

## Pandemic-Resilient Community Planning

*Practical Ways to Help Communities Prepare for, Respond to, and Recover from Pandemics and Other Economic, Social and Environmental Shocks*

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*Resilient communities can efficiently absorb economic, social and environmental shocks, including disasters such as pandemics.*

### Abstract

*Resilience* refers to a system's ability to efficiently absorb shocks. This report investigates ways that communities can increase their resilience to pandemics and other sudden economic, social or environmental risks. It compares COVID-19 with other health risks, examines various problems caused by pandemic-control interventions, and recommends specific ways that communities can better prepare for, respond to, and recover from pandemics and other shocks.

Pandemic-control travel restrictions, isolation requirements and job losses cause various domestic, social and economic problems, including physical and emotional stresses, and financial losses. Risks vary by location: urban residents have more exposure to infectious disease while rural residents are more likely to die if infected. All shared vehicle travel, including private automobiles carrying passengers, can spread disease. For most households, the safest place to live during a pandemic is an affordable home with ground-floor access in a walkable urban neighborhood where residents have low-risk and affordable mobility options. To improve resilience, communities need effective emergency response, contagion control, safe methods for delivering essential goods and services, adequate housing for all residents, physical and mental support for isolated people, and affordability. Infectious disease risks justify stronger efforts to eliminate homelessness.

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### ***Preface – Live Long and Prosper in an Unpredictable World***

Imagine that in 2019 a trustworthy source predicted that a pandemic would soon severely limit vehicle travel, require your household to isolate at home for months, and possibly reduce your income for extended periods of time. How would you prepare? You would probably collect emergency supplies such as hand sanitizers, facemasks and food supplies, enhance the comfort of your home with more natural light and ventilation, improve your communication links and ability to work on-line with higher speed internet services, and find ways to reduce household expenditures if needed.

Similarly, imagine that you are a city planner or mayor who received a similar prediction. How would you prepare your community? You would probably enhance your emergency management and public health programs with improved communications networks and emergency supplies, ensure that healthcare services can accommodate demand surges, implement transportation policies that can prioritize travel and provide access to essential goods and services, eliminate homelessness, and improve affordable housing and transportation options to serve residents with reduced incomes.

However, disasters are unpredictable. Major pandemics are rare and highly variable events, making them difficult to forecast. It would be a mistake to prepare for just one risk – a major pandemic – and ignore other disasters. For these reasons, this report approaches this issue broadly; it considers how lessons from the COVID-19 pandemic can be generalized to help individual households and communities prepare for diverse health, environmental and economic shocks, including but not limited to infectious disease risks. This can help people and communities live long and prosper despite life’s uncertainties.

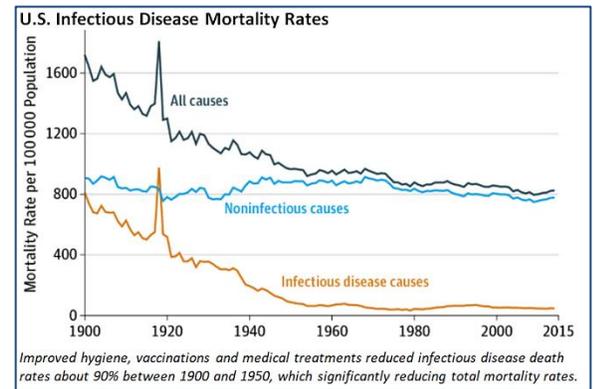
## Executive Summary

This report explores a pertinent and interesting question. How can we best prepare for the “slings and arrows of outrageous fortune,” or to use modern terminology, how can we plan communities that are resilient to economic, social and environmental shocks, including pandemics and other disasters?

According to popular culture, the best disaster survival plan is to isolate on a private island or rural property. For some people, preparing a secluded bunker with sufficient emergency supplies (“prepping”) is a hobby or business. However, for most households this is an ineffective and unrealistic solution. Although an affluent and healthy individual with practical skills and anti-social tendencies may be happy and healthy in rural isolation, most people have responsibilities and dependencies, including work, caregiving, and personal needs that require access to services and activities, and many people find such isolation boring.

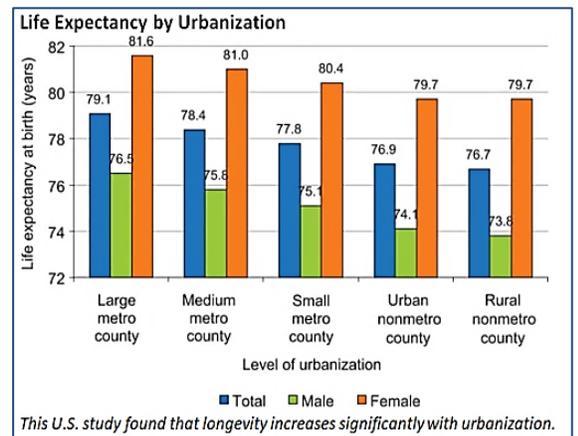
Analysis described in this report indicates that most people are best off during a disaster living in a walkable urban neighborhood with convenient access to common services and activities, and social connections that provide security and support. This is good news overall, because it indicates that policies to increase disaster resilience also tend to help achieve other community goals including affordability, economic opportunity and environmental protection.

The COVID-19 pandemic is a significant risk. If uncontrolled, it could kill hundreds of millions of people, with great social and economic costs. Fortunately, prevention seems to be relatively effective, greatly reducing mortalities. Although infectious diseases were once a dominant cause of death, improved hygiene, vaccinations, healthcare, and other public health interventions have greatly reduced their mortality rates, as illustrated at right. Pandemics now kill fewer people, and cause far fewer potential years of lost life, than many other health risks, including cardiovascular diseases, cancers and accidents.



If COVID-19 follows the pattern of previous pandemics, controlling it will require many months of restricted travel and physical interaction, creating various health, social and economic problems. To improve resilience, communities need effective responses including contagion control, safe access to and delivery of essential goods and services, adequate housing, physical and mental support for isolated people, and affordability.

A key conclusion of this research is that pandemics do not justify abandoning cities. Although city residents are more exposed to infectious diseases, rural residents are more likely to die if infected, and urban living provides large health and safety benefits making cities significantly safer and healthier overall, as illustrated to the right. Many people assume that contagion risk increases with *density* (the number of people per unit of land), but that is not necessarily true; the risk is actually associated with *crowding* (the number of people within an enclosed space, such as a vehicle or house). Most infection risks are associated with specific activities – long-distance travel, worksites, stores and social gatherings – that are similar in cities, suburbs and rural areas.



To reduce the stresses of isolation, homes need adequate space, light and ventilation. Houses with ground-floor access have the least contagion exposure. Multi-family housing with shared entranceways, indoor hallways and elevators have additional risks, but these can be reduced with appropriate design, frequent cleaning and sanitizing, appropriate hygiene, and physical distancing ([Lewyn 2020](#)). Homelessness increases contagion risks, so eliminating homelessness increases resilience. Such efforts, while costly, and therefore requiring state/provincial and federal funding, provide many long-term benefits.

Travel modes vary in their risks and affordability, as illustrated at right. All shared vehicles, including airplanes, trains, buses taxis, ridehailing, and private automobiles carrying passengers, can spread contagions. Walking and bicycling tend to have the least contagion risk, can serve people who for any reason cannot drive, provide exercise and are affordable, so improving walking and bicycling conditions tends to increase resilience. Improving walking and bicycling conditions tends to increase health and resilience.

<b>Pandemic Safety →</b>	Single-Occupant Vehicle	Telework	Bicycling	Walking
	Auto with passenger	Taxi/ Ridehailing	Transit bus	
	Aviation		Subway	
	<b>Increased affordability →</b>			

*Transport modes vary in their pandemic safety and affordability.*

The table below summarizes special urban and rural pandemic risks and solutions. For equity sake, extra consideration should be given to helping physically, economically and socially disadvantaged groups.

### Special Pandemic Risks and Solutions

	Urban	Rural Areas
<b>Special Risks</b>	<ul style="list-style-type: none"> <li>Crowded buildings and sidewalks</li> <li>Elevators</li> <li>Public transit</li> <li>Homelessness and inadequate housing</li> </ul>	<ul style="list-style-type: none"> <li>Vulnerable (old, poor, chronic illness, etc.) populations</li> <li>Limited public health resources</li> <li>Physical and social isolation</li> <li>Poor access to medical facilities</li> <li>Inadequate housing</li> <li>Poverty and limited employment options</li> </ul>
<b>Solutions</b>	<ul style="list-style-type: none"> <li>Targeted cleaning</li> <li>Promote hygiene</li> <li>Promote social distancing</li> <li>Improve walking and bicycling</li> <li>Eliminate homelessness and improve housing quality</li> </ul>	<ul style="list-style-type: none"> <li>Improve public health services</li> <li>Targeted outreach to isolated households</li> <li>Improve access to essential services</li> <li>High speed internet access and e-services</li> <li>Financial assistance to poor and unemployed</li> <li>Improve housing quality</li> </ul>

*Urban and rural areas have special pandemic risks that require special solutions.*

Pandemics are just one of many risks that communities face, and generally not the most important, so it would be inefficient to implement infectious disease reduction strategies that increase other health, economic, environmental problems, for example, by reducing physical activity which increases cardiovascular disease, or increasing vehicle travel and therefore traffic casualties and pollution emissions. To increase resilience, households and communities should be prepared with emergency management programs, develop robust and flexible infrastructure, and favor affordable and resource-efficient housing and transportation options. Many of these strategies provide many economic, social and environmental benefits, in addition to reducing disaster risks.

#### **Analysis Scope**

*Planning analysis can vary in scope:*

1. Infectious disease risks only.
2. All disaster risks.
3. All health impacts.
4. All economic, social and environmental planning goals.

More comprehensive analysis helps identify *win-win solutions* that achieve multiple goals, in addition to reducing infectious disease or disaster risks.

The table below provides checklists of ways that households and communities can increase their resilience to pandemics and other economic, social and environmental risks.

