8
Population Density

a geographic “big idea” and some consequences in East Asia

High-rise apartments and polluted air in Shanghai, China. Photo by Catherine Roy

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Interactive 8.1:
Clickable China

A clickable, interactive version of the China Map

Introduction: Is population a problem?

Population density is important, because large numbers of people working together can do things that are much harder with fewer people. On the other hand, crowding can also create problems.

These facts have consequences that can be seen when you look at many maps of East Asia - maps that show ancient dynasties, Great Walls, farms, roads, bridges, theaters, temples, art, inventions, factories, pollution, and diseases.

Our goal in this chapter is to understand maps like these.

Imagine walking on this trail all day. Eliza Markham had been doing it for months. The only people around were her husband and son. Suddenly, she just stopped walking. Her son went back to check on her. A few minutes later she came back, alone. She told her husband that she had hit their son with a rock. He ran back and found the boy, badly hurt. When they got back to the wagon, they saw that Eliza had set it on fire and left.

This is one story from the Oregon Trail – one of the most famous roads in American history. More than 350,000 people went west on this wagon road. At least 20,000 died on the way.

> **Fact check**: don't believe everything you see in movies or on television.
>
> Only 362 deaths on the Oregon Trail were recorded as due to Indian attacks.
>
> A lot more people died of sickness, starvation, injury, murder, or suicide.

So what happened to people like Eliza Markham? One theory is that she just went crazy after walking for months in such an empty area.

At the other extreme are places with a lot of people. Imagine what might happen in a crowded place if one person gets a really bad disease. In the year 541, this happened in a city called Constantinople. A sick trader came to the city. Others soon caught the disease. Within a few months, half of the people in the city died. This disease changed the course of history, because it helped end the Byzantine Empire. This in turn helped the Islamic empire to expand faster. You can read more about that in a history book or internet site.

Question: What do the Oregon Trail and Constantinople have in common (in addition to the fact that they are both famous in history)?

Answer: Events in both stories seem to be influenced by the number of people in the area.

This is the big idea in this chapter:

Big Idea: The number of people in an area affects what people can do there.

As you read on, keep the stories about the Constantinople disease and the Oregon Trail in mind. They are related to two key sections in this chapter. One is about the spread of disease in crowded places. The other is about traders and bandits on lonely roads.

But before we get to those stories, we should make sure we understand the basic concept of population density.

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Some background about population density

Imagine asking a young child: "What would you most like to see right next to your school?"

One likely answer is a famous place to have fun. A movie theater, for example. Or a beach. A baseball stadium. Maybe even a Disneyland.

There are good geographic reasons why every school can't have a beach nearby. A beach needs an ocean, lake, or big river. Most schools are not near one. That is a geographic fact.

Population density is another kind of geographic fact. **Population density** is the number of people in a unit of area (e.g. a square mile).

Knowing about population density can help us understand why every school can't be close to a baseball stadium. A major-league stadium needs a lot of customers. It is likely to succeed only in places that have many people nearby – places with a high population density!

Question: What does this have to do with global history and geography?

Answer: Many historical events were influenced by the population density in an area.

Think about the pyramids in ancient Egypt. It took a lot of workers to build them. You can find pictures in history books or websites. These books can also answer questions about pyramids. For example, when were they built? How did people lift the stones up to the top?

Geographers ask questions about the place where the pyramids were built. For example, did it have enough good land and farmers to grow food for the workers? Were there enemies nearby who might attack the pyramid builders? If so, were there enough people to form an army to protect them? (All of that depends on the population density!)

We do NOT ask questions like these just because it's fun knowing about ancient civilizations. Knowing about pyramids can help us see what kinds of jobs are likely to be successful today.

For example, does a certain kind of business need more, about the same, or fewer workers than a pyramid? The answer can tell us whether the business is likely to be more successful in a crowded city or in a rural area that is nearly empty.

In other words, the success of a business is often related to the big idea of this chapter:

Population density has an influence on many kinds of human activity.

