SPATIAL DISTRIBUTION AND EVIDENCE OF FACTORS CAUSING OBESITY/LIFESTYLE DISEASES FOR DISTINCT SUB-POPULATIONS

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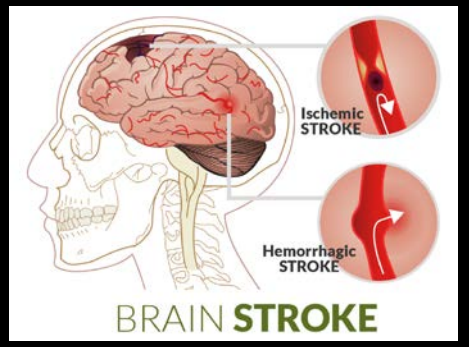
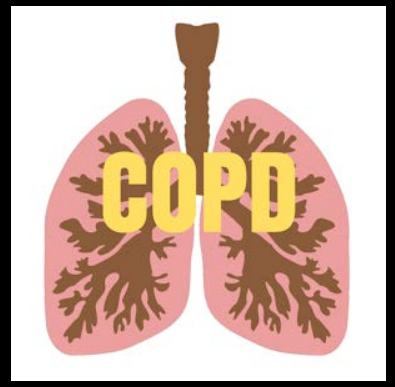
TOP CAUSES OF DEATH IN 2015

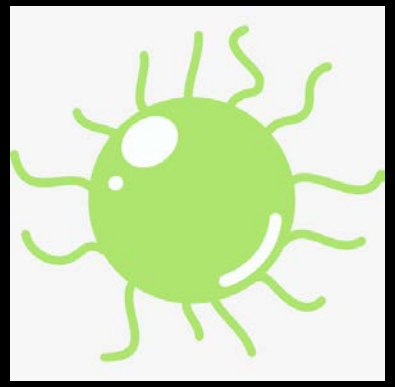
Heart Disease
8.8 million



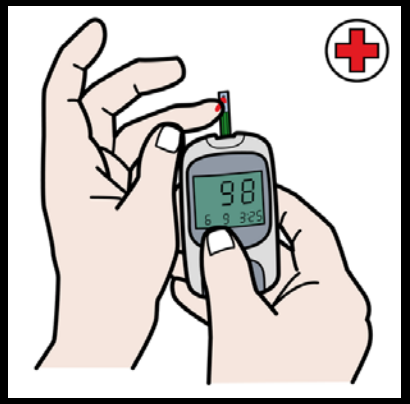
Stroke
6.2 million



COPD
3.2 million
Respiratory
Infection
3.2 million



Cancer
1.7 million

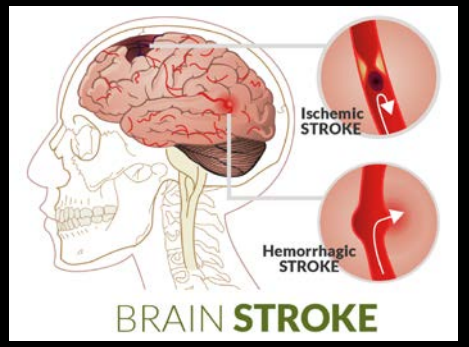


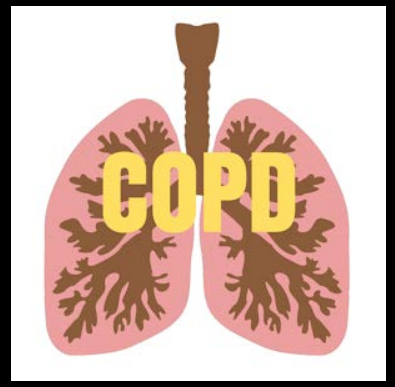
Diabetes
1.6 million

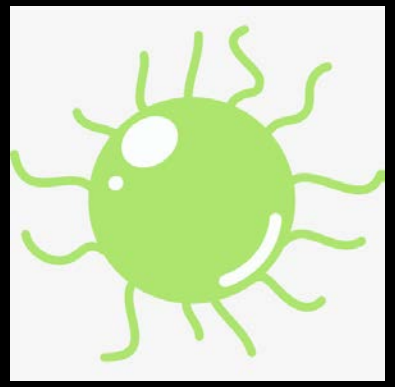
Source: World Health Organization, Factsheet: Top 10 causes of death 2015

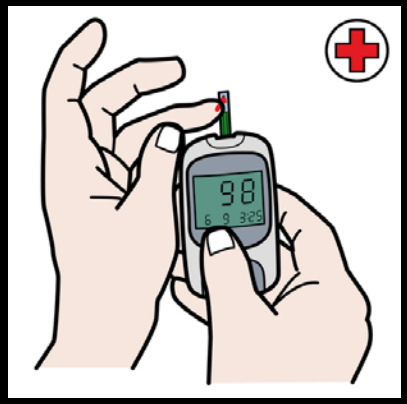
Images: https://play.google.com/store/apps/details?id=com.medallia.mobile.vf; http://www.firstaidforfree.com/what-is-a-stroke-and-who-is-at-risk/; https://www.orcha.co.uk/Review/14120/; https://pngtree.com/freepng/spheroid-cancer-cell_3500555.html; http://teenhealthmatters.org/wp-content/uploads/2016/11/diabetes-pic-3-finger-prick.png

