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Increasing urbanization – The rise of urban disorders

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Agenda

- **Urbanization: background and trends**
- **Consequences of urbanization**
- **Health impact and well-being impact of urbanization**
- **The modern day applicant**

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What is Urbanization?

- **Growth of rural communities into cities**
- **First city thought to be Uruk Mesopotamia (~4500 BCE)**
- **Hong Kong 100%**
- **Ethiopia 19%**
- **By 2050 69% of world's population**

Ancient History Encyclopedia Limited 2017
<http://www.telegraph.co.uk/travel/maps-and-graphics/Mapped-The-worlds-most-urbanised-countries/>

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Historically, urbanized places were not healthy

Jacob's Island ~ 1840



United States Public Domain

Shanghai Today



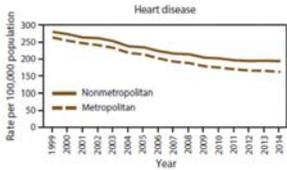
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Historically, urbanized places were not healthy



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- In 19th century, large mortality for city dwellers
 - Especially for communicable diseases
- Improvements in mortality and morbidity with changes in city structure
 - Changes in waste management, water quality, building materials
- Today, mortality is on par if not lower with rural*



| Year | Nonmetropolitan | Metropolitan |
|------|-----------------|--------------|
| 1999 | 280 | 250 |
| 2001 | 260 | 230 |
| 2003 | 240 | 210 |
| 2005 | 220 | 190 |
| 2007 | 200 | 170 |
| 2009 | 190 | 160 |
| 2011 | 185 | 155 |
| 2013 | 180 | 150 |
| 2014 | 180 | 150 |

*MMWR Surveill Summ 2017;66(Ne. SS-2):1-7.

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Urbanization is now spreading...
Implications of growing too fast

Hong Kong



Delhi



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What are the top three mega cities in the world?

A. New York City, Tokyo, Delhi
B. Tokyo, Shanghai, Delhi
C. New York City, Shanghai, Tokyo
D. Tokyo, Mumbai, Los Angeles

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Cities are growing

- Most populous mega cities (2016): Tokyo (~38 million), Delhi (~26 million), Shanghai (~24 million)
- 24 of the worlds 31 megacities are in the global south
- 10 more cities expected to reach this status by 2030

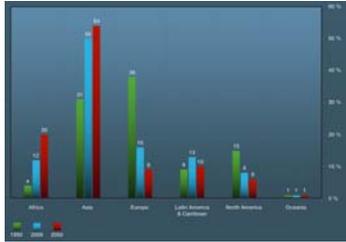


United Nations, Department of Economic and Social Affairs, Population Division (2016). The World's Cities in 2016

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Due to an influx of people

Distribution of world urban population by area



©2016 Population Connection



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But not everyone grows up in an urbanized environment



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Consequences of urbanization

- Changes in our living standards, lifestyles, social behavior and health
- Environmental pollution (air, waste, noise)
- Climate change
- Automobile dependency, long commutes, high traffic, transport accidents
- Criminal violence



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Benefits of Urban Environment

Double edged sword

- Cultural diversity
- Improved infrastructure
- Cutting-edge technology
- Easy access and use of public health services
- Access to a wider range of food
- Easier to access, lots of options for transportation

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Urbanization and Health Hazards

- Environmental degradation, pollution
- Outbreaks of disease due to increased population density
- Increased rates of crime and motor accidents
- Social breakdown, depression, stress related illness
- Alcohol and drug dependency
- Unhealthy diet, lack of exercise and associated illnesses (CAD, HTN, DM)

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Climate Change

- Global surface temperature is increasing
- Presence of storms increasing
- Extreme weather increasing
 - Toronto ON Sept 5th 2018
 - Temp of 34 °C
 - Toronto ON Sept 8th 2018
 - Temp of 17 °C

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Climate Change and Health

- Estimated that between 2030 and 2050 there will be ~250 000 additional deaths per year due to climate change*
- Vector-borne diseases are highly sensitive to climatic conditions

*WHO Climate Change Fact Sheet Updated 2017 <http://www.who.int/mediacentre/factsheets/fs205/en/>

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Air pollution exposure and health impact

- In 2012 about 11.6% of all global deaths were associated with indoor and outdoor air pollution
- Most deaths were due to noncommunicable diseases (cardiovascular diseases, stroke, chronic obstructive pulmonary disease and lung cancer)
- PM_{2.5} (sulfate, nitrates and black carbon) penetrate deep into the lungs and in the cardiovascular system

WHO 2017

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POLLUTION and HEALTH

- WHO estimated 9 million premature deaths in 2015 — 16% of all deaths worldwide— three times more deaths than from AIDS, tuberculosis, malaria combined

Health Effects Institute. 2018. State of Global Air 2018. Boston MA.