Here are two lists of things to think about. Write roughly how many people you think are needed nearby in order to make each activity or business successful. In each group of three statements, write "few" once, "a medium number of" once, and "many" once):

A1. A high-school football field needs _____ people nearby.

A2. A flat grassy area where kids can play football needs _____ people nearby.

A3. A stadium for a professional football team needs _____ people nearby.

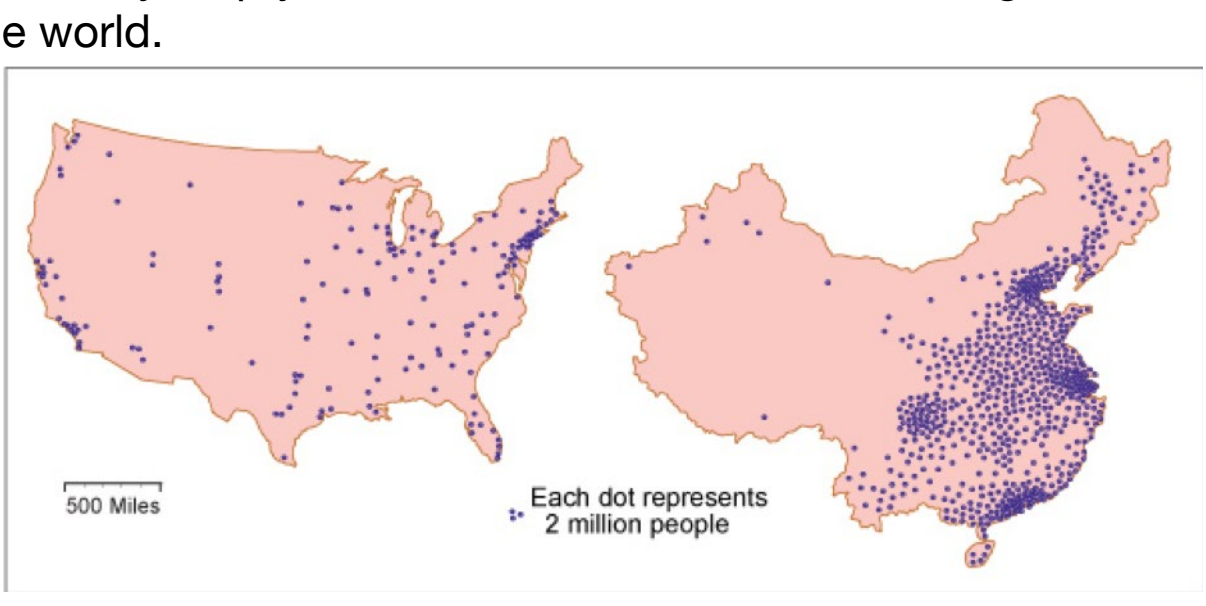
B1. A furniture store that sells tables, chairs, and beds needs _____ people nearby.

B2. A store that sells tools for stained-glass artists needs _____ people nearby.

B3. A convenience store that sells gas, bread, and milk needs _____ people nearby.

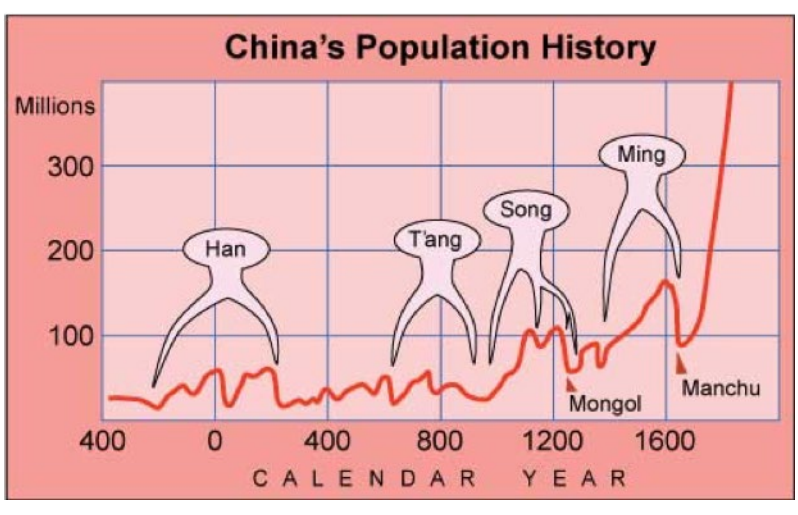
Picking a world region to use as a study area

China is a good place to study the effects of population density. China is about the same size as the United States, but it has four times as many people. (In other words, its population density is four times as great.) Like the United States, China has some crowded cities near the ocean. It has rich farmland near major rivers. It has some nearly empty deserts. It also has some of the highest mountains in the world.