RISK FACTORS



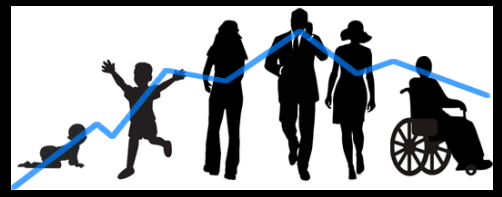






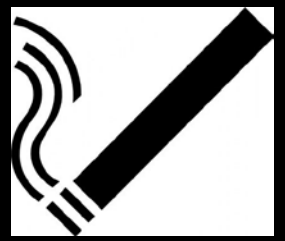
Uncontrollable

DNA



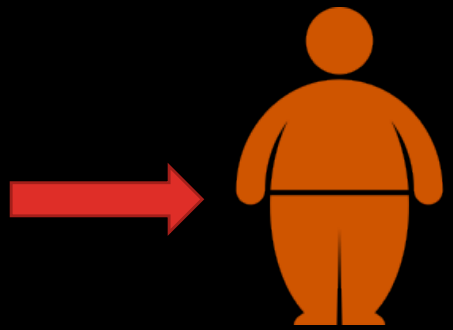
Age

Controllable



Substance Use

Physical Activity



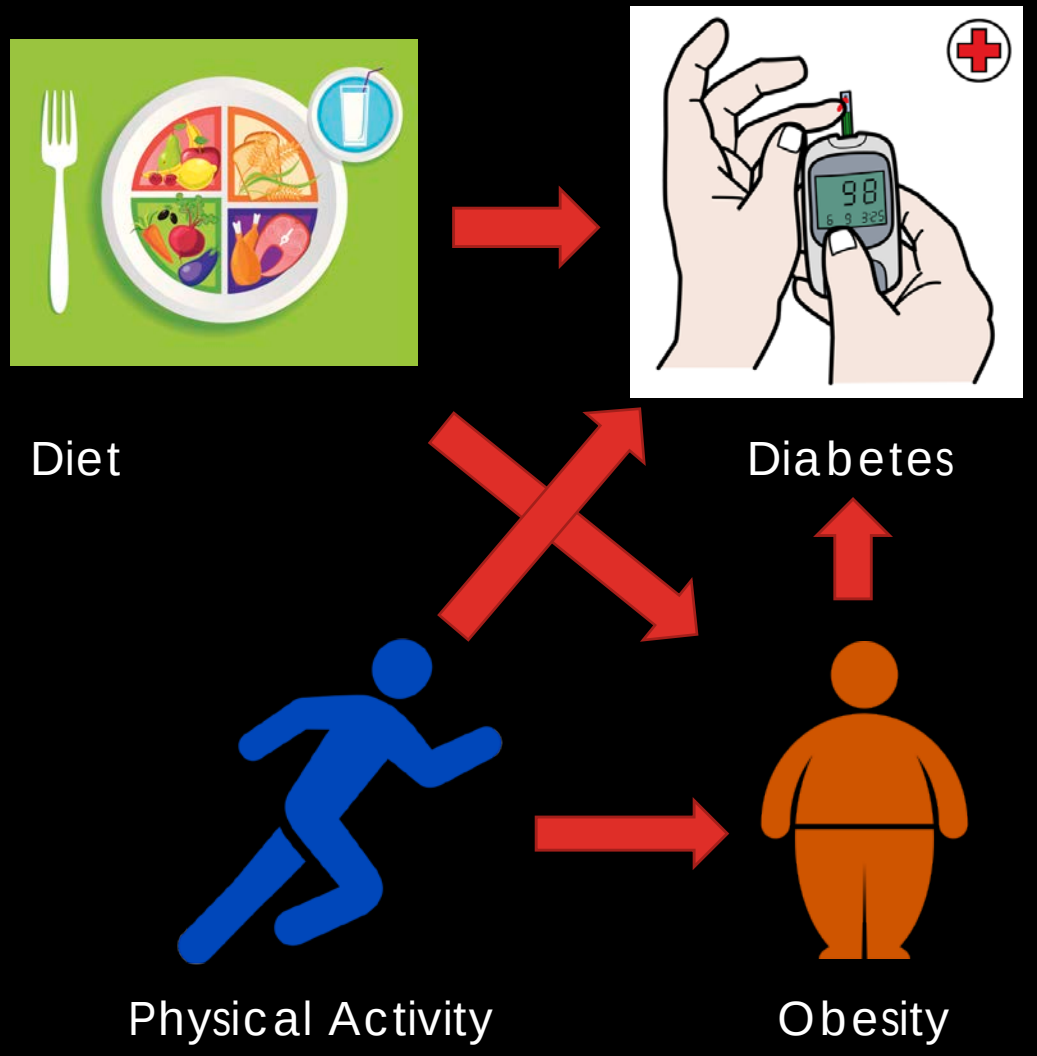
Obesity

Images: https://openclipart.org/detail/58543/dna; https://moz.com/ugc/enhance-your-analytics-with-age-and-gender-demographics; https://www.pinterest.com/mhssig/smoking/; https://data.londonsport.org/topic/physical-activity-and-sport-participation; https://commons.wikimedia.org/wiki/File:Q12174_noun_5364_ccAnaFelix_obesity.svg

THIS STUDY

- What factors cause obesity and diabetes?
- Are these spatially correlated?
- Are there relationships between factors and population characteristics?

