consecutively, focusing on the study’s methods and takeaways in the conclusion. I created

two Word documents for each case study – one for general notes on each reading, and one for a list of general lessons learned across multiple articles. The general notes sheet served as a reference for each source’s opinions and description of the study, while the lessons learned notes allowed me to draw connections between the different articles and understand which takeaways were common throughout the literature. The next three sections outline the examples of specific sources I used for each case study category.

### 2.2.1 Campaign Intervention Sources

- Journals
  - American Journal of Public Health
  - BioMed Central Health Services Research
  - British Medical Journal
  - Health Promotion Practice
  - Preventing Chronic Disease

### 2.2.2 Soda and Junk Food Tax Sources

- Journals
  - The New England Journal of Medicine
  - University of Copenhagen, Institute of Food and Resource Economics
  - Washington Legal Foundation
- Newspapers
  - Bloomberg News
  - Copenhagen Post
  - The Economist
  - New York Times
  - Wall Street Journal
- Websites
  - Ameribev.org
  - Bloomberg.com

### 2.2.3 Environment and Infrastructure Sources

- Journals
  - American Journal of Preventative Medicine
  - Health & Place
  - International Journal of Behavioral Nutrition and Physical Activity

- International Society of Behavioral Medicine
- Social Science & Medicine
- Websites
  - Ipenproject.org

## 2.3 Feasibility Interviews

After developing an initial health policy recommendation for North Carolina based on the lessons learned from my case study research, I conducted interviews with Duke professors and researchers as well as state-level individuals. These individuals have a better understanding of NC's political, cultural, and health context based on their academic and political experience in the state. Therefore, they shedded light on policy feasibility. In the interviews, I sought to gain a better understanding of three things:

- 1) Based on my initial policy recommendation and lessons learned, which policies are feasible in North Carolina at this point in time?
- 2) What would these high level ideas tangibly look like in NC - what *specific* campaigns, taxes, and/or environment changes would be feasible in the state?
- 3) What would a more specific, final health policy look like in NC?

### 2.3.1 Interviewee Selection

I selected my initial interviewees after a conversation with Professor Whetten about which professors and researchers at Duke have insight into NC health policy. I contacted these individuals as a foundation for my interviews, and then during each interview, I asked them for recommendations of other people to interview. Through networking with my initial interviewees, I was able to gain access to other individuals who have knowledge

on my topic and gain a deeper understanding of a feasible health policy for NC. Below is a list of the people interviewed and the date of their interview.

<b>Interviewee</b>	<b>Title</b>	<b>Interview Date</b>
Beth Stringfield	Project Coordinator, Center for Health Policy and Inequalities Research (Duke)	10/30/14
Heather Parnell	Research Project Manager, Center for Health Policy and Inequalities Research (Duke)	10/30/14
Kristen Sullivan	Research Scholar, Center for Healthy Policy and Inequalities Research (Duke)	10/31/14
Perry Foley	Associate Director, Global Digital Health Science Center (Duke)	10/31/14
Robert Korstad	Professor of Public Policy Studies and History (Duke)	11/3/14
Phil Bors	Senior Project Officer, Active Living By Design	11/3/14
Dori Steinberg	Research Scholar, Global Health Institute (Duke)	11/4/14
Donald Taylor	Associate Professor of Public Policy Studies (Duke)	11/4/14
Kelly Brownell	Dean of Sanford School of Public Policy (Duke)	11/5/14
Gabriela Zabala	Program Manager, N.C. Department of Health and Human Services	11/7/14
Heather Miranda	Director of Health Support Services, Piedmont Health Services Inc.	11/10/14
Belinda Pettiford	Branch Head, N.C. Department of Health and Human Services	11/12/14

### 2.3.2 Interview Format

For each interview, I used an interview guide complete with a background introduction and standard questions to ask during the discussion. The interview guide is included below. In addition to the guide, I used a handout outlining the three health initiative categories, the three case studies within each category, and the primary lessons learned for each category. The visual helped interviewees better understand my thesis

question, research, and purpose of our interview. The table is included below with the interview guide.

With the opinions, insight, and information from interviews, I was able to modify my initial health policy recommendation to reflect the political climate and cultural challenges in North Carolina, as well as develop a more specific recommendation.

### 2.3.3 Interview Guide and Visual

#### ***Interview Guide***

Created by: Patton Callaway

Last Updated: 10/21/14

#### *Introduction*

- Developing a health policy recommendation for state of NC with goal of decreasing prevalence of CVD by changing human health behavior
- Changing human health behavior in three possible approaches: campaign interventions, soda and junk food tax, and environment and infrastructure
- Researched case studies across all three categories and developed an initial recommendation
- BUT want a better understanding of what is feasible or realistic for NC
- Seeking your insight and opinion about what these “lessons learned” or this recommendation might look like in NC
  - Develop a more tangible recommendation

#### *General NC Context*

1. What factors cause NC to be a part of the stroke belt?
2. What are your initial reactions and thoughts about these three possible political initiatives in changing human health behavior?

#### *Lessons Learned and Tailored Policy Recommendation*

1. Going through each recommendation – what do you think this would look like specifically in NC? Regional differences? Examples?
2. Do you think these are feasible in NC?
3. Do you think these would be effective in changing NC population health?

#### *Additional Questions*

1. How would NC’s current political/government structure affect implementation of health policies?

2. Do you think a soda tax is feasible in NC with its current political context?

*Next Steps*

1. What additional information do you think I would need to understand to develop a robust recommendation?
2. Any additional resource recommendations?
3. Who else would you recommend I speak to?

Category	Case Studies	Lessons Learned and Recommendation
Campaign Interventions	<ol style="list-style-type: none"> <li>1. North Karelia Project (Finland)</li> <li>2. Alberta Healthy Living Network (Canada)</li> <li>3. Stanford Five-City Project (U.S. – California)</li> </ol>	<ul style="list-style-type: none"> <li>– Partner with local leaders to develop sustainable, community-based projects</li> <li>– Integrate programs and media into local infrastructure</li> <li>– Target the entire population with a campaign, not just the at-risk group</li> <li>– Focus on one simple message to communicate throughout campaign</li> </ul>
Soda and Junk Food Taxes	<ol style="list-style-type: none"> <li>1. Mexican soda and junk food tax (2014- - present)</li> <li>2. Danish soda tax (1930 – 2014)</li> <li>3. Bloomberg soda tax (2012)</li> </ol>	<ul style="list-style-type: none"> <li>– Soda and junk food taxes do influence population’s health behavior</li> <li>– Tax most successful when paired with a media campaign, so the population and interest groups understand motivation behind the tax</li> <li>– In the U.S., tax must overcome concentrated soda companies’ opposition and conservative tax-averse opposition</li> </ul>
Environment and Infrastructure	<ol style="list-style-type: none"> <li>1. PLACE study (Australia)</li> <li>2. IPEN study (Belgium)</li> <li>3. Neighborhood Quality of Life Study (U.S.)</li> </ol>	<ul style="list-style-type: none"> <li>– Environment changes can improve health slightly but significantly across an entire population</li> <li>– Increase street connectivity and residential density in neighborhood layout</li> <li>– Increase land mix use in zoning policies</li> <li>– Increase access to public transportation</li> <li>– Improve resident perception of neighborhood</li> </ul>



## **CHAPTER III: CASE STUDIES – CAMPAIGN INTERVENTIONS**

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I examined three campaign intervention case studies: the North Karelia Project in Finland, the Alberta Healthy Living Network in Canada, and the Sanford Five-City Project in Northern California. Literature covering these interventions demonstrated three main conclusions and lessons for future initiatives. First, researchers from all countries agreed that partnering with local leaders to create community-based projects generated the best results. Second, they recognize the efficacy in targeting everyone in the community instead of tailoring the program to target at-risk persons only. Lastly, researchers underscored the campaigns' integration of their programs, information, and resources into existing community health centers or infrastructure in order to create a sustainable change in the community. (Puska et al 1979, Farquhar et al 1985, Minke et al 2006) With these three main campaign components in mind, I will explain each case study in further detail in chronological order.

### **3.1 North Karelia Project – Finland**

#### **3.1.1 NKP History**

The North Karelia Project (NKP) was the first major initiative working to prevent chronic disease, starting in 1972 North Karelia, Finland. Director of NKP Pekka Puska shaped the program to focus on disseminating information to public through newspapers, radio, posters, and advertisements in North Karelia, as well as integrating health programs into existing health clinics. (Puska et al 1979) NKP became a model for future chronic disease prevention programs after its success in decreasing the heart disease mortality rate by 73 percent among middle-aged women and men in North Karelia. (Puska et al 2002)

#### **3.1.2 NKP Lessons Learned**

Concerning the media component of the campaign, researchers noted three effective practices in implementing a media campaign. First, they concluded that use of multiple mass media outlets was most effective. Future campaigns should utilize local media sources and develop relationships with leaders at these outlets, in order to create a sustainable campaign. (McAlister et al 1982, Puska et al 1985, Puska et al 1986) Also, mass media should target the entire population, not just groups at risk of chronic disease from unhealthy habits. Therefore, everyone can relate to the message and begin developing the proper health habits to avoid future disease. (Puska et al 1979, Puska 2009) Lastly, future campaigns should narrow focus on a simple, repeated message to maximize efficacy and understanding. (McAlister et al 1982)

For other components of the campaign, including person-to-person interactions, the NKP team recognized that their campaign was successful because of the local nature of the campaign. Campaign leaders should partner with local leaders who are already respected and have clout in local organizations. Partnerships with these leaders can increase trust of the project and its purpose, as well as create sustainable change management in the community. (McAlister et al 1982, Puska et al 1986, Puska 2002, Puska 2009) Programs should be integrated into existing infrastructure, from health clinics and hospitals to churches and recreation centers.

