The Built Environment and Public Health

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Summer EH

Learning Objectives

Be able to...

• ... define the built environment & sprawl
• ... describe how these have been conceptualized and measured
• ... analyze the environmental and health consequences of land use and transportation policies & practices
• ... compare & contrast U.S. & world cities
• ... evaluate the motivations for, and implications of, an urban future
• ... offer responses to these challenges
There are geographic disparities in health outcomes. 

10 miles = 30 years

How do these neighborhoods (census tracts) differ? (2010-15)
Why Do Some Neighborhoods Have Worse Health Outcomes Than Others?

*Is it because of the features of the people in these places or the features of the places themselves?*

Characteristics of people
- Education, income, social networks, health care, health behaviors

Characteristics of places
- Unsafe or unhealthy housing
- Access to healthy or unhealthy food
- Opportunities for residents to exercise or for active transport
- Proximity to highways, factories, or other sources of toxic agents
- Access to health care
- Unreliable or expensive public transit (isolate from good jobs, health and child care, and social services)
- Residential segregation and discrimination
- Community isolation (e.g., highways, rail) limits social cohesion, economic growth, and perpetuates cycles of poverty
- Community deprivation, crime, social disorganization
- Lack of greenery, blue space, other natural amenities

Zip Code vs. Genetic Code
- “Zip code is the only code that matters”
- Zip code at birth predicts life expectancy, income expectancy, educational success, behavioral outcomes (expelled from school)
- Neighborhoods associated with higher stress levels, higher cortisol, epigenetic changes, range of health outcomes
An Unprecedented Set of Interlinked Challenges …

- Climate change
- Energy transitions
- The U.S.’s “wrong” built environment
  - Large contributor to GHG emissions & climate change
  - Not prepared for energy transitions
  - Not designed for people → health impacts
- Food production & distribution: fossil fuel inputs
- Changing hydrologic cycle & depleting fossil water reservoirs worldwide
- Species extinctions, loss of biodiversity
- Declining ecosystems
- Financial challenges

… for public health

Important context for topic: fossil fuels are finite; climate cannot take any more

The Age of Oil
If the U.S. built environment was built on a pillar of cheap and plentiful oil, what happens when it gets expensive (scarcity or policy)?

- Industrial agriculture
- EXPENSIVE OIL
- Reliance on automobile
- Suburban "sprawl"
- Hyper-consumerism

Delmarva Peninsula between Smyrna, DE and Chestertown, MD, July 2007

Are places like this sustainable? What % of Americans live in these places? What are the implications of that?
The Built Environment

Definitions

Health Canada
“The built environment encompasses all buildings, spaces and products that are created or modified by people.”

Buildings / Land use / Transportation

- Residential
- Industrial
- Commercial
- Public uses

- Residential
- Industrial
- Commercial
- Agricultural
- Recreational
- Energy

- Roads
- Rail
- Water
- Air
- Active transport

Environmental Health

- **Traditional focus** – agents, sources, routes, etc. of hazardous exposures

- **More recent interest** – how what humans have built (and related use of land) influences health-related behaviors, contributes to place-related health effects (e.g., contextual effects, “stress”), causes climate change, or depletes resources (e.g., water, ecosystems)
History: Built Environment & Health

Three phases of building and related public health inquiry:

Sanitation
- Huge burden of disease from infectious disease; civil engineers built sanitation facilities; military engineers did same for military camps

Industrialization
- We built factories on the landscape; the built environment as a source of pollution

The emptying of US cities → sprawl
- The built environment as an inhibitor of physical activity and social connections; interest in obesity, obesity-related diseases, neighborhood context, stress

Near Houston Ship Channel as seen from top of San Jacinto Monument, 1988
Cities in Early History

- Dense settlement
- Clear distinction between city and country
- Mixture of functions
- Short distance from home to work
- Most desirable addresses at the center
- Public spaces lovely and cherished
Global health, sustainable development: Is About Cities

