Why do we have houses?

- Shelter
  - What are the minimal requirements which must be met in order for it to adequately perform this function?
  - Basic Principles of Healthy Housing, 1938
  - American Public Health Assoc. Committee on the Hygiene of Housing, Dr. C.-E.A. Winslow, Chair

Housing

- APHA & CE-A Winslow
- Basic Principles of Healthy Housing
  - Fundamental Physiological Needs
  - Fundamental Psychological Need
  - Protection Against Contagion
  - Protection from Accidents

Physiological Needs

- Thermal Environment
- Indoor Air Quality
- Sunlight
- Adequate Illumination
- Protection Against Noise
- Adequate Space
**Psychological Needs**

- Privacy
- Family Life
- Community Life
- Prevention of Physical and Mental Fatigue
- Maintenance of Cleanliness
- Aesthetic Satisfaction
- Concordance with Prevailing Social Values & Standards

**Protection Against Contagion**

- Requires:
  - Sanitary Water Supply
  - Toilet Facilities
  - Refrigeration of Foods
  - Sufficient Space
- Requires Prevention of:
  - Sewage Contamination
  - Insanitary Conditions
  - Vermin (Rats & Insects)

**Protection Against Accidents**

- Requires:
  - Proper Construction
  - Fire Escapes
  - Safe Electrical Wiring
  - Safe Heating & Cooking Equipment
- Requires protection against:
  - Fires and Electrical Shocks & Burns
  - Gas Poisoning
  - Falls
  - Automobile Traffic
The House as a System

Air

- Movement of Air in House
- Vacuum and Pressure Moves Air
- Controlling Flow
  - Window Fan
  - Whole House Fan
  - Point Exhaust
- Power v. Natural

Water

- Shed Away from Inside
- Drains
  - Sump Pump
  - Siding
  - Flashing Exercise
- Dry
  - Crawlspace
- Consequences of Moisture
**Fire**

- Water Heater
- Furnace
- Space Heater
- Gap in Vent
- Teepee
- Access and Escape
- Fire Extinguisher / Smoke Alarm

**Earth**

- Dust
- Storage Area
  - Collect Moisture
  - Organize It
  - Air circulation helps
- Clean and Cleanable

**Houses Shelter us From:**

- Animals and insects
- Wind
- Sun
- Rain (sleet, snow)
- Cold or hot air
- Dust
Most of Us are Comfortable

- Air temperature: 65°F (active) - 80°F (bathing)
- Air relative humidity: 30% - 70%
- Air motion: 20 - 40 feet per minute
- Surrounding surface temperatures: within 10 - 15°F of room air

We have Systems to:

- Add heat
- Remove heat
- Ventilate
- Maybe add or remove humidity

Heating Systems

- Fuel - gas, oil, wood, electric
- Distribution
  - hot water, steam, warm air, space heaters
  - Radiators, baseboard, ducts
  - Radiant floors and ceilings
- Chimneys, sealed combustion, fan powered
- Controls - single stat, multiple stats
 Cooling Systems

- Fuel - electric
- Windows, fans and shades
- Distribution
  - Central air
  - Through the wall
  - Duct-less splits
- Dehumidification
  - Air conditioners/part-load
  - Dehumidifiers
- Control - thermostat, humidity

Internal and solar gains:

- Good when cold out; bad when hot out
  - Heat from people (100-150 watts/ person)
  - Heat from electric and gas appliances
  - Solar in through windows
  - In average US house around 23% of heating is done by these gains and 59% of cooling is caused by these gains
Other factors

- Water (drinking, cooking, washing, toilets)
- Cooking and storing food
- Ventilating fans
- Lighting
- Computers, stereos, hair dryers, razors

Relationship of a House to its Community

Cities in Early History

- Dense settlement
- Clear distinction between city and country
- Mixtures of functions
- Short distance from home to work
- Most fashionable addresses at the center
25 Years of Urban Growth in Atlanta

Source: Scientific Visualization Studio, Goddard Space Flight Center
Metro Atlanta loses 50 acres of forested land a day to “development,” according to the Georgia Department of Natural Resources.

What are the Consequences?

- Direct
  - Water pollution
  - Air pollution
  - Toxic exposures (e.g., lead)
- Less Direct
  - Accidents
  - Respiratory disease (asthma)
  - Obesity & Diabetes
**Childhood Lead Poisoning**

A success story

**Lead-Based Paint in Housing**

- Nearly 38 million housing units contain lead-based paint.
- 24 million housing units (25% of the nation’s housing) have significant lead-based paint hazards.
- 1.2 million homes with significant lead-based paint hazards housed low-income families with children < age of 6.


![Graph showing blood lead levels from 1976 to 2000.](image)

Source: U.S. National Health and Nutrition Examination Survey (NHANES)
The Cleaner the Source Water, The Better

- Reduced need for disinfectants (e.g., less chlorine, ozone, chloramine).
- Inability of disinfection process to destroy certain cysts (e.g., cryptosporidium).
- Reduced “breakthrough” of infectious and noninfectious agents.
Impervious Surfaces

- Surface run-off
- Lack of recharge

Air Pollution

Asthma outbreak hits kids
Risks of the 'red zone'

[Image of a street intersection and a photo of a child with an inhaler]
Deaths Due to Asthma
United States, 1979-1997

Results: Acute Care Visits for Asthma
1-16 year old residents of Atlanta
Results: Total Non-Asthma Related Acute Care Visits
1-16 year old residents of Atlanta

- Medicaid Claims
- Kaiser HMO
- Pediatric ER's
- Hospital Admissions

Mean Daily Number of Events
† July 19 – August 4, 1996
Source: Friedman, et al, JAMA, 2001

Ozone

Ozone levels increase in late afternoon as traffic and temperature peak

Heat

Sketch of an Urban Heat-Island Profile
Urban Heat Islands
Affect Energy Use, the Environment, and Public Health

- Increased Smog Production
  The incidence of smog events may increase by 10 percent or 5º increase in temperature
- Increased Electricity Demand
- Increased Emission of CO₂ and other pollutants

Source: U.S. Environmental Protection Agency

Death by Design
or the lack thereof...