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Lung cancer continued

- Data from NCIN (England)
 - Incidence and mortality rates are decreasing for males increasing for females
 - One year survival is increasing

Figure 1. Age standardized incidence rate for lung cancer in England 1980-2011

Figure 2. Age standardized mortality rate for lung cancer in England 1980-2011

www.ncin.org.uk/databriefings 2013 **RGA** 22

Risk of Cancer

- 2014 study of incidence 18 common cancers (Ireland)
 - Risks of 12 cancers higher for urban residents (e.g. stomach, colorectal, lung)
 - Risks of 1 cancer (prostate) higher for rural residents
 - Some cancers have similar risk regardless of where you live
 - May reflect differences in attitudes towards cancer between residents or decision to move closer to urban center for treatment

Sharp, L et al. Journal of Urban Health: Bulletin of the New York Academy of Medicine 2014, 91(3);doi:10.1007/s11524-013-9846-3 **RGA** 22

Negative Impact of Pollution on Life Expectancy

- Increase of 10 microgram per cubic metre of PM2.5 decreased life expectancy by 0.8-1.4 years
- Decrease of 10 microgram per cubic metre of PM2.5 increased life expectancy by 0.77 years¹
- Difference of 3 years in life expectancy between residents living north or south of Huai river in China²
 - Air pollution from coal burning

1. Pope et al. NEJM 2002
2. Ebenman et al. PNAS 2017 **RGA** 22

Traffic and Health

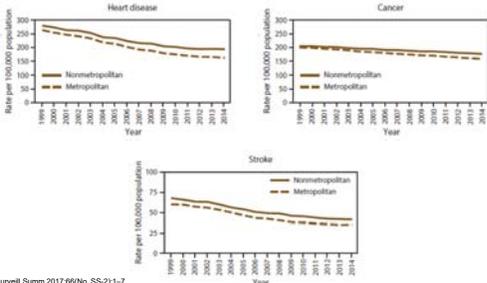
- 2014 study in England*
 - 12% higher mortality risk in cities with high junction density compared to those with low
- Deaths from road traffic injuries 2015 (rate per 100 000)**
 - France 5.1
 - Canada 6.0
 - USA 10.6
 - Romania 8.7
 - Ethiopia 25.3



*Fecht, D et al. Environmental Health 2016, 15(Suppl 1):34
 **World Health Statistics 2017

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Non-communicable diseases in developed countries



Heart disease: Both areas show a downward trend, with Metropolitan areas starting higher and ending lower than Nonmetropolitan areas.

Cancer: Both areas show a downward trend, with Metropolitan areas starting higher and ending lower than Nonmetropolitan areas.

Stroke: Both areas show a downward trend, with Metropolitan areas starting higher and ending lower than Nonmetropolitan areas.

MMWR Surveill Summ 2017;66(No. SS-2):1-7.

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Urbanization and Developing countries

- 2014 Review
 - Lower risk of under nutrition, higher risk of obesity in children, lower fertility rate
 - Both urban residence and lifetime exposure to urban environment were associated with greater odds of hypertension, diabetes and overweight
 - Urbanization was positively but not significantly associated with life expectancy

Eckert, S & Kohler, S. World Health & Population 2014, 15(1): 7-20

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- Today's megacities are very heterogeneous
- An urban area disadvantage is seen in extremely distressed neighborhoods
- Urbanization implies the greater concentration of people, which increases the speed at which new infections are spread.

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Which of the following would you consider an urban disorder?

- A. Diabetes mellitus
- B. Hypertension
- C. Sexually transmitted disease
- D. Mood disorder
- E. Sick building syndrome

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Modern Times
Understanding the natural stress response



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Urban areas and stress

How urban life can affect brain biology

- 2011 functional MRI study University of Heidelberg
- Currently live in urban environment = increased amygdala activity
- Grew up in urban environment = increased activity in cingulate cortex
- Amygdala implicated in anxiety, depression, and other mental health issues
- Cingulate cortex involved in stress regulation



Lederbogen, F et al. Nature 2011 474:458-501

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Mood disorders

- Increased levels of stress and anxiety



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SOCIAL ISOLATION

- Loneliness is a major threat to Americans' mental, physical and emotional well-being
- Connections between [loneliness](#) and [health issues ranging from substance abuse to heart disease](#)