- **70%** of world’s population will live in cities by 2050
- Urbanization generally accompanied by basic health improvements
- Worldwide, some of best AND worst environments (and social inequalities) are found in cities
  - Environmental quality usually worsens then gets better
  - Health, education, & wealth measures generally **better in cities** than in rest of same country
  - In urban areas of concentrated poverty, outcomes are worse than country as a whole; adjusting for SES, urban often better than rural for many traditional health measures
  - 1B persons (33% of urbanites) in slums in developing world
- Likely that climate, energy, water, and food issues will further contribute to urbanization in future
- **Urban planning & design matter** a lot to many health outcomes

Established 1889; rapid population growth 1970s

2005 = 2.9M, projected to be 5.1M by 2015.

The city has an insufficient number of housing units, resulting in illegal construction and uncontrolled settlements into protected forest areas.

Urbanization is rapidly occurring around the world.

The upper delta area shown in the left-hand image had over 7 million people in 1990, but has since more than tripled to over 25 million, with the cities of Dongguan, Foshan, Guangzhou and Shenzhen beginning to merge into one continuous city. This intense urbanization has led to the loss of productive farmland and natural areas, as well as creating a variety of environmental problems.
Several slides from CDC September 2011.

Larger cities produce more wealth and innovation per capita than smaller cities.

The City as Economic Engine

Bigger Cities Do More with Less

New science reveals why cities become more productive and efficient as they grow

By Luis M. A. Bettencourt and Geoffrey B. West

The U.S. (in particular) Stopped Doing it This Way.

What happened?

- Transportation revolution
- The automobile age
- Zoning restrictions
- Subdivision regulations
- Federal housing policy
- Housing lending policy
- Development financing
- Unregulated development
- The power of developers
What are the impacts, and the future, of these places?

American’s and their large, PRIVATE spaces

U.S.: The Role of Automobiles

- Automobile invented 1882, a curiosity, plaything for the wealthy
- By 1890’s, electric streetcars were being used for public transportation
- Principal obstacle to industry growth: lack of roads
- Early 1900’s: industry persuaded all levels of government to subsidize automobile industry by committing $100B+ to road construction
- By 1920’s, automobile manufacturers & suppliers controlled large share of U.S. economy
- Transformation of American landscape and lifestyle
- Europe invested in trains, trolleys, & subways
Transformation of U.S. Landscape

• In 1932, GM formed United Cities Motor Transit to buy streetcar lines and dismantle them (replace with diesel buses)
• In 1936, Firestone and Standard Oil of CA formed National City Lines to expand these activities
• By 1956, 45 cities had “been relieved of their electric rail systems”
• Also 1956: Interstate Highway Act – authorized $25B for 38,000 miles of divided roads

The Current American Landscape

• 80% constructed since World War II
• Sprawl chewed through 2.6M acres/yr of farmland, open space, wetlands, & meadows
• From 1985-2001, 40% of new homes built on lots > 1 acre (DU density < 1 per acre)
• > 90% of metropolitan-area population growth since 1950 has been in suburbs
• Approximately 60% of Americans live in suburbs
• From 1970-2000, average household size ↓ from 3.14 to 2.62 persons (17%) while average new house ↑ from 1,385 to 2,140 ft² (54%)
• 70% of oil we consume is used for transportation

Some statistics from Farr
Levittown, NY, 1948 shortly after mass-produced suburb was completed on Long Island farmland. Prototypical suburban community was first of many mass-produced housing developments... for soldiers coming home from WWII. It became a symbol of US postwar suburbia. (The Atlantic Feb 2013)

28 Years of Urban Growth in Atlanta

Source 1973-1997: Scientific Visualization Studio, Goddard Space Flight Center

2001: National Land Cover Database
The Built-up Areas of Atlanta and Barcelona Compared on the Same Scale