### Resilience Planning Checklists

	For Households	For Communities
<b>Reduces Pandemic Risks</b>	<ul style="list-style-type: none"> <li>• Resources to sanitize personal items, vehicles and homes, plus face masks and gloves.</li> <li>• A home with adequate space, home offices, natural light and ventilation, and private outdoor spaces such as a balcony, deck or yard to provide comfort for extended isolation.</li> <li>• Good communications resources, including telephone, internet service and computers for socializing, e-commerce and telework.</li> <li>• Fitness program, including in-home exercise and nearby walking and bicycling.</li> </ul>	<ul style="list-style-type: none"> <li>• Good public health programs, particularly infectious disease control and smoking reduction.</li> <li>• Healthcare services able to handle surges.</li> <li>• Shared vehicle density restrictions, cleaning and sanitizing, plus employee and passenger hygiene.</li> <li>• Minimal homelessness or inadequate housing.</li> <li>• Programs to address mental illness, substance abuse, domestic violence, and vulnerable resident supports.</li> <li>• Expanded pedestrian facilities to prevent crowding, traffic calming and road space reallocation.</li> </ul>
<b>Reduces All Risks</b>	<ul style="list-style-type: none"> <li>• Household emergency plan, including emergency contact information.</li> <li>• Emergency supplies, including first aid equipment, flashlights, mobile phone and portable radio backup power, and food for at least two weeks.</li> <li>• A home in a relatively safe location (out of floodplains and wildfire interface) built to withstand local risks such as earthquakes, hurricanes, plus extreme heat and cold.</li> <li>• Comfortable shoes for walking and a sturdy bicycle for riding.</li> <li>• Housing in a compact, walkable and bikeable neighborhood where essential services and activities are accessible without a car.</li> <li>• Ways to reduce household expenditures if income declines.</li> <li>• Positive relationships with neighbors.</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency management with trustworthy leadership, reliable communications and critical supplies.</li> <li>• Robust internet and telecommunications networks, e-government, e-commerce, and delivery services.</li> <li>• Restrictions on development in high-risk areas such as floodplains and wildfire interface.</li> <li>• Zoning codes and house retrofit programs that ensure homes can withstand local risks such as earthquakes, and extreme weather, and are energy efficient.</li> <li>• Compact, walkable and bikeable neighborhoods where most essential services and activities can be accessed without using an automobile.</li> <li>• Sufficient affordable housing to serve demand.</li> <li>• Community cohesion, so most residents have positive relationships with their neighbors.</li> <li>• Unemployment insurance and support for lower-income households.</li> </ul>

*Good planning by households and communities can increase their resilience to pandemics and other risks.*

Human intelligence allows us to learn from previous experiences and generalize those lessons to solve new problems. The COVID-19 pandemic is a good learning experience. The bad news: we face diverse and unpredictable risks, with no simple solutions. You can run, but you cannot hide. The good news: cooperative actions can greatly reduce deaths, and most people and communities are highly resilient. Given appropriate support, we can be healthy and happy despite economic, social and environmental shocks. This report should be of interest to policy makers, practitioners and the general public. Although focusing on North American conditions, many of the findings are applicable in other world regions.

**Introduction**

COVID-19 is a serious threat; if uncontrolled it could kill hundreds of millions of people around the world. Fortunately, strong public health interventions are reducing its spread and preventing it from overwhelming healthcare systems, greatly reducing deaths. Thanks public health professionals!

However, we can do better. Unnecessary delays and inadequate preparation reduced the effectiveness of these responses, and communities face many practical problems in preventing infections and addressing the pandemic’s social and economic impacts. During a disaster people often ask, “Why were we not better prepared?” Every disaster is unique, so it would be a mistake to prepare for identical future pandemics; we need to identify general principles that can help communities respond effectively to diverse risks. Planners use the term “[resilience](#)” to describe a system’s ability to absorb shocks, that is, sudden economic, social or environmental changes. [Many communities](#) have goals to increase their resilience ([100 Resilient Cities](#)).

This pandemic created an interrelated set of problems that include illness and deaths, healthcare system stress, travel restrictions, stay-at-home and isolation requirements, fear and confusion, mental and physical stresses, plus lost income to individuals and businesses which threaten local, national and global economic development. Although there is extensive literature on emergency management and community resilience planning, most existing publications focus on environmental threats such as hurricanes, earthquakes and wildfires; pandemics receive little consideration. Pandemics differ from most other disasters because they threaten people but not infrastructure, have long durations and huge economic impacts, as summarized below, so their mitigation is primarily concerned with protecting people and providing economic security, with little need for infrastructure protection and repair.

**Exhibit 1 Disaster Impacts**

Type	Scale	Duration	Warning	Healthcare Needs	Evacuation Needs	Economic Costs	Infrast. Damages
Earthquake	Large	Short	None	Large	Varies	Large	Large
Extreme weather <sup>1</sup>	Varies	Moderate	Short	Small	Moderate	Moderate	Moderate
Tsunami	Large	Short	Short	Moderate	Local	Large	Large
War/civil unrest	Varies	Short	Short	Moderate	Large	Moderate	Large
Wildfire	Large	Long	Moderate	Small	Moderate	Large	Large
Major utility failures <sup>2</sup>	Large	Moderate	Short	None	None	Large	Large
Chemical spill/fire	Small	Varies	Short	Large	Local	Large	Large
<i>Pandemic</i>	<i>Very Large</i>	<i>Very Long</i>	<i>Long</i>	<i>Very Large</i>	<i>None</i>	<i>Very Large</i>	<i>None</i>

*Pandemics are one of many types of disasters that should be considered in emergency response planning.*

- 1. Extreme weather includes hurricanes, tornados, blizzards, ice storms, and extreme cold and heat.*
- 2. Major, long-term utility failures could result from technical failures, extreme weather, terrorist attacks or solar flares.*

This report investigates these issues. It compares COVID-19 with other health risks; examines various impacts on people and economic activity; identifies specific problems such as homelessness and unaffordability; compares urban and rural risks; and recommends specific ways that communities can better prepare for, respond to, and recover from pandemics and other shocks. This report focuses on actions that can be implemented by individual households, community organizations, local and regional government. It highlights “win-win” strategies that increase resilience while helping to achieve other community and household goals. It should be of interest to anybody involved in emergency response or community resilience planning, or who wants guidance preparing their own household for future disasters.

## Principles of Resilience

The future is unpredictable so smart planning prepares for possible unexpected changes, what economists call *shocks*, or as my grandmother recommended, we should “hope for the best but prepare for the worst.” This would be easy if we faced just one possible shock, but there is a large range of possible threats that individuals and communities may face. Below are general principles for community resilience.

### **Prepared and Responsive**

Prepared and responsive means that communities have trustworthy leadership, effective emergency management programs, and good communication that allows public officials to communicate with residents and residents to communicate with public officials.

### **Robust, Secure, Redundant and Flexible**

Critical infrastructure must be strong, redundant and flexible in order to withstand potential stresses and failures, and should avoid higher-risk locations. For example, earthquakes cause much less damage and casualties in areas with strong building codes, and extreme weather is less likely to cause power failures where utility lines are underground. Similarly, for security sake, homes and communities should avoid vulnerable floodplains, shorelines and forests susceptible to wildfires, risks that are increasing with climate change.

### **Diversity**

A diverse system is better able to respond to unexpected changes. For example, people who normally travel by automobile should value having alternatives, such as good walking, bicycling and public transport in their community, for possible future situations in which they cannot or should not drive, because of a vehicle failure, medical problem or lost income, or because a disaster makes roads impassable or fuel unavailable. Drivers also benefit from non-auto modes that reduce their chauffeuring burdens. Similarly, households benefit from having diverse home heating and cooking options, food supplies, and employment opportunities.

### **Affordable and Resource-efficient**

If we are lucky, we will always be affluent, but we should prepare for the possibility that sometime we will be impoverished and need more affordable options. Since housing and transportation are most household’s two largest expenses, affordable housing and transportation are particularly important for resilience planning.

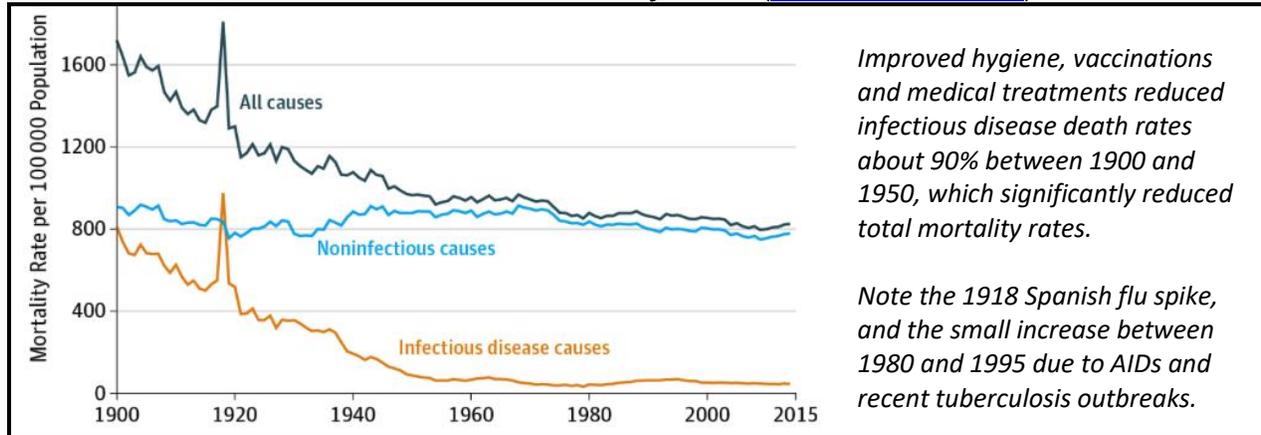
These principles can be applied to many types of planning decisions. For example, this suggests that to increase resilience, households should choose homes, and communities should design neighborhoods, that are in lower-risk locations, with efficient and redundant public infrastructure, and build multi-modal transportation systems that provide convenient access to important services and activities without requiring an automobile. These principles also suggest that communities should ensure that affordable housing and transportation options are available, so any household, including those with low incomes, physical impairments or other special needs can find suitable affordable homes in a walkable neighborhood.

These principles increase a community’s resilience to many risks including pandemics and other disasters, and individual households’ resilience to shocks such as lost income and physical disabilities. Although a pandemic does not damage physical infrastructure like natural disasters, it does stress household infrastructure and constrain travel activity, and its financial impacts will force many households to need more affordable housing and transport options.

## Comparing COVID-19 with Other Health Risks

Infectious disease epidemics, including smallpox, typhus, plague, cholera, polio, and measles, were once common and deadly ([Healthline 2016](#)). Fortunately, better hygiene, vaccines, and improved medical treatments greatly reduced these risks, as illustrated below. Globalization increases contagion dispersion but also the speed of responses, so even highly contagious and deadly diseases can be controlled. As a result, our infectious disease risks are far smaller than our grandparents’.

