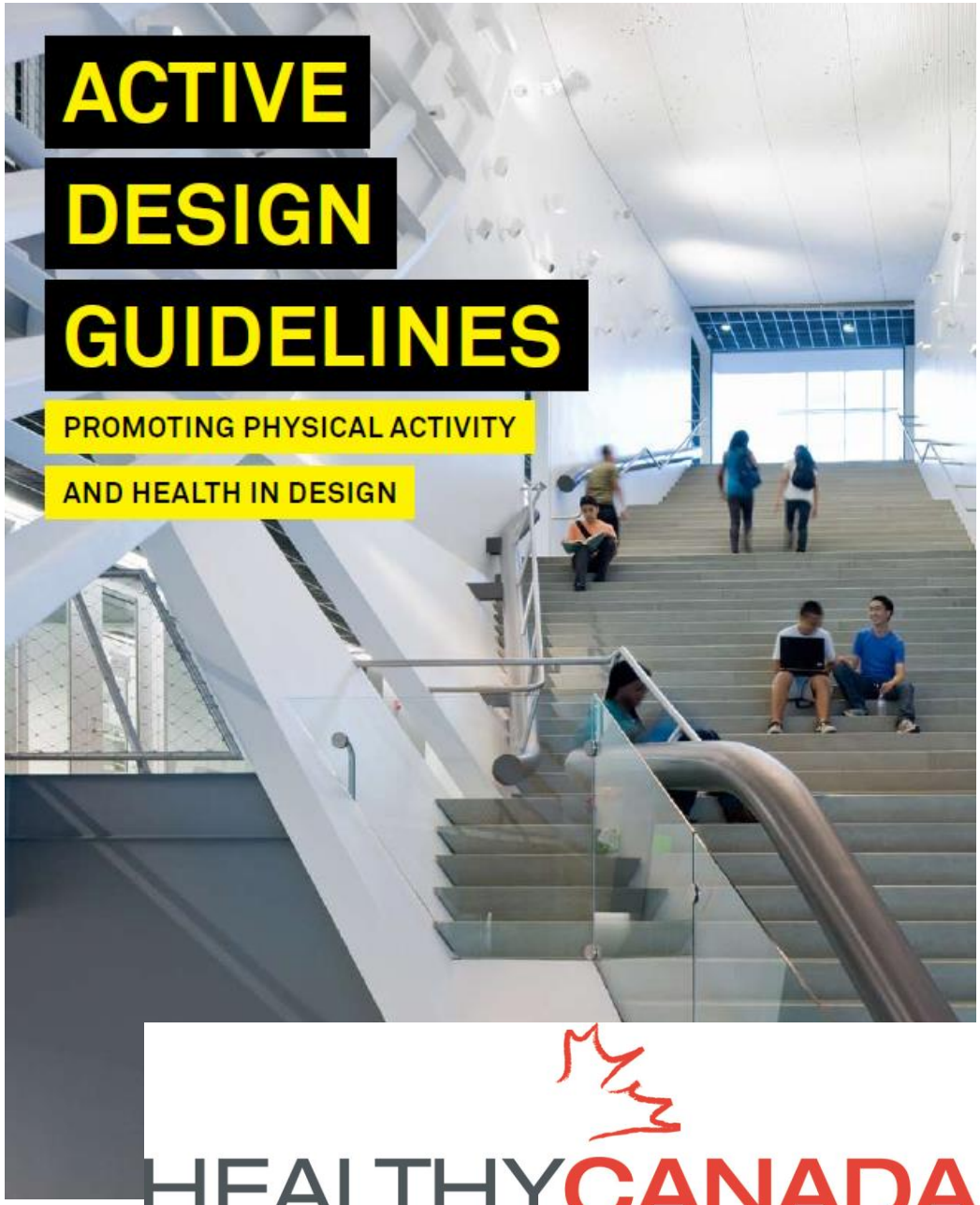
The Key Roles of Urban & Building Environments in Addressing Disease Epidemics

Karen K. Lee, MD, MHSc



CLASP
COALITIONS LINKING ACTION & SCIENCE FOR PREVENTION
An initiative of:
CANADIAN PARTNERSHIP AGAINST CANCER
PARTENARIAT CANADIEN CONTRE LE CANCER

HEALTHY CANADA by design

THE 19th CENTURY:

Infectious Diseases

19th Century codes, planning and infrastructure as weapons in the battle against contagious disease

These strategies were built into the city fabric, and they were effective

THE 21st CENTURY:

Chronic Diseases,
many of which are
"Diseases of Energy"

The emerging design solutions for health parallel sustainable design solutions

Effective designs will have to be an invisible, pervasive, and inevitable part of life

100+ years ago, urban conditions were a breeding ground for infectious disease epidemics

A PERPETUAL FEVER-NEST.
[Engraved from a Photograph by Anthony.]

Over-crowding
in Lower Manhattan

1910 density:
114,000 people/ sq. mi.

2011 density:
67,000 people/ sq. mi.

+

Inadequate systems
for garbage, water, and sewer, leading to pervasive filth and polluted water supplies

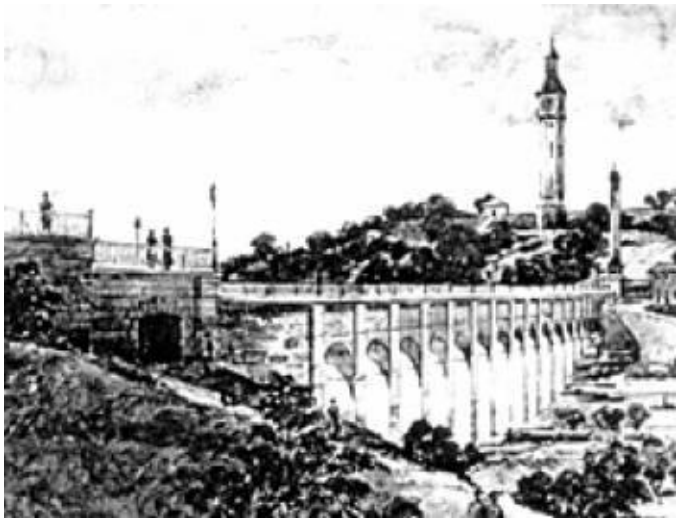
Major epidemics:

Air/droplet-borne diseases:
TB

Water-borne diseases:
Cholera

Vector-borne diseases:
Yellow-fever

The response was through infrastructure interventions



1842 New York's **water system** established – an aqueduct brings fresh water from Westchester.

1857 NYC creates **Central Park**, hailed as "ventilation for the working man's lungs", continuing construction through the height of the Civil War

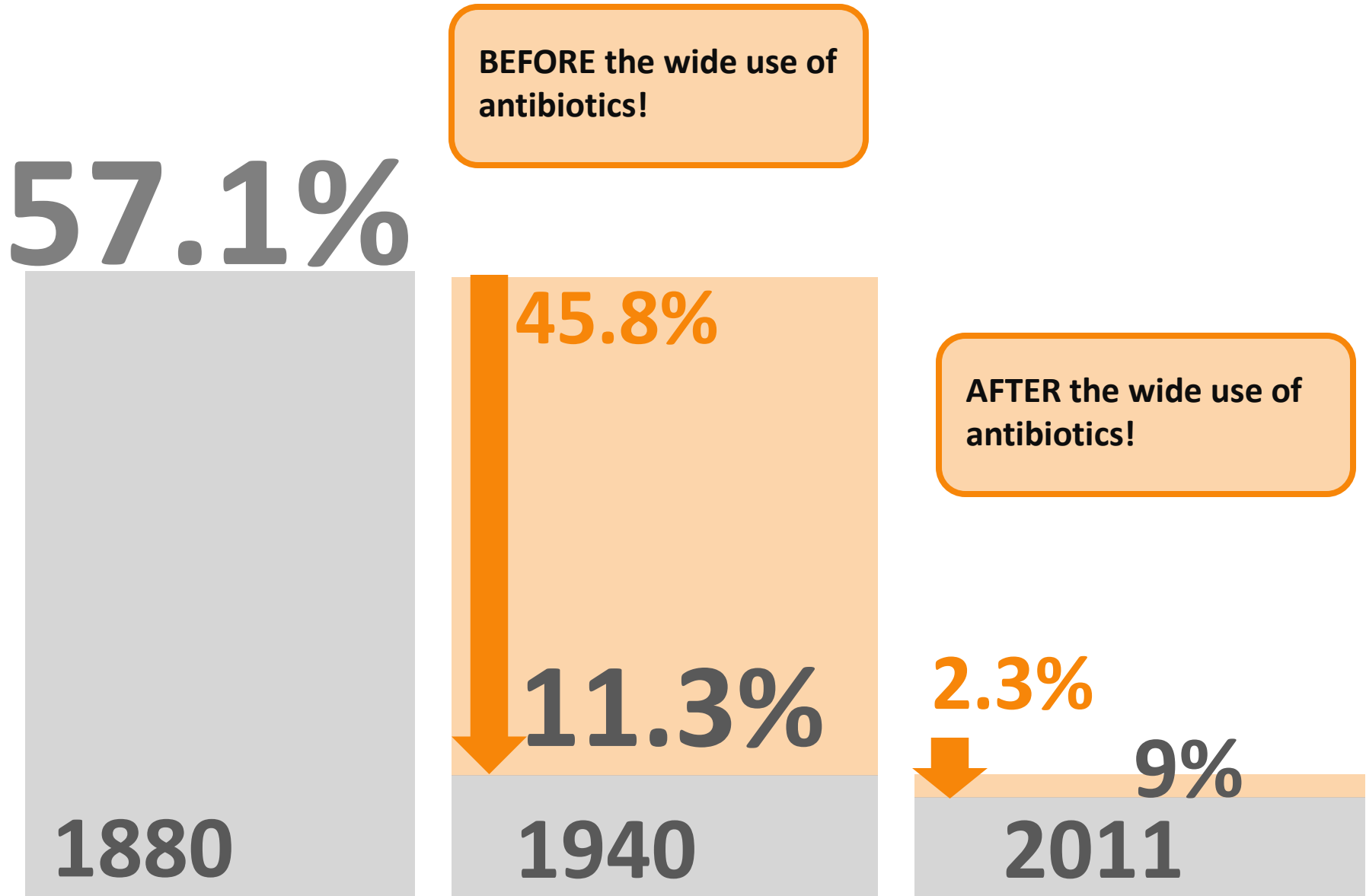
1881 Dept. of Street-sweeping created, which eventually becomes the **Department of Sanitation**

1901 **New York State Tenement House Act** banned the construction of dark, airless tenement buildings

1904 First section of **Subway** opens, allowing population to expand into Northern Manhattan and the Bronx

1916 **Zoning Ordinance** requires stepped building setbacks to allow light and air into the streets

The Results: Infectious disease successes



The epidemics of today are:

CHRONIC DISEASES

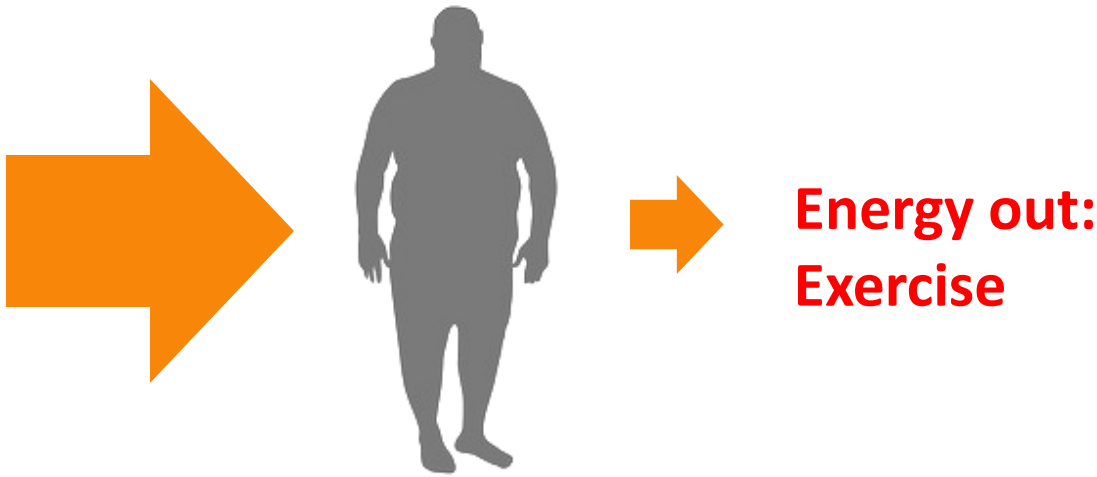
(obesity, diabetes, heart disease & strokes, cancers)

Chronic Diseases - #1 cause of death globally (36 million deaths/y).

Leading Risk Factors accounting for 80% of deaths_ (WHO 2011):

- Tobacco
- **Physical Inactivity**
- **Unhealthy Diets**
- Harmful Use of Alcohol

Energy in: Food

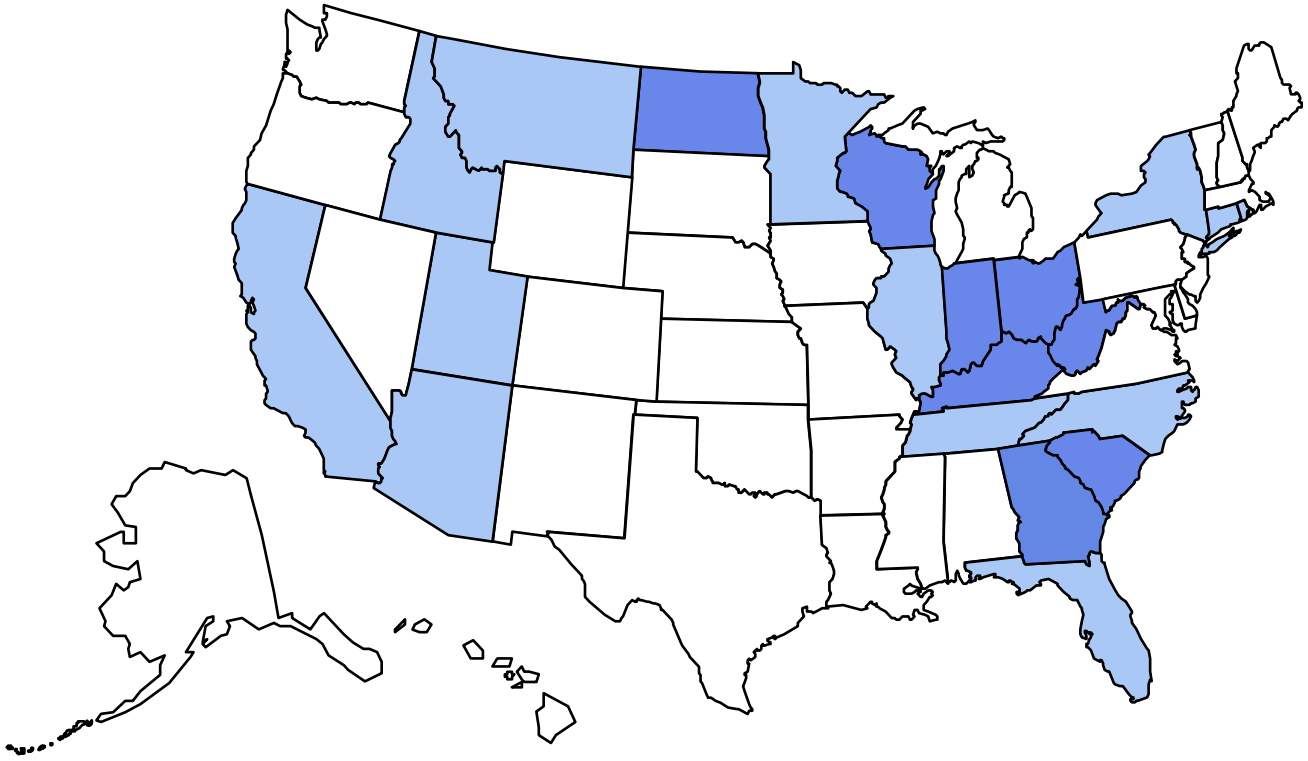


Energy out: Exercise

Obesity Trends* Among U.S. Adults

BRFSS, 1985

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” woman)



Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 1986

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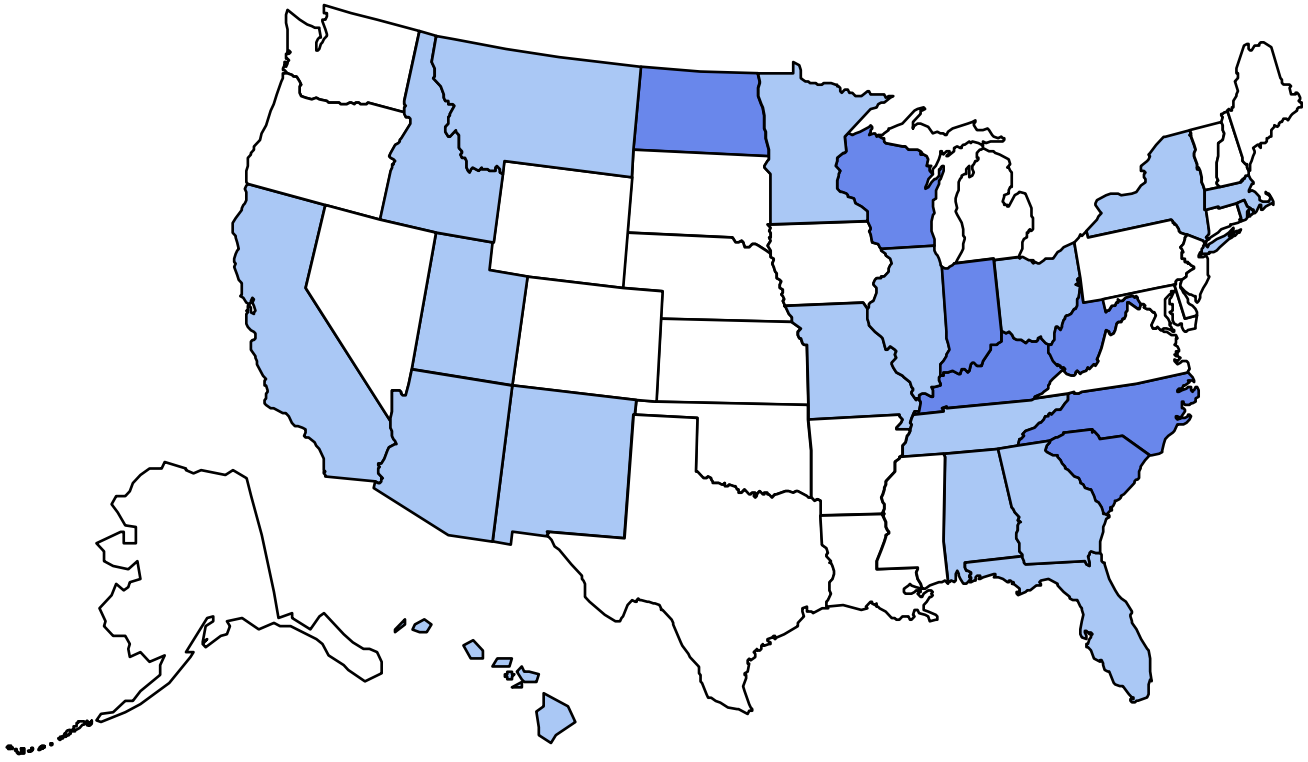

Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 1987

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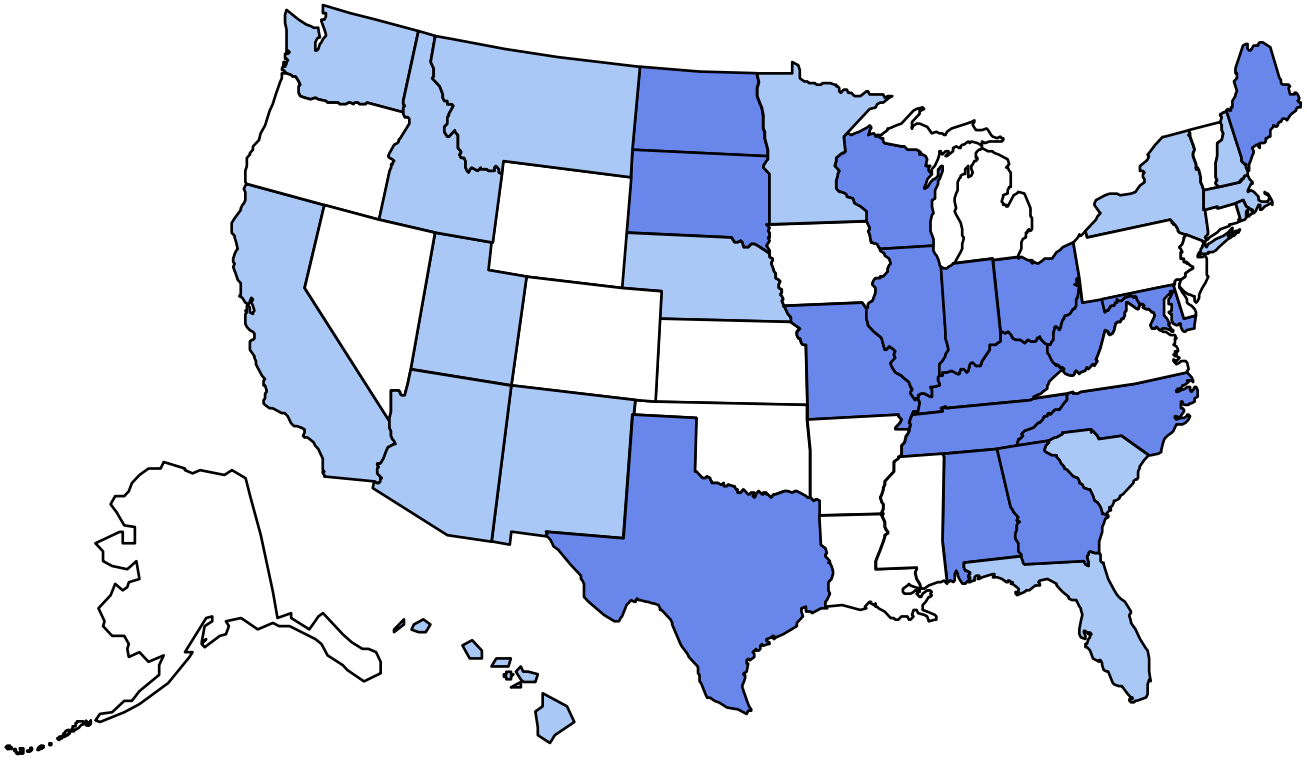

Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 1988

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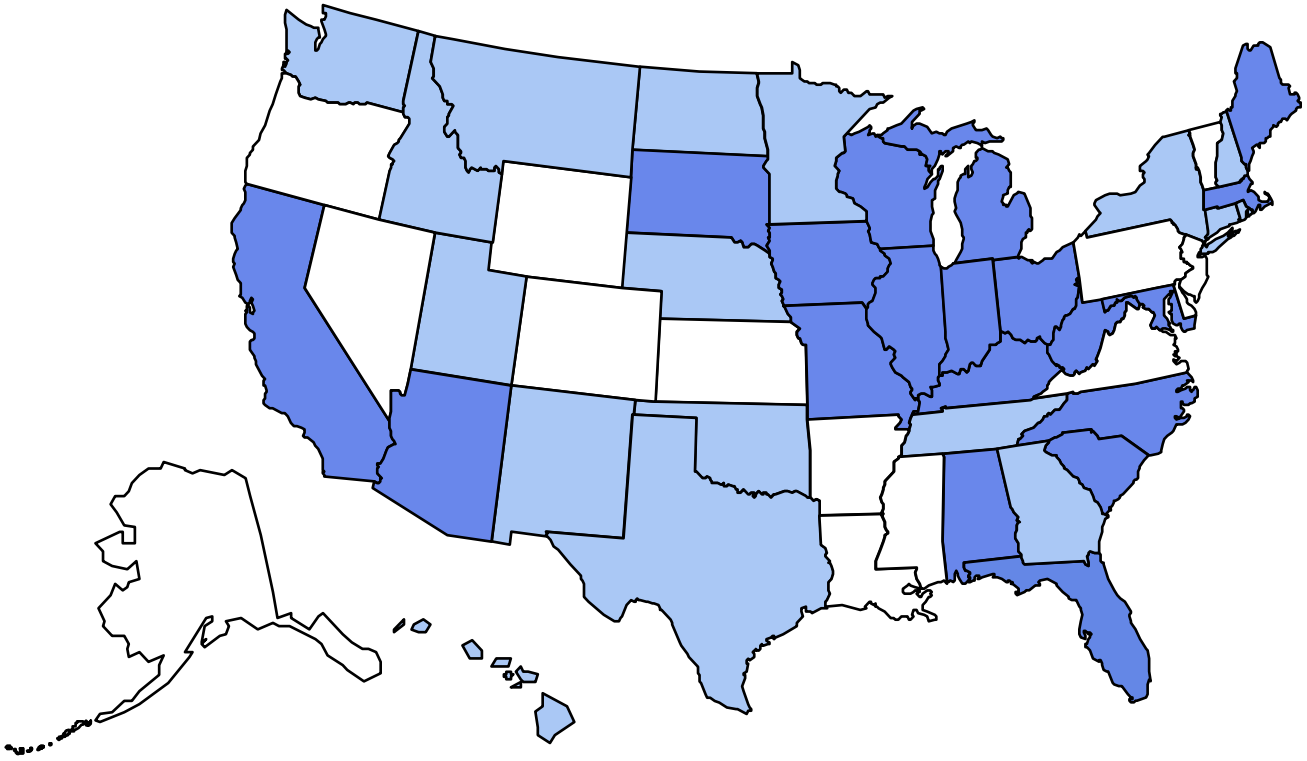

Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 1989

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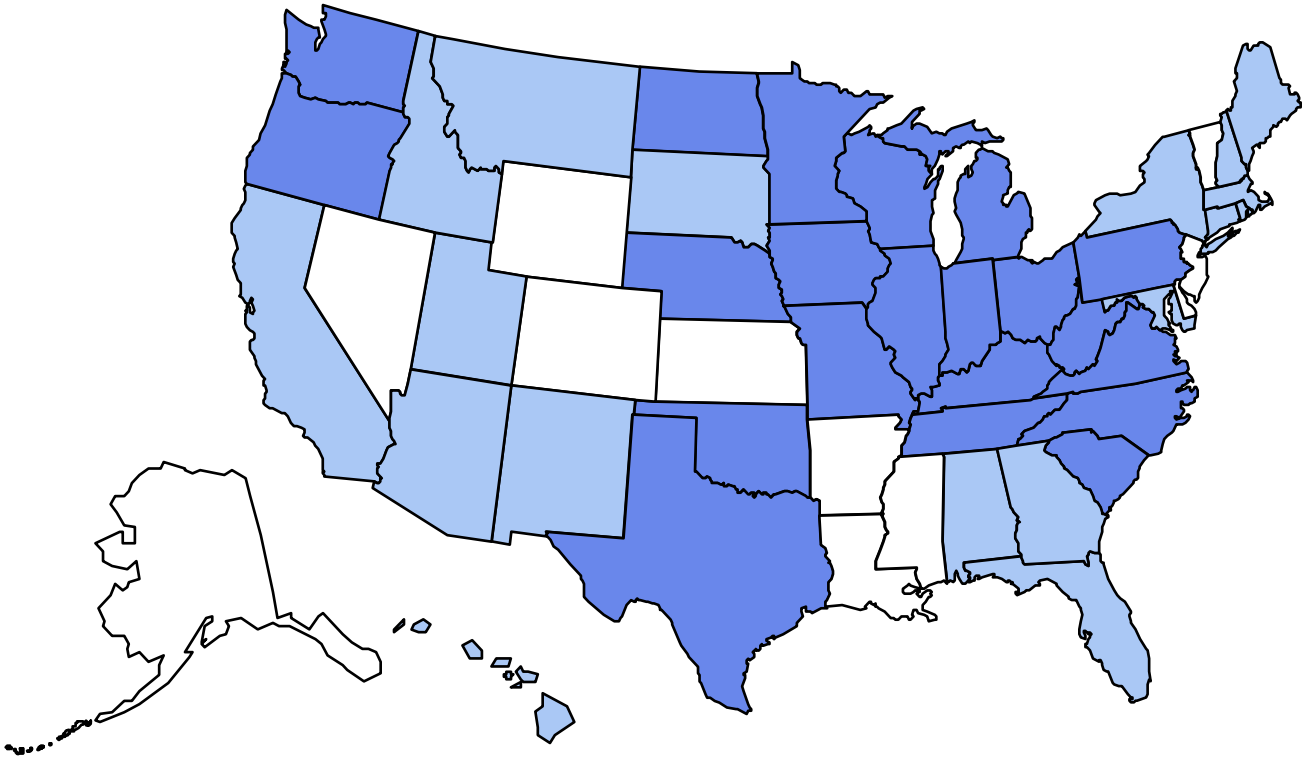

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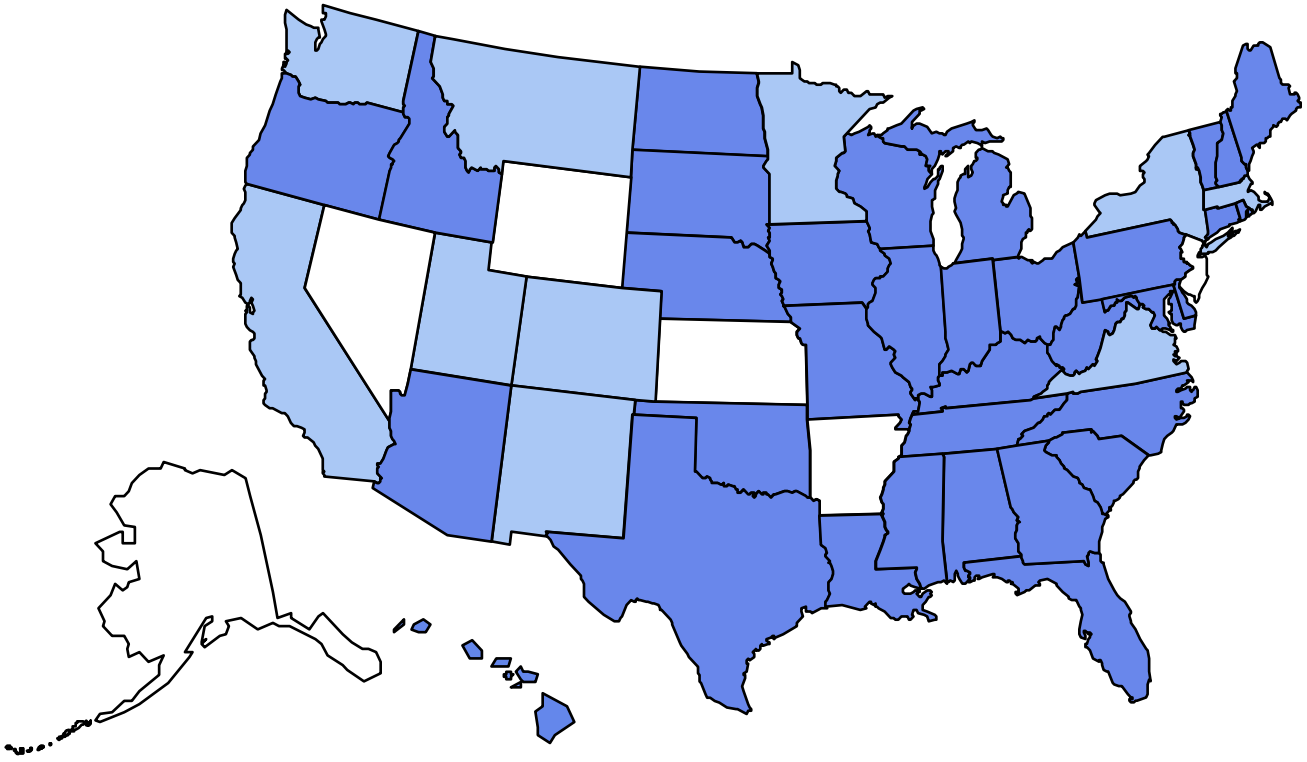

Source: U.S. Centers for Disease Control and Prevention (CDC)

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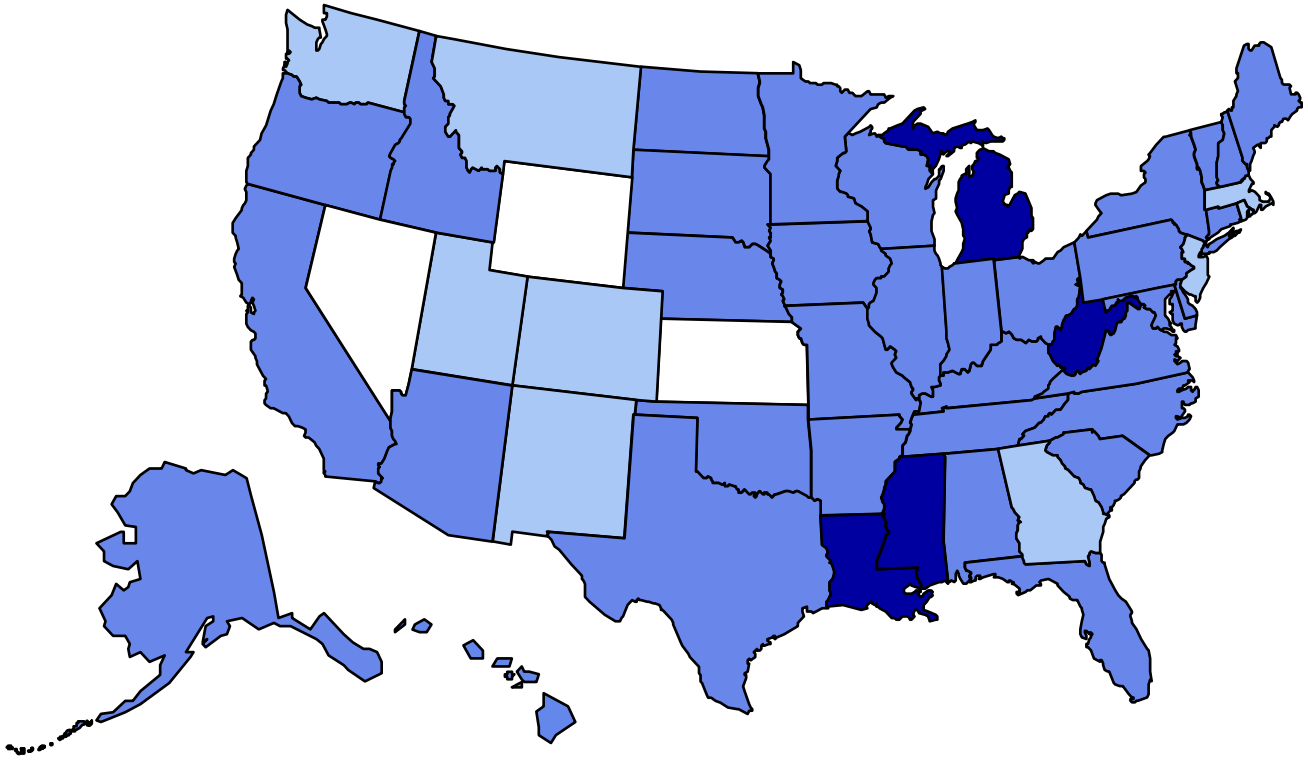

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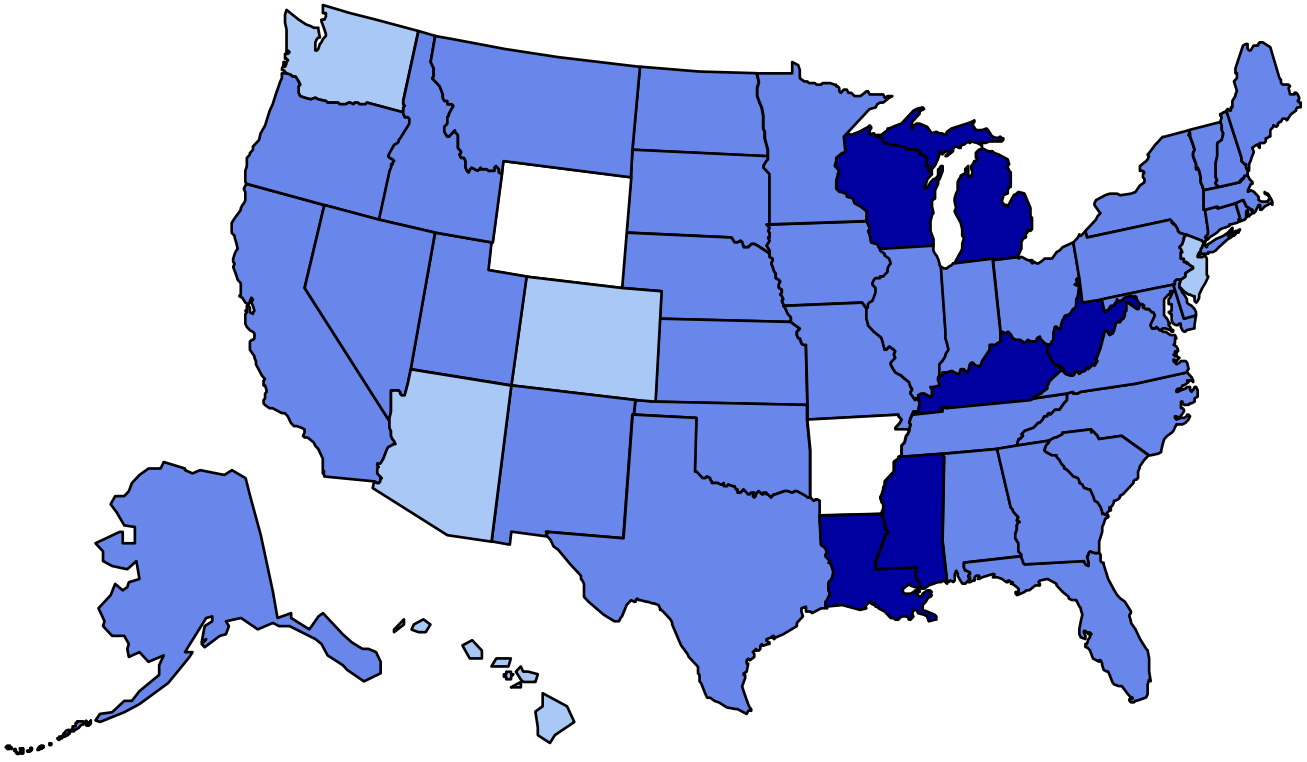

Source: U.S. Centers for Disease Control and Prevention (CDC)

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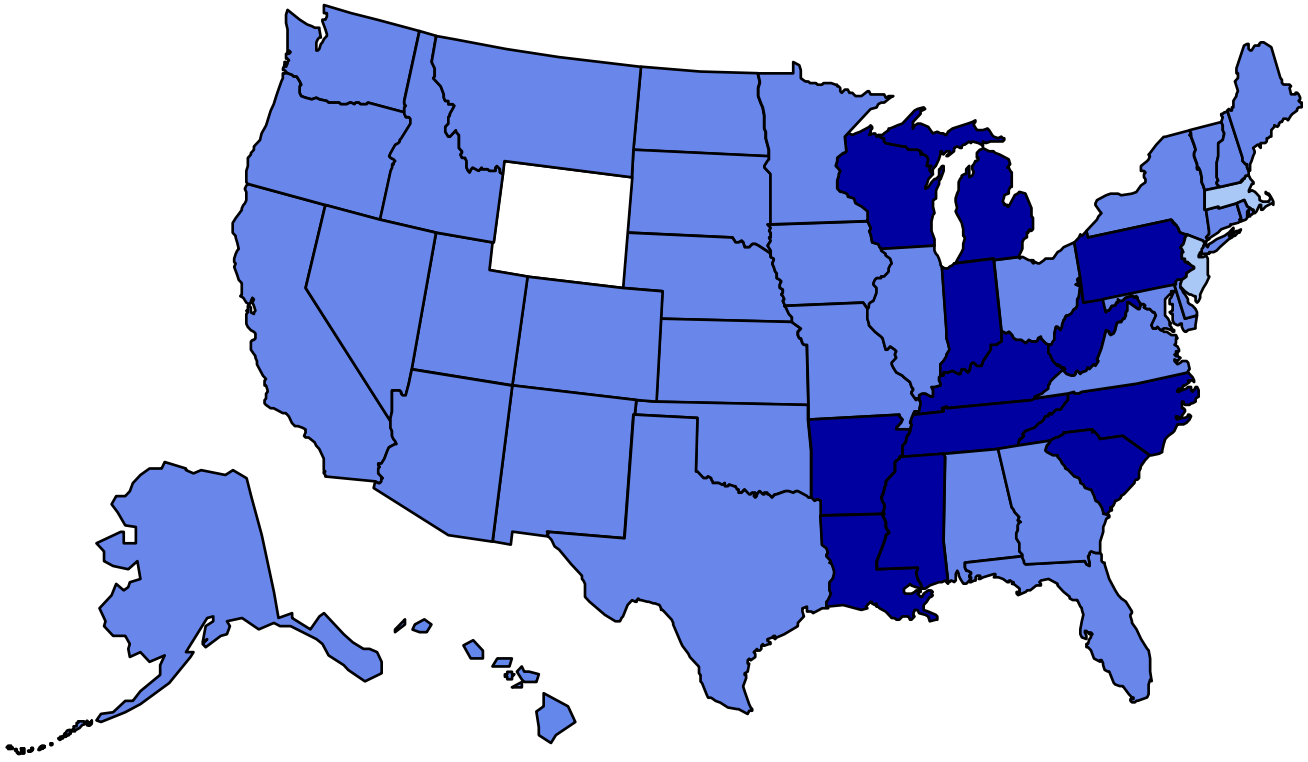

Source: U.S. Centers for Disease Control and Prevention (CDC)