Land Use Impacts on Transport Emissions

ATLANTA

5.3M (2015)
7,692 km²
689p / km²

Population
5.3 million
Urban area
7,692 km²
Transport carbon emissions p.c.
6.9 tonnes

BARCELONA

5.0 (2015)
648 km²
7,716p / km²

Population
5 million
Urban area
648 km²
Transport carbon emissions p.c.
1.16 tonnes

1 ha = 2.47 ac; 1 km² = 100 ha; 1 mi² = 259 ha = 640 ac = 2.59 km²

Cuyahoga Land Use

1950 Census
1,389,532

1948
26% of county’s land developed

2000 Census
1,393,978

2002
90% of county’s land developed

Red = developed; green = park and preserved; tan = undeveloped
Developed Land in Maryland, 1973 and 2010
- Spread out from core metropolitan and municipal areas
- > 1.7M acres of developed land (27% of state), 60% of this since 1973
- By 2010, 900,000 acres of low or very-low density development (primarily single-family homes)
- 84% of this type of development is located outside current Priority Funding Areas boundaries
- Less than half of all developed land is located inside the current PFA boundaries

Figure 2-1: Developed Land in Maryland, 1973 and 2010
Source: Land Use/Land Cover Analysis, Maryland Department of Planning, 2011

Percent change in population and urbanized land, 1982-1997, by Census region

For U.S. in 1990s:
- Population ↑ 17%
- Land use ↑ 47%

Urbanized land = 1,000 persons per square mile (but only 1.6 persons per acre)
Low-density Suburbs are Growing

<table>
<thead>
<tr>
<th>Type of Place</th>
<th>Percent Change in Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban counties*</td>
<td>+0.4</td>
</tr>
<tr>
<td>Higher-density suburbs*</td>
<td>+0.8</td>
</tr>
<tr>
<td>Lower-density suburbs*</td>
<td>+0.2</td>
</tr>
<tr>
<td>Mid-size metros</td>
<td>+0.2</td>
</tr>
<tr>
<td>Small metros</td>
<td>+0.2</td>
</tr>
<tr>
<td>Non-metropolitan areas (Rural)</td>
<td>+0.2</td>
</tr>
</tbody>
</table>

Percent change in population by type of place from 2015-16 and on average from 2010-15

- Most of US large metros became more suburban 2010-16
- All of fastest growing large metros were in south or west
- Rust belt cities continue to lose population
- Urban densities increasing in NE, upper MW, NW – areas with strong urban planning
- Urban densities declining in S, SW, cities that were never very urban

- 3100 US counties grouped by type

Roanoke Rapids, North Carolina

- City: 17,000 in 8 mi²
- Micro area: 76,000 in 1,360 mi²
- 2,215 vs. 56 per mi²

Sprawl around small towns/cities: micropolitan areas (urban core 10-50K)
- ~30M people in 541 µSAs
- Farmlands → subdivisions
This Rampant Development Has Many Environmental Consequences

• Water supplies are being drained, not recharging aquifers
• Decreased ecosystem services, more impermeable surfaces – water collection, filtering, storage, flood control
• Wildlife is being driven out, ecosystems destroyed
• We’re polluting the air and water
• This contributes to global climate change

Adapted from Anthony Flint, *This Land*. 35

But Also Many Human and Social Consequences

• Spatial segregation by socioeconomic status
• Spatial segregation by race/ethnicity
• Imbalances between jobs & housing
• Public services inequities
• We’re losing regional identity
• We’re losing sense of place, historical presence
• Decay & disinvestment in first-ring & older suburbs
• Municipalities go broke paying for sprawl infrastructure
• Self-defeating tax incentives spurred by competing municipalities
• Loss of civic engagement
• Loss of social capital

Saunders WS. Sprawl and Suburbia, 2005. 36
The problems of U.S. cities are directly related to these places.

Why do our places look the way they do?

