Active Design: The Key Roles of Urban & Building Environments in Addressing Health Epidemics

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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

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 rates

BEFORE the wide use of antibiotics!

57.1%  1880

45.8%  1940

AFTER the wide use of antibiotics!

11.3%  2011

2.3%  9%
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

(*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, 1987

(*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, 1988

(*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, 1989

(*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, 1990

(*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, 1991

(*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, 1992
(*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, 1993

(*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, 1994

(*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, 1995

(*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, 1996

(*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, 1997

(*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, 1998

(*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, 1999

(*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, 2000

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

No Data        <10%         10%–14%         15%–19%         20%+

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

(*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, 2005

(*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, 2006

(*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, 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

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

Source: U.S. Centers for Disease Control and Prevention (CDC)
Diabetes trends among U.S. adults

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 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

<table>
<thead>
<tr>
<th>Designing to Increase Active Transportation</th>
<th>Walking, Bicycling and Transit-oriented development</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>Median increase in physical activity 35% to 161%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Designing to Increase Active Recreation</th>
<th>Enhancing access to places for physical activity, such as creating walking trails or having onsite or nearby parks, playgrounds and exercise facilities (homes &amp; worksites)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>increases leisure-time activity and weight loss</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Designing to Increase Stair Use</th>
<th>Point-of-Decision stair prompts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Signs placed at elevators &amp; escalators encouraging stair use, w/ info on benefits of stair use</td>
</tr>
<tr>
<td></td>
<td>Median 50% increase in stair use</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design and Aesthetic Interventions</th>
<th>Design stairs to be more convenient and visible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Music &amp; art in stairwells</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Stairs to Be More Convenient and Visible</th>
<th>Skip-stop elevators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3300% increase in stair use</td>
</tr>
</tbody>
</table>
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.
### Co-benefits of Active Design: Improve the Environment

<table>
<thead>
<tr>
<th>Activity</th>
<th>Fuel / Electricity Use</th>
<th>Air Quality</th>
<th>Obesity/Diabetes/Heart Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biking or walking rather than automotive transport</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Stairs rather than elevators and escalators</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Active recreation rather than television</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Safe tap water rather than bottled and canned beverages</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Fresh produce rather than unhealthy processed foods</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
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: Economic Benefits

- Job creation through supermarket development in high needs areas
- Prevent loss of food $ to other communities and neighborhoods
Co-benefits: Create jobs

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

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: Reduce infrastructure costs

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

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Water &amp; Sewer Laterals Required</th>
<th>Water &amp; Sewer Costs (billions)</th>
<th>Road Lane Miles Required</th>
<th>Road Land Miles Costs (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprawl Growth Scenario</td>
<td>45,866,594</td>
<td>$189.8</td>
<td>2,044,179</td>
<td>$927.0</td>
</tr>
<tr>
<td>Compact Growth Scenario</td>
<td>41,245,294</td>
<td>$177.2</td>
<td>1,855,874</td>
<td>$817.3</td>
</tr>
<tr>
<td>Savings</td>
<td>4,621,303</td>
<td>$12.6 (10.1%)</td>
<td>188,305</td>
<td>$109.7 (6.6%)</td>
</tr>
</tbody>
</table>

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
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
  - **Transportation, City Planning, Design + Construction, Buildings, Housing, Parks, School Construction, 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 24/25, 2013
Fit City Conferences

Fit-City: Promoting Physical Activity Through Design

Fit-City 3: Promoting Physical Activity Through Design
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

www.nyc.gov/adg
Creation of the Guidelines

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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

www.nyc.gov/adg
Site & 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

www.nyc.gov/adg
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.
Smart Growth
Focusing the development for 1 million new people by the year 2030 near public transit access.
Changing the form of the Public Right of Way
City Policy + Implementation

Public Plaza Program
89% OF THE ROAD SPACE FOR VEHICLES, 11% FOR PEOPLE
89% of the road space for vehicles, 11% for people.

Pedestrian volumes up:
- 6% in Herald Square
- 11% in Times Square

Retail up:
- in Times Square
- 49% drop in vacant storefronts in Union Square
Creating a more continuous and inviting pedestrian environment

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
The off-street parking regulations in the City were written nearly a half century ago:

- Define ‘car share’ in the zoning resolution
- Establish rules for quantity and location
Studies show people drive less, therefore taking more cars off the streets, reducing pollution and traffic congestion, and making a friendlier environment for the pedestrian to WALK!
City Policy + Implementation

Land Use Mix: Public Parks and Open Spaces
City Policy + Implementation

Vision 2020: Comprehensive Waterfront Plan
Availability of Healthy (vs Unhealthy) Food and Beverage Premises
NYC FRESH Program:
Zoning and tax incentives for supermarket creation in the city’s underserved fresh food areas
Green Carts sell fresh fruits and vegetables in underserved neighborhoods.
Increasing Community Gardening Opportunities

Gardening can provide both physical activity and healthy food opportunities.
Improved tap water facilities (inclusion of water bottle refilling stations) passed as part of Greencodes bills.
City Policy + Implementation

Stair Promotion

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

Burn Calories, Not Electricity

Take the Stairs!
Walking up the stairs just 2 minutes a day helps prevent weight gain. It also helps the environment.

Learn more at www.nyc.gov or call 311.
City Policy + Implementation

Bicycle Network

2005
City Policy + Implementation

Bicycle Network

2010
Provide attractive and sheltered seating areas to encourage use of transit routes.
Bicycle parking now required for new buildings, enlargements, conversions and public parking garages (floor area is discounted).
Starting 2013

10,000 bicycles, 600 stations – Manhattan, Queens, Brooklyn (including Brooklyn DPHO)

Bike Share Health Evaluation – Chronic Disease, Injury, Environmental Health
City Policy + Implementation

Programming Streets for Active Recreation: Summer Streets and Play Streets
Evaluation:

- Average amount of physical activity from distances walked, ran, biked on route: >40 minutes of vigorous physical activity, or >70 minutes of moderate physical activity
- 24% of people were those who didn’t meet PA Recs
- 87% of participants got to event by active modes
Evaluation:

Ages of children attending Playstreets (from surveys): Ages 1-13

Visited Playstreets at least once before: >80%

Average length of time children stayed at the Playstreet (from surveys): ~1.5 hours

Most likely activity if children had not come to the Playstreet:

- TV or other inside activity: 52%
- Outdoor activity: 38%
- Indoor or outdoor activity equally likely: 10%
Integrating Health Items into City Administrative Processes Across Sectors

- Public Sector RFPs and Contracts

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

- Active Design issues and checklists included in development review processes and approvals

- Training of City staff in all relevant agencies
Creation of LEED Physical Activity Innovation Credit
(Siting near schools, Adult and children’s active recreation spaces, Gardening space, Stair use promotion strategies)

Developed through a public-private partnership; used Health Dept Clinic as 1st building

Now approved for multiple NYC and US Buildings, incl. office buildings, college campuses, affordable housing

Also Innovation Credits for Healthy Food and Beverage Promotion, and Urban Agriculture
U.S. CDC’s Investments in Creating Healthier Environments

- Communities Putting Prevention to Work Program

- Communities Putting Prevention to Work Built Environment Mentoring Program
- 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

www.nyc.gov/adg
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
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