**Exhibit 2 U.S. Infectious Disease Mortality Rates** ([Hansen, et al. 2016](#))



COVID-19 is dangerous due to its high transmissibility (it travels easily to uninfected people) and mortality rates (1-10% of infected people die; [CEBM 2020](#); [Varity, et al. 2020](#)). Its long-term risks will depend on its immunity patterns (the degree infected people become immune to reinfections; [Wu 2020](#)), the ease of creating vaccines, and mutation rates (how quickly new strains develop). If it follows previous flu pandemic patterns, risks will be acute for several months, and decline as prevention and treatment methods improve, vaccines are developed, and more people become immune.

Due to successful public health interventions, pandemics are now a relatively small health risk overall. COVID-19 is predicted to kill 200,000 to 2.2 million Americans over an 18-month period ([Fritze 2020](#); [Kristof 2020](#)), causing a 5-40% increase over the 2.8 million typical annual deaths. Assuming that major pandemics occur twice a century, they average 4,000-44,000 annual deaths, as indicated below.

**Exhibit 3 U.S. Leading Causes of Deaths** ([CDC 2018](#))

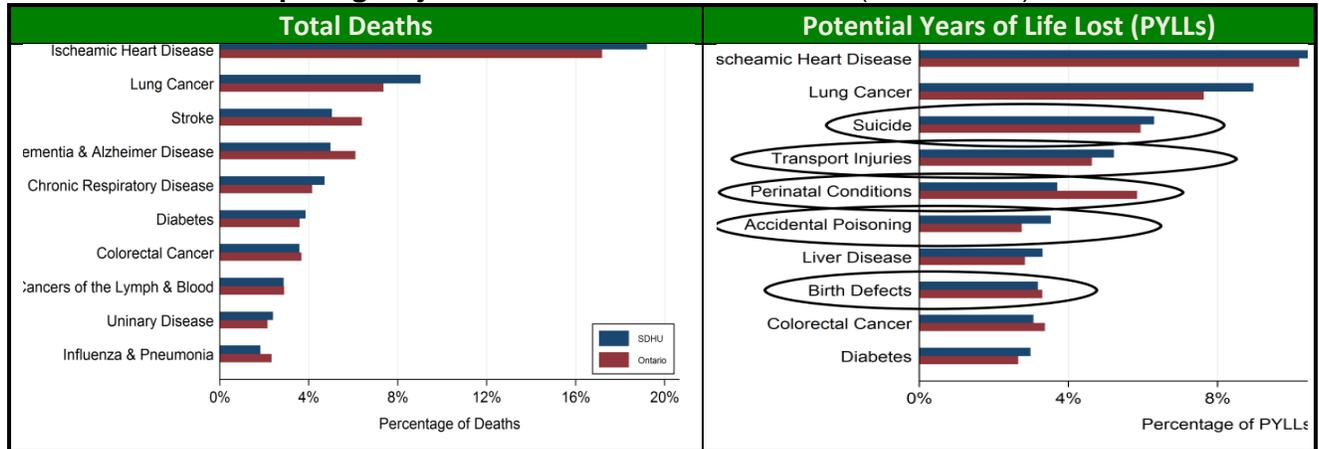
Disease	2017 Deaths
Heart disease	647,457
Cancer	599,108
Lower respiratory disease, Influenza and pneumonia	215,873
Accidents (unintentional injuries)	169,936
Strokes	146,383
Alzheimer’s disease	121,404
Diabetes	83,564
Nephritis, nephrotic syndrome and nephrosis	50,633
Intentional self-harm (suicide)	47,173
<i>Estimated pandemics deaths</i>	<i>150,000-250,000</i>

*Assuming major pandemics occur twice a century, they represent a relatively small portion of average annual deaths.*

*This suggests that long-term health policies should treat pandemics as one of many health risks.*

Because COVID-19 mostly kills older people, it causes smaller reductions in [Potential Years of Life Lost \(PYLLs\)](#), which accounts for the average age when people die, and so gives greater weight to risks to younger people. The figures below compare total death and PYLLs rates for the SDHU Region in Ontario. Risks that kill younger people, including suicides, transport injuries, perinatal conditions, poisonings and birth defects, are relatively important when measured by PYLLs, making their prevention a more important public health priority. Measured this way, diseases such as influenza and respiratory diseases rank relatively low compared with suicides, accidents and birth defects.

**Exhibit 4 Comparing Major Causes of Death and PYLLs (PHSD 2018)**



Cardiovascular diseases, cancers, dementia and respiratory diseases are major causes of death, but because they kill younger people, suicides, accidents and birth defects (circled) cause more potential years of life lost.

The table below compares COVID-19 with other major mortality risks, [assuming](#) a 30% infection rate (30% of people contract the disease in 2020) and 1% mortality rate. During the next year it would be the largest cause of death for people over 60, but even in this age group would cause a minority of all deaths, and for younger groups would cause fewer deaths than traffic crashes, drug overdoses, homicides or suicides.

**Exhibit 5 Comparing Coronavirus with Other Mortality Risks (New York Times 2020)**

Here is where coronavirus deaths would rank in the U.S., assuming an overall infection rate of **30%** and fatality rate of **0.5%** over the next year:

**How Coronavirus Deaths Could Compare With Other Major Killers**

CAUSE OF DEATH	U.S. DEATHS
1 Heart disease	655,381
2 Cancer	599,274
3 <b>Coronavirus (estimate)</b>	<b>480,000</b>
4 Alzheimer's, dementia and brain degeneration	267,311
5 Emphysema and COPD	154,603
6 Stroke	147,810
7 Diabetes	84,946
8 Drug overdoses	67,367
9 Pneumonia/flu	59,690
10 Liver disease and cirrhosis	55,918
11 Renal failure	50,404
12 Car crashes	42,114
13 Septicemia	40,718
14 Guns	39,201

Age Group	Rank	Cause of Death	U.S. Deaths
Age 10 to 19	1	Guns	2,149
	2	Car crashes	2,070
	3	Suicide	1,522
	4	Cancer	1,071
	5	<b>Coronavirus (estimate)</b>	<b>800</b>
Age 20 to 29	1	Drug overdoses	11,477
	2	Guns	6,929
	3	Car crashes	6,284
	4	Suicide	3,542
	5	<b>Coronavirus (estimate)</b>	<b>2,300</b>
Age 30 to 39	1	Drug overdoses	17,202
	2	Guns	6,006
	3	Cancer	6,540
	4	Car crashes	6,265
	7	<b>Coronavirus (estimate)</b>	<b>2,800</b>
Age 40 to 49	1	Cancer	19,395
	2	Heart disease	18,276
	3	Drug overdoses	14,203
	4	<b>Coronavirus (estimate)</b>	<b>7,100</b>
	5	Liver disease and cirrhosis	5,916
Age 50 to 59	1	Cancer	70,996
	2	Heart disease	54,499
	3	<b>Coronavirus (estimate)</b>	<b>32,000</b>
	4	Drug overdoses	14,659
	5	Liver disease and cirrhosis	14,642
Age 60 to 69	1	Cancer	147,935
	2	Heart disease	102,449
	3	<b>Coronavirus (estimate)</b>	<b>97,000</b>
	4	Emphysema and COPD	27,769
	5	Diabetes	19,122
Age 70 to 79	1	Cancer	172,905
	2	<b>Coronavirus (estimate)</b>	<b>147,000</b>
	3	Heart disease	125,243
	4	Emphysema and COPD	49,289
	5	Alzheimer's, dementia and brain degeneration	27,219
Age 80+	1	Heart disease	325,740
	2	Alzheimer's, dementia and brain degeneration	220,976
	3	<b>Coronavirus (estimate)</b>	<b>192,000</b>
	4	Cancer	177,706
	5	Stroke	66,590

COVID-19 could become the largest cause of death for older people, but for most people it is likely to cause fewer deaths than traffic crashes, drug overdoses, homicides or suicides.

This analysis indicates that pandemics present very large potential health risk. If uncontrolled, COVID-19 could kill up to 2% of affected community members, potentially causing up to 140 million deaths. Fortunately, public health interventions can greatly reduce this risk. Although the interventions are economically costly, they are smaller than the potential damages of uncontrolled COVID-19. The table below compares best- and worst-case pandemic futures.

**Exhibit 6 Best and Worst U.S. Pandemic Futures**

Best	Worst
Infection rates are quickly controlled	Out-of-control infection rates overwhelm healthcare systems
Fewer than 200,000 U.S. deaths	More than one million U.S. deaths
Pandemic declines during spring 2020	Pandemic continues unabated
Effective vaccine is quickly developed	Rapid mutations make vaccines ineffective
Life and economy returns to normal by 2021	Life and economy are continually disrupted

*With good management and luck, life and economic activity will soon return to normal.*

**Problems of Physical Distancing and Isolation**

Pandemic control involves restrictions on travel, commercial and social activities, plus isolation and sometimes quarantine. The table below summarizes resulting problems and potential community solutions.

**Exhibit 7 Isolation Problems and Community Solutions**

Problem	Community Solutions
Confusion and fear	Good communication, particularly for vulnerable and isolated people.
Inadequate access to essential goods	Provide shopping opportunities and delivery services.
Healthcare needs	New service models, such as on-line consultations and pharmacy deliveries.
Crowding and discomfort	Adequate housing, with private outdoor space (balconies, decks, yards)
Mental stress	Community support and mental health services. Design for “sociable distancing.”
Physical inactivity	Opportunities for outdoor activity. “Open streets” with restricted vehicle traffic.
Domestic conflicts	Adequate housing. Community support. Domestic violence response.
Reduced household income	Emergency funding. Community support. Affordability.
Reduced business income	Emergency funding. Support for new business models, such as delivery services.
Homelessness	Eliminate homelessness, as described in the following section.

*Restrictions on travel, commercial and social interactions can create various problems.*

Some of these solutions require technologies such as high-speed internet and video conferencing, plus delivery services, to help people to stay informed and entertained, access essential goods and services, work, and maintain social connections. Homes should have sufficient space and comfort features, natural light and air, and private outdoor spaces such as balconies, porches, decks and yards. Communities can be designed for “sociable distancing,” for example, houses with windows oriented to the street, and front porches, plus wide sidewalks and recreational paths ([Mehaffy 2020](#)). These features are particularly important for families with children and people with disabilities.