## **3.2 Stanford Five-City Project – United States**

### **3.2.1 Stanford Project History**

Following the initial success of NKP, the Stanford Five-City Project adopted the general model in Northern California in 1978. The project focused solely on a media campaign, distributing information through local newspaper, radio, television, and

advertisement outlets. The campaign included educational programs in schools as well. The Stanford project compared the intervention cities to control cities in the area, proving the significant effects the campaign had on community smoking habits and general health. The campaign demonstrated that increasing knowledge and information through local media outlets could make health risk behaviors a priority in legislator's agenda and influence policy. (Farquhar et al 1977, Farquhar et all 1985, Schooler et all 1996)

### 3.2.2 Stanford Project Lessons Learned

The Stanford Five-City project concluded with findings similar to NKP, proving that the NKP model can be successfully translated into a U.S. context. The project leaders highlighted two takeaways that overlapped. Like NKP, the Stanford Project targeted the entire community instead of a specific, at-risk group. Also, the Stanford project emphasized the importance of a single simple message, communicated through multiple modes of media. The project's main message was "quit smoking," backed by further details about the negative health implications of smoking. Data demonstrated that mass media could lead to significant changes in dietary knowledge and practice, especially when the message includes examples of behavior change. (Stern et al 1976) Populations in intervention cities showed a decline in blood pressure, smoking prevalence by 27 percent, and less weight gain than the populations in control cities. (Fortmann et al 1990, Fortmann et al 1993, Taylor et al 1991) The project concluded that increasing knowledge could change behavior over an extended period of time, using the best practices from NKP adapted for the local cultures and communities.

## **3.3 Alberta Healthy Living Network – Canada**

### 3.3.1 AHLN History

Alberta Healthy Living Network was developed in Canada's Alberta province as the Canadian arm of the World Health Organization's Countrywide Integrated Non-communicable Diseases Intervention in 2003 as an international, collaborative initiative against chronic disease. Canada's CINDI program manifested in AHLN, a successful chronic disease initiative. (Stachenko 2003)

### 3.3.2 AHLN Lessons Learned

With the goal of connecting leaders in all sectors related to human health behavior, AHLN reiterated many of the lessons learned from NKP and the Stanford Five-City Project. Mainly, AHLN aimed to integrate and collaborate on approaches to preventing chronic disease with local leaders and institutions. Studies completed years after AHLN began all addressed the same three components crucial to the program's success: local leadership, policy advocacy, and enhancement of existing infrastructure. (Felix et al 2003, Dressendorfer 2004, Minke 2006)

### **3.4 Campaign Intervention Case Studies Lessons Learned**

NKP served as the first example of a health intervention fighting heart disease, and Stanford Five-City followed as an American pilot of the same project. The Canadian AHLN initiative allows for comparison to campaign feasibility in the U.S. as well based on similar populations and political climate. Understanding the similarities and differences between each case study context allows for a better understanding for an effective campaign in North Carolina.

Across all three case studies, researchers recommend three major components of a successful campaign intervention. First, each initiative emphasized the importance of partnering with local leaders to develop sustainable, community-based projects,

integrating the programs into existing infrastructure. Also, the campaigns appealed to the entire population instead of targeting the at-risk group alone. Finally, the campaigns focused on a simple message to communicate throughout the campaign, ensuring audience reception and understanding of the health message.

## **CHAPTER IV: CASE STUDIES – SODA AND JUNK FOOD TAXES**

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Within the soda tax category, I researched three case studies closely: the abolished soda tax in Denmark, Mayor Michael Bloomberg's soda tax in New York City, and the new junk food and soda tax in Mexico. Soda taxes can have a small but widespread impact across the entire nation, eliminating a root cause of obesity and cardiovascular disease in the U.S. The decrease in sugar and caloric intake can have major implications for overall population health, prevalence of chronic disease, and reduced healthcare costs as a result. Politicians and other interest groups must collaborate to combat soda industry opposition and successfully implement a national policy. I will begin with a discussion of the Danish soda tax, followed by an analysis of the Bloomberg soda tax and Mexican taxes in chronological order.

### **4.1 Danish Soda Tax**

#### **4.1.1 Danish Tax History**

Denmark was the first legislative state that enforced a soda tax, beginning in the 1930s and just repealed in January this year. The law imposed a 1.64 Danish krone tax (approximately 28 U.S. cents) per liter of sugary soft drink. The Danish tax serves as an example of the longer-term risks and benefits of implementing a soda tax. Research and literature on the topic addressed four primary benefits of the tax as well as a major negative consequence.

#### 4.1.2 Danish Tax Benefits and Consequences

The Danish tax was successful in achieving its primary objectives: decreasing population soda consumption and driving government revenue. Concerning human health behavior, analysis revealed that the tax decreased the consumption of saturated fats by ten to 20 percent, changing consumer behavior for the long term. (Jensen and Smed 2013, Smed et al 2007, Smed 2011) In addition, Danes increased consumption of diet beverages while decreasing consumption of more expensive sugary drinks. Even grocery stores and soda distributors began changing their behavior as consumer demand shifted – they adjusted their price scheme, marketing strategy, and product diversity with the goal of offering healthier alternatives to caloric sugary drinks. (Jensen and Smed 2013) From an economic perspective, the tax also generated significant revenue for the Danish government. (Adam 2012, Smed et al 2007, Smed 2011)

The tax had several adverse, unexpected affects on the economy however, leading to the tax's appeal in 2014. As a result of the tax, people were crossing the Danish-German border to purchase untaxed soda, negatively impacting border employment. (Scott-Thomas 2013) The Danish government cited economic concerns when explaining the appeal of the tax this year.

#### 4.1.3 Danish Tax Lessons Learned

Reflecting on the Danish tax policy, implementation, benefits, and appeal, researchers drew a similar conclusion and lesson learned from the pilot policy – soda taxes should be implemented in conjunction with a campaign intervention. A campaign allows citizens to better understand the purpose of the tax, eliciting a more positive reaction from the population. If the Danish government had educated the population about the

motivation behind the tax, then individuals may have made more dramatic changes to their health choices and not crossed the border, avoiding damage to the Danish economy. A Danish study using economic models showed minimal effects of the tax alone, recommending a tax implementation in conjunction with increased availability of nutritional information. (Smed et al 2005) Similar taxes in the future should occur simultaneously with a campaign – the synergies between the two approaches would maximize the population’s health education as well as their long-term health habits and outcomes.

## **4.2 Bloomberg Soda Tax**

### **4.2.1 U.S. Soda Tax History**

Before discussing the Bloomberg soda tax in detail, it is important to understand the history of soda taxes in the U.S. Over the past several decades, soda and junk food taxes have become a political issue in multiple states outside of New York. Thirty-three American states have had a sales tax on soda in the past, but states’ proposals for excise tax increases on sugary beverages have been shut down. (Park 2012) Kelly Brownell, Dean of the Sanford School of Public Policy, introduced the idea of a soda tax in the U.S. in 1994, arguing that this “sin tax” would reduce obesity and chronic disease and generate government revenue for other health initiatives. (Brownell, Farley et al 2009, Brownell, Frieden et al 2009) Both articles claimed that people are manipulated by soda advertisements and make their decisions based on imperfect information. Opponents of soda tax emphasized the lack of research linking increases in soda price to a change in consumer behavior, or even linking soda consumption to the obesity epidemic. (Basham and Luik 2010) Brownell rebuffed this claim by acknowledging the lack of knowledge

about any public health intervention's effects until the intervention is complete. The 20-year CARDIA study conducted in the U.S. from 1985 to 2005 did find a significant correlation between soda price and consumption. (Duffey et al 2010) Soda tax adversaries also argued that the tax would inequitably burden the poor and threaten individual autonomy. (Basham and Luik 2010) Both Brownell articles claimed the opposite, that people with low socioeconomic status would benefit the most from a tax because they currently carry the largest burden of obesity-related disease.

#### 4.2.2 Bloomberg Soda Tax History

New York Mayor Michael Bloomberg created a limit on soft drink size for New York City in 2012, prohibiting the sale of sweetened drinks larger than 16 ounces. The New York City's Board of Health voted in favor of the limit, but New York Supreme Court invalidated the law. Bloomberg appealed and went to court with the support of the Department of Health, but the New York Court of Appeals shut down the law in 2014, claiming that the law was beyond the Board of Health's scope of power. (Park 2012, Malkin 2013) Bloomberg's soda limit sets an example as the most ambitious and progressive soda tax in the U.S. to date. Other states can learn lessons and best practices from Bloomberg's example in order to successfully implement a similar policy.

#### 4.2.3. Bloomberg Soda Tax Lessons Learned

Researchers drew two main conclusions from the Bloomberg tax. First, they drew a similar conclusion to Danish tax researchers –a health tax is more effective and better understood by the population if partnered with a media campaign. Bloomberg launched an anti-soda campaign that included ads showing individuals drinking fat instead of soda. These advertisements explained to the New York population why he supported the soda



limit and that he has their best interests in mind. Although the tax was unsuccessful politically, the soda tax was generally supported and accepted by the population at large.