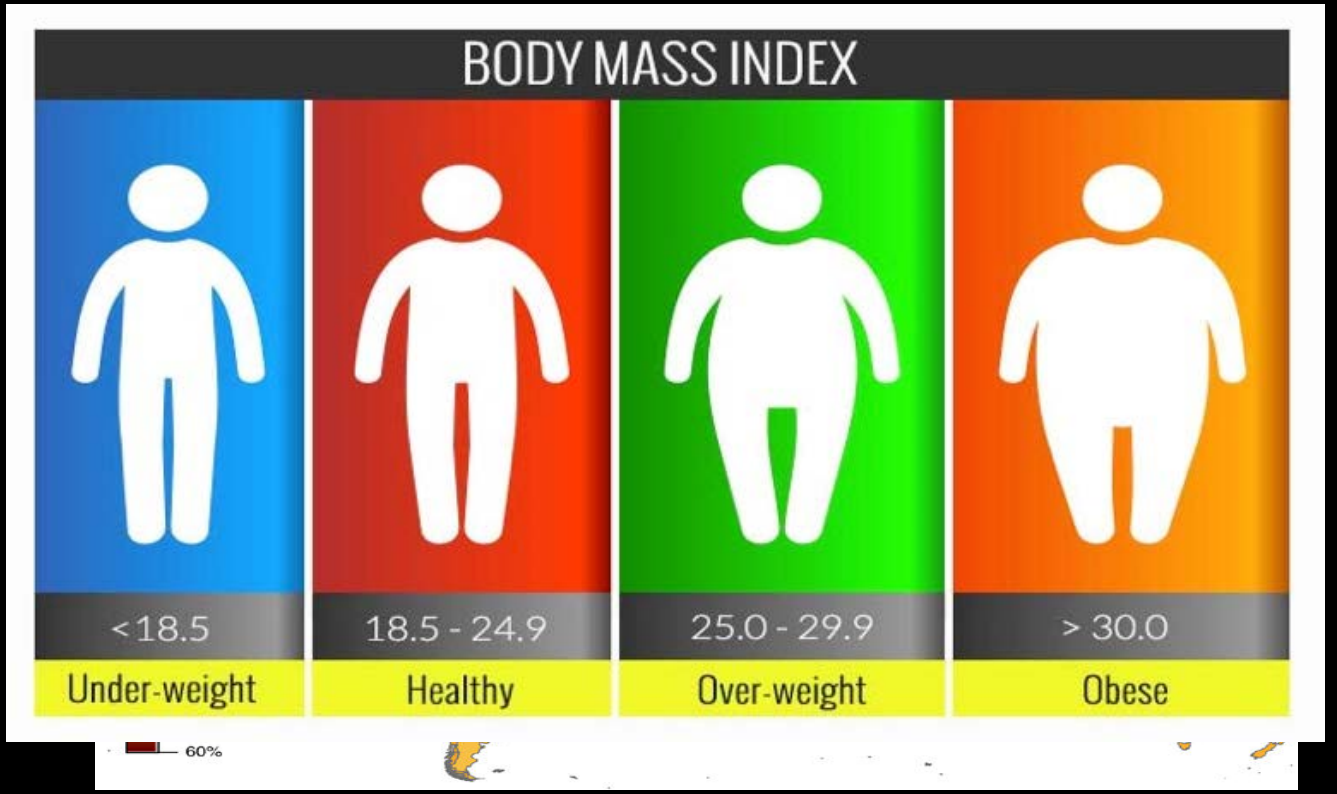
- Obesity and diabetes – definitions and background
- What work has already been done?
- Objectives
- Data and Analysis
- Expected Results and Timeline



Images: https://projectlogicga.com/tag/food/

OBESITY

- Body Mass Index (BMI) = Body Mass in kg/Square of height in meters (kg/m^2)
- Obesity is spreading worldwide
- Previously considered a disease of affluence
- Developing countries will have more obese by 2030 (Kelly et al)



Prevalence of Overweight(top) and obesity (bottom) in adults in 2005
T Kelly et al. (2008)

Images: http://blog.sciencescore.com/how-to-calculate-bmi/

Obesity

More than half of American children set to be obese by age 35, study finds

- Harvard researchers predict 57% of children will grow up obese
- 'It's definitely a shocking and sobering number' says lead author