## Homelessness Risks and Solutions

People experiencing homelessness or inadequate housing, and the organizations that serve them, face special challenges from contagious diseases ([Brasuell 2020](#)). Homeless people tend to be vulnerable to infections due to a combination of daily stress, poor nutrition and chronic diseases, and living in crowded conditions that lack basic hygiene resources such as sinks, clean toilets, and opportunities to bath and clean clothes ([Woodyard 2020](#)). Homelessness services providers are also vulnerable to infectious illnesses and so may be unable to work during outbreaks.

Public health officials advise people exposed to or infected by contagious diseases to shelter in place. Such quarantines are difficult enough for people with stable homes and reliable incomes; they are virtually impossible for people who are homeless or living in inadequate housing ([Fuller 2010](#)), such as housing that is crowded, or lacks sufficient heating or cooling ([DeParle 2020](#)). If homeless people become infected, they will need to stay in hospitals, using scarce beds, adding stresses and costs to overburdened public health services. Everybody benefits by minimizing homeless residents' infection risks.

Many communities have programs to reduce homelessness, but a pandemic makes these efforts far more urgent. Homelessness service providers are reorganizing their services to reduce contagion risks, ensure physical distancing and improve hygiene ([Woodyard 2020](#)). Some communities are using RVs, tents or underutilized hotels to provide quarantine housing for homeless people who are infected but don't need hospitalization ([Canales 2020](#)). To be successful these efforts require coordinated food, healthcare and mental health services, with plans to transition occupants into stable long-term housing when the pandemic ends.

This is difficult. Homeless people have diverse abilities and needs. Although some are homeless temporarily, due to a short-term financial or domestic crisis, and simply need affordable housing, a portion is chronically homeless due to severe mental illness and substance abuse problems and so need housing with integrated medical, social and economic support. Such programs are costly but can be justified economically by their long-term health, social and economic benefits.

Homelessness problems are particularly severe in large central cities ([DHUD 2018](#)). Since homeless people tend to migrate from their home communities to those cities, called "social drift," regional, state/provincial and national governments should bear most of these costs ([Lederbogen, Haddad, Meyer-Lindenberg 2013](#)).

### Resources for Addressing Homelessness Pandemic Risks

CDC (2020), [Interim Guidance for Homeless Shelters](#), Center for Disease Control.

Homelessness Hub (2020), [Infectious Diseases](#).

Jen Monnier (2020), "[Coronavirus Poses Unique Threat to U.S. Homeless Population](#)," *Scientific American*, 11 March.

NAEH (2020), [Coronavirus and Homelessness](#), National Alliance to End Homelessness.

NCEH (2020), [What Homeless Folks Should Know about Coronavirus \(COVID-19\)](#), National Coalition for the Homeless.

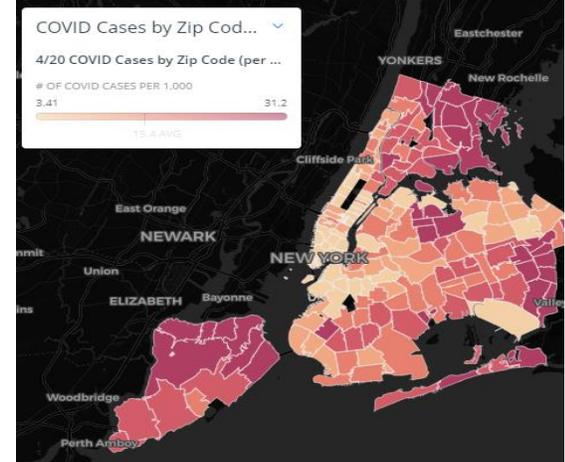
NHCHC (2020), [Coronavirus Resources](#), National Health Care for the Homeless Council.

## Comparing Urban and Rural Risks

Many people assume that contagion risk makes cities dangerous ([Dawid 2020](#); [Rosenthal 2020](#)), but this is generally untrue ([Fox 2020](#); [Smith 2020](#); [Steuteville 2020](#)). Although, all else being equal, infection exposure can increase with density,<sup>1</sup> other factors are more significant, so dense cities with good public health programs have lower infection and death rates than sprawled areas with poor programs ([Li Richmond and Roehner 2018](#)).

High COVID-19 infection rates in large cities such as Chicago, New York and Seattle reflect their global connections – they are major centers of travel, trade, tourism and migration – more than density. Some dense cities such as Hong Kong, Singapore and San Francisco, and highly urbanized countries, such as Japan, South Korea and Taiwan, minimized COVID-19 deaths ([Kahn 2020](#); [Leonard 2020](#); [Lindeke 2020](#); [Normile 2020](#)), and many suburban areas have higher infection rates than nearby central cities ([Bliss and Capps 2020](#); [Dobkin and Diaz 2020](#); [Keil, Connolly and Ali 2020](#)). Using sophisticated statistical analysis, [Hamidi, Sabouri and Ewing \(2020\)](#) found that, accounting for other risk factors, COVID-19 infection rates are not significantly related to county density, and higher density counties have significantly lower virus-related mortality rates, possibly due to better health care. Although COVID-19 took longer to reach rural areas, within two months, two thirds of rural counties had cases, and some have high infection rates ([Healy, et al. 2020](#)).

**Exhibit 8** New York City COVID-19 Cases ([Open Street Map](#))



*Infection rates are much higher in lower-density outer suburbs than in central neighborhoods.*

For this analysis, it is important to distinguish between *density* (people per acre) and *crowding* (the number of people within an enclosed space, such as a vehicle or house). Contagion risks results from crowding, not density. There is no reason to believe that city worksites, stores, and healthcare facilities are more contagious than in suburban and rural areas. The table below summarizes risk factors and solutions.

**Exhibit 9** Contagion Risk Factors and Solutions

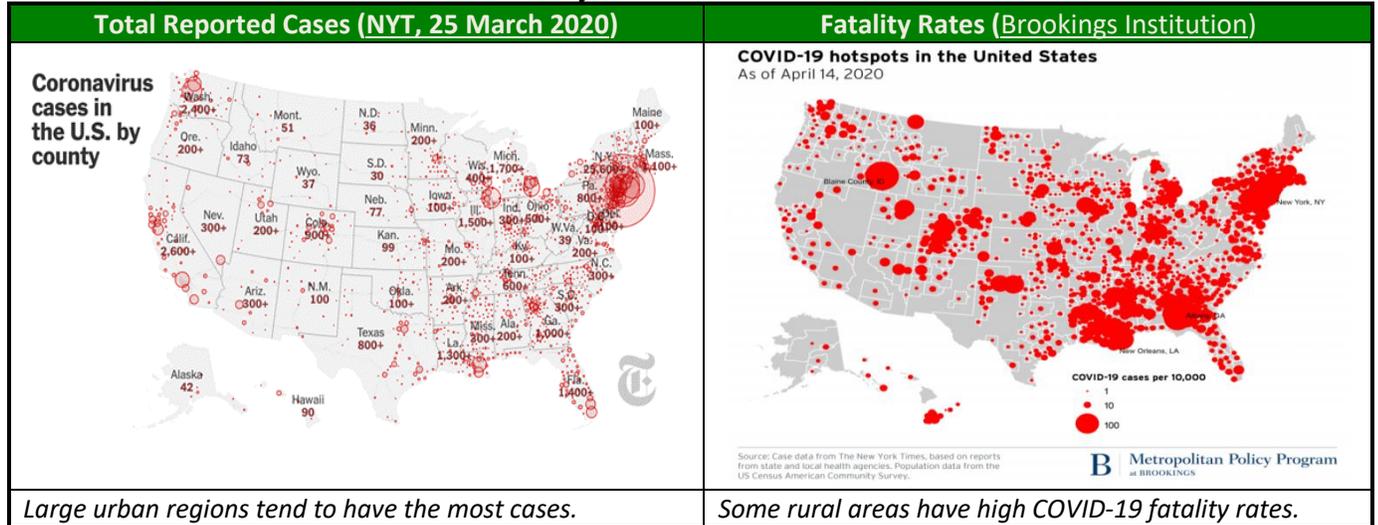
Risk Factors	Solutions – Responses
Long-distance travel	Limit mobility and require quarantines, particularly from higher-risk areas.
Crowded buildings	Limit crowding, clean touch surfaces, and encourage resident, employee and visitor hygiene.
Stores and restaurants	Limit crowding, use delivery services, clean touch surfaces, and encourage hygiene.
Shared vehicles	Limit crowding, clean touch surfaces, encourage hygiene, protect operators.
Sidewalks and paths	Reduce crowding and encourage distancing. Pedestrianize streets.
Social gatherings	Forbid or discourage social gatherings, clean touch surfaces, encourage hygiene.
Nursing homes and medical facilities	Develop comprehensive infection prevention, testing and control protocols, limit access by non-essential visitors, encourage hygiene, protect staff.
Homelessness	Provide housing for homeless residents and targeted services to vulnerable groups.

*Infectious diseases present specific risks which can be reduced.*

<sup>1</sup> [Fan and Song \(2009\)](#) found 28% higher infection-related mortality in central cities during 1979-2008, and [Chandra, et al. \(2013\)](#) found higher death rates in denser regions during India’s 1918–19 influenza epidemic.

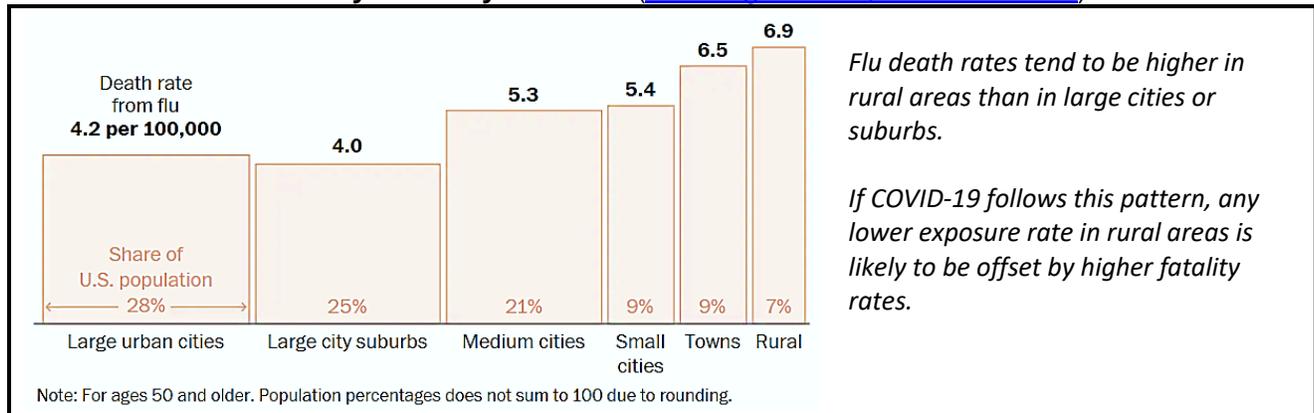
For this analysis, it is also important to measure risk *per capita*. Large population states, such as New York, California, and Florida have more virus cases, as indicated on the left, but many lower density areas have high per capita death rates, as indicated on the right. Density is less a risk than factors such as long-distance travel (and therefore global connections), public health programs, demographics and lifestyle.