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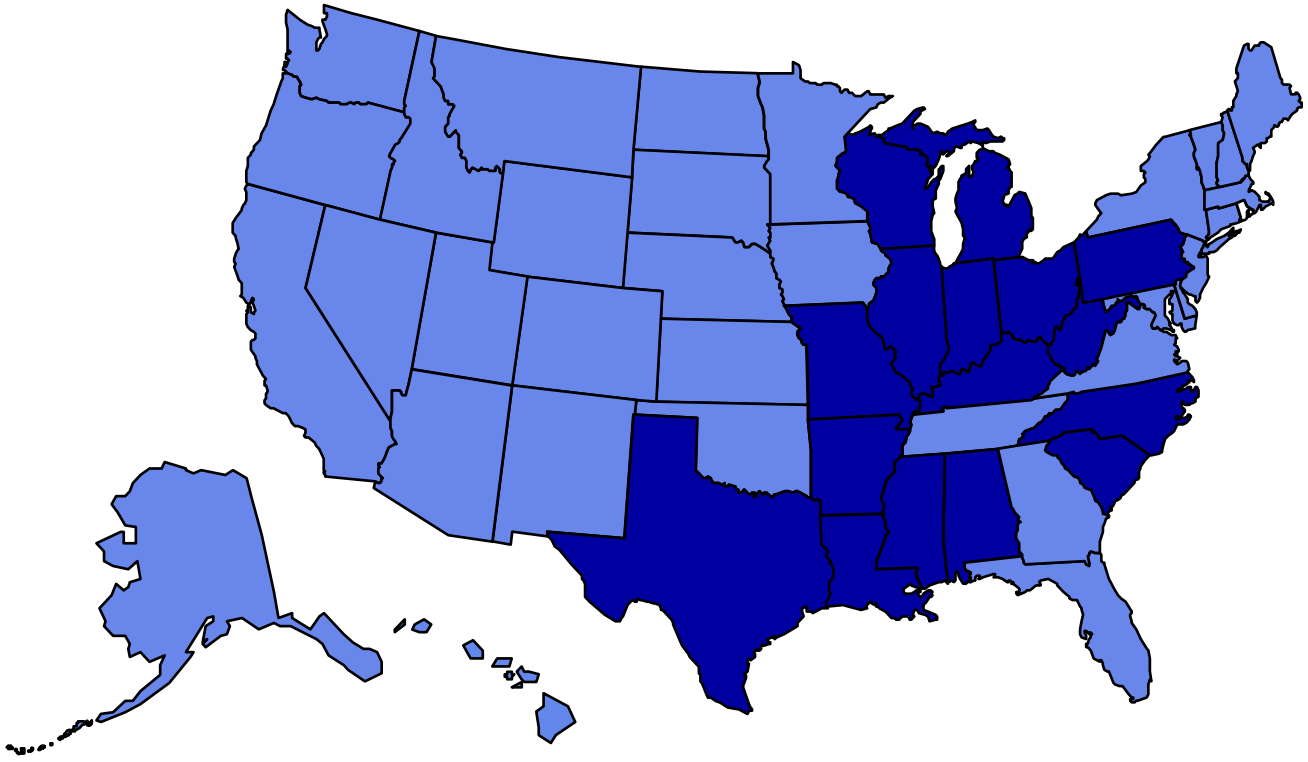

Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

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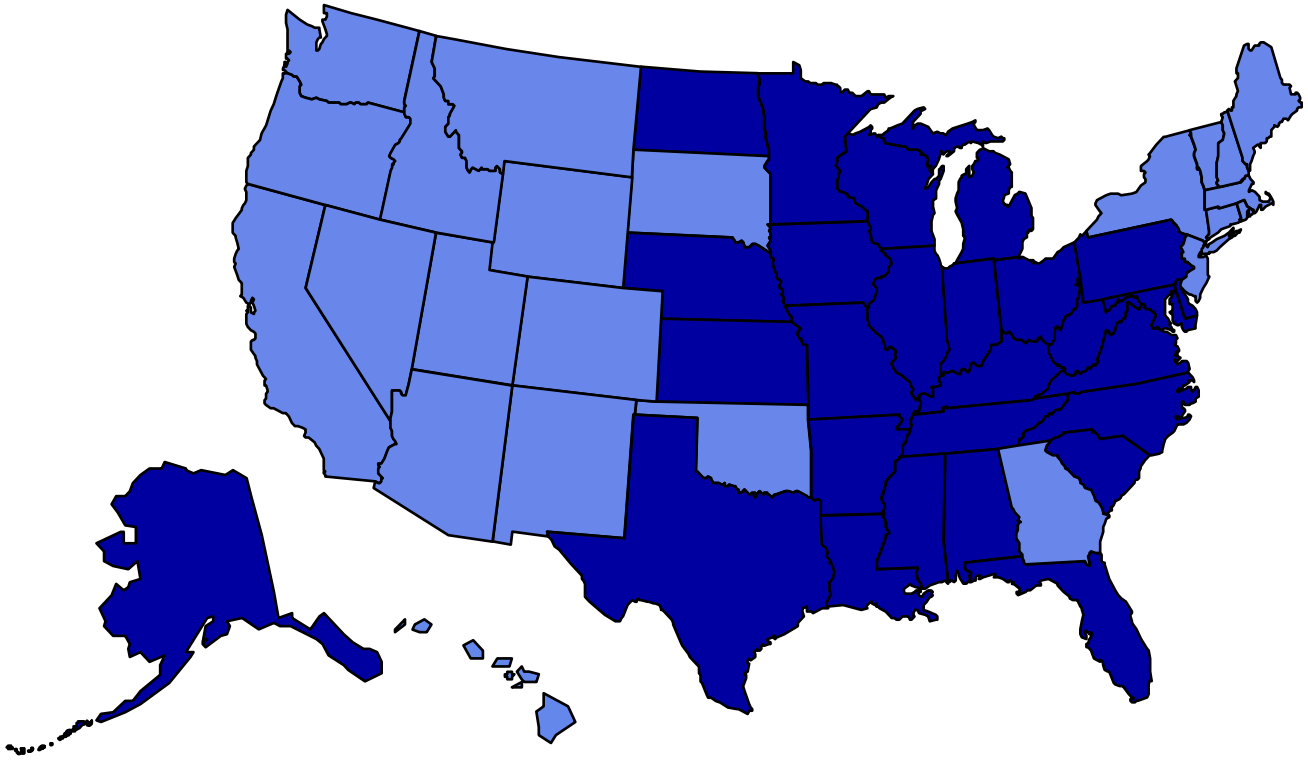

Source: U.S. Centers for Disease Control and Prevention (CDC)

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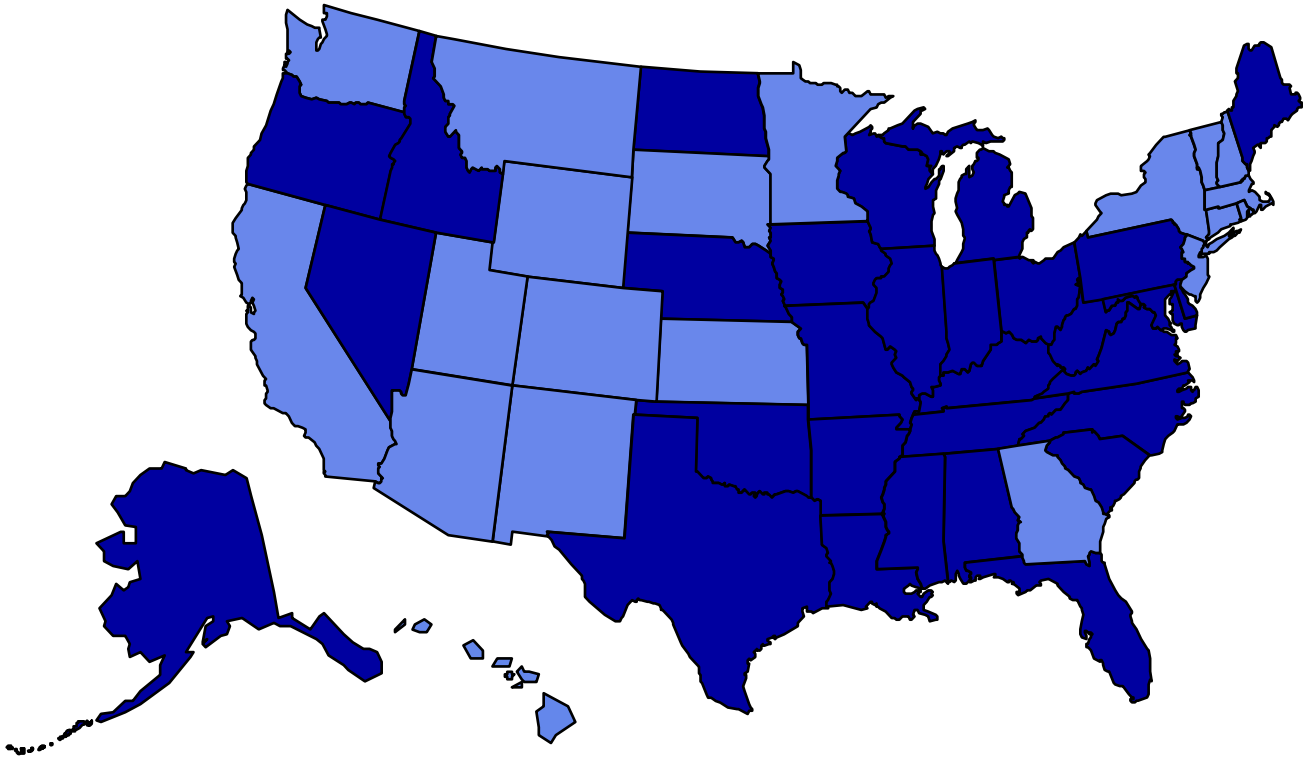
BRFSS, 1996

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” woman)



Source: U.S. Centers for Disease Control and Prevention (CDC)

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BRFSS, 1997

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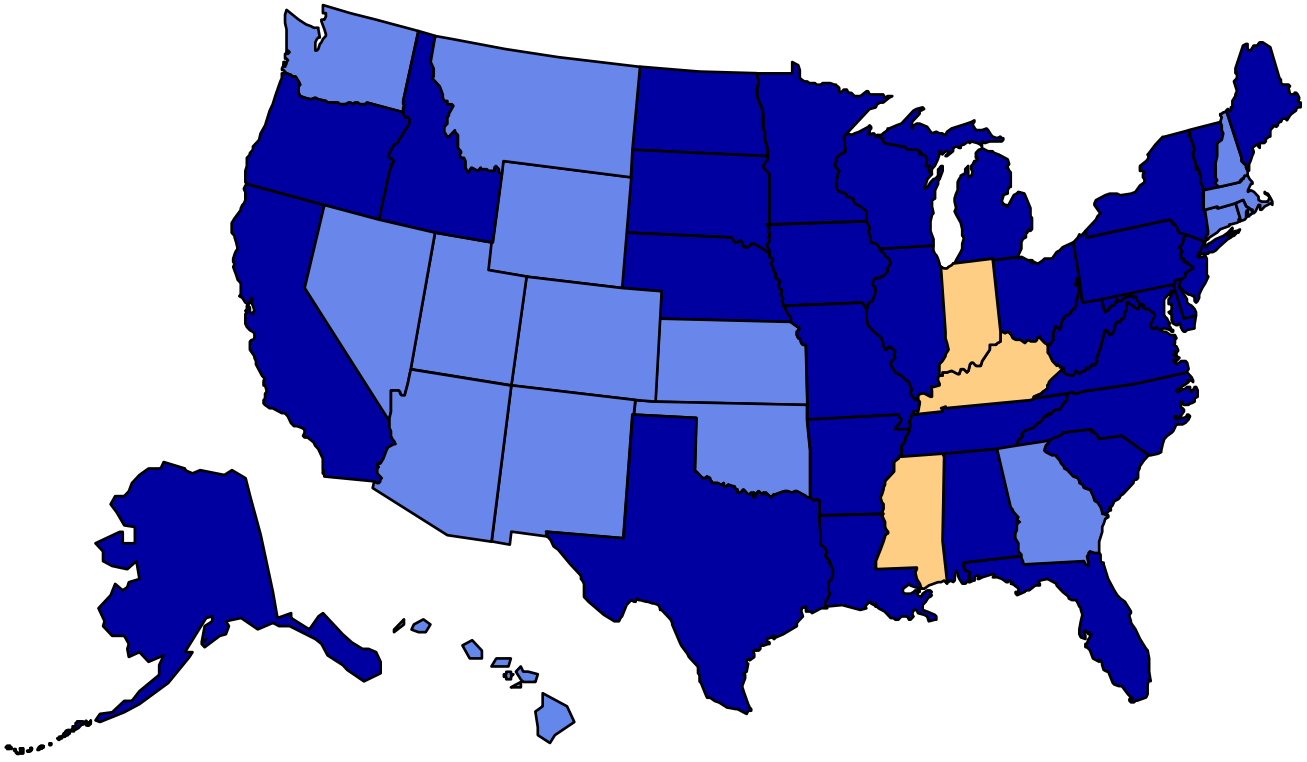

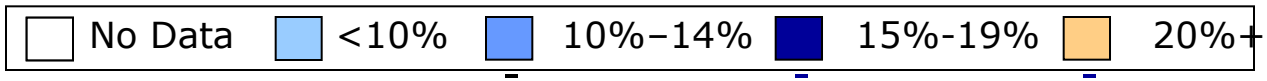

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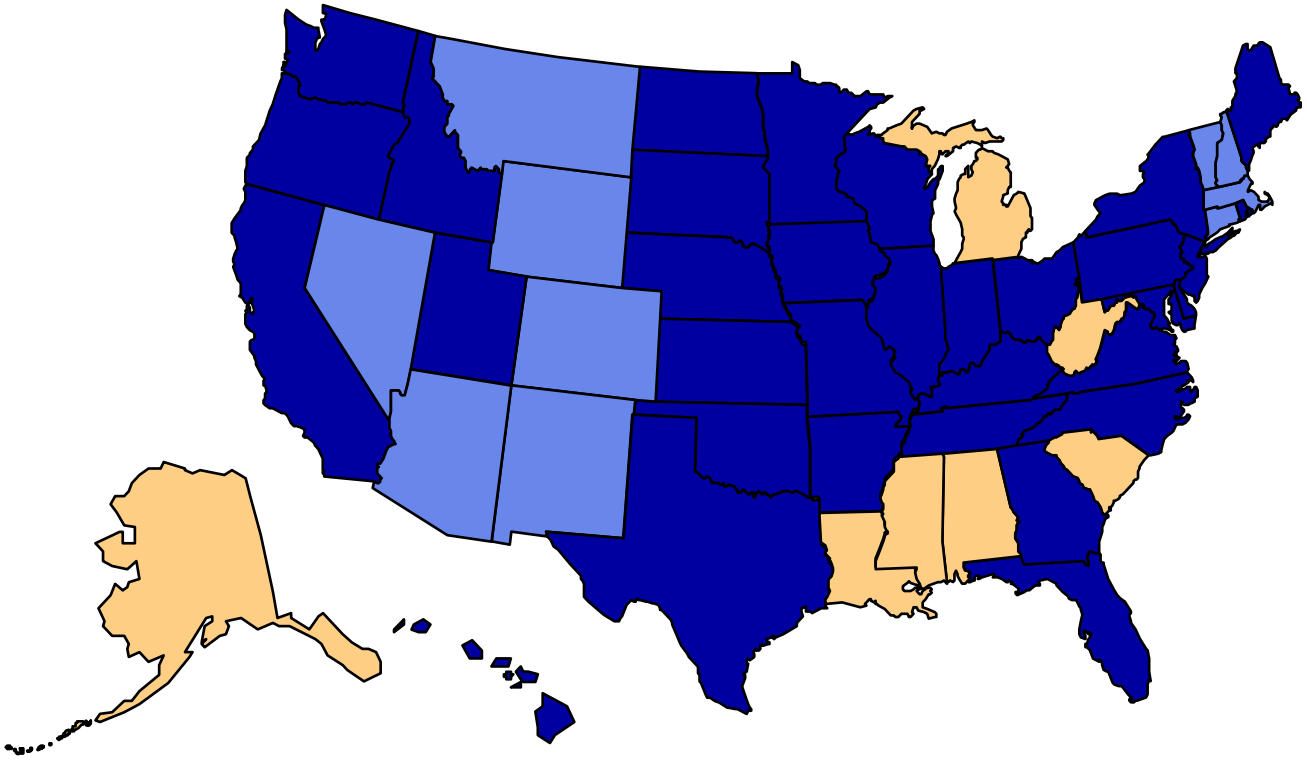

Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 1999

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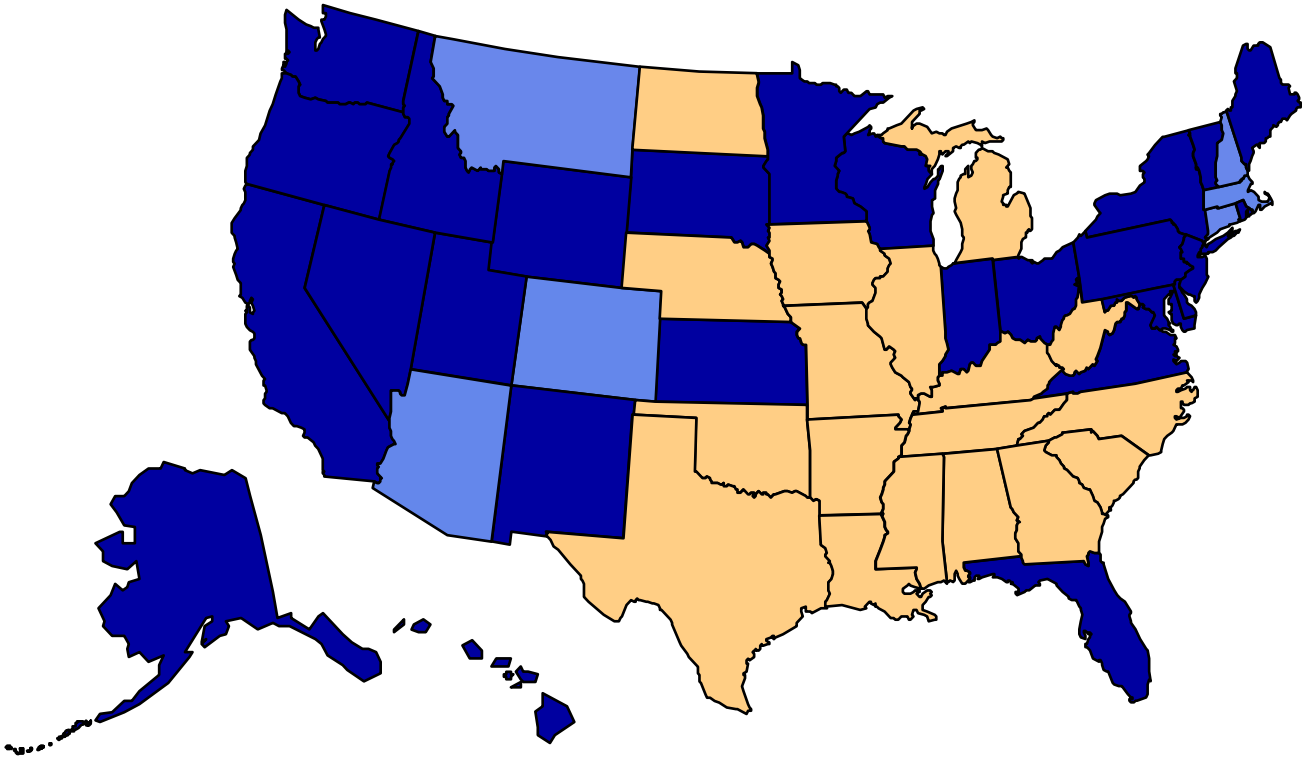
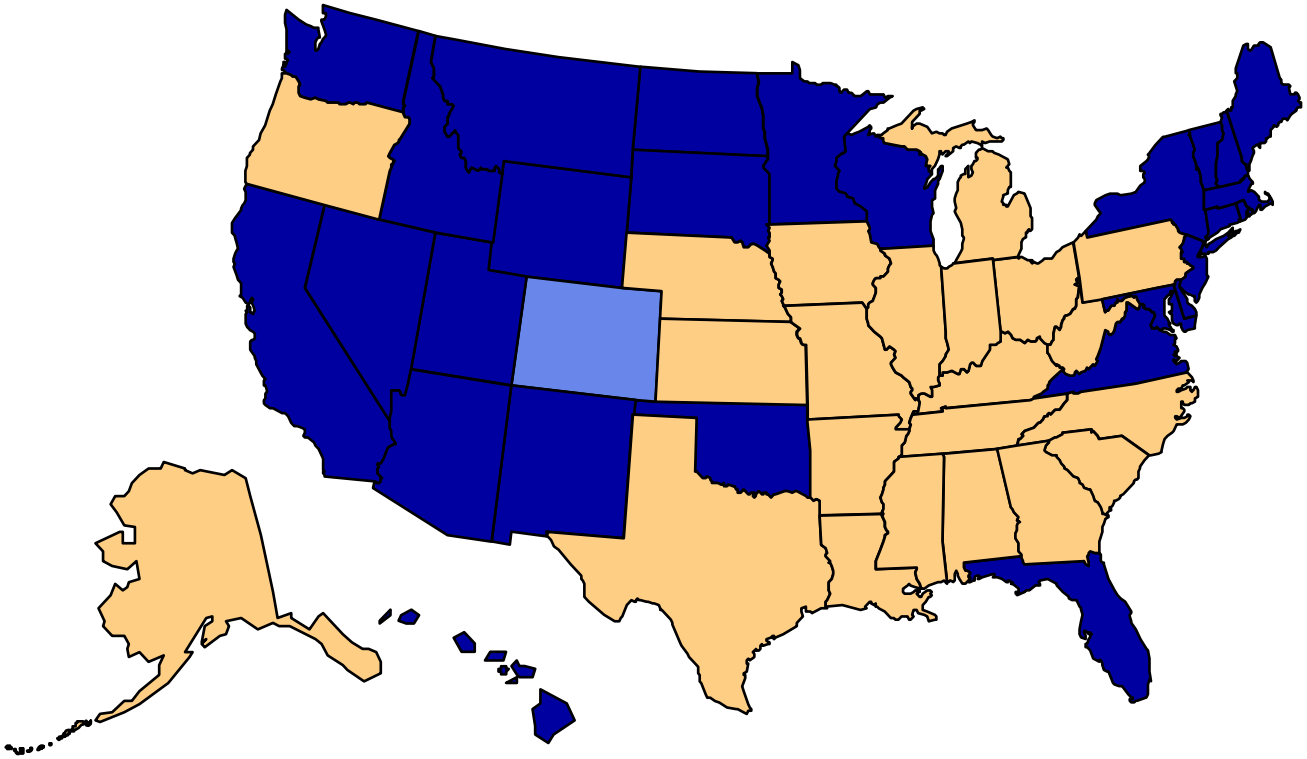


Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2000

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” woman)

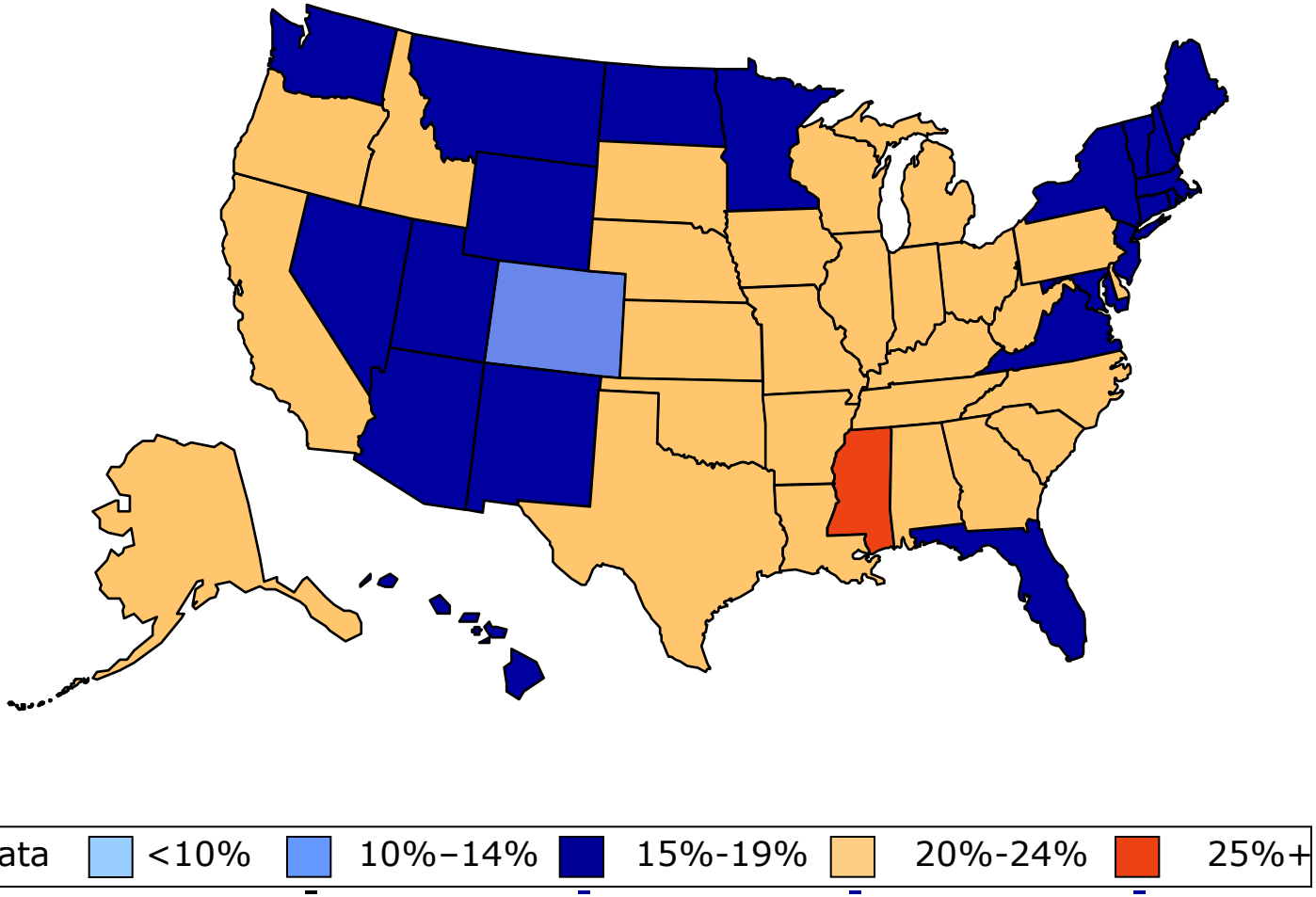


Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2001

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” woman)

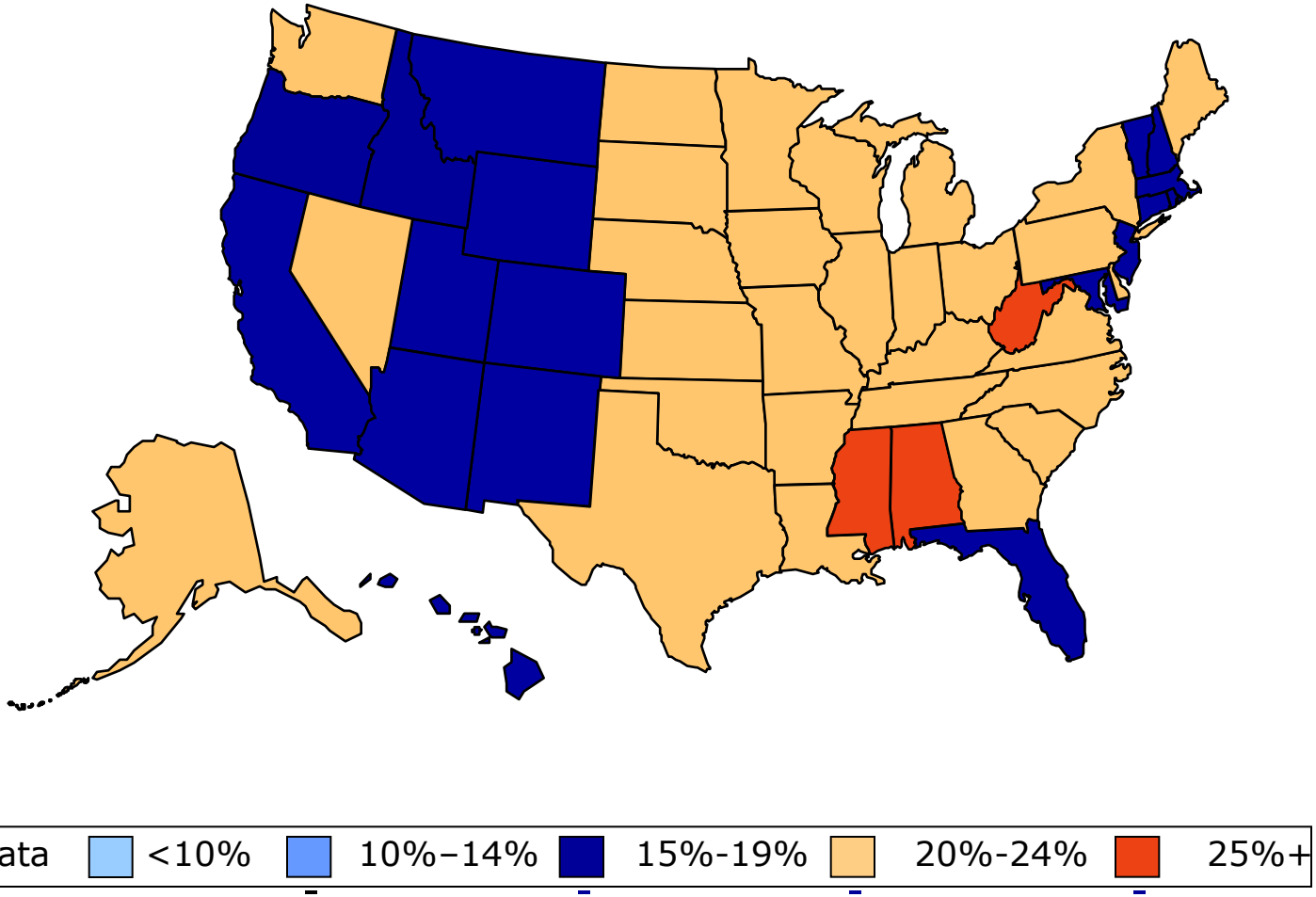


Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2002

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” woman)

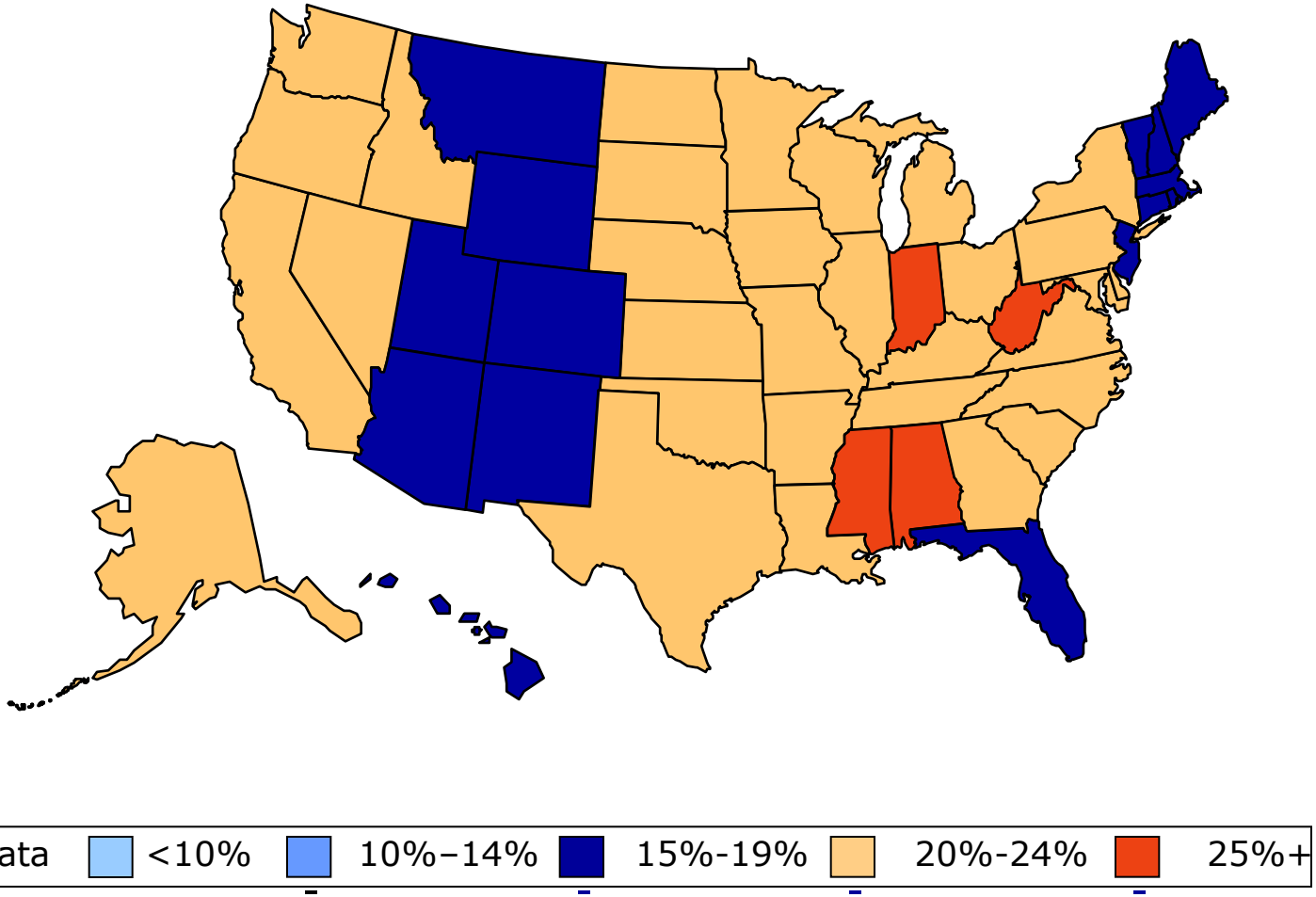


Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2003

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” woman)



Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2004

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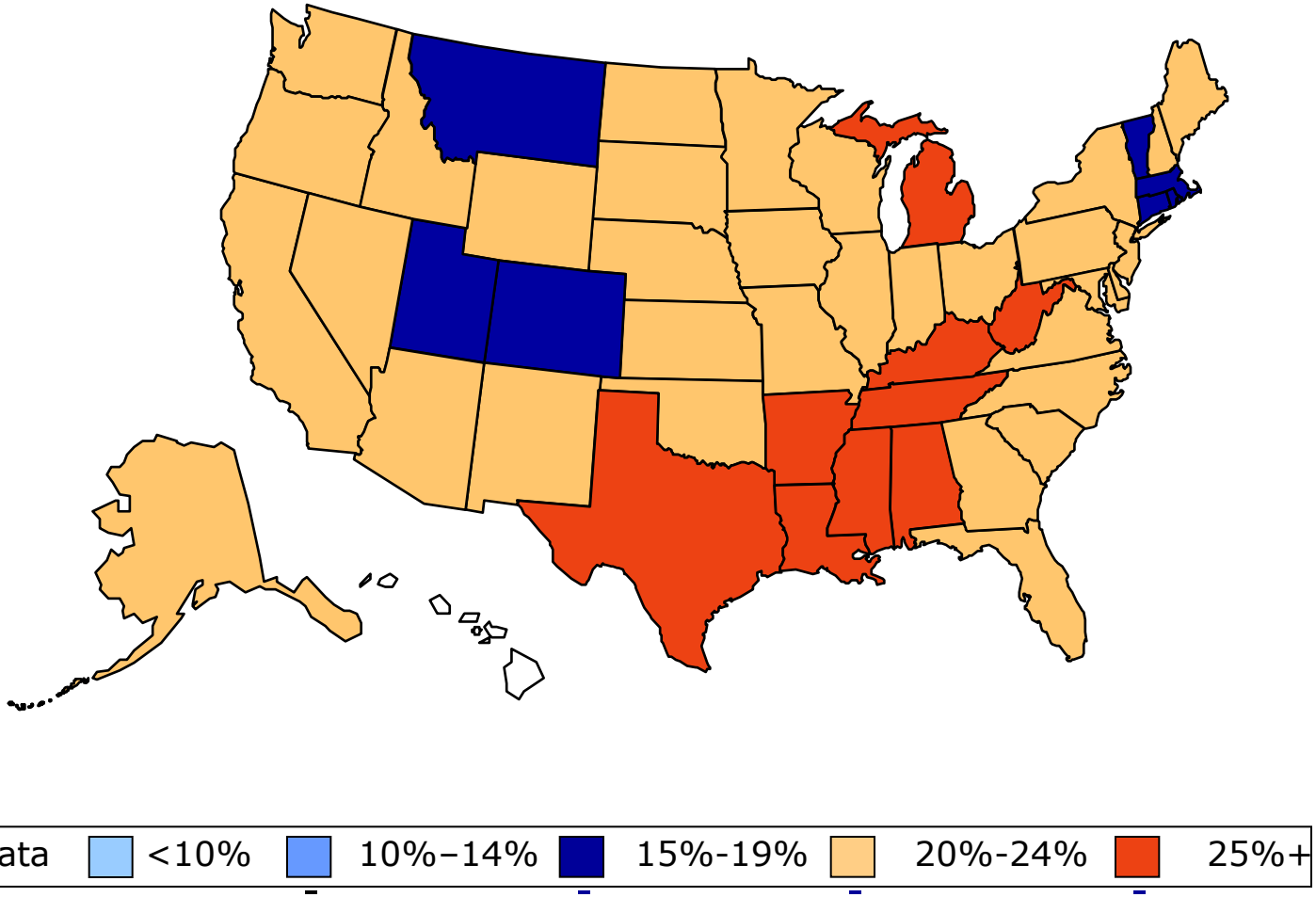

Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2005

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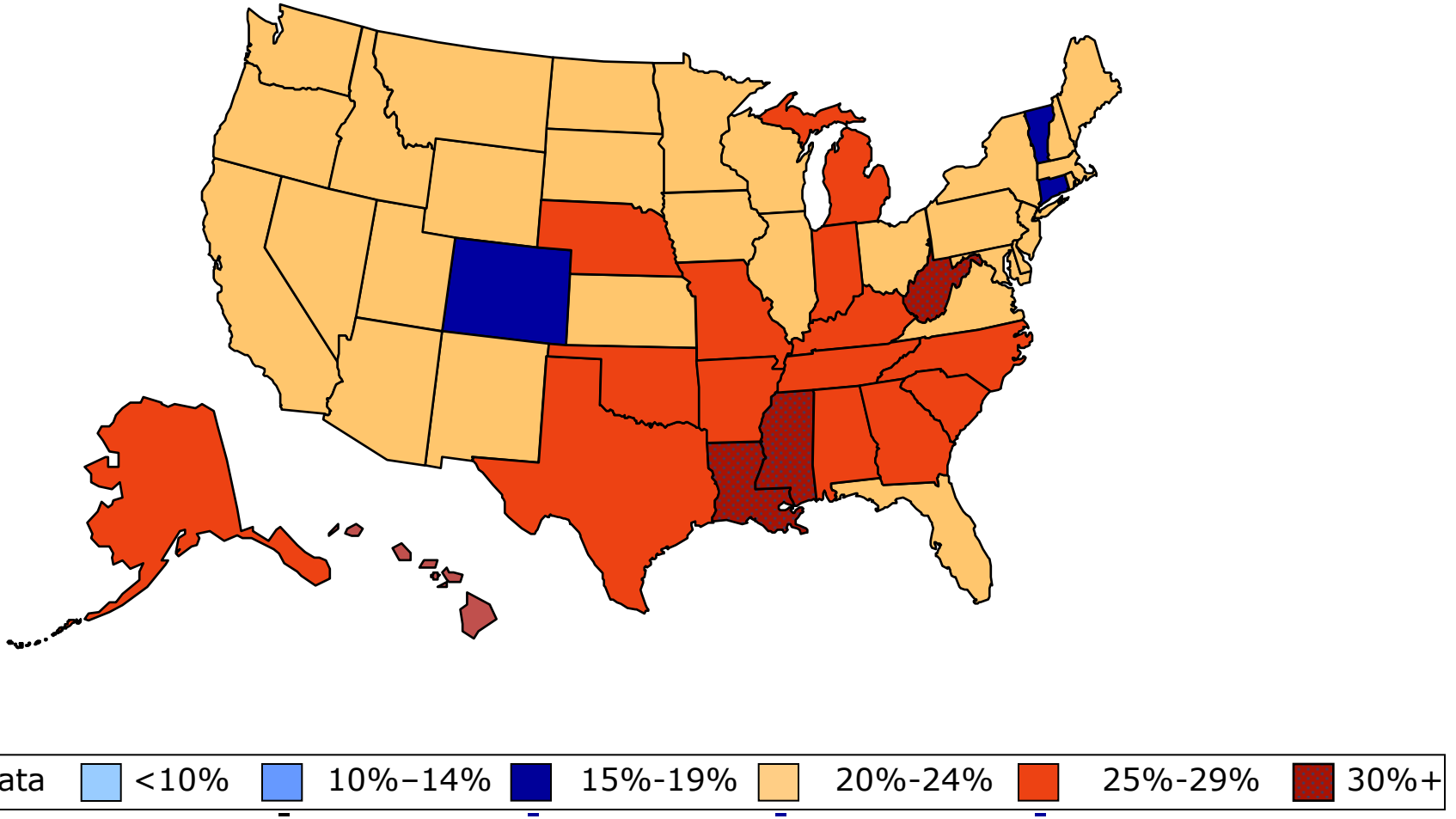

Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2006

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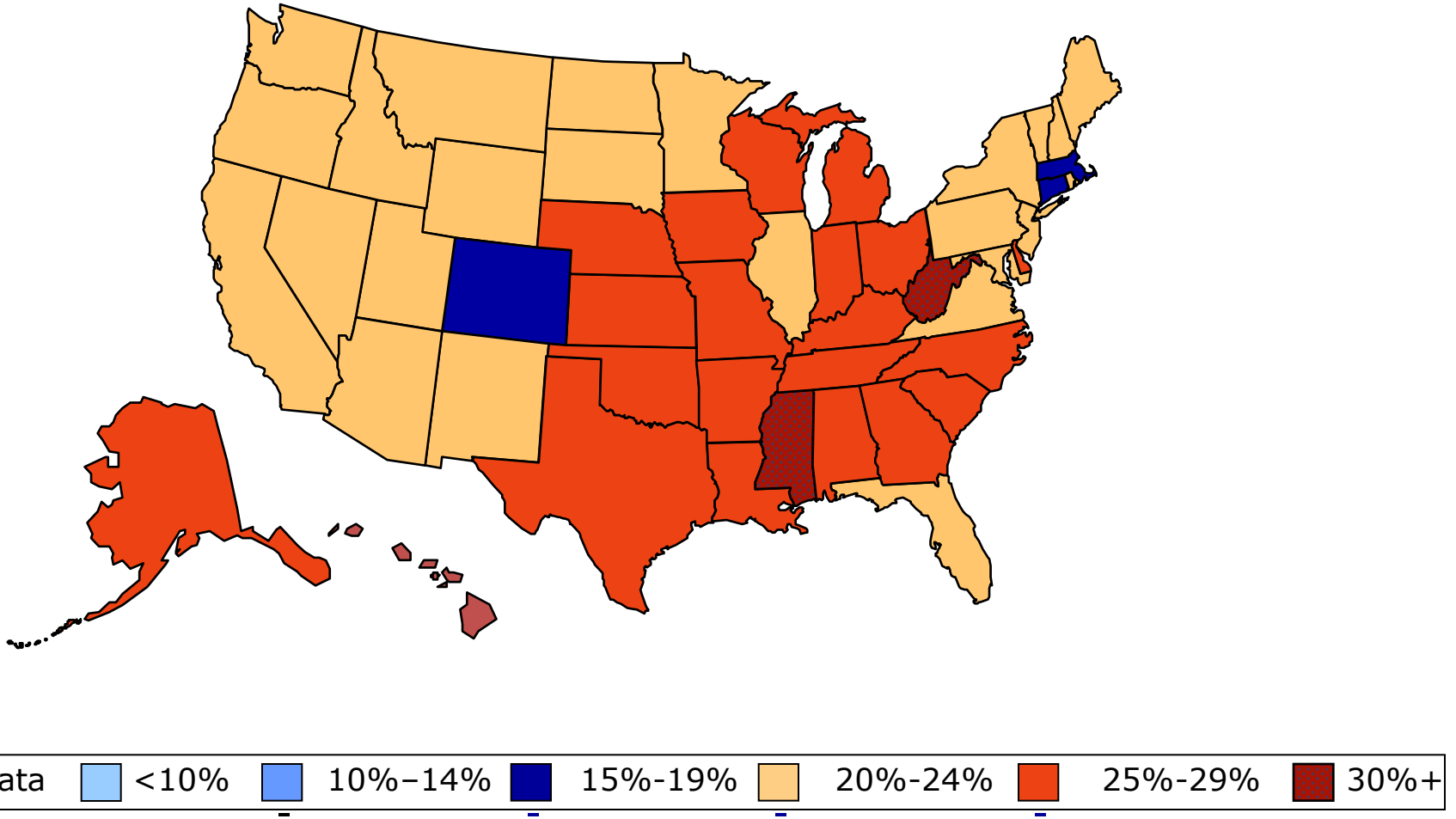
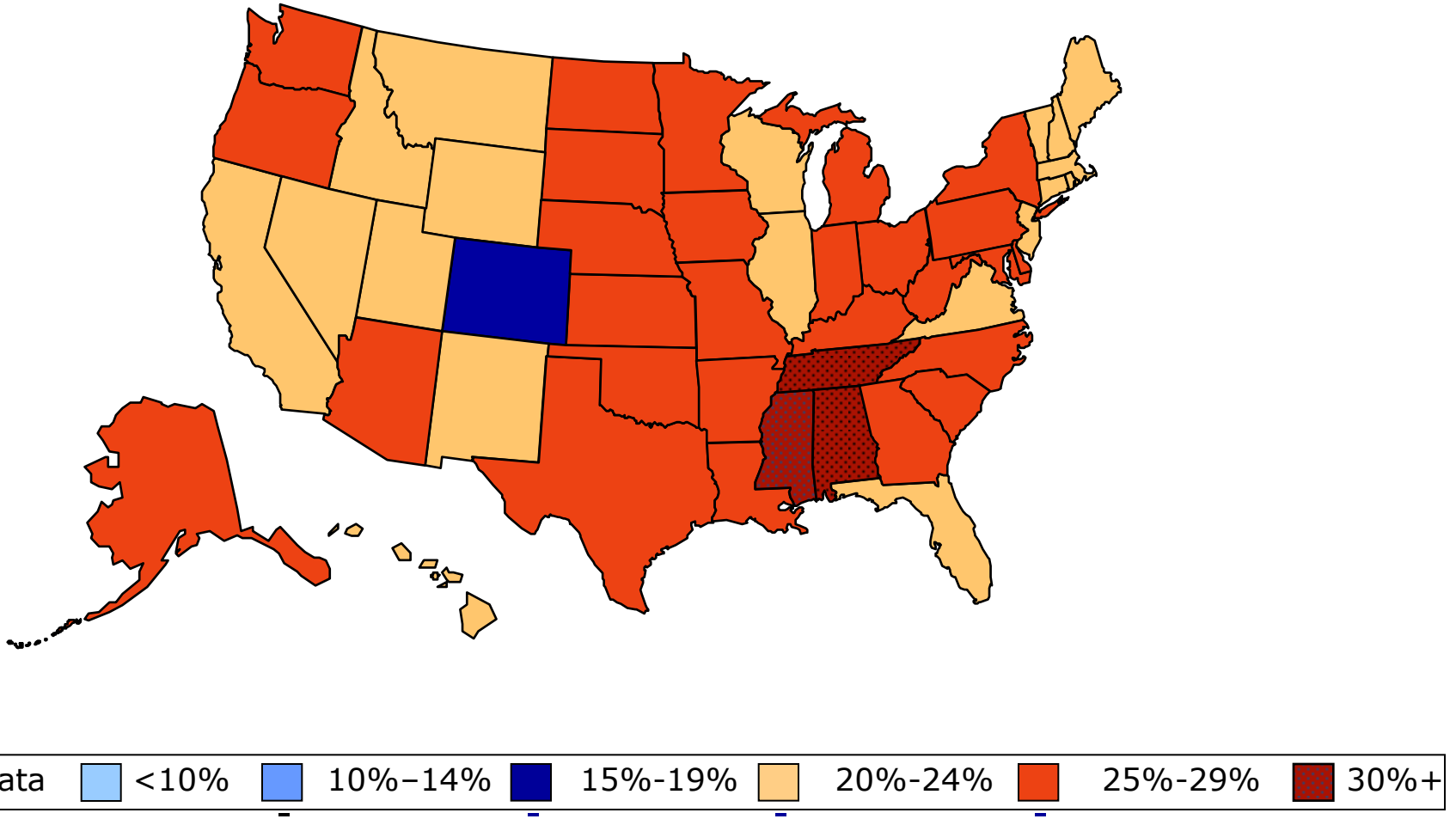


Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2007

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” woman)

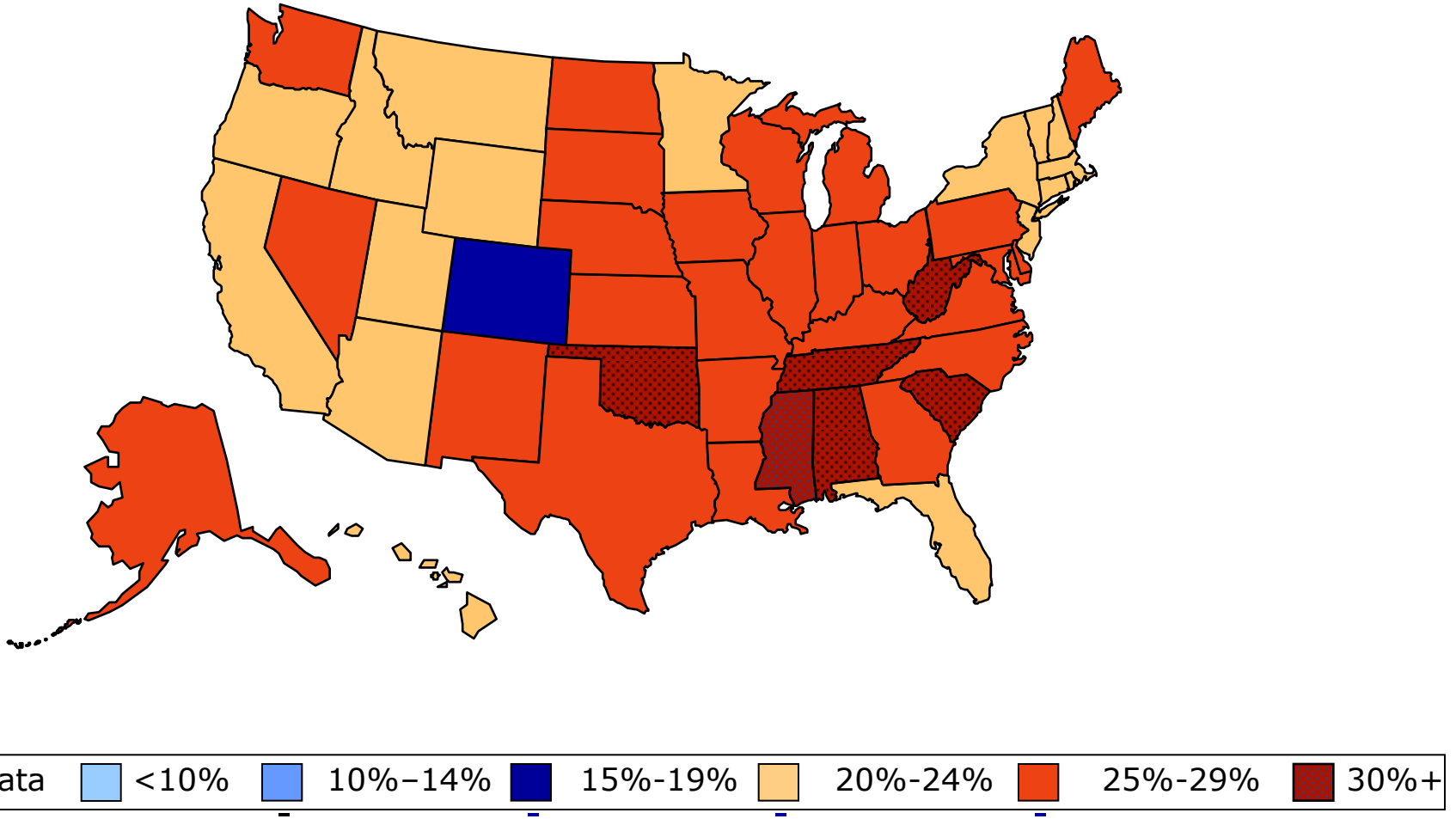


Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2008

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” woman)



Source: U.S. Centers for Disease Control and Prevention (CDC)

Obesity Trends* Among U.S. Adults

BRFSS, 2009

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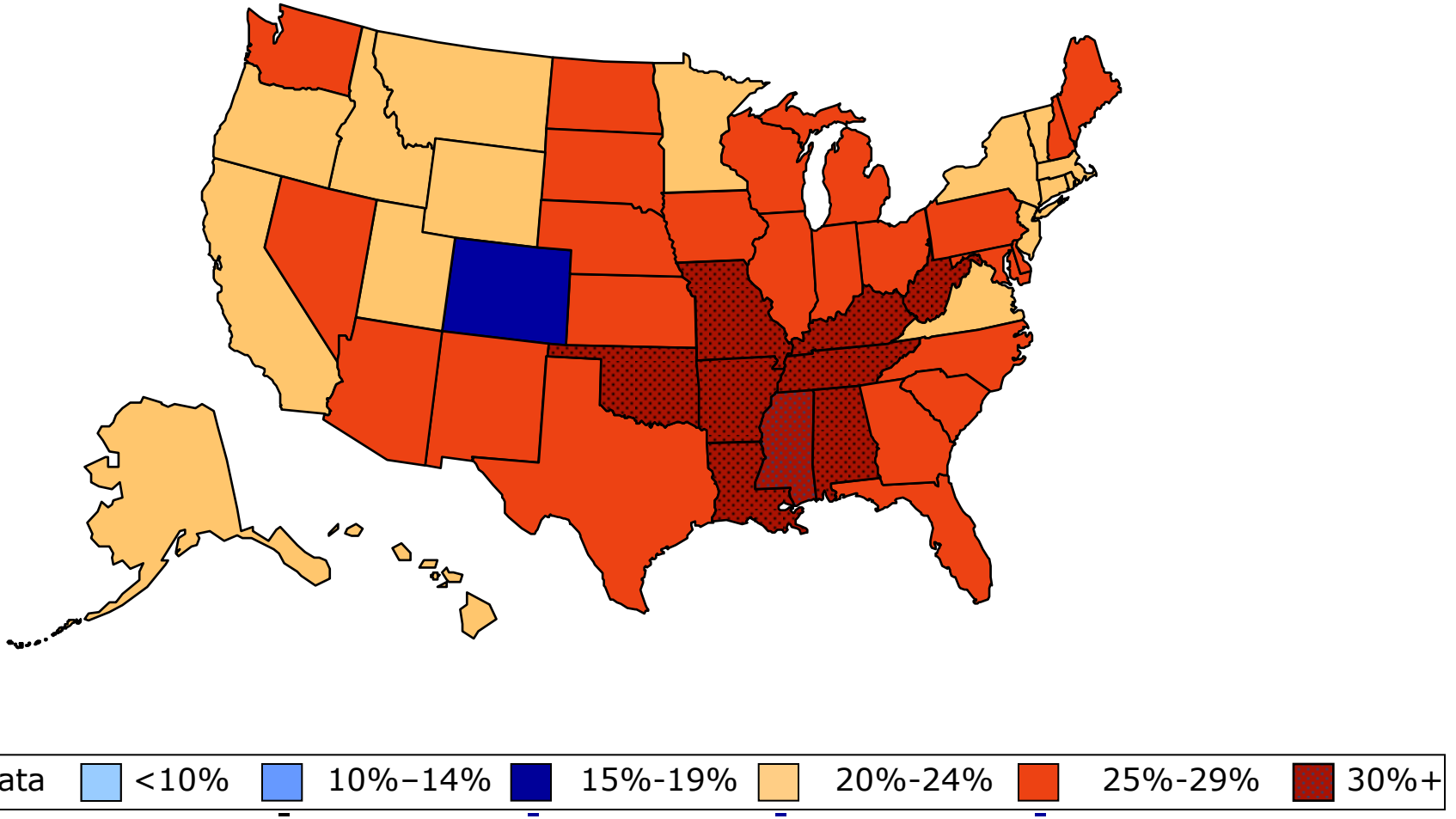
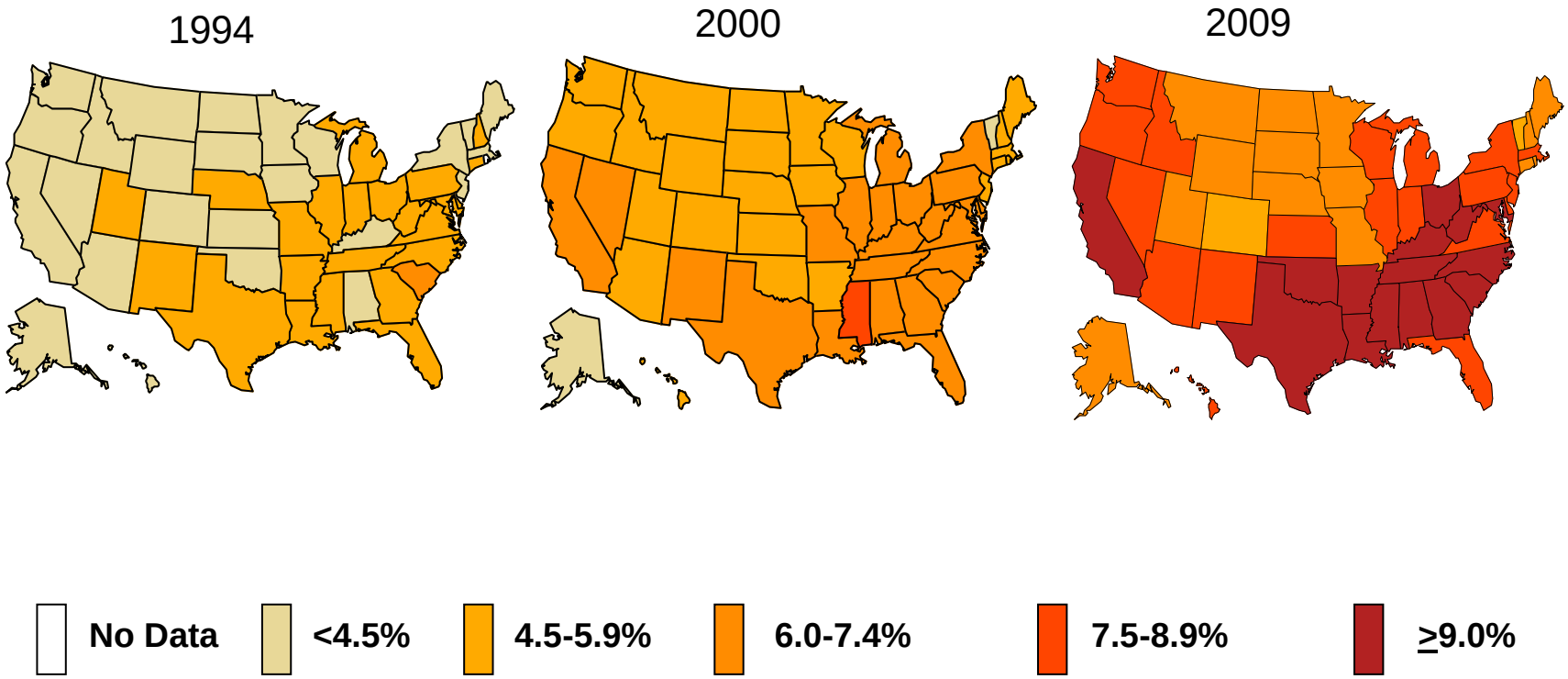


Source: U.S. Centers for Disease Control and Prevention (CDC)

Diabetes trends among U.S. adults



Source: CDC's Division of Diabetes Translation. National Diabetes Surveillance System available at http://www.cdc.gov/diabetes/statistics

According to the CDC……

the medical costs attributable to obesity today in the U.S. are estimated to be

$147 billion per year.

By 2030,

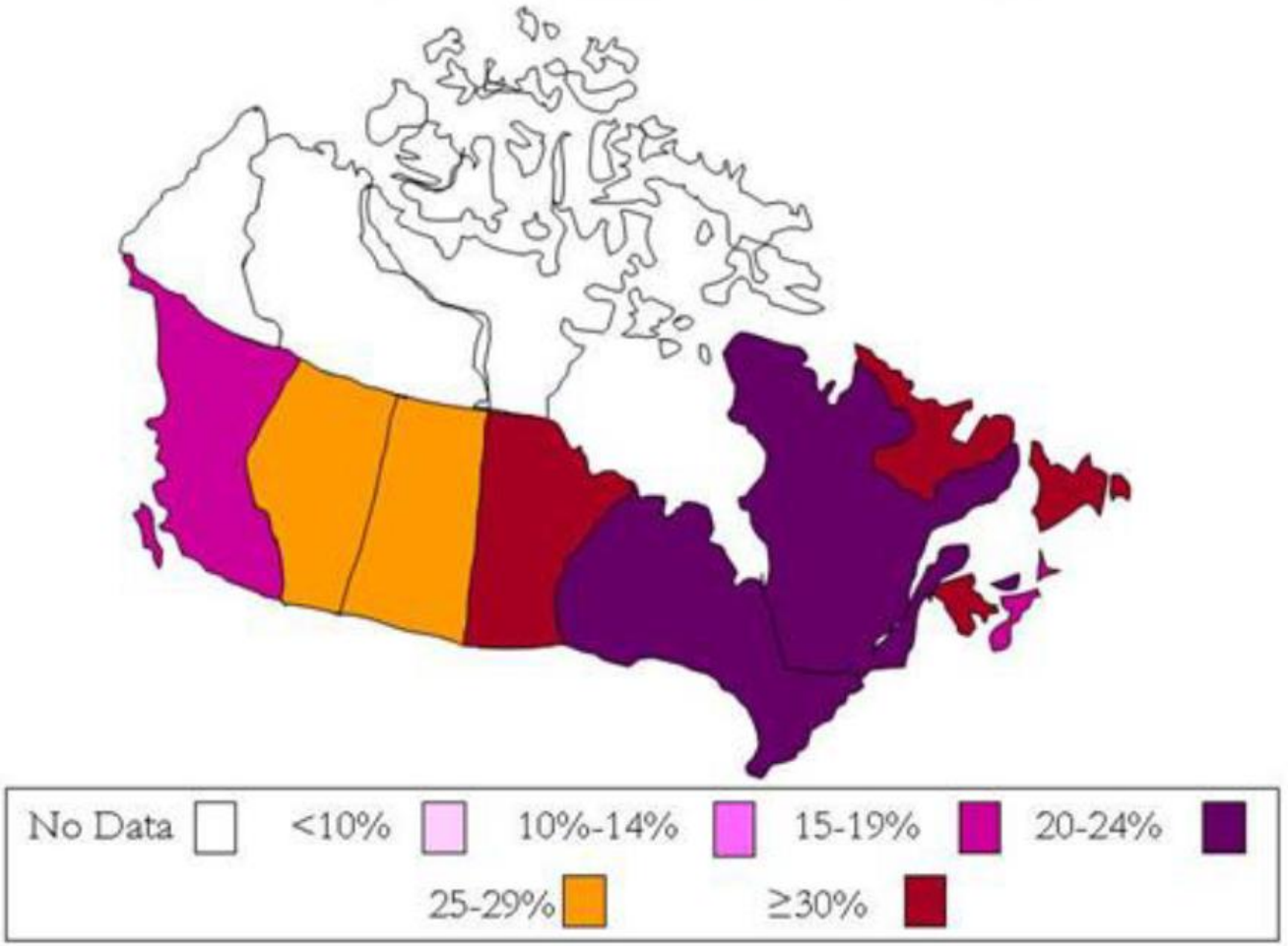
if obesity trends continue as shown,

the total attributable health-care costs will be

$860-$956 billion per year.