**They were designed for cars!**

- Low density
- Single use
- Low destination accessibility
- Streets designed for cars
  - Little street detail
  - High speeds & volumes, wide
  - Not gridded
  - Not safe to walk
- Public transit is not a priority and not effective

And they are generally divorced from the bioregions in which they are located for food, water, energy.
Scaled to Automobiles

- “Number of noticeable differences” (Amos Rapoport) theory of urban space – focuses on speed of travelers through environments
- Environments designed for automobiles
  - Wide roads to maximize speed; enormous buildings & signage, few details; dangerous & monotonous to walk
- Environments for people (pedestrians)
  - Rich in building and streetscape detail, greenery; fun, interesting and safe to walk

CENTER ON URBAN & METROPOLITAN POLICY
Who Sprawls Most? How Growth Patterns Differ Across the U.S.
William Fulton, Rolf Pendall, Mai Nguyen, and Alicia Harrison

How do you measure sprawl? July 2001
**TRADITIONAL**
--Mixed use
--Higher density
--High connectivity
--Designed for people
--Public spaces
--Can meet daily needs on foot

**SPRAWL**
--Single use
--Low density
--Low connectivity
--Beyond extent of infrastructure
--In the middle of nowhere
--Designed for cars
--Private spaces
--Inadequate tax base
--Separates where people live, work, shop
--Led to urban decay

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**The Death and Life of Great American Cities, Jane Jacobs, 1961**

- Density and diversity are the twin engines that make human communities work
- Society requires a critical mass; spread people out too much & they cease to interact
- Move them together, they watch out for one another, stay attuned to each others’ needs, life is varied and engaging
- We now know that dense cities are *scalable* while sprawling suburbs and “isolated straw-bale eco-buildings” are not

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* From computer science: a system with the ability to readily handle greater volumes or to be easily enlarged

Adapted from Owen D. Green Metropolis, 2009.
Describing the Built Environment
Three D’s Now Expanded to Five
3 D’s (Cervero & Kockelman 1997)

- **Density** – population or employment per area
- **Diversity** – mix of land uses, typically residential and commercial (jobs-housing balance)
- **Design** – neighborhood layout and street characteristics
- **Destination accessibility** – ease, distance, or convenience of trip destinations
- **Distance to transit** – ease of access to transit from home or work (0.25-0.5 mi)

*These are generally measured at the place level*

*The importance of …*

*… neighborhood, context, scale*

“We drive up and down the gruesome, tragic suburban boulevards of commerce, and we're overwhelmed at the fantastic, awesome, stupefying ugliness of absolutely everything in sight—the fry pits, the big-box stores, the office units, the lube joints, the carpet warehouses, the parking lagoons, the jive plastic townhouse clusters, the uproar of signs, the highway itself clogged with cars—as though the whole thing had been designed by some diabolical force bent on making human beings miserable.”

James Howard Kunstler, *Home from Nowhere,* 1994
Early studies evaluated land use & transportation systems and physical activity.

**Built Environments → Health**

*Any human-modified environment →*

- ... exposures (pollution) that arise from these environments (indoor or outdoor)
- ... influences behaviors
- ... contributes to “stress”
- The land, energy, and water that are used by what has been built
- Some specific conceptualizations of relevance
  - The food, land use, physical activity, and social environments
- Contextual effects; the importance of place
- The importance of scale – local, regional, global
Ecological Model of Health Behavior

The idea: the physical environment and policy context enable the wrong behaviors and constrain the right behaviors.
Nature and Health

Terry Hartig,1 Richard Mitchell,2 Sjerp de Vries,4 and Howard Frumkin6

Conceptual framework connecting natural environment to health. Four pathways require contact with nature; two others do not, implying that the natural environment may affect health without consciously engaging with nature.