**Exhibit 10 Total Cases Versus Fatality Rates**



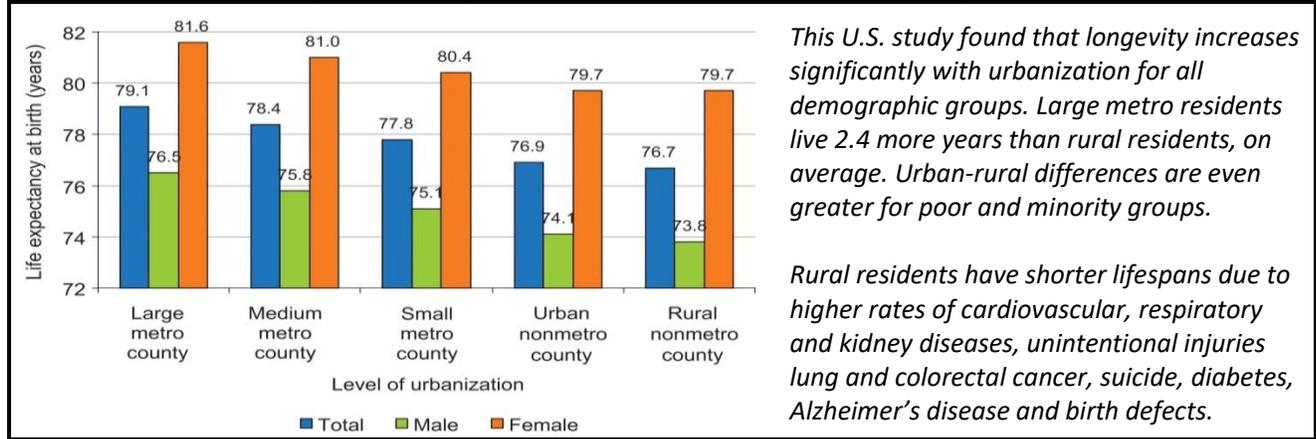
Larger and denser cities tend to have longer flu seasons, but less dense areas have greater spikes that can strain health care systems (Dalziel, et al. 2018). Rural residents tend to be more vulnerable to infectious diseases due to their demographics (they are older, poorer, and have more chronic diseases and higher smoking rates), limited public health systems, and poor healthcare access (Keating and Karklis 2020). Flu death rates are much higher in rural areas than in large cities and suburbs, as illustrated below. As pandemic expert Professor Eva Kassens-Noor explains, “Rural populations have less means to contract it [coronavirus], but rural populations have less means to treat it.” (Bliss and Capps 2020).

**Exhibit 11 Flu Fatality Rates by Location (Washington Post, 19 March 2020)**

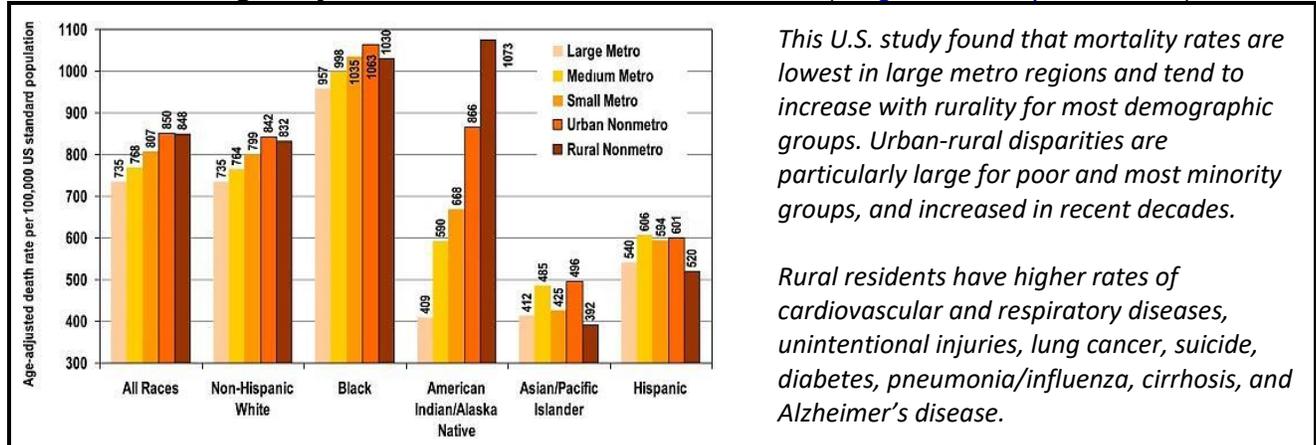


Urbanization tends to increase infectious disease risks but significantly reduces most major causes of death (cardiovascular and respiratory diseases, cancers and unintentional injuries), and so increase overall longevity (Cosby, et al. 2019; Hamidi, et al. 2018; Sallis, et al. 2016), as illustrated below.

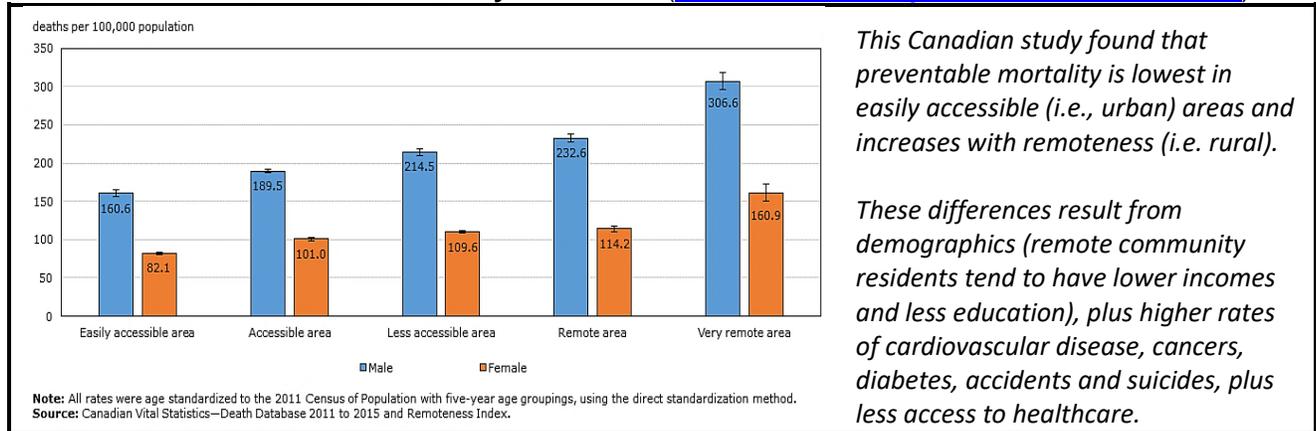
**Exhibit 12 Life Expectancy by Urbanization, U.S., 2005–2009** (Singh and Siahpush 2014)



**Exhibit 13 Age-Adjusted Death Rates, U.S., 1990–2009** (Singh and Siahpush 2014b)

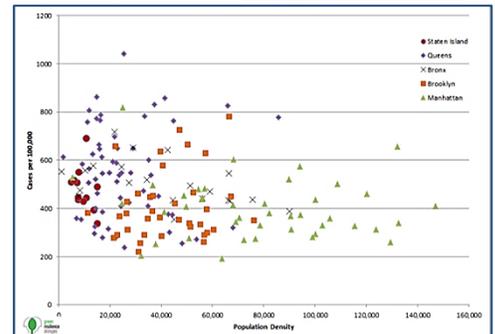


**Exhibit 14 Preventable Mortality in Canada** (Subedi, Greenberg and Roshanafshar 2019)



The figure to the right, from, *Mobilizing Against COVID-19 (by Staying Put)* (Winkelman 2020), published by Green Resilience, shows a negative relationship between neighborhood density and COVID-19 infection rates in New York City.

**Exhibit 15 COVID-19 Versus Density in NYC** (Winkelman 2020)



*New York's denser neighborhoods had lower infection rates than in low-density suburbs.*

Health and safety risks vary by location. City residents tend to have greater risks from infectious diseases, high-rise fires and street crime, but rural residents face greater risks from chronic diseases, accidents (particularly traffic crashes) suicides, and some disasters (such as wildfires), plus less healthcare access and slower emergency response.

In addition to improved health and safety, there are other reasons to favor compact development (Badger 2020). Urban living tends to reduce per capita land consumption and vehicle travel, and increases accessibility, which provide various benefits, as summarized below.

**Exhibit 16 Compact Community Benefits** (Ewing and Hamidi 2015; Litman 2019)

Economic	Social	Environmental
<ul style="list-style-type: none"> <li>• 10-30% <a href="#">transport</a> cost savings</li> <li>• Less time <a href="#">driving and congested</a>.</li> <li>• More <a href="#">productivity</a> and <a href="#">innovation</a>.</li> <li>• <a href="#">Public services</a> cost savings.</li> </ul>	<ul style="list-style-type: none"> <li>• Lower <a href="#">traffic casualty rates</a>.</li> <li>• Residents are <a href="#">healthier</a> and <a href="#">live longer</a>.</li> <li>• Greater <a href="#">economic opportunity</a> for disadvantaged people.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires less land for <a href="#">roads and parking</a>, preserving <a href="#">open space</a>.</li> <li>• <a href="#">Energy savings and emission reductions</a>.</li> </ul>

As a result, any additional contagion risk in cities should be balanced against the benefits of compact living. This is not to suggest that rural living is “bad” and everybody should move to cities; people should be free to live where they want. This analysis simply indicates that it would be misguided to move from a city to a rural area to reduce pandemic risks; that would reduce safety overall and endanger rural residents. Rather than abandon cities, resilient community planning would reduce risks so cities and rural areas become even safer and healthier overall (Holland 2020), as indicated in the table below.