Obesity Trends Among Canadian Adults

CCHS, 2004 (MEASURED height & weight)



Source: M Tjepkema & M Shields, Statistics Canada. June 2005

Cost to Health Care:

- **CURRENT:**
  - Canada – $4.6 Billion – estimated economic costs of obesity (2008)
  - Saskatchewan – $230-260 Million annually (2010)

Please note: these numbers have most likely increased as the National cost estimation is 5 years old and Provincial is 3!

Physical Inactivity

- 85% of Canadian Adults do not get the minimum 150 minutes of moderate-vigorous physical activity per week
- 91% of Canadian boys and 96% of Canadian girls (ages 6-19 years) do not get the 60 min of moderate-vigorous physical activity per day

•Physical Inactivity contributes to:

– 21,000 premature deaths (Canada, 1995)

Obesity and Diabetes have increased rapidly.
Our genetics have not changed in one generation, but our built environment has!

Evidence Base for Improving Health through Building, Street and Neighborhood Design

www.thecommunityguide.org/pa

Designing to increase active transportation

Walking, Bicycling and Transit-oriented development

Designs to improve street safety and aesthetics (less crime and traffic / more greening), having sidewalks and bike paths connected to destinations, mixed land use, high population density

Median increase in physical activity 35% to 161%

Designing to increase active recreation

Enhancing access to places for physical activity, such as creating walking trails or having onsite or nearby parks, playgrounds and exercise facilities (homes & worksites)

increases leisure-time activity and weight loss

Designing to increase stair use

Point-of-Decision stair prompts

Signs placed at elevators & escalators encouraging stair use, w/ info on benefits of stair use

Median 50% increase in stair use

Design and aesthetic interventions

Music & art in stairwells

Design stairs to be more convenient and visible

Skip-stop elevators

3300% increase in stair use

Addressing Healthy vs Unhealthy Food and Beverage Access

Food Retail – Supermarkets vs Fast Food

- Supermarket availability is associated with lower rates of neighborhood obesity.
- High density of fast food restaurants is associated with increased weight and obesity in area residents.

Community Gardens

- People with a household member who participated in a community garden ate more fruits and vegetables per day.
- Garden-based nutrition education improved adolescent fruit and vegetable intake.

Access to Tap Water vs Caloric Beverages

- Big source of calories in the US diet (9% of calories) are from carbonated and non-carbonated soft drinks; Children & Adolescents are getting 10-15% of total calories from sugar-sweetened beverages and 100% fruit juice.
- Water fountain installation + education in elementary schools in deprived neighborhoods reduced risk of overweight in children.

Sources: Moreland K et al., Supermarkets, other food stores, and obesity. AJPM 2006; 30(4): pp. 333-339.
Mehta NK, Chang VW. Weight status and restaurant availability: a multi-level analysis. AJPM 2008; 34(2): pp. 127-133.
Alaimo K, Packnett E, Miles RA, Kruger DJ. Fruit and vegetable intake among urban community gardeners. J Nutr Educ Behav. 2008; 40(2): pp. 94-101. McAleese JD, Rankin LL. Garden-based nutrition education affects fruit and vegetable consumption insixth-grade adolescents.J Am Diet Assoc. 2007 Apr;107(4):662-5.
Block G. Foods contributing to energy intake in the US: data from NHANES III and NHANES 1999–2000. J Food Comp Anal. 2004;17: pp. 439–47.
Wang Y, Bleich S, Gortmaker S. Increasing caloric consumption from sugar-sweetened beverages and 100% fruit juices among US children and adolescents, 1088-2004. Pediatrics 2008; 121(6): pp.1604-1614.
Muckelbauer R et al. Promotiona and provision of drinking water in schools for overweight prevention: randomized, controlled cluster trial. Pediatrics 2009; 123(4): pp. e661-7.

Co-benefits of Active Design: Improve the Environment

	Fuel / Electricity Use	Air Quality	Obesity/Diabetes/ Heart Disease
Biking or walking rather than automotive transport	√	√	√
Stairs rather than elevators and escalators	√	√	√
Active recreation rather than television	√	√	√
Safe tap water rather than bottled and canned beverages	√	√	√
Fresh produce rather than unhealthy processed foods	√	√	√

Co-benefits: Create more accessible places for all

- Creating safer places to walk, take transit, & for wheelchair travel

- Making elevators more available for those who need them

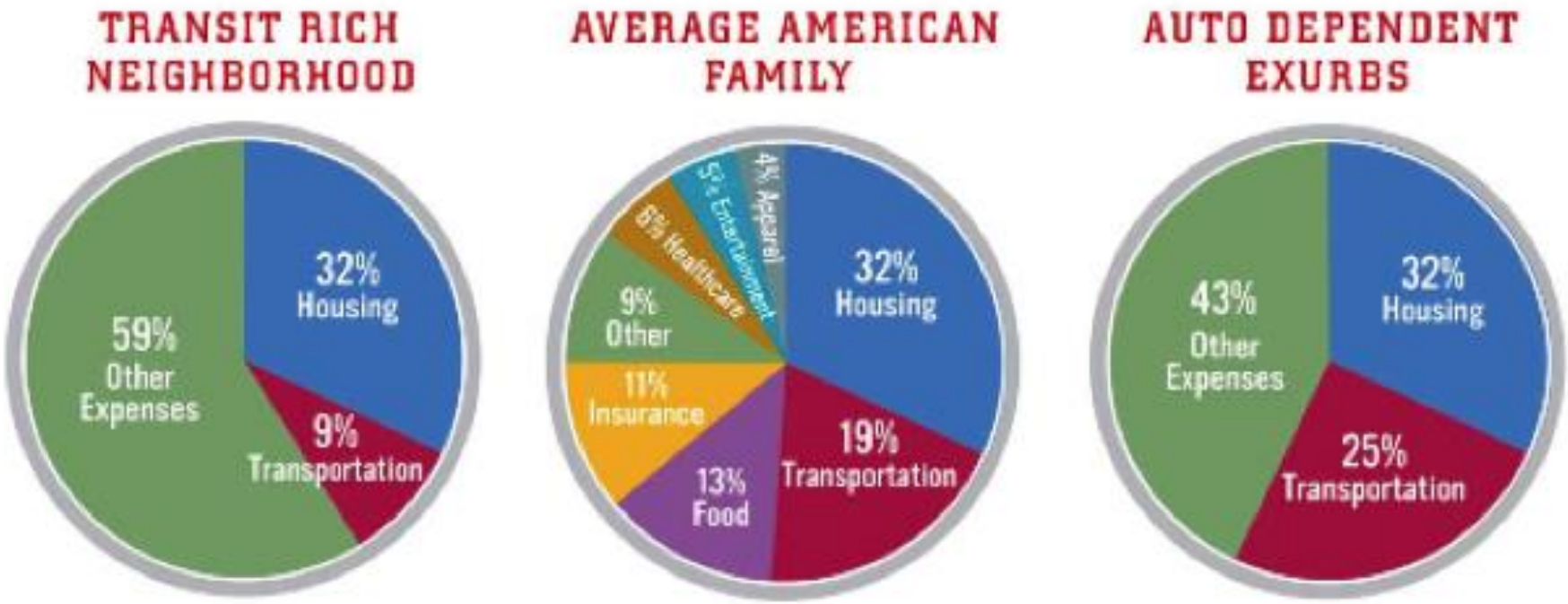
Co-benefits: Reduce infrastructure costs

More compact, walkable development patterns save money on avoided infrastructure costs

	Water & Sewer Laterals Required	Water & Sewer Costs (billions)	Road Lane Miles Required	Road Land Miles Costs (billions)
Sprawl Growth Scenario	45,866,594	$189.8	2,044,179	$927.0
Compact Growth Scenario	41,245,294	$177.2	1,855,874	$817.3
Savings	**4,621,303**	**$12.6 (10.1%)**	**188,305**	**$109.7 (6.6%)**

Sprawl Costs: Economic Impacts of Unchecked Development, Robert W. Burchell, Anthony Downs, Barbara McCann and Sahan Mukherji, Island Press, 2005

Co-benefits: Save people money



People in walkable, transit-rich neighborhoods spend only 9 percent of their monthly income on transportation costs; those in auto-dependent neighborhoods spend 25 percent.

Source: Center for Transit-Oriented Development

Co-benefits: Create jobs

Project type	Road	Bicycle	Pedestrian	Off-street trail	Number of projects	Direct jobs per $1 million	Indirect jobs per $1 million	Induced jobs per $1 million	Total jobs per $1 million
Total, all projects					58	4.69	2.12	2.15	8.96
Bicycle infrastructure only		•			4	6.00	2.40	3.01	11.41
Off-street multi-use trails				•	9	5.09	2.21	2.27	9.57
On-street bicycle and pedestrian facilities (without road construction)		•	•		2	4.20	2.20	2.02	8.42
Pedestrian infrastructure only			•		10	5.18	2.33	2.40	9.91
Road infrastructure with bicycle and pedestrian facilities	•	•	•		13	4.32	2.21	2.00	8.53
Road infrastructure with pedestrian facilities	•		•		9	4.58	1.82	2.01	8.42
Road infrastructure only (no bike or pedestrian components)	•				11	4.06	1.86	1.83	7.75

Building bicycle and pedestrian infrastructure creates more jobs per dollar invested, compared to road infrastructure only

Source: Political Economy Research Institute: June 2011

Co-benefits: Create desirable places to live, work & play

Sprawl Community :

Preferred by 43%

There are **only single-family houses** on large lots

There are **no sidewalks**

Places such as shopping, restaurants, a library, and a school are within **a few miles** of your home and **you have to drive** most places

There is enough parking when you drive to local stores, restaurants, and other places

Public transportation, such as bus, subway, light rail, or commuter rail, is **distant or unavailable**

Smart Growth Community :

Preferred by 56%

There is a **mix** of single-family detached houses, townhouses, apartments, and condominiums on various sized lots

Almost all of the streets have **sidewalks**

Places such as shopping, restaurants, a library, and a school are within **a few blocks** of your home and **you can either walk or drive**

Parking is limited when you decide to drive to local stores, restaurants, and other places

Public transportation, such as bus, subway, light rail, or commuter rail, **is nearby**

Source: NAR National Poll, 2011 Q: In which community would you rather live?

Integrating Health into Urban & Building Design Policies & Practices

- The Need for **Partnerships Across Sectors**
- **Finding Synergies and Co-Benefits**
- **Complementary Roles** of Partners
  - Health: Data on key health issues; evidence for interventions; helped organize meetings/conferences for cross-sector discussions; co-leader/partner in initiatives; health-related evaluations
  - Planning, Transportation, Parks, Public Works, Housing, School Construction, Buildings, Private Sector Architects/Developers: Ideas of what's feasible in the current local context; identifying opportunities and mechanisms, including and especially synergistic efforts; co-Leadership and participation in the efforts
  - Researchers: evidence reviews and synthesis, evaluation research
- Using **Evidence-Based and Best-Practice Strategies**
- Using **Annual Conferences as Strategic Milestones**
  - **E.g. Annual NYC Fit City Conferences – Fit City 8 June 24, 2013 www.aiany.org/fitcity7**

U.S. - Built Environment & Health Initiatives

- Supported by CDC Communities Putting Prevention to Work Mentoring grant
- Partnership between NYC DOHMH, AIANY, and 14 communities
- All communities are recipients of CPPW grants

Boston MA ~ Cherokee Nation OK ~ Chicago IL ~ Cook County IL ~ Douglas County NE ~ Jefferson County AL ~ King County WA ~ Louisville KY ~ Miami-Dade County FL ~ Multnomah County OR ~ Nashville TN ~ Philadelphia PA ~ Pima County AZ ~ San Diego CA

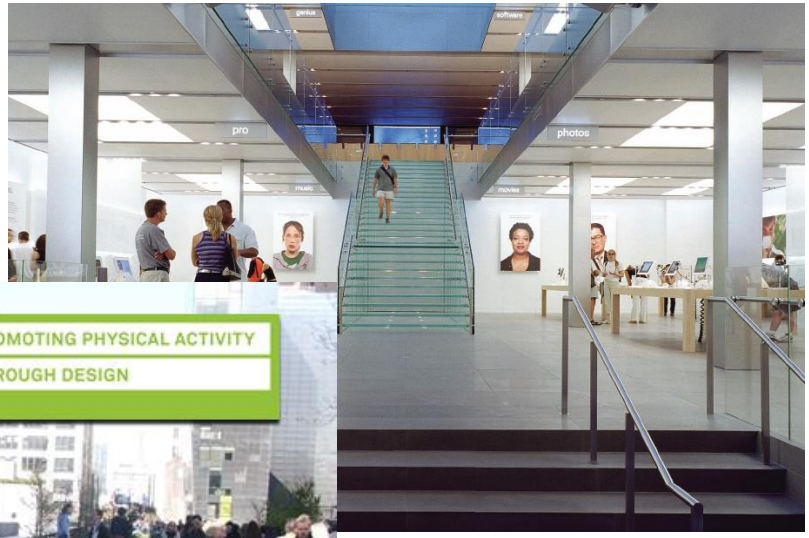
COMMUNITIES PUTTING PREVENTION TO WORK

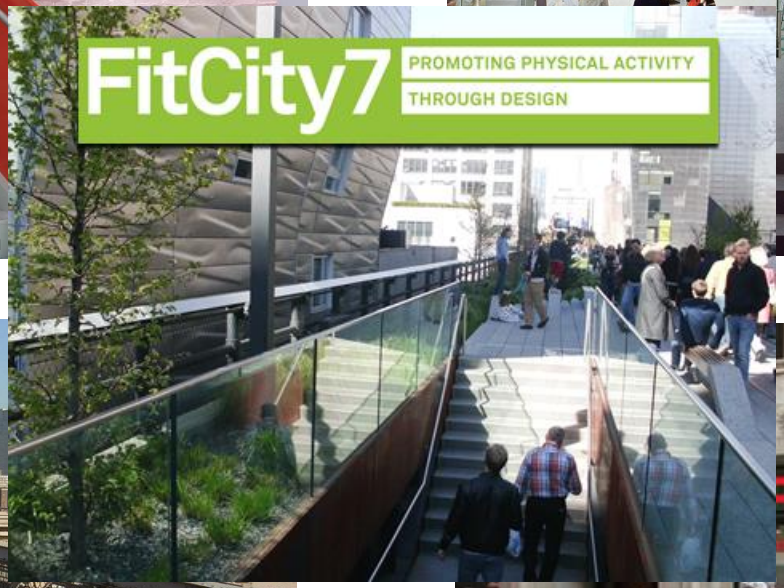
Cross-Sector Partnerships in U.S. Cities

Key Intergovernmental Partners in Local Communities (n=15, incl. NYC):

- Public Health – 15
- Planning – 15
- Transportation – 14
- Education/School Construction – 12
- Parks and Recreation – 12
- Public Works – 8
- Housing Development or Management – 6
- Buildings – 3

Fit City Conferences



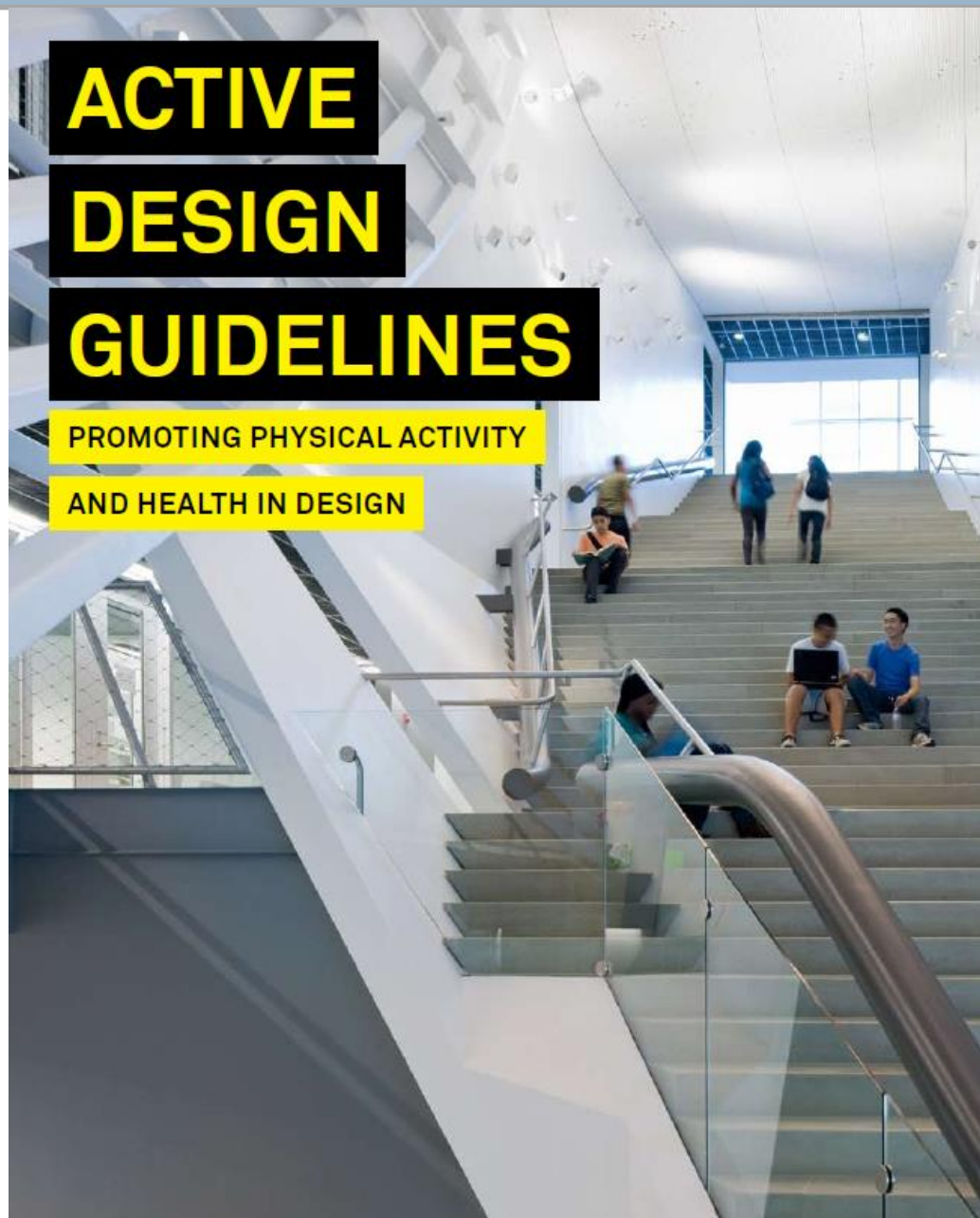


www.aiany.org/fitcity7

The Active Design Guidelines

Chapters

1) Environmental Design and Health: Past and Present
2) Urban Design: Creating an Active City
3) Building Design: Creating Opportunities for Daily Physical Activity
4) Synergies with Sustainable and Universal Design



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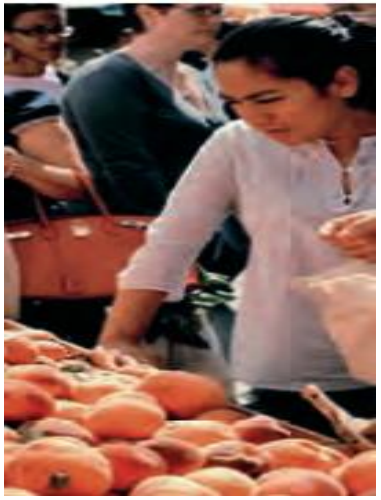
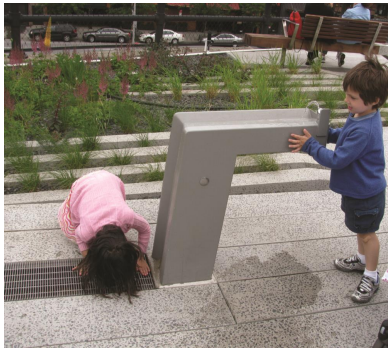
Thanks to all the design practitioners and organizations who participated in the 2009 Design Charrette to help test the Guidelines prior to its publication.

*We also thank the many city agencies that gave input including the Depts of Parks and Recreation, Buildings, Housing Preservation and Development, School Construction Authority, Aging, and Mayor's Offices of Long-Term Planning and Sustainability, and of People with Disabilities.



Urban Design Strategies

- Land Use Mix
- Access to Supermarkets, Farmers Markets, Drinking Water
- Parks / Play Areas / Plazas
- Transit Access
- Pedestrian Friendly Environment
- Bicycle Network and Infrastructure



Building Design Strategies

- Bicycle Parking and Storage
- Active Recreation Spaces for Children + Adults
- Stairs: Accessibility, Visibility, Convenience
- Stairs: Aesthetics
- Stairs: Signage and Prompts
- Skip-Stop Elevators
- Improving Access to Drinking Water

General Approach: Integration into Master Plan

Added a Public Health Chapter:

"New York City is one of the healthiest cities in the United States, with a life expectancy that exceeds the national average.