Second, Bloomberg realized politicians and advocates must find the resources and support to combat aggressive, wealthy beverage companies. The American Beverage Association (ABA) spent over \$25 million lobbying against the proposed New York soda tax in 2009 and 2010 alone. Bloomberg's soda tax passed in September 2012 but was then invalidated by the New York Supreme Court after ABA's aggressive campaigning. Some believe that the Mexican soda tax will re-spark the U.S. soda tax debate, especially with Bloomberg's involvement in the Mexican initiative. (Wood 2013)

### **4.3 Mexican Soda and Junk Food Tax**

#### **4.3.1 Mexican Tax History**

In October 2013, Mexico approved an excise tax of one peso per liter of sugary beverages and a five percent sales tax on junk food to combat its status as the world's most obese country. (Barquera et al 2008) Unlike Mayor Bloomberg, President Enrique Peña Nieto had a successful population-based information campaign as well as a successful political endeavor. The Mexican tax serves as an example for future politicians to study and better understand how to persuade a population and a government to implement a soda tax.

#### **4.3.2 Mexican Tax Lessons Learned**

President Nieto's success was rooted in his ability to combat population and soda industry backlash with data analysis and emotional appeal. From a data perspective, Nieto was able to overcome the concentrated soda industry by conducting proper economic analyses with researchers. They found that the economic benefit of reducing non-

communicable disease and CVD morbidity and mortality outweighed the projected costs of to the country's economy. Articles covering the tax noted the Mexican government's success in overcoming opposition from Coca-Cola FEMSA, the largest Coke bottler in the world based in Mexico, stigma against ex-New York City Mayor Michael Bloomberg's involvement in the initiative and controversy over soda as the core of the obesity issue in Mexico. (Wood 2013, Malkin 2013)

From a persuasive emotional perspective, the President emphasized and made clear to the Mexican population that the government was putting long-term population health ahead of short-term consequences. (Boothroyd 2013) He set an example for future countries' policies concerning food taxes by letting the population understand the reasoning behind the policy. Although the tax's full impact on reducing obesity has yet to be recorded, there has already been a rise in sales of zero-calorie beverages, a process indicator of the tax's success. (Martin and Cattan 2013)

#### **4.4 Tax Case Studies Lessons Learned**

Across the three case studies discussed, North Carolina politicians should understand two major takeaways. First, the literature covering the taxes across all three countries agreed that a soda or junk food tax is most likely to be politically and tangibly successful when paired with a media campaign. The Danish tax lacked a campaign, which may have caused its eventual demise. The Bloomberg tax persuaded the population opinion with its media campaign but could not persuade the soda industry. The Mexican tax serves as an example of the most effective campaign that persuaded both the population and the appropriate interest groups, including the soda industry. A tax campaign within NC should

address concerns based on the population's more conservative political views, tailoring messages to target and persuade individuals.

The second major takeaway crucial to understanding the tools of a successful tax in NC lies in an understanding of the cultural differences between Denmark, New York, Mexico, and North Carolina. Based on my experience studying abroad in Copenhagen, Denmark has a larger and more liberal government that the Danish population trusts when paying high taxes annually. Therefore, Danes were likely more receptive to a health tax since they were accustomed high taxes. In the U.S., citizens tend to be more conservative and tax-adverse, creating an additional obstacle for any health tax. New York is a more liberal state than North Carolina, based on historical context and past election results. Therefore, creating a new tax in NC would prove to be more difficult than Bloomberg's attempt in New York. Because North Carolina is traditionally more conservative than both Denmark and New York, NC politicians should follow President Nieto's approach in Mexico, since the obesity epidemic and prevalence of CVD have reached similarly alarming levels both in Mexico and in the NC population as a part of the "stroke buckle" in the U.S. North Carolinian politicians should conduct the proper data and cost benefit analysis in order to persuade both the population and the soda industry to change their health behaviors and adopt a soda tax.

## **CHAPTER V: CASE STUDIES – ENVIRONMENT AND INFRASTRUCTURE**

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Increasing evidence shows a strong association between a neighborhood's environment and the physical activity (PA) or prevalence of obesity in a neighborhood. To investigate these claims further, I examined three case studies: the Belgian Environmental Physical Activity Study (BEPAS), the Physical Activity in Localities and Community

Environments (PLACE) study in Australia, and the Neighborhood Quality of Life Study (NQLS) in the U.S. Literature across all three studies found that four primary changes in environment can improve health outcomes for the community. Comparing neighborhood layout and structure, the studies found three strong, positive associations between a neighborhood's street connectivity, residential density, and land use mix with the community's health outcomes. (Badland et al 2009, Saelens et al 2003, Van Dyck et al 2009) These findings conclude that neighborhoods with many intersections (street connectivity), multiple people living in houses or apartment-style buildings (residential density), and neighborhoods with a mix of houses and access to local destinations have better health outcomes. In addition, researchers found that easy access to public transportation increases walkability and improves population health. (Cole et al 2010, Lachapelle et al 2011) With these four conclusions in mind, I will explain each case study in further detail in chronological order of when the study took place, beginning with the NQLS study in the U.S.

## **5.1 Neighborhood Quality of Life Study – United States**

### **5.1.1 NQLS Methods**

The NQLS study aimed to understand the association between environmental variables and physical activity. Between 2001 and 2005, researchers tracked metrics in sixteen neighborhoods in Washington and sixteen neighborhoods in Maryland based on walkability. Led by James Sallis, Professor of Psychology at San Diego State University, the teams used Geographic Information System databases to objectively measure the environment while tracking individual physical activity levels.

### **5.1.2 NQLS Findings**

After four years of research, the study concluded that three main characteristics influenced the walkability of a neighborhood, in turn influencing the population's overall health. The data showed that residents in more walkable neighborhoods had significantly more low-intensity physical activity and lower prevalence of obesity. (Saelens et al 2003, Adams et al 2011, Frank et al 2007, Sallis 2008, Sallis et al 2009, Sallis and Kerr 2006) More walkable neighborhoods shared three common characteristics –street connectivity, residential density, and land use mix diversity. Looking at street connectivity, researchers found that neighborhoods with higher street connectivity were organized in a grid structure, allowing easy and safe walking between houses and locations. Neighborhoods with higher numbers of cul-de-sacs were associated with residents who spent less time doing low-impact PA, resulting in more negative health outcomes. Literature defined residential density as the number of individuals living within a certain area, and the research showed that populations in sparse, rural areas tended to rely on car transportation and did not engage in daily PA as often. Finally, researchers recommended an increase in land use mix, meaning incorporating local destinations such as shopping centers into or close to neighborhoods, allowing residents to walk instead of taking another form of transportation.

### 5.1.3 NQLS Lessons Learned

In addition to their specific recommendations listed above, NQLS research leaders developed initial recommendations for using their data and findings. They noted that partnerships across disciplines and business sectors must collaborate in order to effectively change and shape neighborhoods to foster healthy living. Changing permanent environments, infrastructure, and neighborhoods will require collaboration between

politicians, zoning officials, local communities and leaders, as well as companies and businesses.

Changing an environment has small but widespread and long-term benefits for an entire community. (Saelens et al 2003, Frank et al 2010, Sallis 2008, Sallis and Kerr 2006) Collaboration across disciplines will begin the transformation, altering neighborhood layout, density, distance to local destinations, and access to public transportation. (Saelens et al 2003, Latent profile, Frank et al 2007, Saelens et al 2003)

## **5.2 Physical Activity in Localities and Community Environments Study – Australia**

### **5.2.1 PLACE Methods**

The PLACE study was conducted in Adelaide, South Australia from 2003 to 2004, comparing the physical activity levels of residents in high-walkable areas to residents in low-walkable areas. PLACE was a part of the International Physical Activity and the Environment Network (IPEN), a collaborative effort between twelve participating countries to pool data using similar methodology. Neville Owen, Professor of Health Behaviour at the University of Queensland, led the study.

Similar to NQLS, the PLACE study defined a highly walkable neighborhood as a neighborhood with high street connectivity, residential density, and land use mix. Street connectivity indicates grid-organized streets; residential density refers to the number of individuals living within a certain area; and land use mix designates areas with residential and retail or commercial destinations within walking distance.

### **5.2.2 PLACE Findings**

The PLACE study found similar data in Australia as the NQLS study found in the U.S. The data demonstrated that residents in more walkable neighborhoods had higher activity

levels than residents in neighborhoods with lower walkability. (Leslie et al 2005, Owen et al 2004) On a more granular level, PLACE researchers discovered three significant factors that made a neighborhood more walkable and were associated with increased activity levels. PLACE elaborated on NQLS findings, agreeing that increased street connectivity, residential density, land use mix, and public transportation affect residential PA. The PLACE study took these findings a step further and found an additional health factor – residents with higher neighborhood satisfaction, based on perception of aesthetics and safety, demonstrated better mental and physical health. (Cole et al 2010, Leslie et al 2005, Van Dyck et al 2011)

### 5.2.3 PLACE Lessons Learned

The PLACE study affirmed the NQLS study findings, supporting evidence of specific characteristics of walkability that significantly improve resident physical activity. PLACE researchers concluded that increasing walkability of neighborhoods in city planning as well as improving neighborhood aesthetics and land use mix can improve residents' physical activity. Similar to NQLS, they recognized that such changes require a collaborative effort across private and public sectors to change policy and implement changes. (Cerin and Leslie 2008)

## **5.3 Belgian Environment Physical Activity Study (BEPAS) – Belgium**

### 5.3.1 BEPAS Methods

BEPAS focused on the relationship between physical activity (PA) and neighborhood environment and was conducted in Belgium from May 2007 to September 2008, led by Ilse De Bourdeauhuij, Faculty of Medicine and Health Sciences at Ghent University in Belgium. Like the PLACE study four years earlier, the study was a branch of the International

Physical Activity and the Environment Network (IPEN). Studying 24 neighborhoods and 1,200 participants in Ghent, Belgium, BEPAS utilized Geographic Information System databases to measure neighborhood metrics and accelerometers to measure physical activity.