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Jessica Glenza in New York

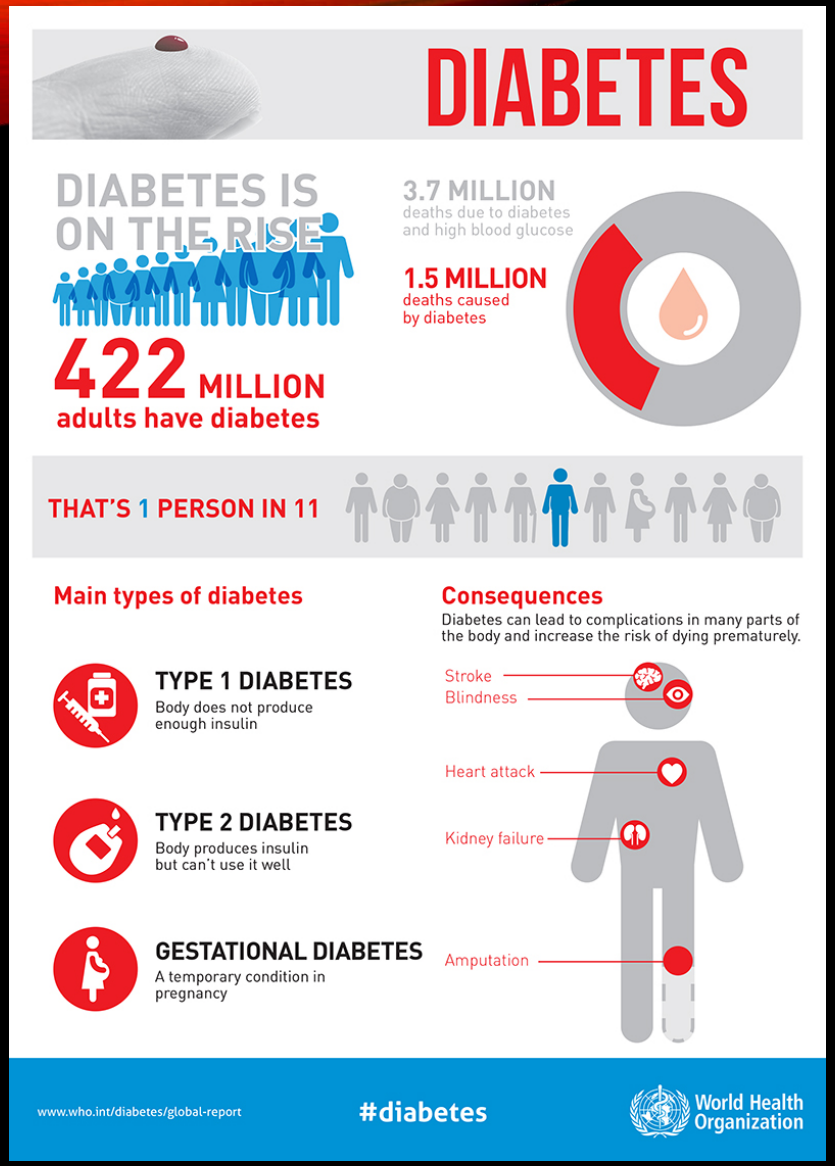
@JessicaGlenza

Thursday 30 November 2017 09.16 EST

'A 2-year-old who is obese is more likely to be obese at 35 years of age than an overweight 19-year-old,' the study found. Photograph: McCrickard/Rex Shutterstock

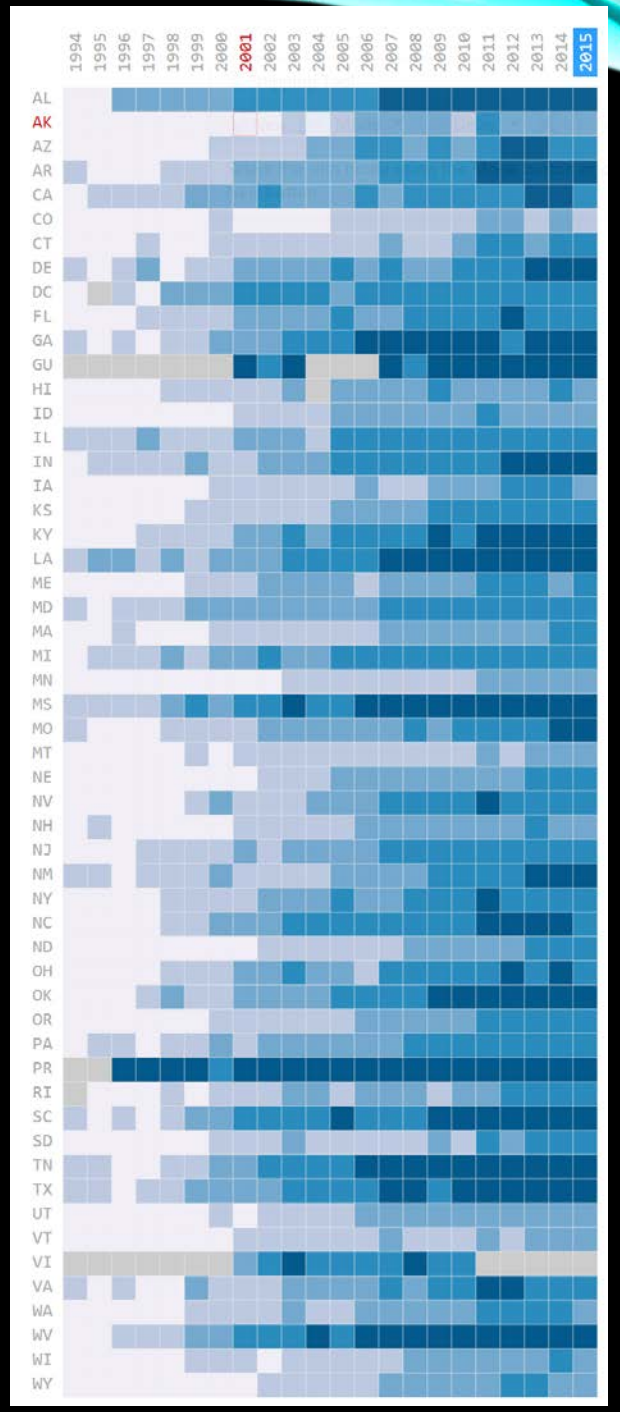
https://www.theguardian.com/society/2017/nov/30/more-than-half-of-american-children-set-to-be-obese-by-age-35-study-finds

DIABETES



Source: World Health Organization

- Diabetes : high blood glucose levels
- 2 types
  - Type 1 : no insulin production – autoimmune disorder
  - Type 2 : insulin resistance
- Rapidly growing disease
- Link between diabetes and other lifestyle diseases



Source: https://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html

LITERATURE

- What are the determining factors in obesity/lifestyle diseases?
- Do these factors have a spatial dependency?

Study	Description	Population Characteristics	Stratification	Location
Ludwig(2001)	SSB and obesity	11-12 year olds in selected MA schools		Massachusetts
Saelens(2003)	Neighborhoods and physical activity	San Diego random sample	Neighborhood walkability	San Diego
Morland(2006)	Supermarkets and obesity	ARIC participants		MI, NC, MY, MN
Lopez(2007)	Neighborhood Risk factors	Adults with BMI > 30		USA
Smith(2008)	Walkability and BMI	Utah Population Database BM>18.5	Gender	Salt Lake County
Kwate(2008)	Fast food density in NYC	NYC Dept of Health restaurant list	Race, Income	New York City
Lovasi(2009)	Built environment and obesity in Disadvantaged populations	low socioeconomic status, black race, or Hispanic ethnicity		USA
Black(2009)	Neighborhoods and obesity	Adults with BMI > 30		New York City
Zick(2009)	Neighborhoods and obesity	Utah Population Database BM>18.5, age 25-64	Income	Salt Lake County
Brown(2009)	Walkability and BMI	Utah Population Database BM>18.5, age 25-64	Gender	Salt Lake County
Michimi(2010a)	Supermarket accessibility	BRFSS	Urban/Rural	USA
Michimi(2010b)	Spatial patterns of obesity	BRFSS		USA
Block(2011)	BMI and fast food	Adults in Framingham Study	Age, gender, education	Massachusetts
Smith(2011)	Walkability and weight	Utah Population Database 17-20 and 27-30		Salt Lake County
Laraia(2014)	Spatial pattern of BMI in Northern California	Adults with Diabetes		Northern California
Gartner(2016)	Spatial distribution of gender differences in obesity prevalence	BRFSS	Gender	USA
Althoff(2017)	Activity inequality and obesity	Adults who walked	Gender, income	Worldwide