Here is one big difference. At the time of the Declaration of Independence in 1776, the American colonies had about three million people. It took until 1890 for the population of the United States to reach 50 million. That is a large number, but how does it compare? China had 50 million people during the Han Dynasty. That was two thousand years ago.

The red line on this graph shows the population of China through 2400 years of history. It also shows the times of four main dynasties (ruling families). Finally, the graph shows the dates of invasions by Mongol and Manchu nomads from the north. (You'll learn about them in a little while).



The graph clearly shows many times when the population of China grew rapidly. It also shows several times when the population went down. Compared to the United States, China had a much longer time to experience the effects of the big idea of this chapter: The number of people in a place has many influences on what people do there.

So, what are some consequences of the big idea? Brainstorm awhile, then read on.

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Consequence #1 Large size means plenty of mineral resources.

Bumper sticker: "Two people can do twice as much as one."

That sounds like simple math, but it's wrong. Two people working together can usually do more than twice as much as one. Why is that so? Here are three reasons:

1. Some parts of a job might require more strength than one person has. For example, two people can carry a box that one person might not be able to lift.
2. Some jobs require several different skills. Working together, people can do the jobs they do best. For example, one person can make pizza while the other waits on customers.
3. Some jobs require people to be in different places at the same time. For example, one person can hold one end of a board while the other nails the other end into place.

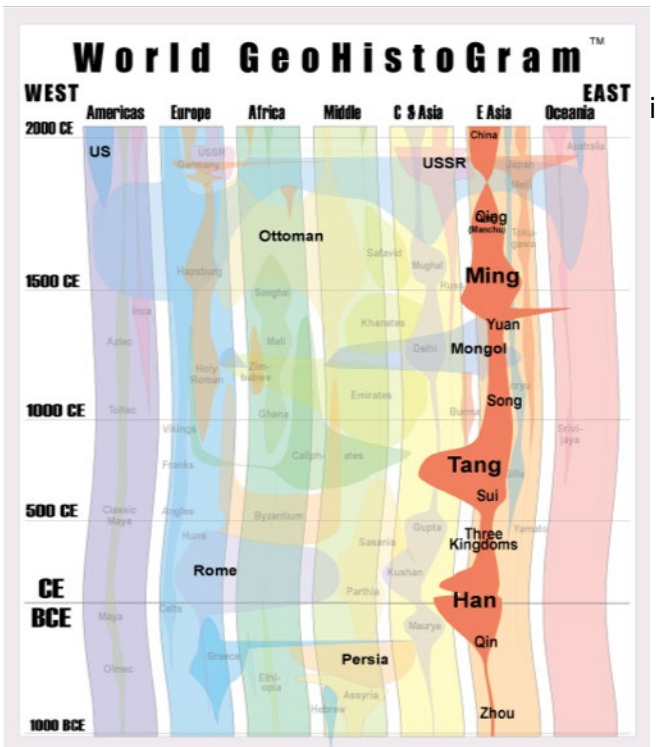
These three reasons are even more important with a really big project, like making a movie, doing a concert, or building a pyramid. These projects might require hundreds or thousands of workers, who do many different jobs with different tools in different places.

Chinese rulers figured this out a long time ago. They wanted people who were good at doing certain jobs – farming, metalworking, trading, etc. They had a job-choosing system by the time of the T'ang Dynasty. (This dynasty lasted for about 300 years, from 618 to 907 CE).