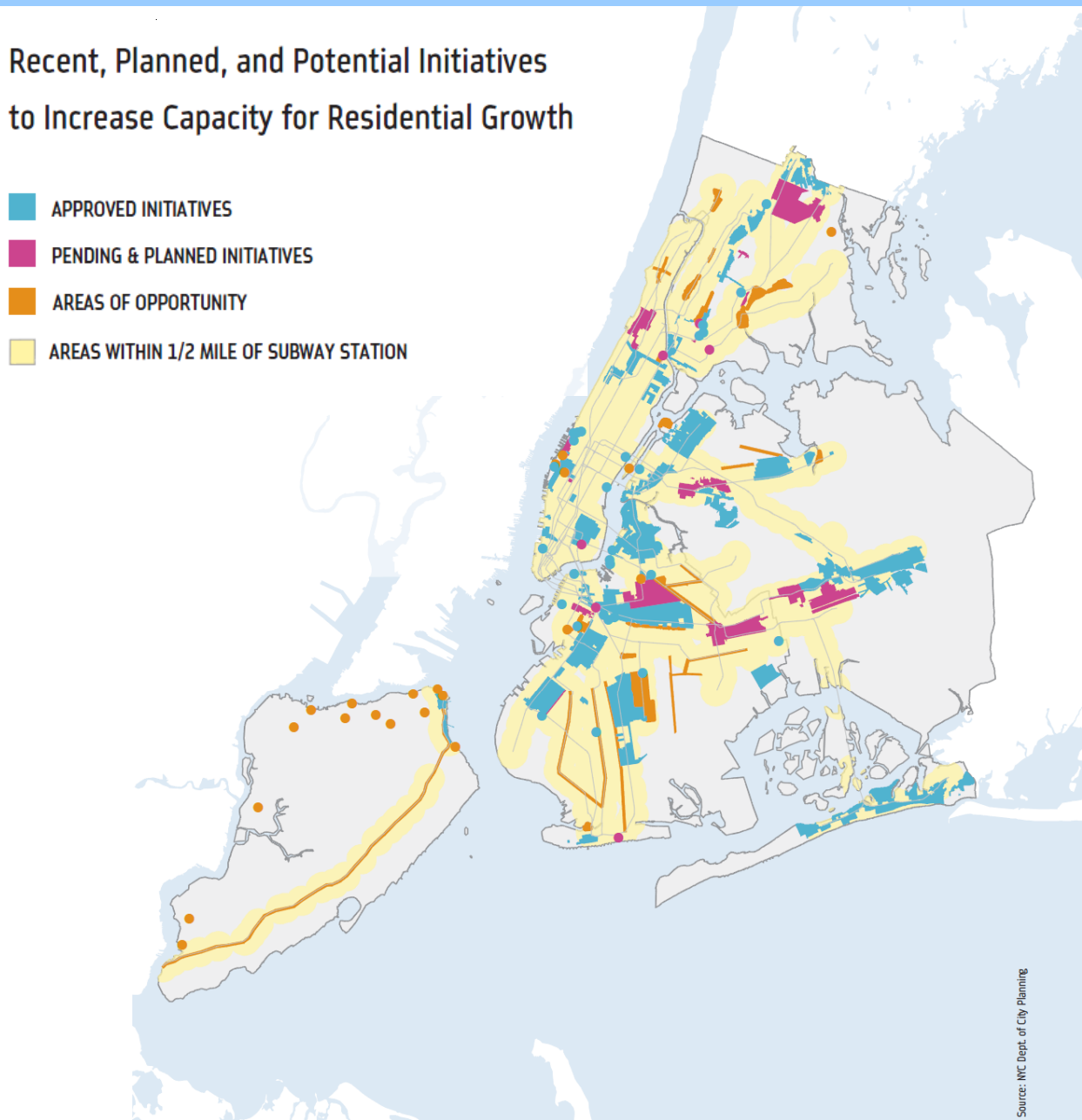
This achievement is the result of visionary planning and sustained investment……

…..Despite these successes, health challenges remain—and new ones are emerging—that require creative, modern shifts in how the city operates."

General Approach: Smart Growth, incl. TOD

Smart Growth

Focusing the development for 1 million new people by the year 2030 near public transit access.



Improving Streets: Residential Streetscape Preservation Text Amendment

Too many curb cuts result in:

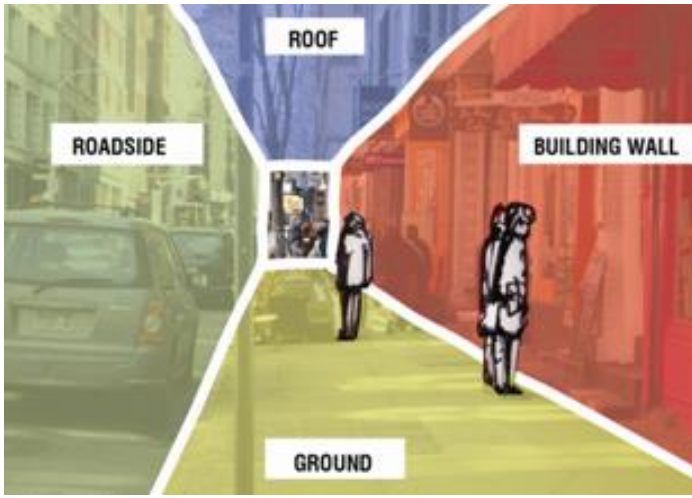
1. **Unattractive streetscapes**
2. **Loss of on-street parking**
3. **Potential vehicular/pedestrian conflicts**
4. **Loss of ground floor retail space in commercial and mixed-use districts**

Creating a more continuous and inviting pedestrian environment

Improving Streets: Residential Streetscape Preservation Text Amendment

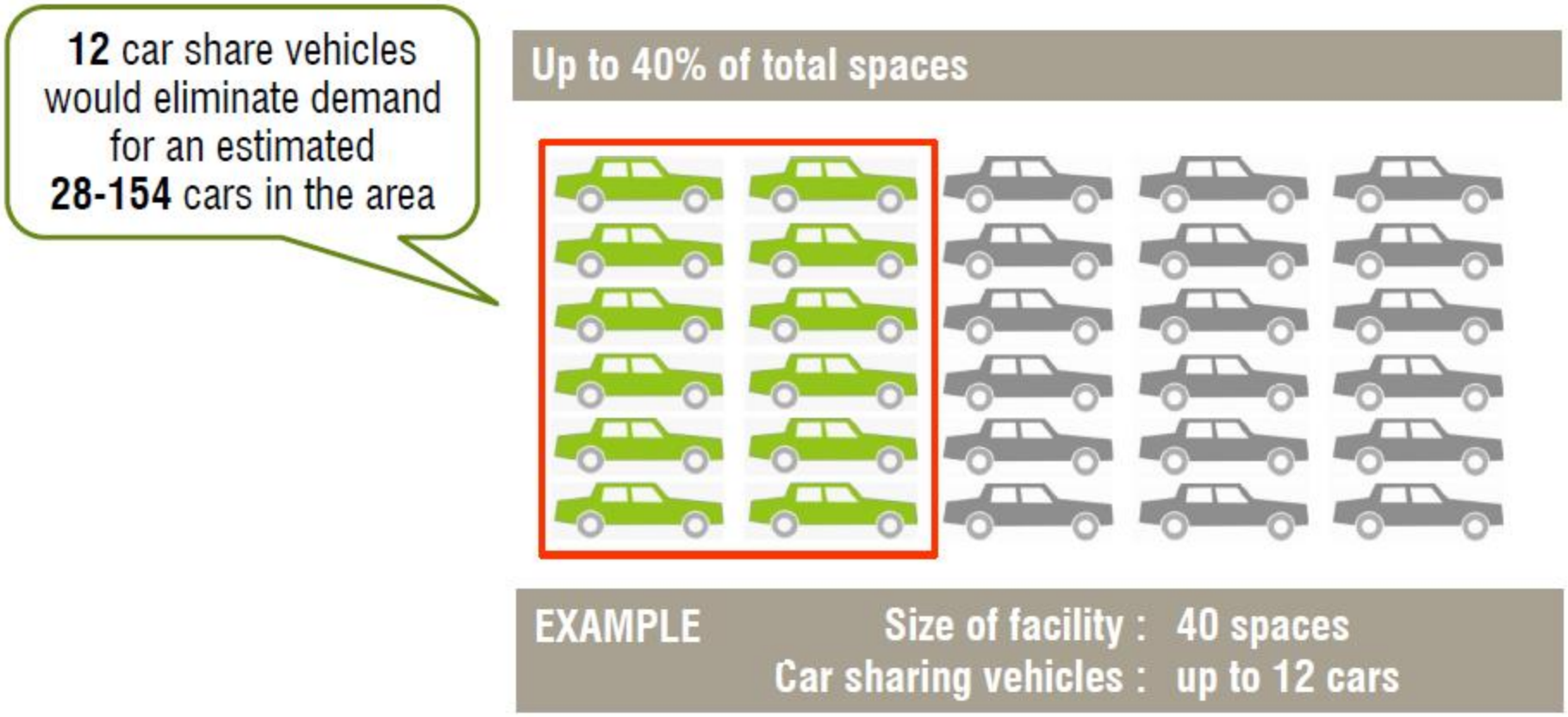
Creating a more continuous and inviting pedestrian environment

Improving Sidewalks



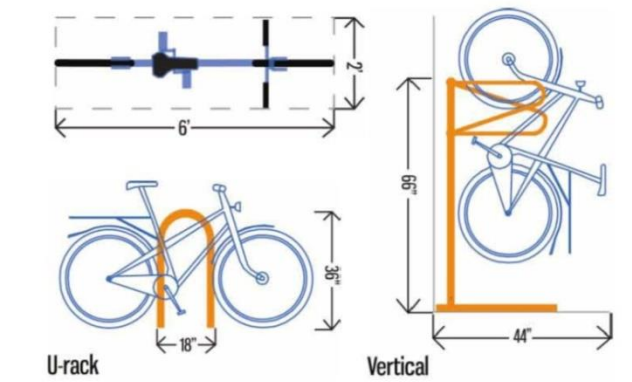
http://www.nyc.gov/html/dcp/html/sidewalk_experience/index.shtml

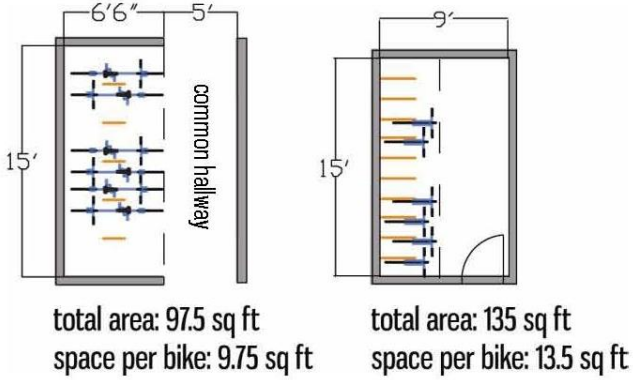
Improving Amenities: Car Share Zoning Text Amendment

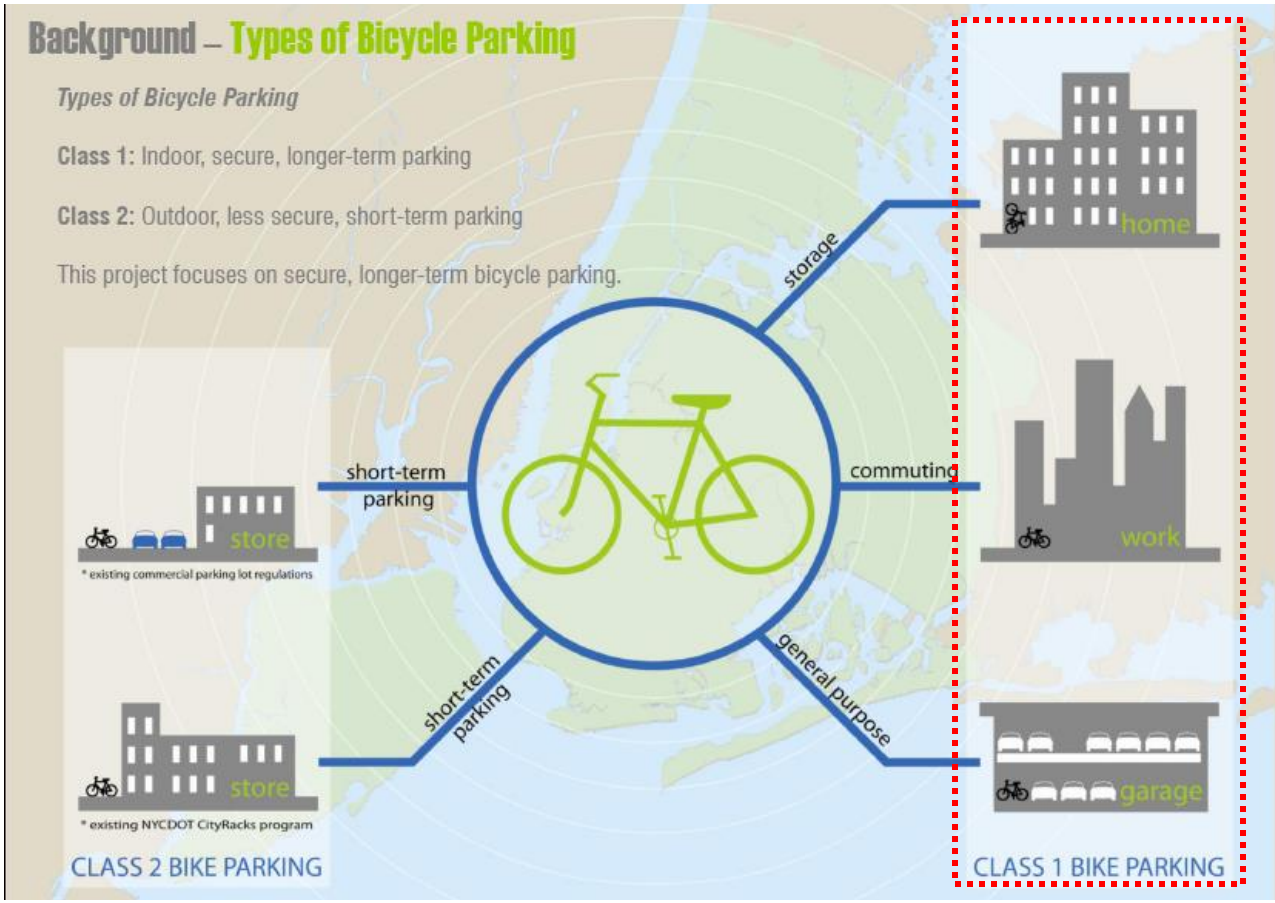


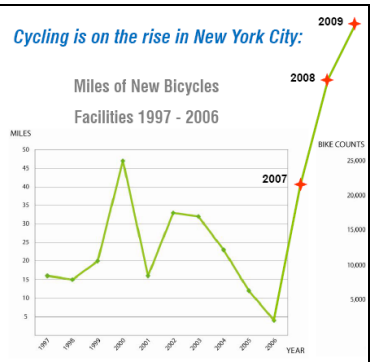
- Define ‘car share’ in the zoning resolution
- Establish rules for quantity and location

Improving Amenities: Zoning for Bicycle Parking – Mandating/Relieving



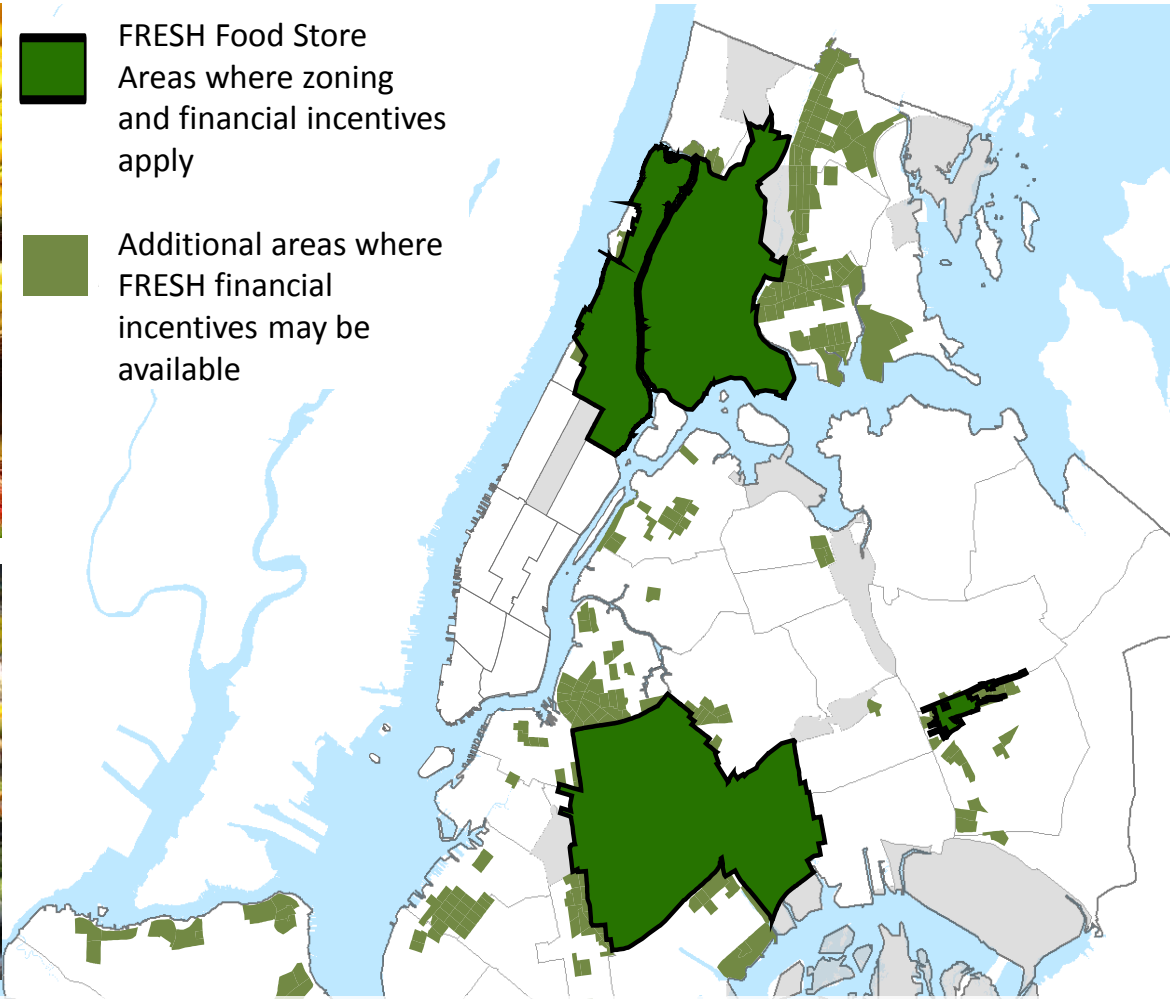






Bicycle parking now required for new buildings, enlargements, conversions and public parking garages
(floor area is discounted)

Improving Amenities - Food Retail Expansion to Support Health (FRESH)