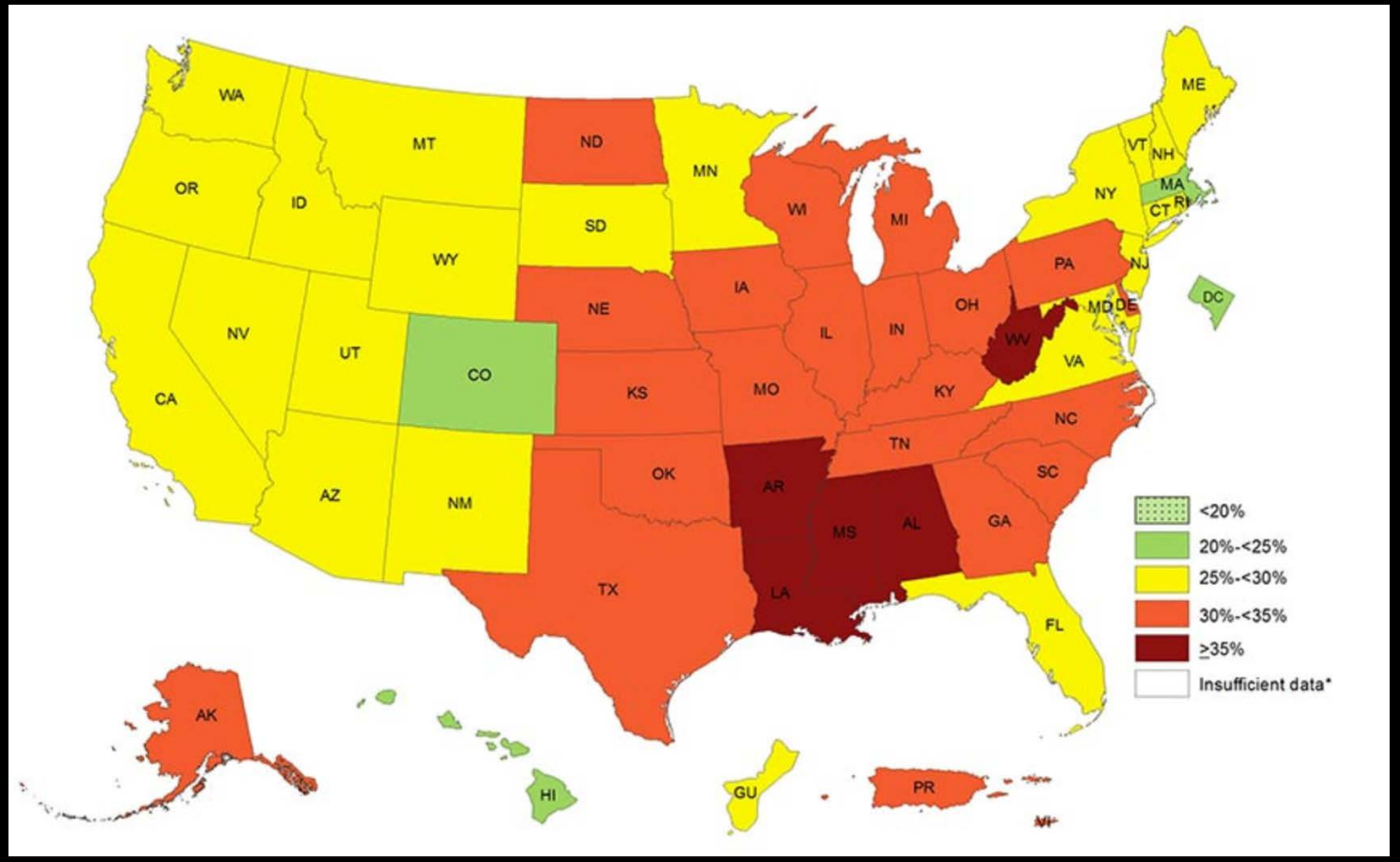
KEY FINDINGS

- Obesity is a key factor in lifestyle disease
  - NHLBI review (2013)
  - Basu et al. cite high obesity/low diabetes, low obesity high diabetes
- Obesity result of consumption of energy dense-foods and reduced physical activity
  - WHO
- Walkability has an influence on obesity
  - Saelens, Smith
  - Feng et al found no correlation
  - Zick et al observed an inverse correlation for low income neighborhoods