**Exhibit 17 Special Pandemic Risks and Solutions**

	Urban	Rural Areas
<b>Special Risks</b>	<ul style="list-style-type: none"> <li>• Crowded buildings and sidewalks</li> <li>• Elevators</li> <li>• Public transit</li> <li>• Homelessness and inadequate housing</li> </ul>	<ul style="list-style-type: none"> <li>• Vulnerable (old, poor, chronically ill, etc.) populations</li> <li>• Limited public health resources</li> <li>• Physical and social isolation</li> <li>• Poor access to medical facilities</li> <li>• Inadequate housing</li> <li>• Poverty and limited employment options</li> </ul>
<b>Solutions</b>	<ul style="list-style-type: none"> <li>• Targeted cleaning</li> <li>• Promote hygiene</li> <li>• Promote physical distancing</li> <li>• Improve walking and bicycling</li> <li>• Eliminate homelessness and improve housing quality</li> </ul>	<ul style="list-style-type: none"> <li>• Improve public health services</li> <li>• Targeted outreach to isolated households</li> <li>• Improve access to essential services</li> <li>• High speed internet access and e-services</li> <li>• Financial assistance to poor and unemployed</li> <li>• Improve housing quality</li> </ul>

*Urban and rural areas have special pandemic risks that require special solutions.*

## Transport Risks and Solutions

Both long-distance and local travel present contagion risks: long-distance travel can introduce diseases into a community and local travel can disperse it. Transport hubs and corridors, such as airports and highways, are often gateways to diseases. All shared vehicles present risks: buses, trains and airplanes can have crowded vehicles and stations, while automobiles used for taxis, ridehailing, or carrying family and friends have confined spaces and numerous touch services (handles, arm rests and seats). These risks are difficult to compare; for example, it is uncertain whether total contagion risk is lower if 1,000 non-drivers travel on 100 buses with 10 average passengers, 500 taxi/ridehail vehicles with a driver and two average passengers, or 1,000 private cars with a driver and one passenger, since each presents unique risks. The figure below compares my estimates of contagion risk and affordability of common travel modes.

**Exhibit 18 Safety and Affordability by Mode**

Pandemic Safety →	Telework	Bicycling	Walking
	Single-Occupant Vehicle		
	Auto with passenger	Taxi/ Ridehailing	Transit bus
	Aviation		Subway
<b>Increased affordability →</b>			

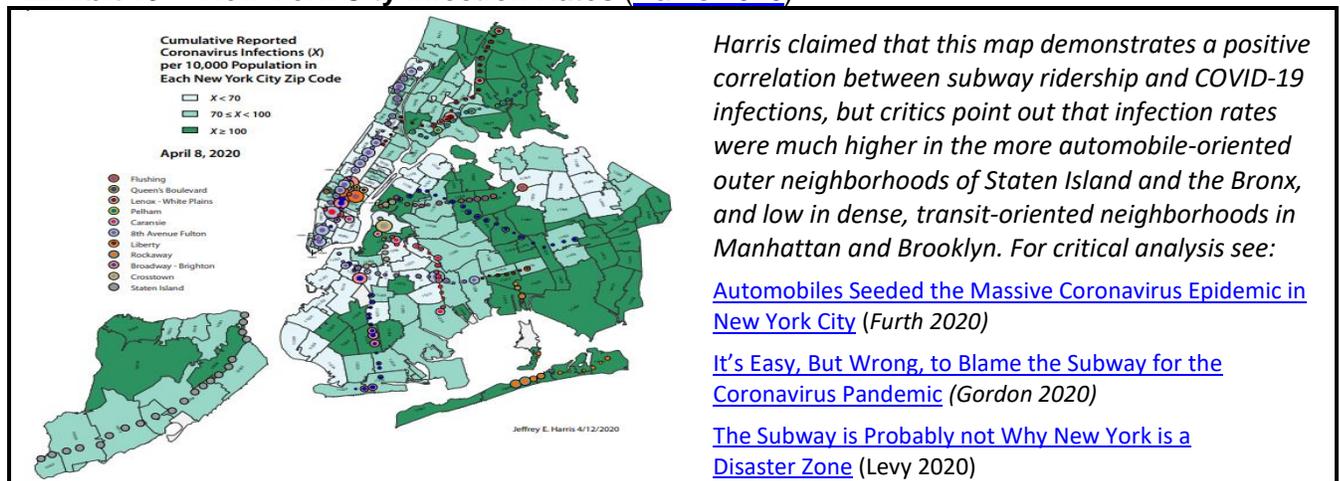
*Transport modes vary in their pandemic safety and affordability. Of course, actual impacts will vary depending on conditions.*

This suggests that to reduce risks travellers should minimize all types of shared vehicle travel. This can severely constrain the out-of-home activities of non-drivers in automobile-dependent areas. Commuters who don't drive may be unable to work, and adolescents lack independence. Even urgent rides, such as healthcare access, can be difficult and costly in sprawled areas where taxi and ridehailing services are limited and travel distances are long. Intercity vehicle travel may also be inconvenient, due to limited traveler services.

Public transport can present special risks. A paper by Jeffrey E. Harris, [The Subways](#)

[Seeded the Massive Coronavirus Epidemic in New York City](#), claimed that subways were the major cause of COVID-19 dispersion in New York City, based on maps showing reported cases concentrated along subway lines, and because late-March ridership declines were followed by reductions in new cases, but critics point out that infection rates are actually higher in more automobile-oriented suburban areas than in transit-oriented areas, and many other contagion-control policies were implemented in late March which can explain the decline in new infections ([Furth 2020](#); [Gordon 2020](#); [Grabar 2020](#); [Levy 2020](#); [Winkelman 2020](#)).

**Exhibit 19 New York City Infection Rates (Harris 2020)**



*Harris claimed that this map demonstrates a positive correlation between subway ridership and COVID-19 infections, but critics point out that infection rates were much higher in the more automobile-oriented outer neighborhoods of Staten Island and the Bronx, and low in dense, transit-oriented neighborhoods in Manhattan and Brooklyn. For critical analysis see:*

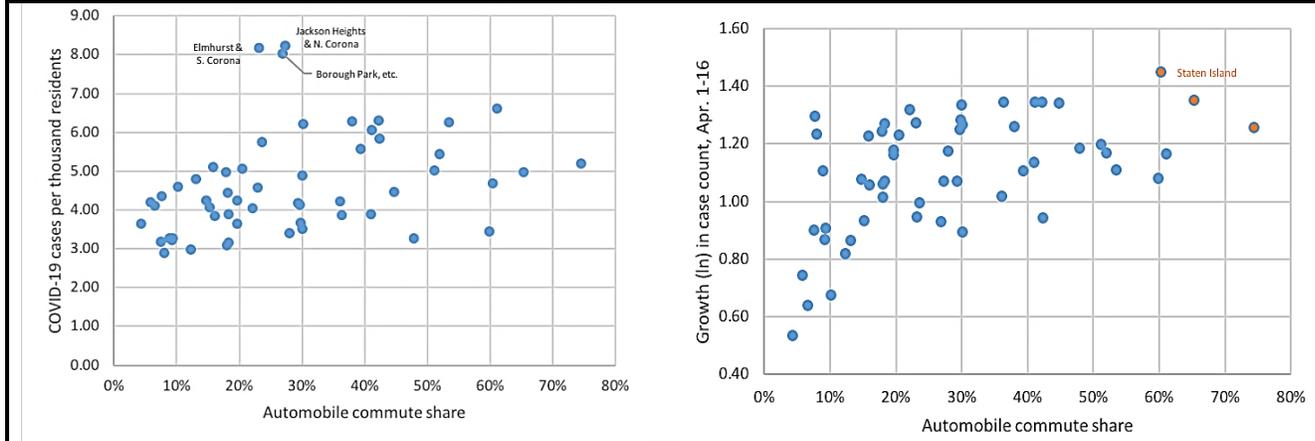
[Automobiles Seeded the Massive Coronavirus Epidemic in New York City](#) (Furth 2020)

[It's Easy, But Wrong, to Blame the Subway for the Coronavirus Pandemic](#) (Gordon 2020)

[The Subway is Probably not Why New York is a Disaster Zone](#) (Levy 2020)

Analysis by Salim Furth, [Automobiles Seeded the Massive Coronavirus Epidemic in New York City](#), shows that neighborhood COVID-19 infection rates tend to decline with transit mode share and increase with automobile mode share, as illustrated below. He identifies various ways that motorists are likely to spread disease more than transit users: motorists tend to travel farther, visit more destinations, and reduce their vehicle trip-making less than transit users, and take fewer precautions because driving seems safer than transit travel. This explains the high infection rates in more automobile-oriented areas.

**Exhibit 20 COVID-19 Infection Rates Versus Auto Commute Mode Share (Furth 2020)**



Aron Furth’s study, [Automobiles Seeded the Massive Coronavirus Epidemic in New York City](#), shows statistically strong positive correlations between automobile commute mode shares and both COVID-19 infection rates (left figure) and April 1-16 infection growth rates (right figure), plus strong negative correlations between both subway and other transit commute mode shares and infection rates.

Transit risks can be reduced by limiting crowding, appropriate cleaning and sanitizing, employee and passenger hygiene, operator protection (Fletcher, et al. 2014; Levy and Goldwyn 2020), and operational improvements that reduce delay (Transit Center 2020). Taxi, ridehailing and motorists carrying passengers can reduce risks by limiting crowding, cleaning, sanitizing and hygiene. Taxi and ridehailing companies can offer sick leave so drivers are less likely to work when they may be contagious. Delivery services reduce but do not eliminate risk since couriers handle many people’s goods. Walking, bicycling and telework are generally the safest and most affordable travel modes, making walkable urban neighborhoods resilient, particularly if they are designed for minimal crowding and *sociable distancing* (Mehaffy 2020).