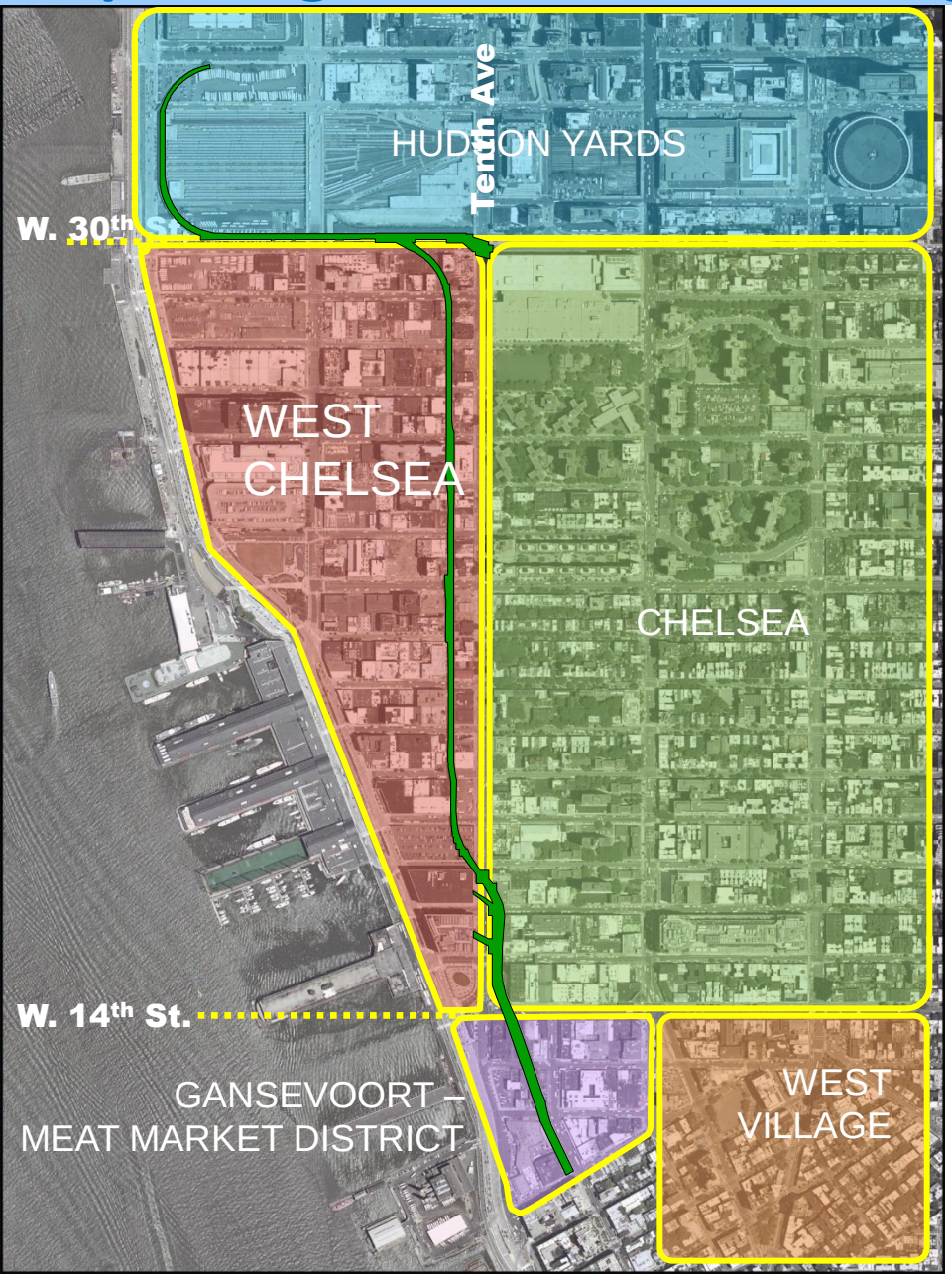


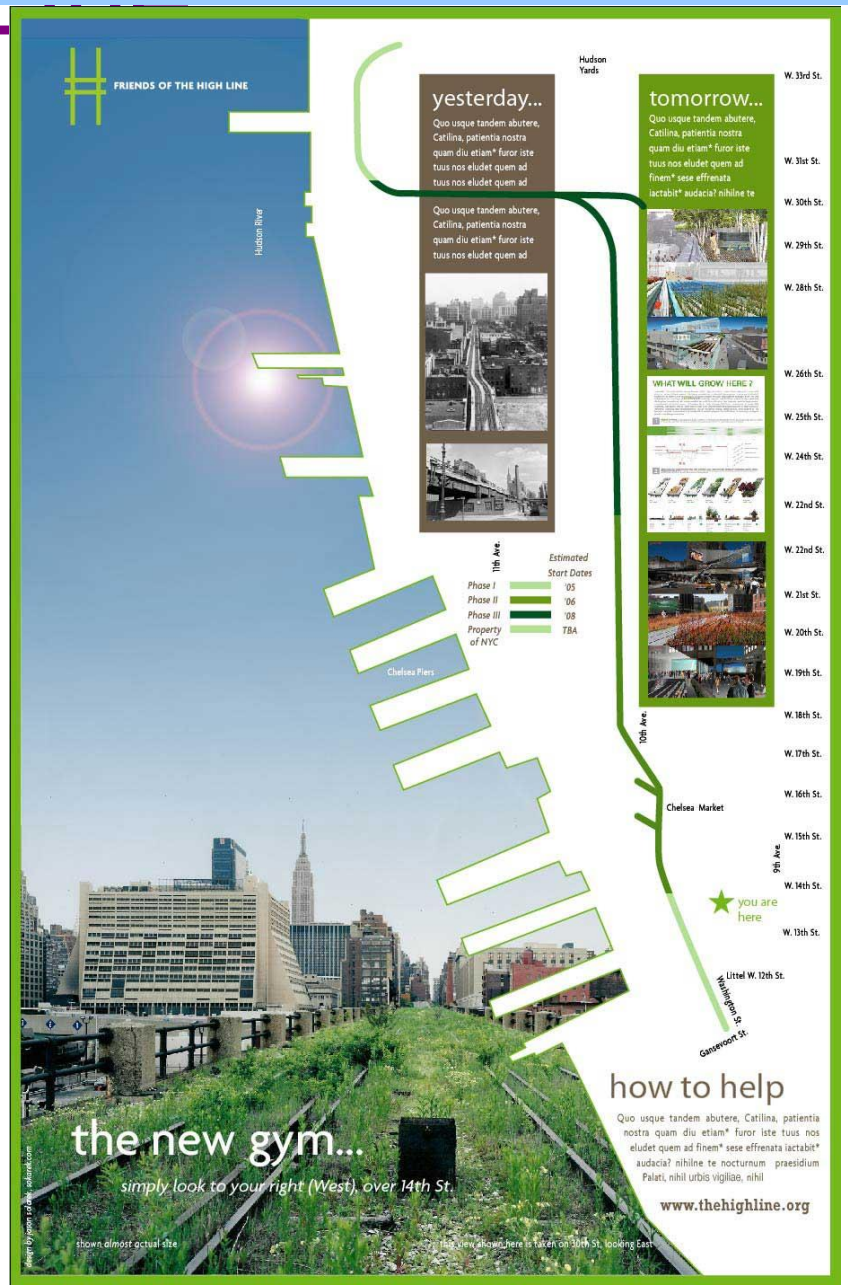
NYC FRESH Program:

Zoning and tax incentives for providing fresh food options in the city's underserved areas

www.nyc.gov/fresh

Improving Amenities: Rezoning for New Public Parks





Improving Amenities: Vision 2020 - Comprehensive Waterfront Plan

Working with DOT to Change the Form of the Public Right of Way

Public Plaza Program

89% OF THE ROAD SPACE FOR VEHICLES, 11% FOR PEOPLE


TOSHIBA
Kodak

Public Plaza Program

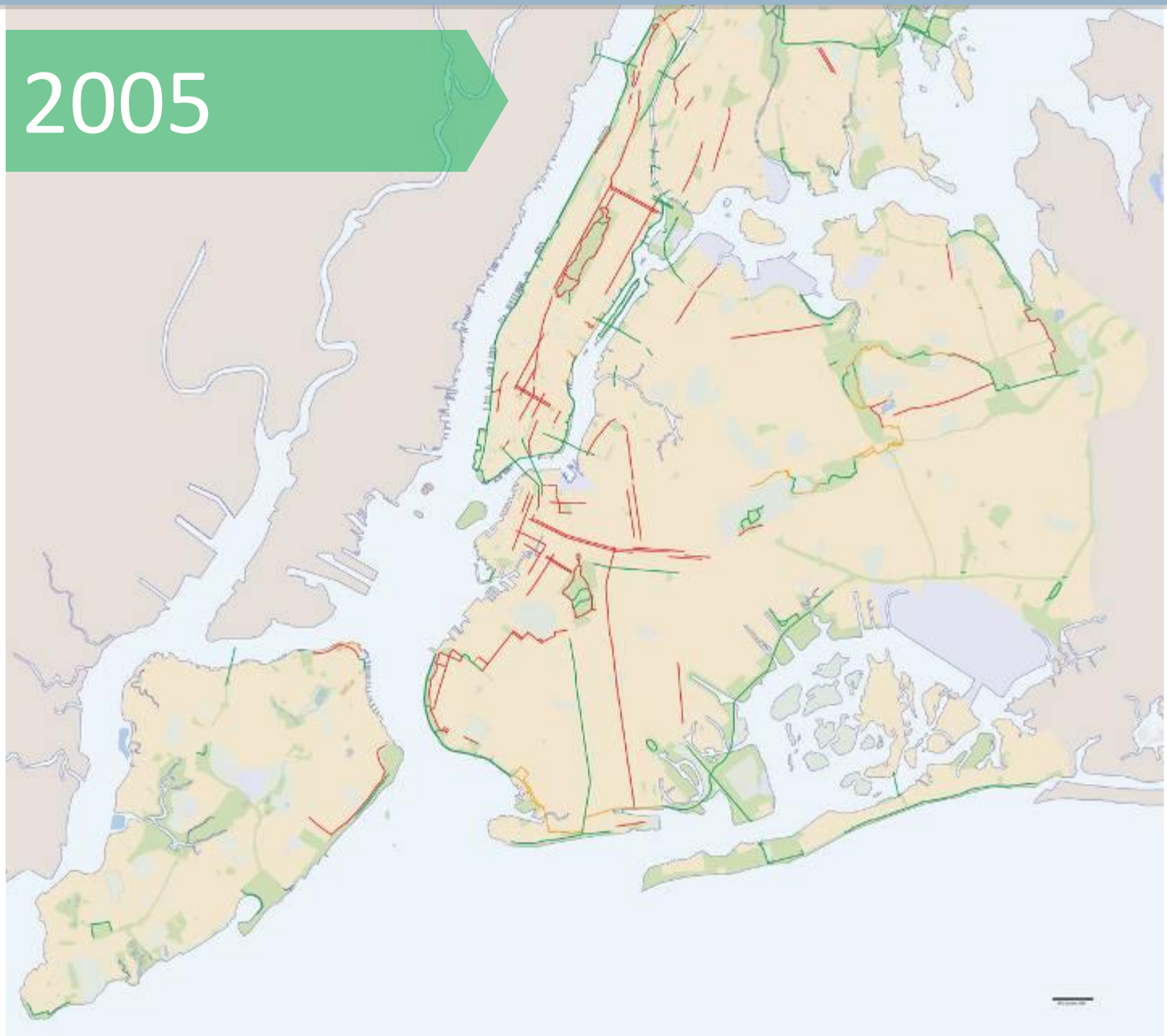
Pedestrian volumes up:

- 6% in Herald Square
- 11% in Times Square

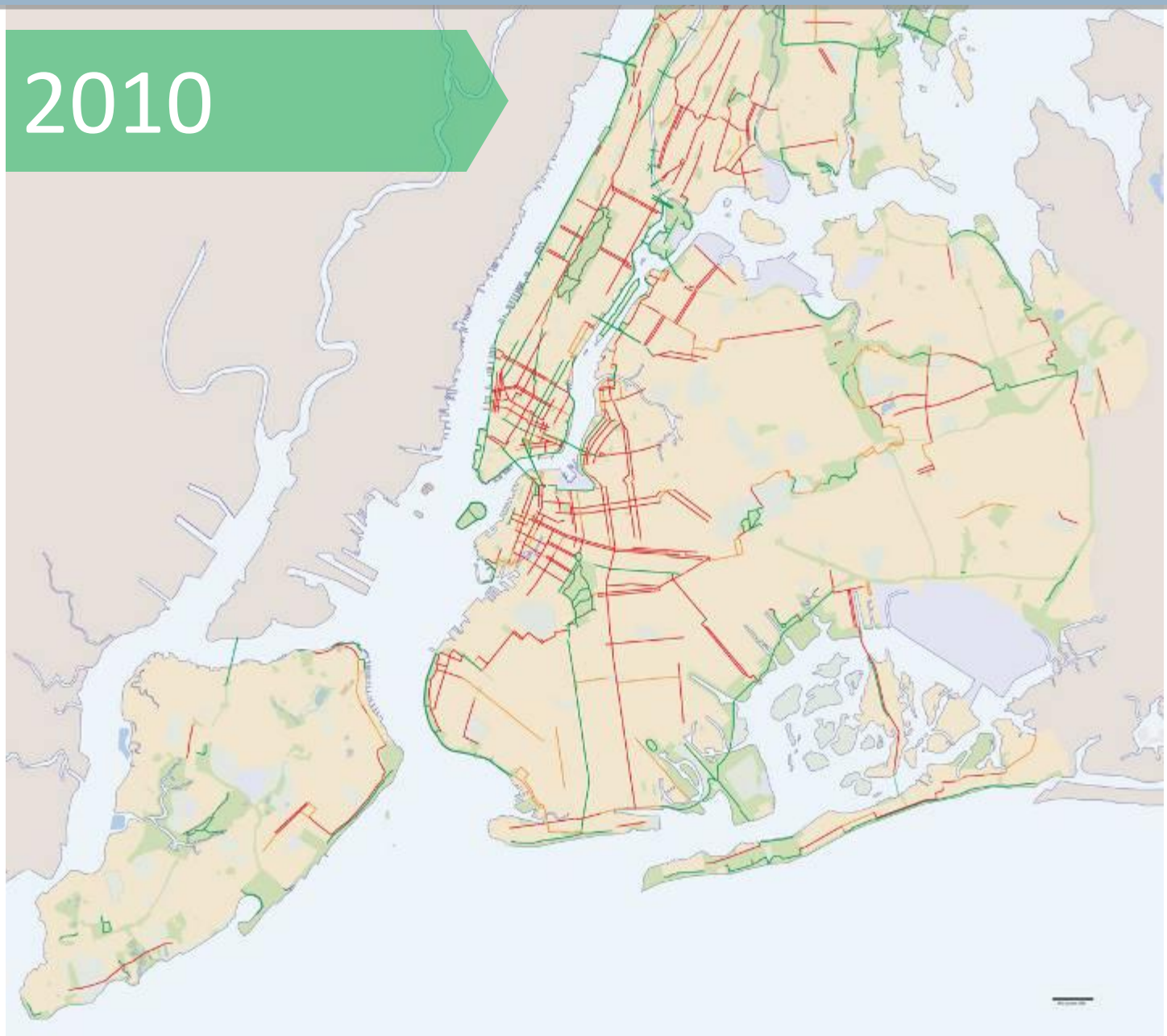
Retail up:

- in Times Square
- 49% drop in vacant storefronts in Union Square

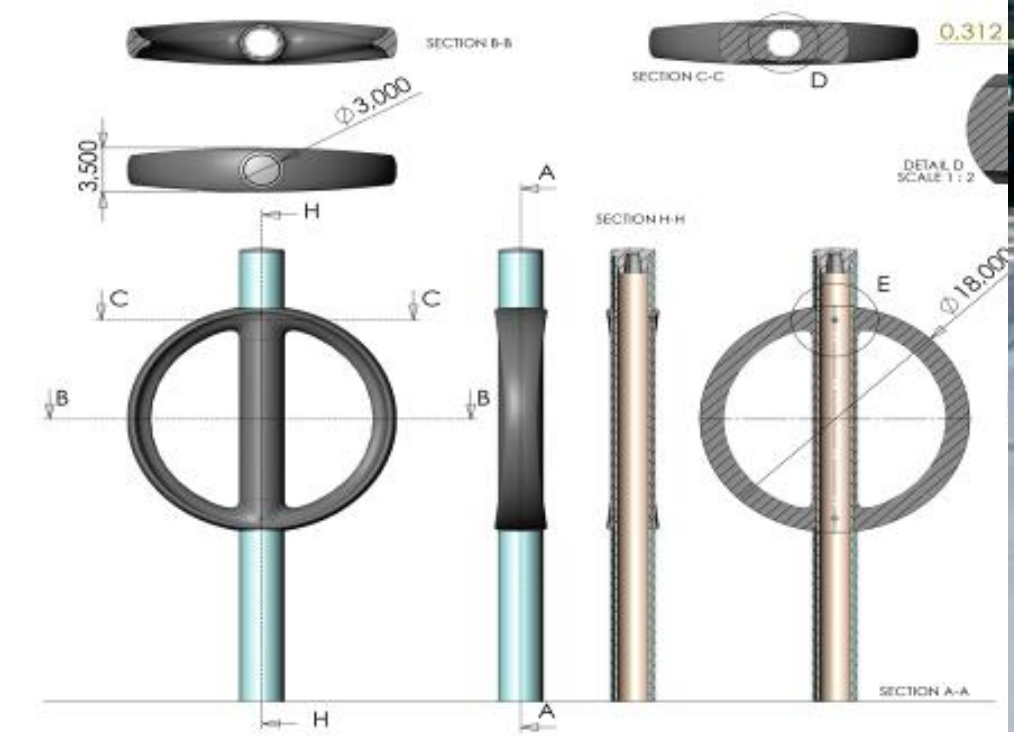
Bicycle Network



Bicycle Network



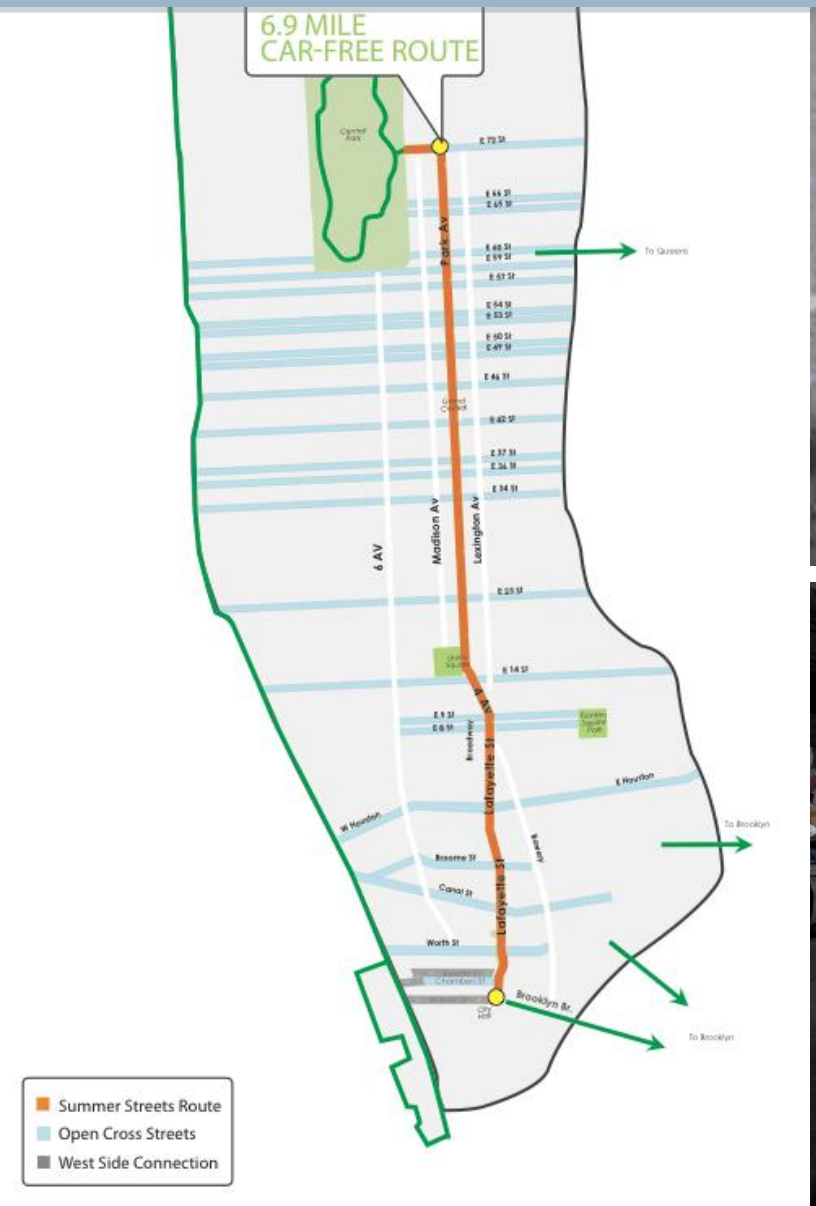
Bicycle Infrastructure



NYC Bike Share

- Started 2013
- 10,000 bicycles, 600 stations – Manhattan, Queens, Brooklyn (including Brooklyn DPHO)
- Bike Share Health Evaluation – Chronic Disease, Injury, Environmental Health

Programming Streets for Active Recreation and Non-Car Mode Uses: Summer Streets and Play Streets



City Policy + Implementation

Improved Access to Tap Water in the Public Realm & Buildings

City Policy + Implementation

Stair Promotion

- Better designed buildings
- >30,000 stair prompt signs distributed to owners and managers of >1,000 buildings

Creating New Green Building Credits: LEED Pilot Credit "Design for Active Occupants"

- Adult and children's active recreation spaces, gardening space, stair use promotion strategies – point added to existing points for site density, walkability, transit access and bike storage

- Being used in >30 NYC & U.S. buildings, incl. worksite buildings, public buildings, affordable housing developments

http://www.usgbc.org/node/2648813

City Policy + Implementation

Integrating Health Items into City Administrative Processes Across Sectors

- Public Sector Design & Construction RFPs and Contracts

- Guidelines and Standards for Foods & Beverages served by City Agencies

- Design and Construction Guidelines and Standards in Different Agencies – Public Buildings, Streets, Schools, Housing

- Training of City staff in all relevant agencies

- >3000 U.S. architects, planners and other built environment professionals trained (>2000 in NYC)

- Training sessions shown to be **effective**
  >70% had not read the Active Design Guidelines before
  >85% say they **plan to use strategies** in Guidelines
  >80% say their **employers will be receptive** and **clients will be receptive** to incorporating strategies

Impacts in NYC

- Increased:
  - Pedestrian volumes through pedestrian plazas
  - Stair use, where stair prompts are posted
  - Commuter cycling – up 289%
  - Bus and subway ridership – up 10%
  - Places for children's play - >60 new Play Streets permitted; >180 schoolyards to playgrounds opened

- Decreased:
  - Traffic fatalities 37%
  - Traffic volumes 1.5%
  - Car registrations 5%

- Started Reversing Childhood Obesity (also in Philadelphia & San Diego!)
- Positive Environmental and Economic Impacts

Further Info

Contact Info:

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Additional Links:

http://activelivingresearch.org/active-design-supplement-affordable-designs-affordable-housing

HEALTHY CANADA by design

CLASP
COALITIONS LINKING ACTION & SCIENCE FOR PREVENTION
An initiative of:
CANADIAN PARTNERSHIP AGAINST CANCER
PARTENARIAT CANADIEN CONTRE LE CANCER