KEY FINDINGS

- Diabetes and obesity shows definite spatial clustering in US
  - Gartner et al

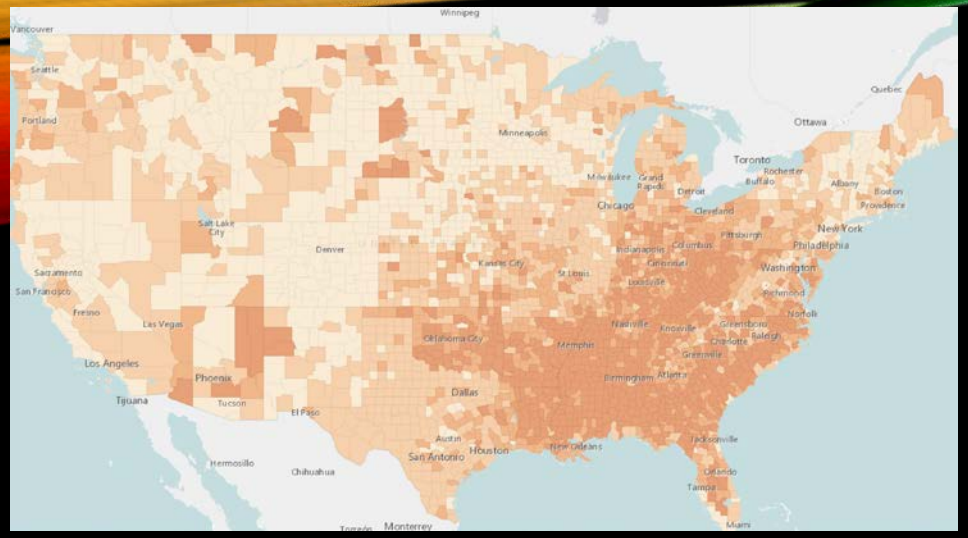
CDC: Map shows Southern obesity belt (2016)



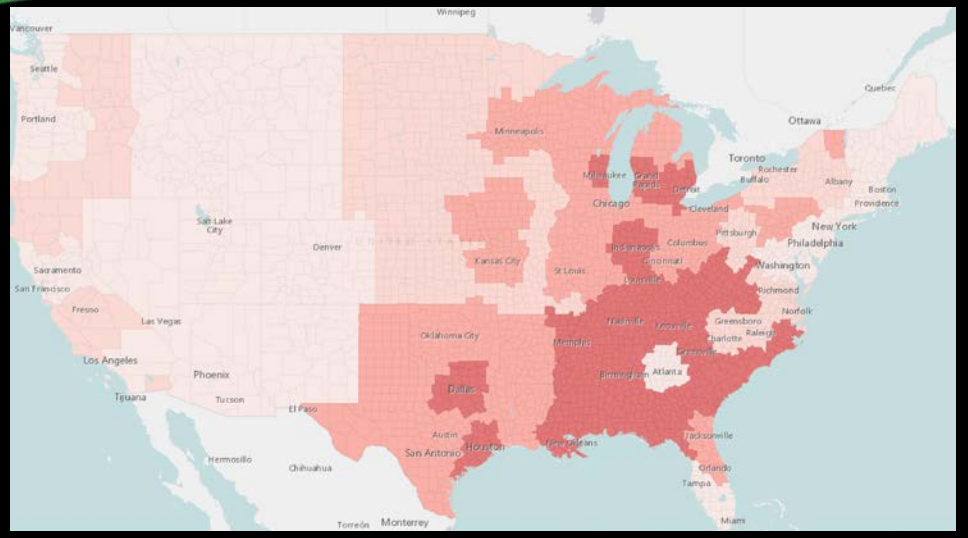
Source: CDC, https://www.cdc.gov/obesity/data/prevalence-maps.html

KEY FINDINGS (CONT.)

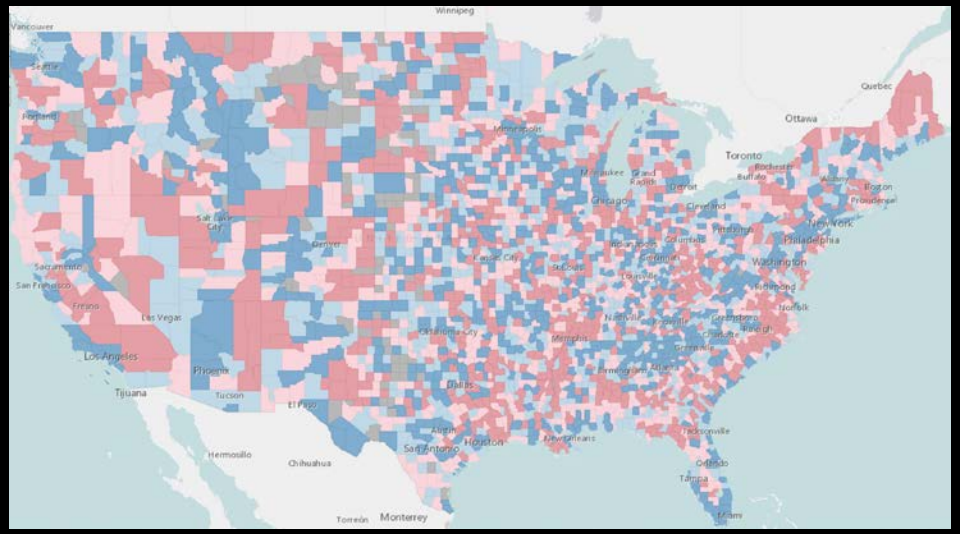
- Proximity of food stores unclear
  - Trapp : positive correlation with proximity of supermarket
  - Michimi : further distance to supermarket resulted in higher obesity only in urban areas
  - Block : no relationship between obesity and distance to fast food outlet
  - Pearce : in poor neighborhoods, highest obesity observed in those furthest from fast food outlets!
  - Kwate : higher density of fast food outlets in African American neighborhoods (with higher obesity)
- Increased sugar consumption identified as a main contributor to obesity rates
  - Increased SSB consumption noted by Malik, Singh, Han
  - Positive correlation (Ludwig, Vasanti)