**Exhibit 21 Transportation Risks and Solutions**

Risks	Solutions
Long-distance travel	Limit mobility and require quarantines, particularly from higher-risk areas.
Private vehicle travel	Avoid carrying passengers, clean touch surfaces, encourage hygiene.
Taxi and ridehailing	Limit crowding, clean touch surfaces, encourage hygiene, protect operators.
Public transit vehicles	Limit crowding, clean touch surfaces, encourage hygiene, protect operators.
Terminals	Limit crowding, clean touch surfaces, encourage hygiene, protect employees.
Walking and bicycling	Encourage distancing. Limit automobile traffic and open streets to active modes.
Automobile dependency	Create neighborhoods with convenient walking and bicycling access.

*Travel activities impose various risks which can be reduced.*

Here are some current and long-term travel impacts.

- Pandemic restrictions on travel and business activities, and stay-at-home orders, have greatly reduced vehicle traffic and public transportation ([Heisler 2020](#)), which has reduced [traffic congestion](#), [accidents](#) and air pollution ([Lunden and Thurlow 2020](#); [Sahagun 2020](#)).
- [Telework](#) (telecommunications and delivery services that substitute for physical travel) was already growing, but is likely to accelerate as people and businesses gain experience during the pandemic.
- [Bicycling](#) is a safe and healthy travel option. The pandemic is [increasing bicycle travel](#), and may justify more long-term [bicycling improvements](#).
- Reduced vehicle traffic and increased need for physical distancing can justify [street space reallocation](#) to expand sidewalks and bike lanes, and create “open streets” where non-motorized modes share road space with low-speed motor vehicle traffic ([Kostelec 2020](#); [Lydon 2020](#)).
- Emergency, service, freight and delivery vehicles may receive additional support and priority.
- Public transit may be stigmatized and criticized, leading to ridership losses and disinvestments. Advocates should respond with evidence of benefits ([Levy 2020](#); [Litman 2018](#); [TUMI 2020](#); [UITP 2020](#)).

Will this pandemic cause people to abandon cities and public transit? Probably not. Perhaps the most relevant example is experience after the September 11<sup>th</sup> terrorist attack, and various public transit terrorist attacks ([Reuters 2017](#)). At the time, many people claimed that these events would end urbanization and public transit demand. Cities and transit agencies responded with increased security and public education. Both urbanization and transit ridership soon returned to previous growth levels. Although terrorist attacks lead some people to [dread](#) (i.e., have irrational fear) cities and transit travel, they are, in fact, generally safer and healthier overall than rural living and automobile travel ([Hamidi, et al 2018](#); [Litman 2005](#)).

During a major pandemic it may be rational to restrict public transit travel, but over the long run, total deaths and illnesses are likely to increase if exaggerated pandemic fear leads to long-term shifts from cities to automobile-dependent suburbs, or from public transit to automobile travel ([Litman 2005](#)).

#### Resources for Reducing Transportation Pandemic Risks

APTA (2020), [The COVID-19 Pandemic Public Transportation Responds: Safeguarding Riders and Employees](#), American Public Transportation Association ([www.apta.com](http://www.apta.com))

CNT (2020), [Urban Opportunity Agenda](#), Center for Neighborhood Technology ([www.cnt.org](http://www.cnt.org)).

EU (2020), [COVID-19: Guidelines on the progressive restoration of transport services and connectivity](#), European Union.

ITE (2020), [COVID-19 Resources](#), Institute of Transportation Engineers ([www.ite.org](http://www.ite.org)).

Feargus O'Sullivan (2020), [In Japan and France, Riding Transit Looks Surprisingly Safe](#), City Lab.

Polis (2020), [COVID-19: Keeping Things Moving](#), Cities and Regions for Transport Innovation.

SLOCAT (2020), [COVID-19 and the Sustainable Transport Community](#), Sustainable Low Carbon Transport Partnership (<https://slocat.net>).

Transit Center (2020), [How Transit Agencies Are Responding to the COVID-19 Public Health Threat](#), (<https://transitcenter.org>).

TUMI (2020), [The COVID-19 Outbreak and Implications to Sustainable Urban Mobility – Some Observations](#), Transformative Urban Mobility Initiative ([www.transformative-mobility.org](http://www.transformative-mobility.org)).

UITP (2020), [Management of COVID-19 Guidelines for Public Transport Operators](#), Union Internationale des Transports Publics (International Association of Public Transport); at ([www.uitp.org](http://www.uitp.org)).

## Affordability

For many households, the COVID-19 pandemic creates severe economic problems. Even before this pandemic, many low- and moderate-income households suffered from excessive housing, transportation and healthcare costs. This pandemic is causing large unemployment and business losses that will reduce many household's incomes. Although stimulus funds, unemployment insurance, and bill deferment policies provide some relief, many households will need additional short- and long-term solutions.

Although affordability concerns often focus on high housing costs, many households also face excessive motor vehicle cost burdens, including occasional large unexpected expenses from mechanical failures and crashes. Many moderate-income households have difficulty making vehicle loan, insurance or repair payments and will need affordable mobility options.

Below are local policies that can increase affordability:

1. Implement [eviction protection](#), [rent moratoriums and deferrals](#), plus subsidies for at risk households.
2. Increase allowable [densities and building heights](#), and allow compact, [missing middle](#) housing types (secondary suites, multi-plexes, townhouses and low-rise apartments) in walkable urban neighborhoods, particularly for corner or larger lots, adjacent to parks, or on busier streets, since these locations minimize negative impact on neighbours.
3. Reduce development fees, approval requirements and inclusivity mandates for moderate-priced (\$200,000-400,000 per unit) infill housing, since these are the projects we most need.
4. Reduce or eliminate [parking minimums](#) and favor unbundling (parking rented separately from housing units) so car-free households are not forced to pay for expensive parking facilities they do not need.
5. Allow higher densities and building heights in exchange for more affordable units. Minimum target densities can be applied in accessible locations, for example, at least three stories along minor arterials and four stories along major arterials.
6. Improve affordable housing design. Municipal governments can support design workshops and contests to encourage better design. The [Affordable Housing Design Advisor](#), the [Missing Middle Website](#), and Portland's [Infill Design Project](#) are examples of affordable housing design resources.
7. Improve [active transport](#) (walking and bicycling) and micro-mobility ([electric scooters and bicycles](#)) through improved sidewalks, crosswalks, bike lanes, [complete streets](#) policies, traffic calming and streetscaping.
8. Improve [public transport services](#) so vehicles and stations are less crowded, cleaner, better ventilated and less delayed, through better design, increased cleaning, dedicated bus lanes, all-door boarding, driver protection, and automated fare payments system, actions that improve convenience and comfort as well as reducing disease risks.
9. Implement [Transportation Demand Management](#) (TDM), which includes various policies and programs that encourage more efficient travel behavior. Local and regional governments can implement TDM strategies and require large employers to have Commute Trip Reduction programs.
10. Support development of [walkable urban villages](#) along frequent public transit corridors (also called [Transit Oriented Development](#) or TOD) to create neighborhoods where residents and workers can easily access common services and activities without a car.

## Pandemic-Resilient Community Planning

This section explores ways to design communities to minimize contagion risks and maximize health and safety.

Housing with ground-floor access – a private door that connects directly to a sidewalk or driveway – minimizes contagion risks. Multi-family buildings with exterior stairs and walkways also have low risk. Buildings with shared entranceways, indoor hallways and elevators are likely to present additional risks, but these can be reduced with frequent cleaning and sanitizing, as well as resident and employee hygiene. To minimize environmental risks homes should be built to withstand local risks such as earthquakes, hurricanes, extreme heat and cold, and located outside floodplains and wildfire interface.

### Exhibit 22 Pandemic Resilient Housing



Townhouses with ground-floor access

Apartments with exterior access.

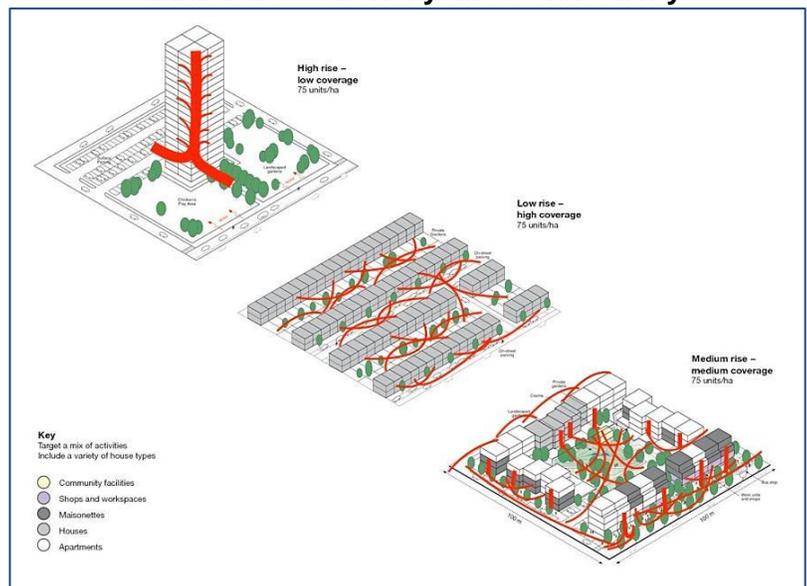
Apartments with balconies.

To reduce the isolation stress, homes need sufficient space and quiet, adequate light and ventilation, plus private outdoor areas such as a balcony or deck with seating, and, particularly for children, a yard or rooftop garden (Poon 2020; Zacka 2020). Home offices are desirable, particularly if household members work or study at home. Personal privacy is important, such as a home office or quiet workspace, particularly for home workers. Windows oriented to the street, and a front porch or low balcony, allow residents to wave and talk to neighbors while maintaining safe distances (sociable distancing).

A given density can be designed to have very different degrees of contagion risk, depending on pedestrian connectivity. For example, high-rise density tends to have low pedestrian connectivity, particularly if located in an automobile-dependent area where much of the land must be devoted to vehicle parking, while mid-rise density with numerous walkways can provide very high connectivity which minimizes crowding and contagion risks, as illustrated to the right.

Mid-rise, pedestrian-oriented development tends to maximize community cohesion (the quality of interactions among neighbor) and livability. A recent article by planner

### Exhibit 23 Density and Connectivity



Michael Mehaffy, [Why We Need 'Sociable Distancing'](#), shows how moderate-density, pedestrian-oriented development maximizes residents' ability to maintain social connections among homes, shops and pedestrians, which increases safety, health and happiness.