Greenspace

Bluespace
Physical Inactivity

- 200,000 deaths attributed to inactivity in the US
  - Smoking linked to ~435,000 deaths
  - Alcohol linked to ~100,000 death
- Linked to 6% of medical costs in Canada, Australia, Switzerland, Netherlands, US
  - Comparable to costs due to tobacco
- Inactivity is playing a role in the obesity and diabetes epidemics
- There are many health benefits: if physical activity could be put into a pill, it would be the most prescribed medication in the world

Adapted from Sallis J, ALR 2009
Promoting Exercise Has Not Worked

Physical activity:
- UTILITARIAN
- LEISURE / RECREATIONAL
- FITNESS / EXERCISE

Data from CDC BRFSS

Figure 2. Physical Activity Environment

Adapted from Sallis J, ALR 2009
Obesity and the Environment

- Has been an active area of research – 100+ studies and counting – complicated literature
- Studies have evaluated:
  - Land use environment and functional physical activity (PA), BMI
  - Local physical activity opportunity environment and recreational or fitness PA, BMI
  - Local food environment and dietary habits, BMI
  - Social environment and PA, diet, BMI
- Measured with 5 D’s
- Decide on relevant scale

The Food Environment

- Close up of a few of our 40 counties
- Two commercial data sources
  - D & B
  - InfoUSA
- Geocoded
- Used to create metrics
- Have available for four years, 1997-2010
Sprawl and Climate Change

- Forest loss (350,000 acres in metro Atlanta over 30 years)
  - Remove sink
  - Put that carbon into air
- CO₂ emissions from motor vehicles


Climate change → more severe weather events
Our built environment → reduced capacity to deal with weather
Land use, water, and climate changed are linked.

Too much vs. not enough water
120 miles east of Los Angeles.


What will happen to Phoenix?

- Phoenix uses 2X more water per capita than Seattle (which gets 39 in rainfall annually)
- Pumps most > 300mi uphill from Colorado river
- Air pollution, concrete hot landscape, poor & race/ethnic minorities have worse environmental quality
- Over 100 d/y > 100 °F; 2011: 33 d > 110 °F (43 °C); human activities have made it hotter
- Recipe: cheap land, cheap water, federal subsidies for suburban infrastructure

The Water Knife: American Southwest, several decades from now. Water supply controlled by the rich and powerful. Phoenix is anarchy, residents try to migrate across well-defended borders to California (which has taken water it needs).
Don’t Walk. **DRIVE!**

- **Neglect for pedestrian safety**
  - Trips made on foot: 5.4%
  - Traffic fatalities that are pedestrians: 13%
  - Federal transportation spending for pedestrians: 0.6%
  - (Data from Surface Transportation Safety Project)

- **The alternative – drive everywhere!**
  - Parents now drive their children everywhere; will shift to driving their parents everywhere as the population ages
  - Compared to 1969, we drive 88% farther to shop, 137% farther for personal and family errands
  - Commuting to work (ACS 2009): 86% of Americans by personal vehicle; 88% of those alone; with average of 50min daily for round trip; all worse if live in suburbs; duration and distance getting much worse over time

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In U.S. and several other countries, lower metropolitan region population densities are associated with:
- higher motor vehicle fatality rates
- higher pedestrian fatality rates

In U.S., rates in Phoenix, Dallas, Houston, Atlanta > > > Philadelphia, New York, Portland, San Francisco
Urban density and transport-related energy consumption

Per capita CO₂ emissions from transportation follows the same pattern

Source: Ewing and Hamidi 2014

Socially isolating, not walkable, total reliance on automobile
What do you think about this neighborhood?

U.S. Predominant Land Use Model

**“BAD” FOR**
- The planet
- Ecosystems
- Water quality & quantity
- Our cities
- The health of residents
- Our social interactions
- Tax payers
- Commuters
- An energy-constrained world

**“GOOD” FOR**
- Builders, developers, real estate industry
- The consumer lifestyle
- Wal-Mart & big box retailers
- Politicians
- “Libertarians”

So, what do we do now?
“Suburbia has a tragic destiny. We spent all our wealth acquired in the 20th century building an infrastructure of daily life that will not work very long in the 21st century.”