### 5.3.2 BEPAS Findings

BEPAS reached similar conclusions as its two predecessor studies about two significant factors of walkability, as well as finding additional evidence for PLACE's conclusions about residents' perceptions of their neighborhood. Providing further evidence supporting NQLS and PLACE findings, BEPAS also discovered a strong positive association between a neighborhood's walkability and its residents' amount of daily physical activity. (Van Dyck 2009) Similar to the study's predecessors, research in Belgium concluded accessibility to local destinations and public transportation embedded into a neighborhood's infrastructure increased the average daily time spent walking or engaging in low intensity physical activity. (De Bourdeaudhuff et al 2003, Van Dyck 2013) Looking at accessibility to local destinations, BEPAS found that residents who lived in neighborhoods with multiple destinations within a ten-minute walking distance had a significant increase in low intensity PA and decrease in motorized transport. (Van Dyck et al 2012, Van Dyck 2013)

In understanding the implications of public transportation, BEPAS found that Belgian children who lived in suburban areas had more PA weekly than kids in urban areas as a result of biking longer distances to school or utilizing public transportation, which required walking to the bus stop. (Van Dyck et al 2009) The study provides data



demonstrating the positive impact of a neighborhood's infrastructure on resident physical activity and overall health.

BEPAS expanded research beyond the scope of NQLS and elaborated on PLACE's findings, discovering a strong association between individuals' perception of their environment and communities' physical activity in Belgium. Individuals with positive neighborhood perception who viewed their community as a pleasant, safe environment demonstrated higher PA. (De Bourdeaudhuij et al 2003, Kerr et al 2013, Van Dyck et al 2011, Van Dyck et al 2013) Therefore, small alterations to neighborhoods that improve the community's perception can have positive implications for community health as well. In addition, researchers found that environment changes mainly had an impact on walking or low intensity PA, not high intensity PA. Individuals who exercised on a regular basis did not vary their habits based on neighborhood characteristics.

### 5.3.3 BEPAS Lessons Learned

BEPAS reiterated the other studies' recommendations for moving forward with changes to infrastructure. Lead researchers noted that altering infrastructure is a long-term project requiring large capital investments and collaboration between politicians, zoning officials, architects, local leaders, and residents. However, the positive impact improves all resident's quality of life and health – significant, long-term outcomes for an entire community. (Cerin et al 2013, De Bourdeaudhuij et al 2003, Kerr et al 2013, Sallis 2011)

### **5.4 Environment and Infrastructure Case Studies Lessons Learned**

All three studies found a significant association between a neighborhood's walkability and its residents' amount of low intensity physical activity – more walkable

neighborhoods had more active residents, resulting in better health outcomes. Each study focused on low intensity PA instead of high intensity PA because an individual's number of minutes spent doing low intensity PA can be changed by altering his or her environment. Changing an environment can change residents' daily habits, integrating more PA and activity into their regular activities.

Specifically, the three case studies agreed that street connectivity, residential density, land use mix, and access to public transportation were the neighborhood characteristics that most influenced residents' PA. Therefore, the researchers encourage politicians and leaders across different sectors to work together to change neighborhood environments to reflect these findings. An ideal walkable neighborhood would include grid organization of streets, high density so houses are within walking distance, mixed land use between residential and commercial destinations, and easy access to public transportation to minimize reliance on cars. PLACE and BEPAS found an additional factor and argue that residents' perception of their neighborhood's walkability also influences PA. Therefore, politicians should investigate factors that their residents consider important within their neighborhood. Many of these factors may already be addressed above.

Beyond the granular factors associated with walkability, all three studies emphasized the importance of interdisciplinary collaboration between different leaders and interest groups. Their conclusion aligns with the campaign case studies from Chapter II. Clearly interdisciplinary cooperation will be the key to any successful and sustainable health intervention, regardless of category or country.

## **CHAPTER VI: NORTH CAROLINA POLICY RECOMMENDATION**

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### **6.1 Initial Policy Recommendation**

Based on the lessons learned from each case study across three categories, I developed an initial recommendation, taking into account North Carolina's cultural and political context. NC politicians should implement a campaign in conjunction with efforts to improve environment and infrastructure of neighborhoods across the state. While a soda or junk food tax would have positive effects for population health, NC's conservative representation and population would not likely allow for such a progressive tax, and therefore all funds and efforts should be channeled into a campaign and infrastructure project instead.

The campaign should adopt the three best practices drawn from North Karelia Project, Stanford Five-City Project, and the Alberta Health Living Network. The campaign should utilize all media outlets across the state, from local newspapers, radio stations, and advertisement venues to statewide initiatives. Also, the campaign should integrate programs into existing health institutions, incorporating improved practices and metrics into routine check ups and health care providers. Finally, campaign leaders should partner with local leaders in different cities and towns in NC in order to establish trust and sustainable change. To be most effective, the campaign should send a simple, repeated message through these multiple media outlets, teaching healthy behavioral skills while providing a general health education.

Altering neighborhood structure for residents across the state will require collaboration across sectors – between zoning officials, politicians, local private businesses, retail stores, as well as the local community. Working together, these individuals can

effectively implement the five best practices from the three case studies – BEPAS Belgium, PLACE in Australia, and NQLS in the U.S. Policies should seek to change zoning laws and allow residential areas to have alternative land uses as well, increasing the number of destinations for residents. Also, the zoning laws should map out neighborhoods in a grid-pattern, since the case studies showed that this layout increased walkability. Third, the state government should increase access to different modes of public transportation and reduce auto dependence, even in rural areas. Finally, laws should increase the number of sidewalks and parks to increase the positive perception of neighborhoods. The combination of increased land use mix, increase in public transportation, layout, and aesthetics will increase walkability of neighborhoods and improve population health as a result. The combination of a statewide campaign intervention and environment and infrastructure change would be the most effective in improving the health outcomes of the North Carolina population.

## **6.2 Interview Findings and Analysis**

After twelve interviews with three Duke professors, five Duke researchers, and four field experts, common themes began emerging from their responses. In each interview, I walked through the “lessons learned” category by category and asked for interviewees’ initial reactions, how feasible these initiatives are for North Carolina, and what these initiatives might tangibly or specifically look like in the state. Their feedback on each “lessons learned” across all health initiatives is included below.

### **6.2.1 Campaign Interventions – Interview Analysis**

Across all of the interviews, three common themes emerged concerning campaign interventions. First, the interviewees agreed that creating a community-based,

participatory initiative is most effective and sustainable for a campaign intervention. They emphasized the importance of capitalizing on local leaders and infrastructure to make a real impact on the community. Second, the research interviewees universally suggested faith leaders as a powerful local leader to partner with in North Carolina specifically. In rural NC communities, churches play a central role in individuals' daily lives, and therefore the pastors are highly respected and regarded in the community, making them an ideal partner in a health initiative. Third, the interviewees were in agreement that targeting an entire population instead of at-risk individuals is crucial to avoid stigmatization of unhealthy individuals.

Interviewees also raised several concerns about these initiatives in NC. Many noted the difficulty of launching an effective campaign in a primarily rural state – it is harder to reach more people through the same channels. Heather Miranda, Director of Health Support Services at Piedmont Health Services Inc, acknowledged the obstacle her organization has faced in NC: “People don’t have continual exposure to campaign messages in rural areas, so you have to keep the message going.” Perry Foley, Associate Director at Duke Global Digital Health Science Center, addressed a potential solution to this issue from a geographic standpoint: “In North Carolina, tiny towns act as geographic clusters, so a campaign could tap into these pockets and let the information disseminate.”

The table below exhibits specific recommendations suggested by interviewees for each lesson learned within the campaign intervention category.

<b>Lesson Learned</b>	<b>Feasibility and Examples in NC</b>
Partner with local leaders	<ul style="list-style-type: none"> <li>- Faith leaders (Foley, Miranda, Steinberg)</li> <li>- Untraditional leaders within community health clinics, respected leaders in medical community (Foley)</li> <li>- Statewide leader as face of campaign (Sullivan)</li> <li>- Partner with NC medical community (Korstad)</li> <li>- Work with local sports leaders (Stringfield)</li> </ul>
Integrate program into local infrastructure	<ul style="list-style-type: none"> <li>- Health clinics (Steinberg)</li> <li>- Schools, easier to prevent unhealthy behaviors in children than change behavior in adults (Miranda, Sullivan)</li> <li>- YMCAs (Steinberg)</li> </ul>
Target entire population	<ul style="list-style-type: none"> <li>- Text messaging for daily reminders, technology-based interventions (Steinberg)</li> <li>- Concentrate in central “towns” that disseminate to rural areas (Foley)</li> <li>- Entire population to avoid stigmatization (Korstad, Stringfield, Taylor)</li> <li>- Hard to not target entire population, almost unavoidable (Parnell)</li> <li>- Tailor campaign message and format to different areas/counties (Miranda)</li> </ul>
Focus on one simple message	<ul style="list-style-type: none"> <li>- “Don't drink your calories” (Miranda, Steinberg)</li> <li>- “Maintain, don't gain” (Foley)</li> <li>- “Eat healthy” (Stringfield)</li> <li>- “Eat Smart, Move More” (Miranda)</li> </ul>
Other	<ul style="list-style-type: none"> <li>- Different strategies in small towns versus cities (Stringfield)</li> <li>- Sometimes good to start with focus pilot group and then expand focus (Zabala)</li> </ul>

### 6.2.2 Soda and Junk Food Taxes – Interview Analysis

Throughout the interviews, it became evident that a soda or junk food tax may not be an effective use resources based on the state’s current political climate. The interviewees emphasized the need for a change in the dialogue around soda and junk food

– they often drew parallels between soda and tobacco as addictive, harmful substances.