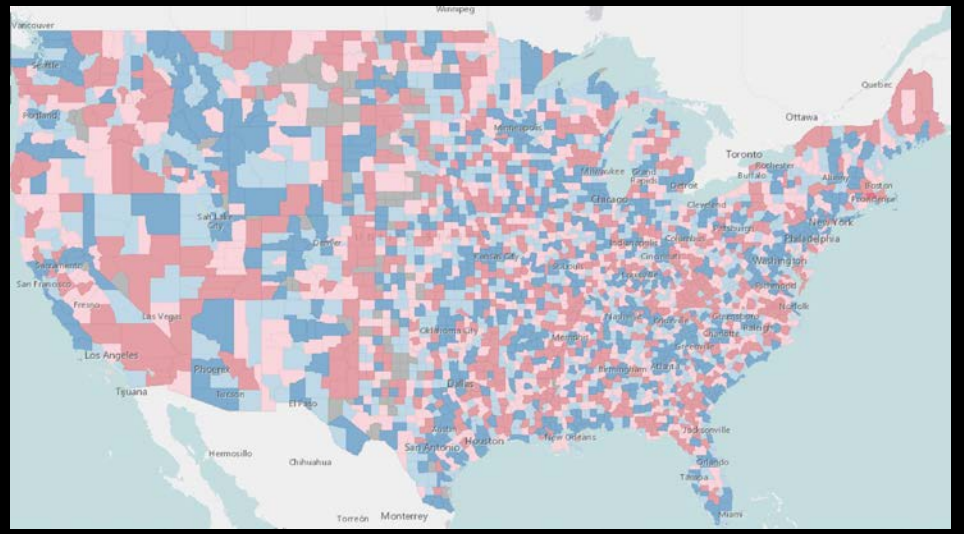
Diabetes Prevalence



Soft Drinks Consumed



Adult Obesity



Physical Activity

Data Source: https://maps.communitycommons.org

KEY FINDINGS (CONT.)

- Limitations of the current studies
- Few have looked at national level
- Discrete populations
  - Adults (BRFSS, Utah Populations, Framingham study)
    - With diabetes, who were obese, who walked
  - 11-12 year olds
  - Low socioeconomic status
  - Ethnicity

- This study will examine obesity at the national level

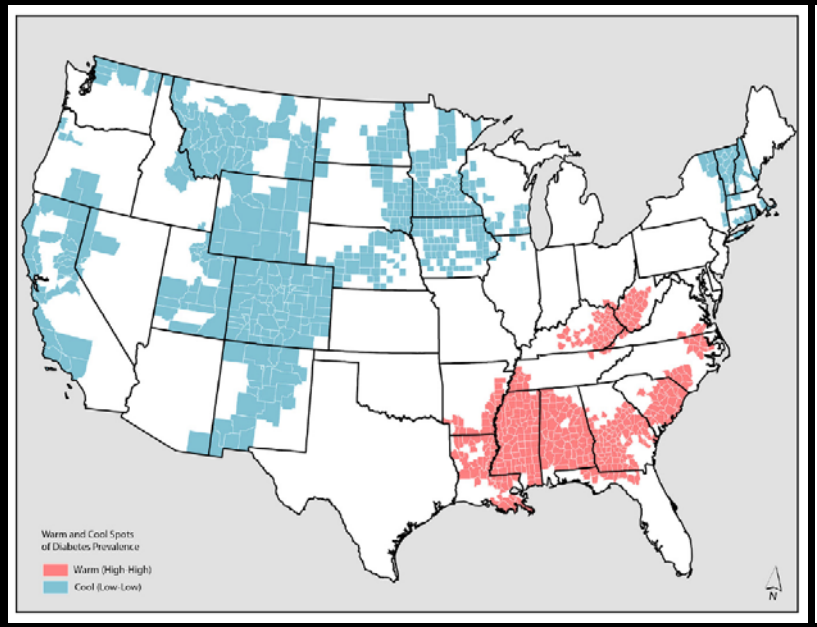
OBJECTIVES

- Examine distribution and growth of obesity (and lifestyle diseases) at the national level (USA)
- What, if any, commonalities exist between geographic locations influencing obesity

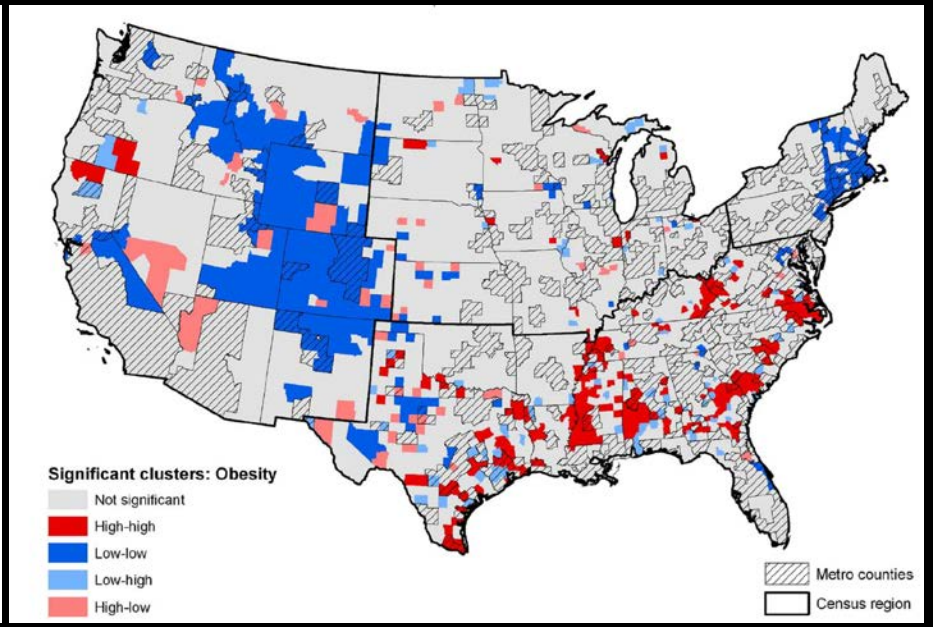
ANALYSIS

Examine the distribution and growth of obesity (and lifestyle diseases)