“Our communities therefore will have to reorganize physically as well as socially and economically.”

“Humanely managing wholesale urban migration will play a critical part in any quest for global sustainability.”

**U.S. Urban Form is Going to Change**

- **Demographic forces**
  - Baby boomers, Gen X, Gen Y, & immigrants all want more urban choices
  - By 2005, suburban poor now outnumber urban poor in U.S.
- **Different energy is (must be) on the way**
- **We will eventually address GHG emissions**
  - To decarbonize the transportation sector (80% below 1990 by 2050) we must change urban form
  - Urban vs. suburban dwellers: 1/3 the per capita resource use
- **2009 housing crisis will blunt market for years**
  - Underwater mortgages, ↓ housing values, housing market’s influence on labor market – worse in **suburbs**
- **When housing and transportation costs are considered, suburbs MORE expensive to live in**
Increasing Interest from Public Health and What to do Now

- To bring architecture, landscape architecture and urban planning literatures to public health
Smart Growth: EPA’s 10 Principles

1) Mixed land uses
2) Take advantage of compact building design
3) Create a range of housing opportunities and choices
4) Create walkable neighborhoods
5) Foster distinctive, attractive communities with strong sense of place
6) Preserve open space, farmland, natural beauty, and critical environmental areas
7) Strengthen & direct development towards existing communities
8) Provide a variety of transportation choices
9) Make development decisions predictable, fair, cost effective
10) Encourage community and stakeholder collaboration in development decisions

Also see Ahwhanee Principles – more detailed statement

Ten Principles for Building Healthy Places

1. Put People First Design for people, not cars. Think about health. e.g., walkable retail.
2. Recognize the Economic Value Partnerships, grassroots, leadership, branding.
3. Empower Champions for Health Rethink and invest in public spaces.
4. Energize Shared Spaces Make healthy choices SAFE: safe, accessible, fun, easy.
5. Make Healthy Choices Easy Design for all ages, abilities, incomes.
7. Mix It Up Retain unique local character, integrate natural systems.
8. Embrace Unique Character Urban agriculture, food as destination, new grocery store ideas.
Sustainability: Dense Cities

- Owen: But the truth is, in a world of 7 billion people, sustainability, if it can be achieved, will likely look much more like midtown Manhattan than like rural Vermont
- The keys:
  - Live smaller (higher density)
  - Live closer (higher destination accessibility)
  - Drive less
    - Make transit easier (lower distance to transit)
    - ... and make driving costlier, difficult, less pleasant

Adopted from Owen D, *Green Metropolis*, 2009
Design Neighborhoods

- **Definition**: Identifiable center and edge
  - Central place for people
- **Compactness**: Walkable size (40-200 acres)
  - Centers & attractions within ¼ mi (5 min) walking
- **Completeness**: Mix of land uses and housing types with opportunities for shopping and workplaces close to home
- **Connectedness**: Integrated network of walkable streets; small block size; traffic calming
- **Biophilia**: Love of nature; invest in public spaces; parks, greens, squares, playgrounds

_The personal appeal and societal benefits of neighborhood living = meeting daily needs on foot._

Denver: Only stopped by the mountains

*How do you re-engineer these places: redensify, & make mixed use, walkable, and transit-oriented?*
We have made a huge investment in the wrong model. What do we do now?

Kunstler: “The greatest misallocation of resources in the history of the world.”

Retrofitting the suburbs comes next.
U Utah: 2.8M acres of parking lots ("greyfields") and 1.1M acres of underutilized shopping areas ripe for redevelopment.

The big design and development project of the next 50 years: retrofitting suburbia integrated habitat whose public realm promotes healthy, sustainable communities.

But do we have 50 years?