Miranda emphasized this point:

We need to villainize junk food and soda industry enough to make their products considered bad, because right now the definition of a snack in the American population is junk food. But until this state turns blue, it would be very difficult to pass a junk food or soda tax because people don't like to be told what they should or shouldn't do.

Instead of channeling funding and resources into a soda or junk food tax campaign, interviewees suggested alternative methods to improve population diet. Foley addressed the need for alternatives: “We are trying to change decisions at a micro level, at the point of purchase when decisions are made. How can we make the healthier alternatives more attractive to a population?” Interviewees’ suggestions are included in the table below.

<b>Lesson Learned</b>	<b>Feasibility and Examples in NC</b>
Overcome conservative constituents and soda/junk food industry	<ul style="list-style-type: none"> <li>- Need a norm change like tobacco (Steinberg)</li> <li>- Need an organized, focused effort by a committed, well-funded interest group (Sullivan)</li> <li>- Anticipate both supporting and opposed interest groups (Korstad)</li> <li>- Frame as “sin tax” to appeal to Bible belt population (Korstad)</li> </ul>
Other	<ul style="list-style-type: none"> <li>- Hard to prove direct link, many factors and only have observational research (Steinberg)</li> <li>- Increasing farmers markets (Foley, Stringfield)</li> <li>- With food especially, need to present alternatives (Foley, Stringfield, Sullivan)</li> <li>- Opposition to paternalistic or “nanny state” laws (Foley, Steinberg, Stringfield)</li> <li>- Change policies to guide decisions with WIC/food stamp programs (Foley, Miranda, Stringfield)</li> <li>- Work with fast food industry to develop healthier options (Korstad)</li> <li>- Add positive spin to tax by funneling money to education, etc (Parnell)</li> </ul>

### 6.2.3 Environment and Infrastructure – Interview Analysis

While the interviewees acknowledge the difficulties in making infrastructural changes to rural areas, they agreed that two of the “lessons learned” could improve the existing and future environments across the state. First, they agreed that changing zoning laws to allow for mixed land use would improve population ability to walk to local destinations. Combining residential and commercial areas would reduce dependence on

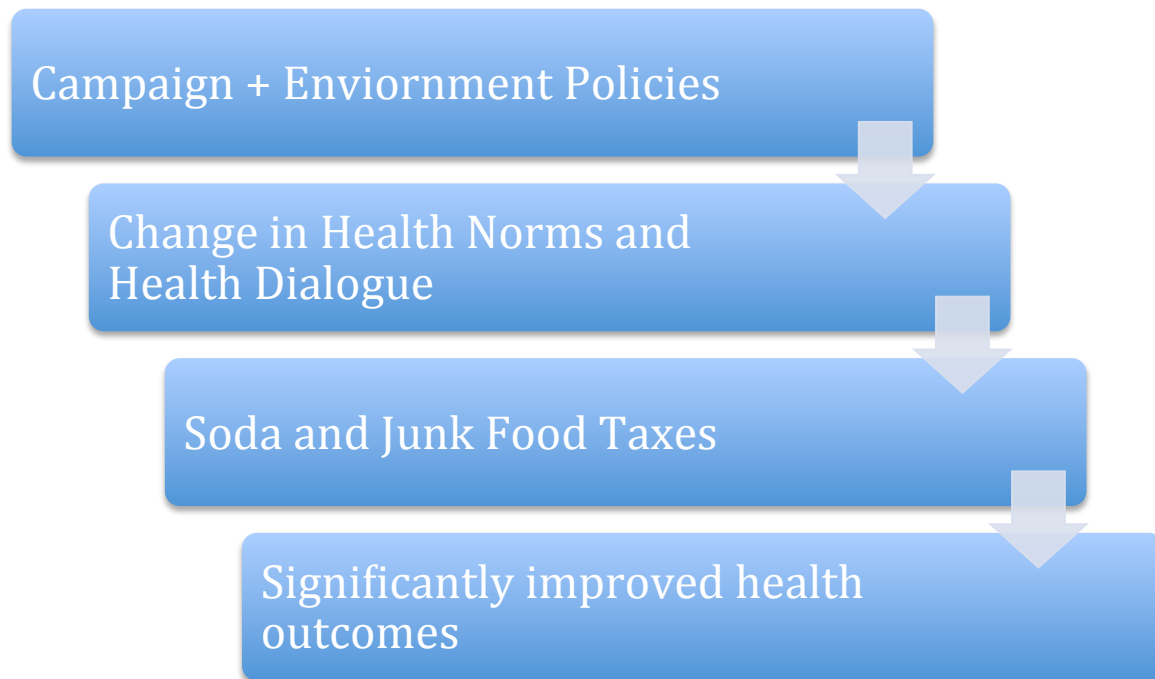


driving for transportation. Beth Stringfield, Project Coordinator at the Center for Health Policy and Inequalities Research, noted a recent surge in these types of living communities. “Durham is a prime example of the revitalization of ‘downtowns.’ People see the value of having a local pharmacy, bookstore, grocery market, and so on, and as a result those types of units are being constructed as they respond to consumer demand.” In addition, the interviewees concluded that increasing access to public transportation would also improve population health by reducing dependence on cars and allowing people to walk to bus stops and to their final destinations. The table below includes other recommendations that arose during interviews.

<b>Lesson Learned</b>	<b>Feasibility and Examples in NC</b>
Increase land use mix	<ul style="list-style-type: none"> <li>- Increasing number of mixed use neighborhoods, “village squares” more popular (Stringfield)</li> </ul>
Increase access to public transportation	<ul style="list-style-type: none"> <li>- Free public transportation across the state as beneficial (Stringfield, Sullivan, Zabala)</li> <li>- More difficult in rural areas (Parnell)</li> </ul>
Other	<ul style="list-style-type: none"> <li>- Trigger effect with diet and then exercise (Foley)</li> <li>- Tax breaks for healthy workplaces/schools, and walkable construction initiatives (Sullivan)</li> <li>- Work with planning board to change zoning and construction laws, allow residential and commercial zoning (Korstad, Stringfield)</li> <li>- Increase in walkability in city areas (Parnell, Stringfield)</li> </ul>

### 6.3 Revised Policy Recommendation

Synthesizing the qualitative data and lessons learned from my case study research and interviews, I developed a final health policy recommendation for North Carolina. Before delving into the specific policy components, it is important to note three major themes from my research process. First, real impact on health outcomes will not result from policy changes alone – the effort must be collaborative, interdisciplinary, and approach the issue from all perspectives, not just top down. Second, although a policy will not be the single solution, it can make healthy options the easier choice for the population, having a significant influence on health outcomes. Finally, a health policy must take short-term and long-term timelines into account, adjusting for changing political and cultural shifts over time. Therefore, the policy recommendation includes a short-term and long-term plan for health policies in NC, shown below.



### 6.3.1 Immediate Action – Short-Term Policy Recommendation

My policy recommendation involves four immediate actions that will lead to long-term changes. First, NC state politicians should begin a state-wide health campaign led by a major state celebrity as the face of the campaign, with the goal of increasing health education, awareness of the severity of heart disease, and understanding of how to change health behaviors to prevent CVD. Miranda emphasized the importance of incenting healthy behaviors now: “We want to be proactive, not just reactive.” The campaign should be widespread and easily identified with a simple slogan such as “Eat Smart, Move More,” based on the pre-existing Eat Smart, Move More NC initiative. In the state’s largest cities – Charlotte, Chapel Hill, Durham, Raleigh, and Wilmington – the campaign should partner with medical leaders at the leading hospitals, universities, and medical centers to spread the word locally. In smaller towns and rural areas, campaign leaders should identify and partner with faith leaders and athletic stars in the local communities. These figures are natural leaders within rural communities as people gather in central towns for church and school, and therefore they would serve as respected and well-known leaders for spreading the health message. As the campaign initiative develops, local communities can tailor their program to their specific needs in order to better serve the population and create sustainable change.

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**“We want to be proactive,  
not just reactive.”**  
*Heather Miranda, Piedmont  
Heath Services*

Simultaneously, NC policymakers should create three new health policies that would begin to alter the state’s environment and infrastructure, improving health outcomes. First, policymakers should alter zoning policies and allow commercial and

residential infrastructure to be built in the same zones, increasing mixed land use and residents' capability of walking to local destinations. Second, policies should provide tax breaks for construction companies that build neighborhoods and towns in ways that increase walkability based the most significant "walkable characteristics" – land mix use, residential density, and neighborhood perception. Lastly, policymakers should work to increase the population's access to free public transportation, decreasing dependency on cars.

### 6.3.2 Long-Term Policy Recommendation

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**“North Carolina will almost certainly have soda taxes, but the timing will lag behind other states.”**

*Kelly Brownell, Sanford School of Public Policy*

The combination of a state-policy led campaign intervention paired with environment and infrastructure changes will spark a

health dialogue and begin to alter the population's health behavior. These two initiatives are the first steps in changing health norms in NC. Just as tobacco transformed from a social norm to a stigmatized, unhealthy behavior, so the conversation surrounding healthy diets and exercise must be re-framed from an optional lifestyle to a necessary way of life.

However, a soda or junk food tax is not feasible in the state's existing political climate:

“Until this state turns blue, it would be very difficult to pass a junk food or soda tax because people don't like to be told what they should or shouldn't do. Maybe the alternative angle is to go to people making the products to change what is going out,” Miranda said. Therefore, the initial campaign and infrastructure changes can begin the conversation and make

health a state priority, leading to an eventual norm change that would allow a soda and junk food tax to pass. Many of the experts interviewed agree that most states will implement these taxes in the future. “Public perception about the seriousness of obesity has reached a critical level. North Carolina will almost certainly have soda taxes, but the timing will lag behind other states,” said Kelly Brownell, Dean of the Sanford School of Public Policy.