Driving

- From 1983-1995 —
  - Average length of driver’s trip to work increased by 37%.
  - Average time it took to get to work went up by 14%.
  - Average speed getting there (in mph) decreased by 20%.

Source: Federal Highway Administration. Nationwide Personal Transportation Study.
Motor Vehicle Crashes

- Leading cause of deaths among persons 1-24 years old
- Each year in the United States, motor vehicle crashes account for:
  - 42,000 deaths
  - 3.4 million nonfatal injuries
  - 24 million vehicles
  - estimated $200 billion in costs

Automobile fatality rates by city, 1998 (excluding pedestrian fatalities; deaths/100,000/year)

Source: NHTSA
Pedestrian fatality rates by city, 1998
(deaths/100,000/year)

- New York: 4.55
- San Francisco: 2.58
- Portland: 3.41
- Houston: 4.09
- Phoenix: 4.28
- Dallas: 6.44
- Atlanta: 1.88
- Philadelphia: 2.45

Source: NHTSA

Neglect for Pedestrian Safety

- Trips made on foot: 5.4%
- Traffic fatalities that are pedestrians: 13%
- Federal transportation spending for pedestrians: 0.6%

Surface Transportation Policy Project
Obesity

- 2.5-fold risk of overall mortality*
- 4-fold risk of cardiovascular mortality*
- 5-fold risk of diabetes
- Risk of hypertension, gall bladder disease, and some cancers

(*30-44 age group, less at older ages)


Mega-Mileage Moms

- Average minutes per day spent in car:
  - Women overall: 64 minutes
  - Single mothers: 75 minutes
  - Married mothers with school-aged children: 66 minutes
- Equates to more than 15 days/year

- Family "chauffeur" for children/elderly parents
- By 2050, 20-25% of Americans will be >65 years old
- Compared to 1969, Americans drive farther:
  - 88% farther to shop
  - 137% farther for family/personal errands

Source: Surface Transportation Policy Project
Women’s Trip Making by Purpose

Women’s Trip Making By Purpose

Church & School
Errand and Chauffeur Trips
Work
Social and Recreational
Other

Surface Transportation Policy Project

Men’s Trip Making By Purpose

Church & School
Errand and Chauffeur Trips
Work
Social and Recreational
Other

Surface Transportation Policy Project

Obesity Trends* Among U.S. Adults

BRFSS, 1990

No Data <10% 10%-14% 15-19% ≥20% ≥20%

Source: Mokdad AH.

BMI ≥ 30, or - 30 lbs overweight for 5’4” woman

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Obesity Trends* Among U.S. Adults  
**BRFSS, 1997**

Obesity Trends* Among U.S. Adults  
**BRFSS, 2000**

**Diabetes Mellitus**
- Afflicts close to 16 million people
- 7th leading cause of death in the U.S.
- One-third of cases are undiagnosed
- Type 2 diabetes accounts for approximately 90% to 95% of all diagnosed cases of diabetes
- Contributing factors are autoimmune, genetic and environmental influences
- Costs more than $105 billion annually in direct and indirect costs (i.e., disability, work loss, and premature death)

*Source: National Institute of Diabetes and Digestive and Kidney Disease (NIDDK), 2000*
Diabetes and Gestational Diabetes Trends Among Adults in the U.S., BRFSS 1990

Source: Mokdad et al., Diabetes Care 2000;23:1278-83.

Diabetes and Gestational Diabetes Trends Among Adults in the U.S., BRFSS 1995-96

Source: Mokdad et al., Diabetes Care 2000;23:1278-83.

Diabetes and Gestational Diabetes Trends Among Adults in the U.S., BRFSS 2000

Source: Mokdad et al., Diabetes Care 2000;23:1278-83.
Mental Health

“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. And naturally this experience can make us feel glum about the nature and future of civilization.”

James Howard Kunstler, “Home From Nowhere”

Depression

Depressive Disorders

- Affects approximately 19 million American adults
- Leading cause of disability in the U.S. and worldwide
- Nearly twice as many women as men are affected
- Often untreated or inadequately treated

Source: National Institute of Mental Health (NIMH), 2001


[Graph showing the number of antidepressant prescriptions by specialty from 1998 to 2001]
"The literature reported here supports a beneficial effect of physical activity on relieving symptoms of depression and anxiety and on improving mood."

Isolated Schools

Credit: Constance E. Beaumant, NTHP

Methylphenidate (Ritalin) Consumption, United States and Elsewhere, 1987 - 1998

Source: Science, Vol 285, 4 August 2000, p. 721
Smart Schools

How Not to Encourage Exercise

Alternatives
Brownfield Redevelopment

New development in existing communities

Smart Growth
What it “Is” And “Is Not”

- More transportation, choices and less traffic: Not against cars and roads
- Vibrant cities, suburbs, and towns: Not anti-suburban
- Wider variety of housing choices: Not about telling people where or how to live
- Well planned growth that improves quality of life: Not against growth
A Need for Research

- Improved data sources
- Improved research methods
- Transportation choices
- Children and school transportation
- Walking, bicycling, and physical activity
- Unintentional injuries
- Crime and neighborhood safety
- Health effects of air and water pollution
- Mental health and social capital
- Community disparities and social equity

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Richard J. Jackson, MD, MPH
Former Director
National Center for Environmental Health
Centers for Disease Control and Prevention
RJJackson@cdc.gov