Dynamic: leapfrogging & recentralization

From edge cities (Garreau, 1991) at highway intersections to a network of transit-served suburban retrofits in 2007

From Williamson J, MORPC, Oct 2009
Predicting the Future: Transportation

“We are on the cusp of one of the fastest, deepest, most consequential disruptions of transportation in history.”

“By 2030, within 10 years of regulatory approval of autonomous vehicles, 95% of U.S. passenger miles traveled will be served by on-demand autonomous electric vehicles owned by fleets, not individuals, in a new business model we call ‘transport-as-a-service.’”

- There will likely be far fewer cars driving more miles each (250M cars on road today vs. 44M by 2030).
- This will save individual consumers a lot of money.
- How will this influence where people live?
- How will this influence the form of the built environment?

Hot Topics & Terms You Will Hear More About

1. Infill re-development
2. Brownfield re-development
3. Re-densification
4. Re-greening
   - Restore local ecology
5. “Under-performing asphalt”
   - “We’re not as built out as we think”
6. Re-inhabitation
   - Space for community uses, “third places”
7. High performance infrastructure

Some ideas from E Dunham-Jones
“Villa Italia Mall in Lakewood, CO, was once described as largest mall west of Mississippi. Today it has been razed and ... renamed Belmar, the 23 urban-scaled streets and blocks that are the new downtown that Lakewood never had.”

These New Places Will Be Better For …

- Health
  - Many different health outcomes
- Resource use – water, land, energy
- Ecosystems & restoration of local ecology (re-greening)
- Greenhouse gas emissions
- A sense of community, neighborliness, social capital
- Tax payers

“A diverse, active, healthy population and a sustainable planet are synergistic.”

NYC, 2009, 144 pp

Initiative of Mayor Michael Bloomberg

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Several slides from CDC
International Efforts
Curitiba, Brazil

- City population 1.8M; metro 3.2M
- Considered a paragon of urban planning
- Planned in 1940s by French urban planner; master plan by 1970s; holistic approach
- Extensive privatized bus network, devoted city lanes
- Governing key – important decisions by public referenda
- Other S. American cities emulating

Curitiba, Brazil

- Streets in star pattern
- Public amenities in pedestrian friendly city center (in 20 sq blocks, vehicles prohibited)
- Dedicated bus ways
- High-density development along bus ways
- Parks do double duty in flood control
- Low income residents can build their own homes with city assistance
- Trash exchange program, citywide recycling
- “Green areas” protected from future development
Copenhagen

- Reduced CO₂ emissions by 25% since 1990, want 20% more by 2016
- 36% of citizens ride bicycles to work (goal is 50% by 2016)
  - 58% feel safe doing so (80% by 2016)
- 59% of all trips are on bike or by foot
- Energy from waste combustion used for electricity and heating
- Other 2016 goals:
  - 90% able to walk to park, harbor in 15 min
  - Use will increase by 50% over 2007
  - 20% of food will be organic, 80% in municipal institutions


Across Europe, irking drivers is urban policy

- Synchronize lights for people, not cars
- Drivers pay congestion charges to enter city
- Environmental zones: only low emission cars may enter
- Tram operators control traffic signals
- Close streets to car traffic
- Switch car lanes to bicycle lanes
- Bicycle sharing programs
- Eliminate parking spaces
- Limit car speeds to a crawl
- Pedestrians may cross anywhere

“We would never synchronize green lights for cars with our philosophy,” said Pio Marzolini, a city official. “When I’m in other cities, I feel like I’m always waiting to cross a street. I can’t get used to the idea that I am worth less than a car.”
Summary

- The world is increasingly urbanized
- Innovative approaches will assist in making the urban areas of the future maximized for economic, health, and social benefits
- The U.S. approach to land use and transportation systems was a 60-year experiment that is not prepared for what is coming
  - This strategy led to environmental and health problems on local, regional, and global scales
  - Other converging challenges will make this extremely difficult to solve while making it absolutely essential to solve
- Many opportunities for public health professionals working with planners, designers, engineers