In the interim, the NC government should focus on alternative fiscal incentives for the population to consume more consciously. Policymakers should change the food stamp program and supplemental nutrition program for Women, Infants, and Children (WIC) to incentivize the purchase of healthy foods by making vegetables and whole foods less expensive on the program than fast food or junk food options.

#### **6.4 Risks and Limitations**

My research had several limitations. My case study and interviewee selections were at risk for self-selection bias on the snowball sampling methods. For example, I began my campaign intervention case study research by studying the North Karelia Project, and that research led me to the Stanford Five-City Project through references and sources. For interviews, I began with several interviewees and then asked for recommendations in terms of the next people to interview. Both of these methods may result in some self-selecting bias. However, I am comfortable with my conclusions because of the common themes throughout the case studies and interviews. If my methodology was replicated, I believe the same conclusion would be reached, even if other case studies or interviewees were used for the research process.

## CHAPTER VII: BIBLIOGRAPHY

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"North Carolina: Preventing Cardiovascular Disease." Ed. Education, Society for Public Health 2010. Print.

"Heart Disease Fact Sheet." Ed. Control, Center for Disease 2012. Print.

"Health North Carolina Update." Ed. Services, North Carolina Department of Health and Human 2013. Print.

Adams, M. A., et al. "Neighborhood Environment Profiles Related to Physical Activity and Weight Status: A Latent Profile Analysis." *Prev Med* 52.5 (2011): 326-31. Print.

Alan S. Go, Dariush Mozaffarian, Veronique L. Roger, Emelia J. Benjamin, Jarett D. Berry, Michael J. Blaha, Shifan Dai, Earl S. Ford, Caroline S. Fox, Sheila Franco, Heather J. Fullerton, Cathleen Gillespie, Susan M. Hailpern, John A. Heit, Virginia J. Howard, Mark D. Huffman. "Heart Disease and Stroke Statistics--2014 Update: A Report from the American Heart Association." *American Heart Association* 129 (2014): 28-292. Print.

Alfred McAlister, Pekka Puska, Jukka Salonen, Jackko Tuomilehto, Kaj Koskela. "Theory and Action for Health Promotion: Illustrations from the North Karelia Project." *American Journal of Public Health* 72 (1982): 43-50. Print.

American Heart Association Statistics, Committee. "North Carolina State Fact Sheet." (2010). Print.

Atkinson, J. L., et al. "The Association of Neighborhood Design and Recreational Environments with Physical Activity." *Am J Health Promot* 19.4 (2005): 304-9. Print.

Bajaj, Vikas. "The Mexican Soda Tax." *The New York Times* October 18 2013. Print.

Bauman, A., and N. Owen. "Physical Activity of Adult Australians: Epidemiological Evidence and Potential Strategies for Health Gain." *J Sci Med Sport* 2.1 (1999): 30-41. Print.

Bennett, Simeon. "Soda Tax Would Have Little Impact on Weight Study Finds." *Bloomberg* December 14 2010. Print.

Bittman, Mark. "Soda: A Sin We Sip Instead of Smoke?" *The New York Times* February 13 2010. Print.

Bors, Phil. *Active Living By Design, North Carolina*. Interview by Callaway, Patton. November 3 2014.

Borut, Donald J. *Leadership for Healthy Communities: Action Strategies Toolkit*: Robert Wood Johnson Foundation, 2011. Print.

Brian E. Saelens, PhD, James F. Sallis, PhD, Jennifer B. Black, BA, and Diana Chen, BA. "Neighborhood-Based Differences in Physical Activity: An Environment Scale Evaluation." *American Journal of Public Health* 93.9 (2003): 1552-58. Print.

Brownell, Kelly. *Sanford School of Public Policy, Duke University*. Interview by Callaway, Patton. November 5 2014.

Caroline Schooler, June A. Flora and John W. Farquhar. "Moving toward Synergy: Media Supplementation in the Stanford Five-City Project." *Communication Research* 20 (1993): 587-610. Print.

Caroline Schooler, S. Shyam Sundar and June Flora. "Effects of the Stanford Five-City Project Media Advocacy Program." *Health Education & Behavior* 23.3 (1996): 346-64. Print.

Cattan, Eric Martin and Nacha. "Mexico Tackles Obesity Epidemic with Tax on Junk Food." *Bloomberg News* October 29, 2013 2013. Print.

Cerin, E., E. Leslie, and N. Owen. "Explaining Socio-Economic Status Differences in Walking for Transport: An Ecological Analysis of Individual, Social and Environmental Factors." *Soc Sci Med* 68.6 (2009): 1013-20. Print.

Cerin, E., et al. "Recreational Facilities and Leisure-Time Physical Activity: An Analysis of Moderators and Self-Efficacy as a Mediator." *Health Psychol* 27.2 Suppl (2008): S126-35. Print.

Chan, Sewell. "Soda Tax Plan Sparks a Debate." *The New York times* December 16 2008. Print.

Delfien Van Dych, Ester Cerin, Terry L Conway, Ilse De Bourdeaudhuij, Neville Owen, Jacqueline Kerr, Greet Cardon, Lawrence D Frank, Brian E Saelens, James F Sallis. "Perceived Neighborhood Environmental Attributes Associated with Adults' Leisure-Time Physical Activity: Findings from Belgium, Australia and the USA." *Health & Place* 19 (2013): 59-68. Print.

Delfien Van Dyck, Benedicte Deforche, Greet Cardon, Ilse De Bourdeaudhuij. "Neighbourhood Walkability and Its Particular Importance for Adults with a Preference for Passive Transport." *Health & Place* 15 (2009): 496-504. Print.

Delfien Van Dyck, Ester Cerin, Greet Cardon, Benedicte Deforche, James F. Sallis, Neville Owen, Ilse de Bourdeaudhuij. "Physical Activity as a Mediator of the Associations between Neighborhood Walkability and Adiposity in Belgian Adults." *Health & Place* 16 (2010): 952-60. Print.

Delfien Van Dyck, Ester Cerin, Terry L Conway, Ilse De Bourdeaudhuij, Neville Owen, Jacqueline Kerr, Greet Cardon, Lawrence D Frank, Brian E Saelens, and James F Sallis.

"Perceived Neighborhood Environmental Attributes Associated with Adults' Transport-Related Walking and Cycling: Findings from the USA, Australia, and Belgium." *International Journal of Behavioral Nutrition and Physical Activity* 9 (2012). Print.

Delfien Van Dyck, Ester Cerin, Terry L. Conway, Ilse De Bourdeaudhuij, Neville Owen, Jacqueline Kerr, Greet Cardon, Lawrence D. Frank, Brian E. Saelens, James F. Sallis. "Associations between Perceived Neighborhood Environmental Attributes and Adults' Sedentary Behavior: Findings from the USA, Australia, and Belgium." *Social Science & Medicine* 74 (2012): 1375-84. Print.

Delfien Van Dyck, Greet Cardon, Benedicte Deforche, James F. Sallis, Neville Owen, Ilse De Bourdeaudhuij. "Neighborhood SES and Walkability Are Related to Physical Activity Behavior in Belgian Adults." *Preventative Medicine* 50 (2009): 74-79. Print.

Delfien Van Dyck, Greet Cardon, Benedicte Deforche, Ilse De Bourdeaudhuij. "Lower Neighborhood Walkability and Longer Distance to School Are Related to Physical Activity in Belgian Adolescents." *Preventative Medicine* 28 (2009): 516-18. Print.

Delfien Van Dyck, Greet Cardon, Benedicte Deforche, Billie Giles-Corti, James F. Sallis, Neville Owen, Ilse De Bourdeaudhuij. "Environmental and Psychosocial Correlates of Accelerometer-Assessed and Self-Reported Physical Activity in Belgian Adults." *International Society of Behavioral Medicine* 18 (2010): 235-45. Print.

Delfien Van Dyck, MA, Greet Cardon, PhD, Benedicte Deforche, PhD, Neville Owen, PhD, James F. Sallis, PhD, Ilse De Bourdeaudhuij, PhD. "Neighborhood Walkability and Sedentary Time in Belgian Adults." *American Journal of Preventative Medicine* 39.1 (2010): 25-32. Print.

Femke De Meester, Delfien Van Dyck, Ilse De Bourdeaudhuij, Benedicte Deforche, James F. Sallis, and Greet Cardon. "Active Living Neighborhoods: Is Neighborhood Walkability a Key Element for Belgian Adolescents?" *BioMed Central Public Health* 12.7 (2012). Print.

Ferney, S. L., et al. "Randomized Trial of a Neighborhood Environment-Focused Physical Activity Website Intervention." *Prev Med* 48.2 (2009): 144-50. Print.

Foley, Perry. *Global Digital Health Science Center, Duke University*. Interview by Callaway, Patton. October 31 2014.

Fortmann, S. P., et al. "Changes in Adult Cigarette Smoking Prevalence after 5 Years of Community Health Education: The Stanford Five-City Project." *Am J Epidemiol* 137.1 (1993): 82-96. Print.

Fortmann, S. P., et al. "Effect of Long-Term Community Health Education on Blood Pressure and Hypertension Control. The Stanford Five-City Project." *Am J Epidemiol* 132.4 (1990): 629-46. Print.



Frank, L. D., et al. "The Development of a Walkability Index: Application to the Neighborhood Quality of Life Study." *Br J Sports Med* 44.13 (2010): 924-33. Print.