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Lifestyle changes and health

- Auto-dependency and long commuting time
- Long working hours
- Lack of exercise
- Unhealthy diet
- Cellphones, social media, loneliness epidemics

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Sedentary Time- Hazard Risk

- 7985 participants
- Evaluated hazard risk based on total time inactive and duration of inactivity
- Highest risk for death in those who are sedentary and sit for long periods of time
- Most adults sit 9-10 hours per day
- No matter how much you exercise, if you sit for a long period each day you will have an increased risk of mortality

Diaz, K.M et al. Ann Intern Med. 2017 doi:10.7326/M17-0212

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Obesity is on the rise

- Reaching epidemic proportions in countries like the US

Figure 1. Obesity status of U.S. adults by (A) age and (B) calendar year.
 Note: Prevalence estimates by calendar year are age-standardized to the U.S. population in 2000. Sources: (A) NHANES 1999-2014; (B) NHANES 1988-2014.
 NHANES, National Health and Nutrition Examination Survey.

Stokes et al. Am J Prev Med 2017

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But... rural residents may not be any better off

- 2015 study in USA
- Higher prevalence of obesity among rural residents compared to urban residents (35% vs 30%)
 - Rural residents displayed poorer diet, less physical activity and more screen time
- Odds of being obese **1.19** times higher for rural vs urban resident



Trivedi, T et al. Rural and Remote Health 2015 15: 3267.



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Fast food/slow food

- Urbanization is an example of social change that has a remarkable effect on diet



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Fitting nature into our lives



Photo by Beyond My Ken / CC BY



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Walking in Urban Park

- 2015 study
- 23 males asked to go for a 15min walk in an urban park in the fall
- Decreased heart rate, nerve activity
 - Subjects felt comfortable and relaxed
- Short term benefits to walks, good to fit into busy schedules

| Location | STAI T-score |
|------------|--------------|
| Urban park | ~38 |
| City area | ~48 |

Song, C. et al. Int. J. Environ. Res. Public Health 2015, 12:14216-14226; doi:10.3390/ijerph121114216

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The Modern Day Applicant is Varied

- Case 1
 - Male
 - Member of wellness program
 - Good weight, goes for regular checkups
 - Utilizes wearable technology
- Case 2
 - Male
 - Overweight
 - Depressed/isolated
 - Insomnia
 - Diabetes

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Urbanization breeds innovation!

- Ride sharing apps
- Food delivery
- Food preparation services
- Rent a bike
- Fitness trackers

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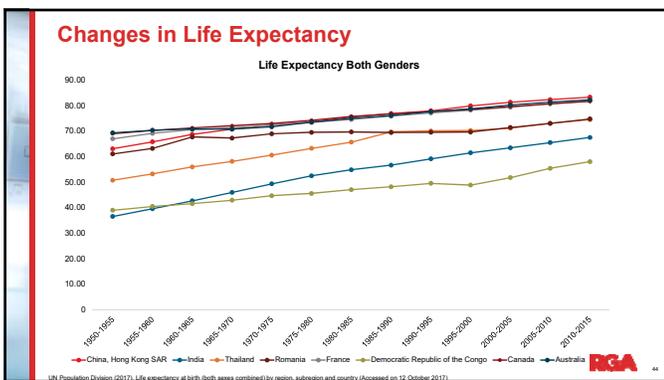
But that does not mean people will use it!

- Meta-analysis of mobile based tech for health behavior change
 - Significant improvement in smoking cessation
 - Little to no effect for weight management, diabetes, physical activity
 - Some bias in most of studies

| Study | WMD (95% CI) |
|---------------------------------------|---------------------|
| BEASLEY 2008 (41) | 0.27 (-0.41, 0.96) |
| ELLROTT 2005 (12) | -0.37 (-1.51, 0.77) |
| Overall (I-squared = 0.0%, p = 0.345) | 0.10 (-0.49, 0.69) |

Free C, et al. PLoS Med 2013 10(1): e1001362. doi:10.1371/journal.pmed.1001362

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Okinawa-the largest group of centenarians per capita

- High life expectancy
- Secret to living a long happy life

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Summary

- Urbanization is growing
- The effect on health of urbanization is double edged
- Modern city life is perceived as stressful and stress can trigger mental disorder
- In less developed countries urbanization opened the door to “western disease” (obesity, CAD, DM)



Thank you



Questions?