Practical Note: you do not need to remember the precise numbers 618 and 907. When you see numbers like this, think of a sentence to put them in perspective. For example, you could say the T'ang Dynasty started about 1400 years ago. Or you could say it was a few hundred years after the fall of the Roman Empire. The dynasty ended nearly 600 years before Columbus sailed to America. And so forth.

During the T'ang dynasty, people had to get a good score on a test in order to get a job in the government. As a result, the government had many skillful workers. Some made coins. Others helped people who were injured or sick. Still others were mail carriers, bridge fixers, judges, soldiers, and so forth.

Specialized jobs like these did not exist in most other parts of the world at that time. Most places did not have enough people to support these jobs.



Part of a World GeoHistoGram, a graphic organizer that shows the time and general location of major events in world history.

Interactive 8.2: World GeoHistoGram

A clickable, interactive version of the World GeoHistoGram

Consequence #2: China had enough people to do large and complicated projects a long time ago.

China has some very good farmland. One very fertile area is called the North China Plain. Each Chinese farmer could produce enough food to feed many more people. All those people could then do other jobs.

In ancient Egypt, people built pyramids. In China, people built a Grand Canal. This "artificial river" was more than a thousand miles long. Its "job" was to connect China's two main rivers. People could ship food to prevent starvation if either area had a bad flood or drought.

This painting was done one year after the famous Erie Canal was built in New York. By that time, the Grand Canal was already over a thousand years old!

The Grand Canal was also much larger than the Erie Canal. Note that it can hold large ships as well as small rowboats.

Painting: Sunrise on the Grand Canal of China, by William Havell, 1826

Building a thousand-mile canal was a huge task. This kind of thing can be built only in a place that has a large number of people. That fact leads to the third consequence of the big idea about population. But first, here is a short note about China's rivers.

Science Note: The Two Main Rivers of China

The Grand Canal linked the Huang He (Yellow River) and Yangtze Jiang (Clear-Water River).

The Yangtze starts in the high country of Tibet. It flows southeast through tree-covered hills. The water in this river stays fairly clear until the river reaches the flat land in eastern China.

The Huang He starts close to the Yangtze, but it goes north instead of southeast. It goes into a dry land with cold winters. In this dry and dusty environment, the river picks up a lot of dirt and mud. This mud gives the river a dirty yellow color (and its name). Still later, the Huang He turns east across a flat floodplain. Some of the oldest cities in the world were built here.

Interesting side fact: the Chinese language actually has two words that mean "river."

A He is a muddy river that floods some of the time and can get very low at other times.

A Jiang is a clear-water river that keeps getting larger as it flows through a rainy forest.

Look very closely at a detailed map of China.

You will see a lot of rivers named He in the northern part of the country.

You will also see a lot of rivers named Jiang in the southern part.

What does that tell you about the climate in the two regions?

Consequence #3: **A large population, if well organized, can usually defend itself against attack.**

As we noted, China already had millions of people during the Han Dynasty, 2000 years ago. Small populations of nomads lived in the colder and drier land north and west of China.

Definition: nomads are people who move, in order to follow

the animals they hunt or the cattle they raise. Nomads often live in tents.

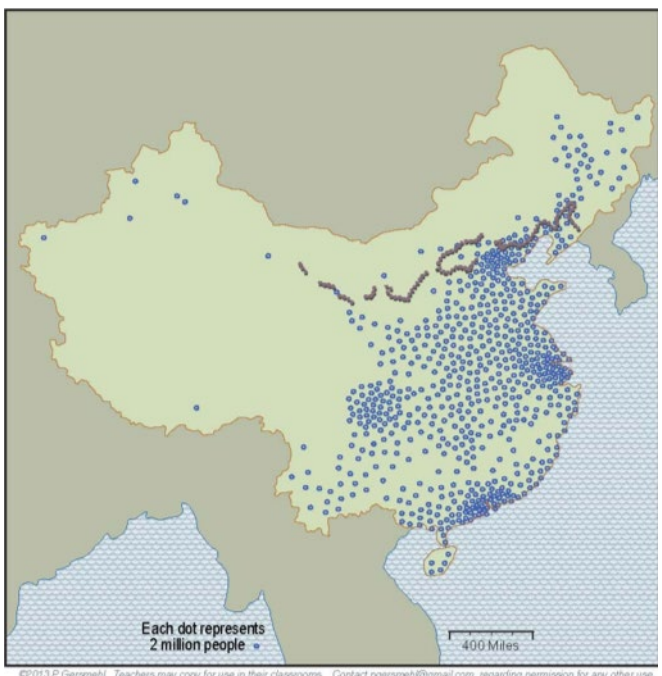
The nomads from the cold north often attacked towns near the edge of the Chinese homeland.