George Howard, PhD, Roger Anderson, PhD, Norman J. Johnson, PhD, Paul Sorlie, PhD, Gregory Russell, MS, Virginia J. Howard, MSPH. "Evaluation of Social Status as Contributing Factor to the Stroke Belt Region of the United States." American Heart Association (1997). Print.

Glanz, K., et al. "Healthy Nutrition Environments: Concepts and Measures." *Am J Health Promot* 19.5 (2005): 330-3, ii. Print.

Go, A. S., et al. "Heart Disease and Stroke Statistics--2014 Update: A Report from the American Heart Association." *Circulation* 129.3 (2014): e28-e292. Print.

"Heart Disease and Stroke Statistics--2014 Update: A Report from the American Heart Association." *Circulation* 129.3 (2014): e28-e292. Print.

Grybaum, Michael M. "Health Panel Approves Restriction on Sale of Large Sugary Drinks." *The New York Times* September 13 2012. Print.

Grynbaum, Michael M. "Soda Industry Sues to Stop a Sales Ban on Big Drinks." *The New York Times* October 12 2012. Print.

Heleen Spittaels, Charlie Foster, Jean-Michel Oppert, Harry Rutter, Pekka Oja, Michael Sjostrom, and Ilse De Bourdeaudhuij. "Assessment of Environmental Correlates of Physical Activity: Development of a European Questionnaire." *International Journal of Behavioral Nutrition and Physical Activity* 6.39 (2009). Print.

Ilse De Bourdeaudhuij, James F. Sallis, Brian E. Saelens. "Environmental Correlates of Physical Activity in a Sample of Belgian Adults." *The Science of Health Promotion* 18.1 (2003): 83-92. Print.

Jackson, C., et al. "The Capacity-Building Approach to Intervention Maintenance Implemented by the Stanford Five-City Project." *Health Educ Res* 9.3 (1994): 385-96. Print.

Jackson, C., D. E. Jatulis, and S. P. Fortmann. "The Behavioral Risk Factor Survey and the Stanford Five-City Project Survey: A Comparison of Cardiovascular Risk Behavior Estimates." *Am J Public Health* 82.3 (1992): 412-6. Print.

Jacqueline Kerr, James F. Sallis, Neville Owen, Ilse De Bourdeaudhuij, Ester Cerin, Takemi Sugiyama, Rodrigo Reis, Olga Sarmiento, Karel Fromel, Josef Mitas, Jens Troelsen, Lars Bruem Christiansen, Duncan Macfarlane, Deborah Salvo, Grant Schofield, Hannah Badland, Francisco Guillen-Grima, Ines Aguinaga-Ontoso, Rachel Davey, Adrian Bauman, Brian Saeens, Chris Riddoch, Barbara Ainsworth, Michael Pratt, Tom Schmidt, Lawrence Frank, Marc Adams, Terry Conway, Kelli Cain, Delfien Van Dyck, and Nicole Bracy. "Advancing Science and Policy through a Coordinated International Study of Physical Activity and Built

Environments: Ipen Adult Methods." *Journal of Physical Activity and Health* 10 (2013): 581-601. Print.

James F. Sallis, Lawrence D. Frank, Brian E. Saelens, M. Katherine Kraft. "Active Transportation and Physical Activity: Opportunities for Collaboration on Transportation and Public Health Research." *Elsevier* 38 (2004): 249-68. Print.

James F. Sallis, PhD and Jacqueline Kerr, PhD. "Physical Activity and the Built Environment." *Research Digest* 7.4 (2006): 1-8. Print.

Jason M. Fletcher, David Frisvold, and Nathan Tefft. "Can Soft Drink Taxes Reduce Population Weight?" *Contemporary Economic Policy* 28.1 (2010): 23-35. Print.

Jelle Van Cauwenberg, Ilse De Bourdeaudhuij, Femke De Meester, Delfien Van Dyck, Jo Salmon, Peter Clarys, Benedicte Deforche. "Relationship between the Physical Environment and Physical Activity in Older Adults: A Systematic Review." *Health & Place* 17 (2011): 458-69. Print.

John W. Farquhar, Peter D. Wood, Henry Breitrose, et al. "Community Education for Cardiovascular Health." *The Lancet* (1977): 1192-95. Print.

John W. Farquhar, Stephen P. Fortmann, Nathan Maccoby, William L. Haskell, et al. "The Stanford Five-City Project: Design and Methods." *American Journal of Epidemiology* 122.2 (1985): 323-34. Print.

Kelly D. Brownell, PhD., and Thomas R. Frieden, M.D., M.P.H. "Ounces of Prevention - the Public Policy Case for Taxes on Sugared Beverages." *The New England Journal of Medicine* 360.18 (2009): 1805-08. Print.

Kelly D. Brownell, Ph.D., Thomas Farley, M.D., M.P.H., Walter C. Willett, M.D., Dr.P.H., Barry M. Popkin, Ph.D., Frank J. Chaloupka, Ph.D, Joseph W. thompson, M.D., M.P.H., and David S.

Ludwig, M.D., Ph.D. "The Public Health and Economic Benefits of Taxing Sugar-Sweetened Beverages." *The New England Journal of Medicine* 361.16 (2009): 1599-605. Print.

Kerr, J., et al. "Active Commuting to School: Associations with Environment and Parental Concerns." *Med Sci Sports Exerc* 38.4 (2006): 787-94. Print.

Kiyah J. Duffey, PhD, Penny Gordon-Larsen, PhD, James M. Shikany, MD, David Guilkey, PhD, DAvid R Jacobs Jr., PhD, and Barry M. Popkin, PhD. "Food Price and Diet and Health Outcomes: 20 Years of the Cardia Study." *Archives of Internal Medicine* 170.5 (2010): 420-26. Print.

Koohsari, M. J., et al. "Street Connectivity and Walking for Transport: Role of Neighborhood Destinations." *Prev Med* 66 (2014): 118-22. Print.

Korstad, Robert. *Sanford School of Public Policy, Duke University*. Interview by Callaway, Patton. November 3 2014.

L Frank, J Kerr, B Saelens, J Sallis, K Glanz, J Chapman. "Food Outlet Visits, Physical Activity and Body Weight: Variations by Gender and Race-Ethnicity." *British Journal of Sports Medicine* 43 (2009): 124-31. Print.

Lauren C. Abercrombie, MPH, James F. Sallis, PhD, Terry L. Conway, PhD, Lawrence D. Frank, PhD, Brian E. Saelens, PhD, James E. Chapman, MA. "Income and Racial Disparities in Access to Public Parks and Private Recreation Facilities." *American Journal of Preventative Medicine* 34.1 (2008): 9-15. Print.

Lawrence D. Frank, James F. Sallis, Terry L. Conway, James E. Chapman, Brian E. Saelens, and William Bachman. "Many Pathways from Land Use to Health: Associations between Neighborhood Walkability and Active Transportation, Body Mass Index, and Air Quality." *Journal of the American Planning Association* 72.1 (2007): 75-87. Print.

Lindsay McLauren, Laura M. Ghali, Diane Lorenzetti, and Melanie Rock. "Out of Context? Translating Evidence from the North Karelia Project over Place and Time." *Health Education Research* 22.3 (2007): 414-24. Print.

Luik, Patrick Basham and John. "Kicking the Soda Can: Hard Truths About Soft Drink Taxes." *Washington Legal Foundation* 25.21 (2010): 1-4. Print.

"Kicking the Soda Can: Hard Truths About Soft Drink Taxes." *Legal Backgrounder* 25.21 (2010): 4. Print.

M P Stern, J W Farquhar, N McCoby and S H Russell. "Results of a Two-Year Health Education Campaign on Dietary Behavior. The Stanford Three Community Study." *Journal of the American Heart Association* 54.5 (1976): 826-33. Print.

Malkin, Elisabeth. "Mexico Takes Bloomberg-Like Swing at Soaring Obesity." *The New York Times* October 15, 2013 2013. Print.

Marc A. Adams, James F. Sallis, Jacqueline Kerr, Terry L. Conway, Brian E. Saelens, Lawrence D. Frank, Gregory J. Norman, Kelli L. Cain. "Neighborhood Environment Profiles Related to Physical Activity and Weight Status: A Latent Profile Analysis." *Preventative Medicine* 52 (2011): 326-31. Print.

Miranda, Heather. *Piedmont Health Services Inc*. Interview by Callaway, Patton. November 10 2014.

Owen, N. "Physical Activity and Population Health." *J Sci Med Sport* 9.3 (2006): 209-10. Print.

"Physical Activity and Population Health." *J Sci Med Sport* 9.3 (2006): 209-10. Print.

Owen, N., et al. "Understanding Environmental Influences on Walking; Review and Research Agenda." *Am J Prev Med* 27.1 (2004): 67-76. Print.

"Understanding Environmental Influences on Walking; Review and Research Agenda." *Am J Prev Med* 27.1 (2004): 67-76. Print.

P. Puska, K. Koskela, A. McAlister, H. Mayranen, A. Smolander, S. Moisio, L. Viri, V. Korpelinen, & E. M. Rogers. "Use of Lay Opinion Leaders to Promote Diffusion of Health Innovations in a Community Programme: Lessons Learned from the North Karelia Project." *Bulletin of the World Health Organization* 64.3 (1986): 437-46. Print.

Park, Alice. "The New York City Soda Ban, and a Brief History of Bloomberg's Nudges." *Time* May 31, 2012 2012. Print.

Parnell, Heather. *Center for Healthy Policy and Inequalities Research, Duke University*. Interview by Callaway, Patton. October 30 2014.

Pekka Puska, Aulikki Nissinen, and Jaakko Tuomilehto. "The Community-Based Strategy to Prevent Coronary Heart Disease: Conclusions from the Ten Years of the North Karelia Project." *Annual Review Public Health* 6 (1985): 147-93. Print.