- Perform Hotspot analysis on obesity and diabetes prevalence to determine hot and cold clusters
  - Getis-Ord Gi*
    - Analyze at the national level (2005, 2015)



Diabetes hot spots and cold spots
Grubesic et al (2014)



Obesity hot spots and cold spots
Michimi et al (2010)

What if any commonalities exist between geographic locations influencing obesity

ANALYSIS

Examine areas:

- Contain high-high obese rates
- For outlier areas (areas with high obese rates surrounded by areas with low obese rates)

Within these areas select subpopulations that are similar

For each area analyze variables that may affect obesity and diabetes:

- Walkability and it sub-factors (land use, climate, crime levels)
- Population characteristics
- Availability of food types (supermarkets, fast-food restaurants, sugar sweetened beverages)
- Geographic distribution of other measured variables

Analysis of clusters and outliers with Morans's I and LISA
Statistical analysis to assess similarities, differences and correlations

DATA SOURCES

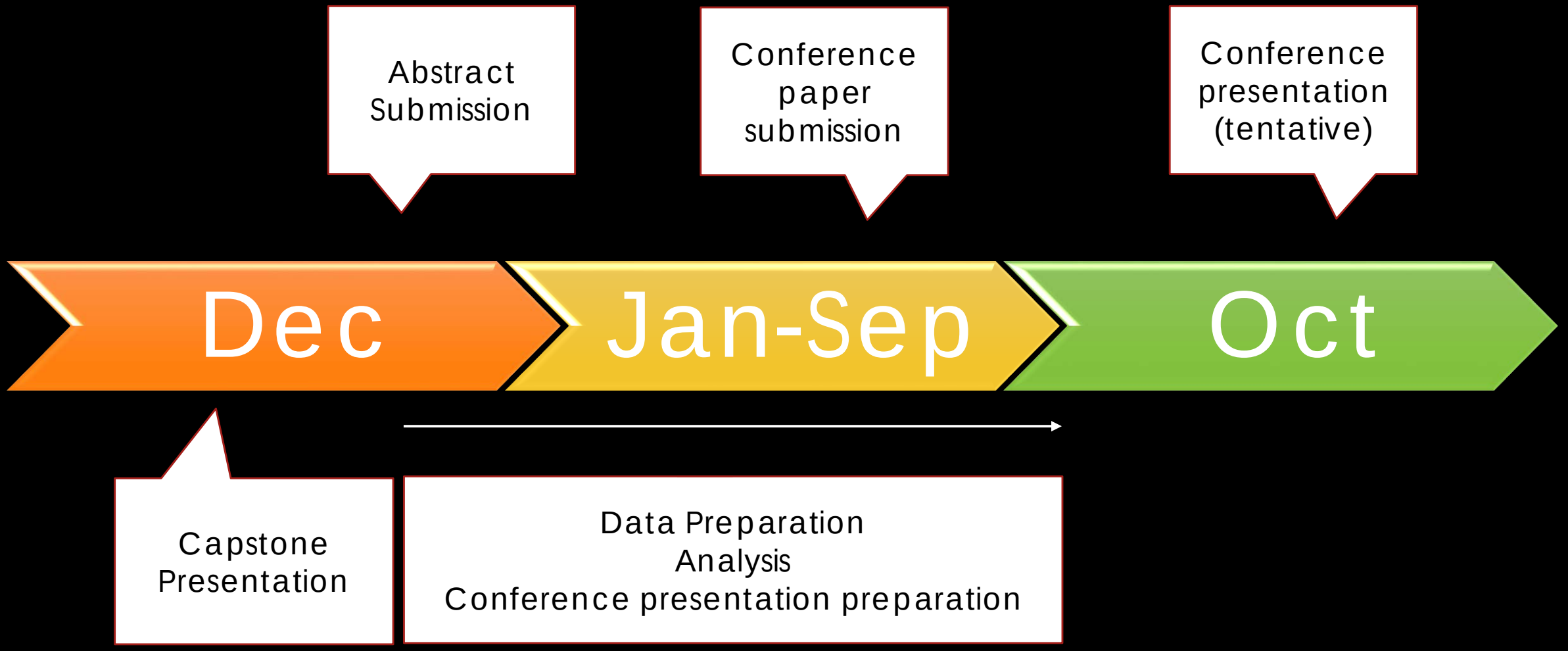
- BRFSS SMART data : https://www.cdc.gov/brfss/smart/smart_data.htm
  - 2002-2015
  - City level (MMSA Metropolitan/micropolitan statistical area)
  - Demographics, Health assessment, BMI, Smoking, Alcohol, Diet, Physical Activity
- CDC 500 Cities project : https://www.cdc.gov/500cities/
  - Data at census tract level for Cancer, Heart Disease, Diabetes, Stroke, Physical Activity, Obesity
- USDA
- TIGER

EXPECTED RESULTS

- Identify key obese areas throughout the USA
- Characterize key obese areas and outlier areas
- Determine similarities and differences

- Results could provide guidance regarding response to obesity and diabetes

TIMELINE


Abstract Submission
Conference paper submission
Conference presentation (tentative)
Dec
Jan-Sep
Oct
Capstone Presentation
Data Preparation
Analysis
Conference presentation preparation

THANK YOU

QUESTIONS?

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