(You can read more about nomads in the chapters on Africa and Russia.)

At first, people tried to defend their towns. Unfortunately, small towns rarely had enough soldiers to defeat a large group of nomads. Then, the towns tried sending armies across the border to attack the nomads. That didn't work well either. When farmer-soldiers tried to chase the nomads, they were too slow to catch the enemy warriors, who were riding horses.

In time, Chinese leaders decided to build a wall along the border. The wall was at least 15 feet high. It had a road on top, and small forts where soldiers could sleep. These forts were close enough to each other that they could signal for help during an attack.

Great Wall of China. As you can see on the map, the Great Wall was actually several short walls that protected different areas. (The dots show population in 2010.)



Side point: The spacing of forts is a good example of a practical geographic problem.

- You want the forts close enough to help each other during an attack.
- You do not want to spend money building more forts than you need.

Interesting fact: The Romans built a wall in England. They put their forts the same distance apart as the Chinese did on the Great Wall.

Building the Great Wall was a huge job. It also cost a lot to pay soldiers to defend it. It could not be done by a country that had only a few people.

Historic note: Even in China, the wall didn't really work. In bad time, the government couldn't afford to pay enough soldiers. As a result, the nomads found places to cross the wall and came in anyway. This often led to the end of dynasties like the T'ang and Ming.

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Consequence #4: **Large populations are likely to have plenty of smart people.**

This good consequence of population density is partly a result of simple probability. **Probability** is the mathematical study of luck.

Here is an example. Shuffle a deck of cards and pick one card. Is it likely to be an ace?

"Probably not. There is only a small chance that you will get an ace with one draw."

If you draw 20 cards, however, the probability of getting an ace is much higher. In fact, it would be surprising if you didn't get at least one ace.

Why is this idea important? Because a large population is like drawing a lot of cards – it has a greater probability of having people who are good at inventing new things. A large country also has more teachers to help creative people get the skills needed to make their inventions.

China had a large population for a long time. It is no surprise that many important inventions came from China. This list shows the dates of some major Chinese inventions. The dates to the right show when things first appeared in Europe – by separate invention or by trade.

about 1060 CE	Reliable compass for ships	1190
about 1000 CE	Movable type for printing	1456
about 900 CE	Printing press	1420s
about 850 CE	Gunpowder	??
about 300 CE	Porcelain pottery	??
about 100 CE	Paper	1100s
about 100 BCE	Iron moldboard plows	900s
about 250 BCE	Wheelbarrow	1200s
about 1300 BCE	Silk cloth	about 100 BCE

Chinese history, however, has a big puzzle. Sometimes, the people seemed to lose the ability to invent things. In fact, several times, Chinese people even seemed to forget things that they knew a hundred years earlier. What else was happening at those times?

A good answer to that question would be important for Americans today. The United States has enjoyed two centuries of great inventions. Americans invented steamboats in the early 1800s. They invented television in the middle 1900s. They invented computers in the late 1900s. They invented electric lights, plastics, nylon cloth, smartphones, and so forth. Factories using these inventions made good jobs – inventions made a lot of people rich!

In the 21st century, however, things are changing. Many new inventions are coming out of other parts of the world, including China. These include robots, laser cutting machines, smart batteries, brain scanners, and so forth. In the long sweep of history, this looks like the giant country of China is reclaiming its historic role as a major source of new inventions. At the same time, many American factories are closing. When that happens, people lose their jobs.

It is very important to have a clear idea of what is happening and what can be done about it.