Pekka Puska, Erkki Vartiainen, Tiina Laatikainen, Pekka Jousilahti, and Meri Paavola. *The North Karelia Project: From North Karelia to National Action*. Helsinki: Helsinki University Printing House, 2009. Print.

Pekka Puska, Jaakko Tuomilehto, Jukka Salonen, Liisa Neittaanmaki, Juhani Maki, Jarmo Virtamo, Aulikki Nissinen, Kaj Koskela, Tuula Takalo. "Changes in Coronary Risk Factors During Comprehensive Five-Year Community Programme to Control Cardiovascular Diseases (North Karelia Project)." *British Medical Journal* II (1979): 1173-78. Print.

Pettiford, Belinda. *North Carolina Department of Health and Human Services*. Interview by Callaway, Patton. November 12 2014.

Philip Jacobs, Arto Ohinmaa, Kamran Golmohammadi, Sandor Demeter, and Donald Schopflocher "Chronic Diseases in Alberta: Cost of Treatment and Investment in Preention." *National Library Canada* (2004): 1-59. Print.

Philip Jacobs, Arto Ohinmaa, Kamran Golmohammadi, Sandor Demeter, Donald Schopflocher and Scott Klarenbach. "Public Investment in Providing Information for Chronic Disease Prevention for Adults in Alberta." *Canadian Journal of Public Health* 97.3 (2006): 197-200. Print.

Puska, Pekka. "Successful Prevention of Non-Communicable Diseases: 25 Year Experiences with North Karelia Project in Finalnd." *Public Health Medicine* IV.1 (2002): 5-7. Print.

"The North Karelia Project: 30 Years of Successfully Preventing Chronic Disease." *Diabetes Voice* 53 (2008): 26-29. Print.

"Fat and Heart Disease: Yes We Can Make a Change - the Case of North Karelia (Finland)." *Annals of Nutrition & Metabolism* 54.1 (2009): 33-38. Print.

Rasmusson, Torben Greve and Lasse Skovby. "Economic Nutrition Policy Tools - Useful in the Challenge to Combat Obesity and Poor Nutrition?" *Danish Academy of Technical Sciences, ATV* (2007): 110. Print.

Rosenstock, Donald Klos and Irwin. "Some Lessons from the North Karelia Project." *American Journal of Public Health* 72.1 (1982): 53-54. Print.

Rovniak, L. S., et al. "Adults' Physical Activity Patterns across Life Domains: Cluster Analysis with Replication." *Health Psychol* 29.5 (2010): 496-505. Print.

Roxanne Felix, Annette Flaherty, Karen K. Lee, Leann Meronek, Ellen Murphy, and Cynthia Smith. *Alberta Healthy Living Network* 2003. Print.

Rudolph H. Dressendorfer, Kim Raine, Ronald J. Dyck, Ronald C. Plotnikoff, Ruth L. Collins-Nakai, W. Keith McLaughlin, and Kathleen Ness. "A Conceptual Model of Community Capacity Development for Health Promotion in the Alberta Heart Health Project." *Health Promotion Practice* 31.6 (2004): 31-36. Print.

S. Barquera, I. Campos and J.A. Rivera. "Mexico Attempts to Tackle Obesity: The Process, Results, Push Backs and Future Challenges." *Obesity Reviews* (2013): 69-78. Print.

Saelens, B. E., J. F. Sallis, and L. D. Frank. "Environmental Correlates of Walking and Cycling: Findings from the Transportation, Urban Design, and Planning Literatures." *Ann Behav Med* 25.2 (2003): 80-91. Print.

Sallis, J. F. "Angels in the Details: Comment on "the Relationship between Destination Proximity, Destination Mix and Physical Activity Behaviors"." *Prev Med* 46.1 (2008): 6-7. Print.

Sallis, James F. "Environmental and Policy Research on Physical Activity Is Going Global." *Japanese Association of Exercise Epidemiology* 13.2 (2011): 111-17. Print.

Sallis, J. F., et al. "Neighborhood Built Environment and Income: Examining Multiple Health Outcomes." *Soc Sci Med* 68.7 (2009): 1285-93. Print.

Scott-Thomas, Caroline. "Denmark to Scrap Decades-Old Soft Drink Tax." *foodnavigator.com* April 25, 2013 2013. Print.

Sharlene Wolbeck Minke, Cynthia Smith, Ronald C. Plotnikoff, PhD, Ernest Khalema, Kim Raine, PhD. "The Evolution of Intergrated Chronic Disease Prevention in Alberta, Canada." *Preventing Chronic Disease* 3.3 (2006): 1-12. Print.

Shea, Steven. "Community Health, Community Risks, Community Action." *American Journal of Public Health* 82.6 (1992): 785-87. Print.

Simon Barquera, Lucia Hernandez-Barrera, Maria Lizbeth Tolentino, Juan Espinosa, Shu Wen Ng, Juan A. Rivera, and Barry M. Popkin. "Energy Intake from Beverages Is Increasing Among Mexican Adolescents and Adults." *The Journal of Nutrition* (2008): 2454-61. Print.

Sinne Smed, Jorgen Dejgaard Jensen, and Sigrid Denver. "Differentiated Food Taxes as a Tool in Health and Nutrition Policy." *European Association of Agricultural Economists XI* (2005): 15. Print.

Sinne Smed, Jorgen D. Jensen, Sigrid Denver. "Socio-Economic Characteristics and the Effect of Taxation as a Health Policy Instrument." *Food Policy* 32 (2007): 624-39. Print.

Smed, Albdulfatah Sheikhibi Adam and sinne. "The Effects of Different Types of Taxes on Soft-Drink Consumption." *University of Copenhagen: Institute of Food and Resource Economics* (2012): 43. Print.

Smed, Jorgen Dejgard Jensen and Sinne. "The Danish Tax on Saturated Fat: Short Run Effects on Cnosumption and Consumer Prices of Fats." *Institute of Food and Resource Economics: University of Copenhagen* (2012): 39. Print.

Denmark's Experience on Food Taxes and Subsidies: *University of Copenhagen: Institute of Food and Resource Economics*, 2013. Print.

Smed, Sinne. *Financial Penalties on Unhealthy Foods - the "Fat Tax" in Denmark: University of Copenhagen: Institute of Food and Resource Economisc*, 2011. Print.

*Financial Penalties on Unhealthy Foods: The "Fat Tax" in Denmark. Natural Salt and Sugar Replacers Conference*. 2011. Print.

Spencer Moore, Cynthia Smith, Tammy Simpson, and Sharlene Wolbeck Minke. "The Influence of Partnership Centrality on Orgazational Perceptions of Support: A Case Study of Ahln Structure." *BioMed Central Health Services Research* 141.6 (2006): 7. Print.

Stachenko, Dr. Sylvie. Cindi: *World Health Organization*, 2003. Print.

Stanford, Henry Goldman and Duane. "NYC Mayor Bloomberg Seeks Ban on Super-Size Soft Drinks." *Bloomberg* May 31 2012. Print.

Steinberg, Dori. *Global Health Institute, Duke University*. Interview by Callaway, Patton. November 4 2014.

Stringfield, Beth. *Center for Healthy Policy and Inequalities Research, Duke University.* Interview by Callaway, Patton. October 30 2014.

Sugiyama, T., et al. "Perceived Neighbourhood Environmental Attributes Associated with Adults Recreational Walking: Ipen Adult Study in 12 Countries." *Health Place* 28 (2014): 22-30. Print.

Sugiyama, T., et al. "Initiating and Maintaining Recreational Walking: A Longitudinal Study on the Influence of Neighborhood Green Space." *Prev Med* 57.3 (2013): 178-82. Print.

Sugiyama, T., et al. "Joint Associations of Multiple Leisure-Time Sedentary Behaviours and Physical Activity with Obesity in Australian Adults." *Int J Behav Nutr Phys Act* 5 (2008): 35. Print.

Sugiyama, T., et al. "Associations of Neighbourhood Greenness with Physical and Mental Health: Do Walking, Social Coherence and Local Social Interaction Explain the Relationships?" *J Epidemiol Community Health* 62.5 (2008): e9. Print.

Sullivan, Kristen. *Center for Healthy Policy and Inequalities Research, Duke University.* Interview by Callaway, Patton. October 31 2014.

Taylor, Donald. *Sanford School of Public Policy, Duke University.* Interview by Callaway, Patton. November 4 2014.

"Physical Activity for Recreation or Exercise on Neighbourhood Streets: Associations with Perceived Environmental Attributes." *Health Place* 15.4 (2009): 1058-63. Print.

Ugo Lachapelle, Larry Frank, Brian E. Saelens, James F. Sallis, and Terry L. Conway. "Commuting by Public Transit and Physical Activity: Where You Live, Where You Work, and How You Get There." *Journal of Physical Activity and Health* 8.1 (2011): 72-82. Print.

Villegas, Paulina. "Mexico: Junk Food Tax Is Approved." *The New York Times* October 31 2013. Print.

Wagner, Edward. "The North Karelia Project: What It Tells Us About Prevention of Cardiovascular Disease." *American Journal of Public Health* 72.1 (1982): 51-53. Print.

Wood, Robert W. "Mexico's Coca-Cola Tax Beats Bloomberg's New York Big Soda Ban." *Forbes* October 29, 2013 2013. Print.

Young, D. R., et al. "Effect of Community Health Education on Physical Activity Knowledge, Attitudes, and Behavior. The Stanford Five-City Project." *Am J Epidemiol* 144.3 (1996): 264-74. Print.

Zabala, Gariela. *North Carolina Department of Health and Human Services*. Interview by Callaway, Patton. November 7 2014.