**Exhibit 24 Urban Space as a Web of Connections** ([Mehaffy 2020](#))



*Urban space is a complex web of places where we can be, move, see and hear, and therefore connect. This provides sociable distancing, where people can safely interact with minimal contagion risks.*

The National Association of City Transportation Officials ([NACTO](#)) developed the [Rapid Response: Tools for Cities](#) which describes ways that local governments can increase transport safety during this pandemic. These include prioritizing essential over non-essential travel, protecting front-line workers, and changing street design and management to provide more space and safety for pedestrians and bicyclists.

**Exhibit 25 Roadway Management for Pedestrian and Bicycle Safety** ([NACTO 2020](#))



*Many communities are changing streets to give pedestrians and bicyclists more space and safety.*

The table below summarizes actions that households and communities can take to increase their resilience to pandemics and other economic, social and environmental shocks.

**Exhibit 26 Resilience Planning Checklists**

	Households	Communities
<b>Reduces Pandemic Risks</b>	<ul style="list-style-type: none"> <li>• Resources to sanitize personal items, vehicles and homes, plus face masks and gloves.</li> <li>• A home with adequate space, home offices, natural light and ventilation, and private outdoor spaces such as a balcony, deck or yard to provide comfort for extended isolation.</li> <li>• Good communications resources, including telephone, internet service and computers for socializing, e-commerce and telework.</li> <li>• Fitness program, including in-home exercise and nearby walking and bicycling.</li> </ul>	<p>Good public health programs, particularly infectious disease control and smoking reduction.</p> <p>Healthcare services able to handle surges.</p> <p>Shared vehicles (taxis, ridehailing and public transport) density restrictions, cleaning and sanitizing, plus employee and passenger hygiene.</p> <p>Minimal homelessness or inadequate housing.</p> <p>Programs to address mental illness, substance abuse, domestic violence, and vulnerable resident supports.</p> <p>Expanded pedestrian facilities to prevent crowding, traffic calming and road space reallocation.</p>
<b>Reduces All Risks</b>	<ul style="list-style-type: none"> <li>• Household emergency plan, including emergency contact information.</li> <li>• Emergency supplies, including first aid equipment, flashlights, mobile phone and portable radio backup power, and food for at least two weeks.</li> <li>• A home in a relatively safe location (out of floodplains and wildfire interface) built to withstand local risks such as earthquakes, hurricanes, plus extreme heat and cold.</li> <li>• Comfortable shoes for walking and a sturdy bicycle for riding.</li> <li>• Housing in a compact, walkable and bikeable neighborhood where essential services and activities are accessible without a car.</li> <li>• Ways to reduce household expenditures if income declines.</li> <li>• Positive relationships with neighbors.</li> </ul>	<ul style="list-style-type: none"> <li>• Effective emergency management with trustworthy leadership, reliable communications networks and critical supplies.</li> </ul> <p>Robust internet and telecommunications networks, e-government, e-commerce, and delivery services.</p> <p>Restrictions on development in high-risk areas such as floodplains and wildfire interface.</p> <p>Zoning codes and house retrofit programs that ensure homes can withstand local risks such as earthquakes, and extreme weather, and are energy efficient.</p> <p>Compact, walkable and bikeable neighborhoods where most essential services and activities can be accessed without using an automobile.</p> <p>Sufficient affordable housing to serve demand.</p> <p>Community cohesion, so most residents have positive relationships with their neighbors.</p> <p>Unemployment insurance and support for lower-income households.</p>

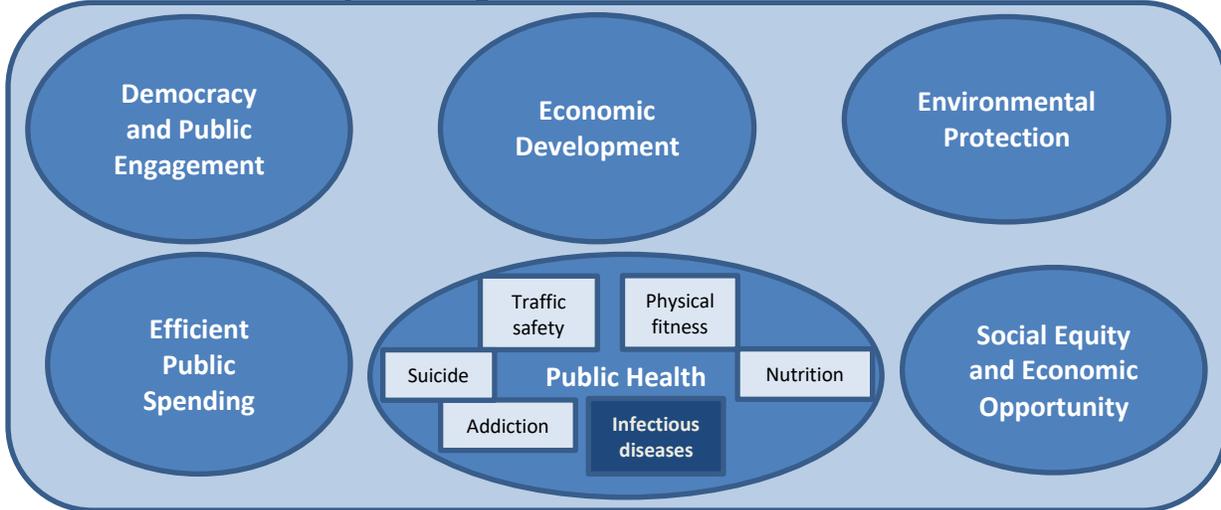
*Good planning by households and communities can increase their resilience to pandemics and other risks.*

This analysis indicates that, although affluent motorists may be healthy and happy in automobile-dependent areas, such locations impose significant costs and constraints: they require every adult to own a private vehicle, and offer poor mobility options for residents who cannot, should not, or prefer not to drive. In such areas, physical and digital access to essential services and activities is limited and expensive. For most households, the safest, healthiest and most resilient home is located in walkable urban neighborhood where commonly-used services and activities are easy to access on foot and by bicycle.

## Comprehensive Solutions

Comprehensive planning recognizes that flues are just one type of infectious diseases, infectious disease reduction is just one public health objective, and improving public health is just one community planning goal. A basic principle of good planning is that individual, short-term decisions should be consistent with strategic, long-term community goals. As a result, comprehensive planning favors “win-win” solutions to pandemic problems that also help achieve other community goals.

### Exhibit 27 Community Planning Issues



*Infectious diseases – including flu pandemics – are just one of many public health risks, and reducing these risks is just one of many community planning goals. Comprehensive planning strives to find win-win solutions that help achieve multiple community goals – such as solutions to pandemic problems that also support economic development, social equity and environmental protection.*

Many pandemic solutions help achieve other planning goals, as illustrated in the following matrix. For example, walking and bicycling improvements, reducing automobile travel and increasing affordable housing options helps achieve various health, social equity and environmental protection goals.

### Exhibit 28 Benefits Provided by Various Policies

Policy Solutions	Reduce Contagion	Public Health	Sustainability
Limit public gatherings and activities	✓		
Targeted cleaning and hygiene	✓	✓	
Improve public health and emergency services	✓	✓	
Walking and bicycling improvements	✓	✓	✓
Encourage public transport use		✓	✓
Reduce private auto travel		✓	✓
Reduce homelessness	✓	✓	✓
Affordable infill housing	✓	✓	✓
Traffic safety programs		✓	
Assist low-income households	✓	✓	✓

*Policy solutions vary in their scope of benefits. Smart planning favors solutions that also help achieve multiple goals, such as pandemic control policies that support other public health and sustainability objectives.*

## Conclusions

A basic test of human intelligence is whether we learn from previous experiences and generalize those lessons to solve new problems. There is much to learn from the COVID-19 pandemic to better prepare for future pandemics and other health, social and economic threats.

Many people assume that cities are more dangerous than rural areas during a pandemic, but most infection risks are associated with specific activities – long-distance travel, worksites, stores and social gatherings – that are similar in cities, suburbs and rural areas. Although cities tend to have higher contagion risk, other factors have more effect on mortality rates, so dense cities with good public health programs have lower infectious disease fatality rates than rural areas with poor public health programs. Overall, urban residents tend to be healthier and live longer than in rural areas, as illustrated to the right.

If COVID-19 follows the pattern of previous pandemics, controlling it will require months of travel restrictions and isolation requirements. This creates various domestic, social and economic problems for households, businesses and communities. Resilience requires robust physical and social infrastructure that allows people to protect themselves and their neighbors, including trustworthy leadership, responsive community organizations, plus neighborhood design that facilitates social connections.

To improve resilience, communities need effective emergency response programs, contagion control, adequate housing for all residents, physical and mental support for isolated people, and affordability. Homes can be designed to reduce quarantine stress, with adequate space, light and ventilation, and located in walkable neighborhoods. Ground-floor access is safest, but risks can be minimized in multi-family housing with appropriate cleaning and sanitizing, plus resident and employee hygiene. Homelessness tends to increase contagion risks, so everybody is safer if it is eliminated. Intercity travel can introduce infections into a community, and local travel can disperse it. All shared vehicles can spread germs, including taxis, ridehailing, public transit, and private automobiles that carry family and friends. This suggests that to increase safety, residents should minimize shared vehicle travel, and shared vehicle operators and passengers should ensure appropriate distancing, sanitizing and hygiene practices. Walking and bicycling are generally the safest modes, are affordable and provide exercise, so improving their conditions tends to increase resilience, particularly expanding facilities to prevent pedestrian and bicyclist crowding.

Pandemics are just one of many risks communities face, and generally not the most important, so it would be inefficient to implement contagious disease control strategies that increase other problems, for example, by reducing physical activity which increases cardiovascular disease, or increasing vehicle travel and therefore traffic casualties and pollution emissions. Many “win-win” solutions can help reduce pandemic risks and achieve other community goals, such as increasing affordability and economic opportunity, and reducing traffic problems and pollution emissions.

**Exhibit 29 Analysis Scope**

Risks	Analysis Question
<b>1. Infectious diseases pandemics</b>	How do pandemics compare with other risks? What factors affect these risks, and how can they be reduced?
<b>2. Disaster risks</b>	How do disasters compare with other risks? How can communities minimize disaster deaths, injuries and damages?
<b>3. Health risks</b>	How do various health risk compare? What factors affect community health and longevity, and how can they be maximized?
<b>4. Economic, social and environmental risks</b>	How does health compare with other community goals? What trade-offs exist between these goals? What win-win strategies provide multiple benefits?

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