No matter what politicians say in speeches, they cannot just pass a law to make jobs. The only way to promote inventions is to make sure that your community has a large number of people with the right skills. To do that, you have to understand where inventions come from – how they depend on population size, resources, and education.

Figuring that out is much harder than making a speech or passing a law!

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Consequence #5: **A large population is more likely to trade with other people.**

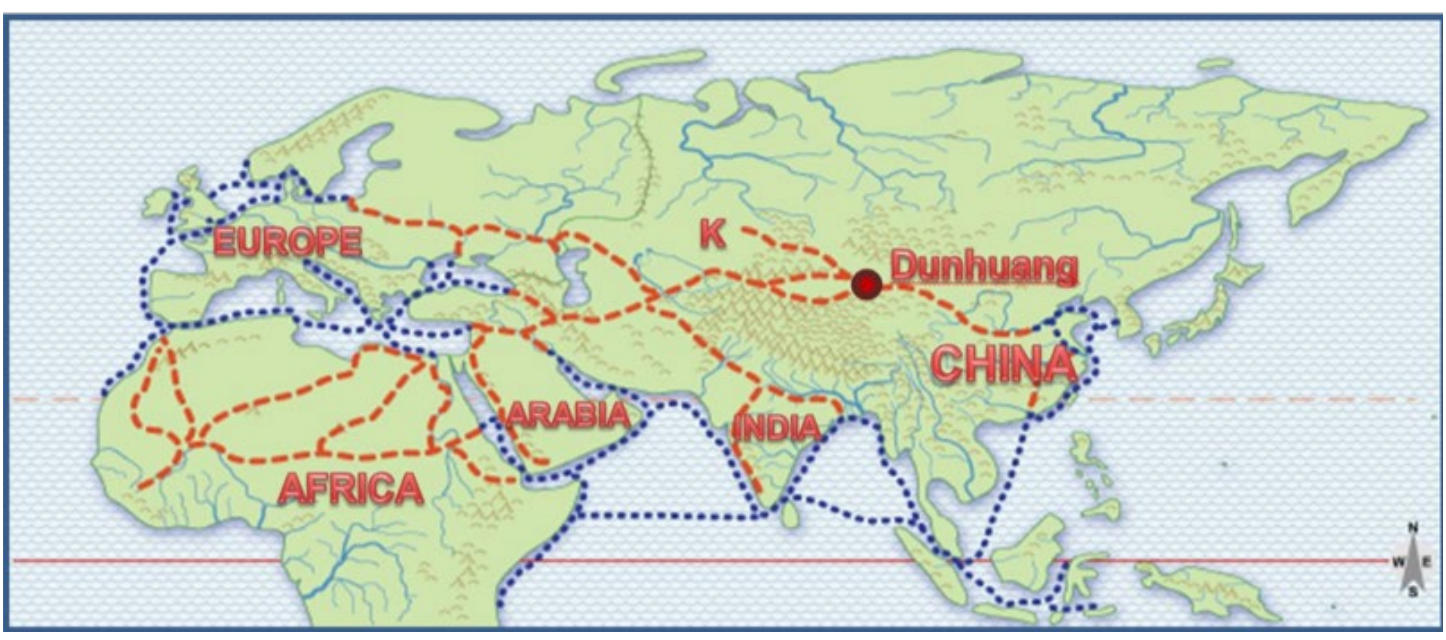
Chinese people started long-distance trading many thousands of years ago. By the time of the Han Dynasty, Chinese trading networks went all the way to Europe and Africa. (Remember, that was 2000 years ago.)

Part of this trade route is called the Silk Road. It got that name because traders took silk (a high-value cloth) from China all the way to Europe and Africa.

The name – Silk Road – is misleading. For one thing, silk was not the only thing the traders carried. They also carried gold, spices, tools, and other light but valuable items.

Moreover, it was not a single road. Inside China, traders used many roads to go from the crowded eastern areas to a place called Dunhuang. At Dunhuang, the "road" split into three main branches. One went northwest into the horse-producing area of Kazakhstan ("K" on the map). Two went around the barren Takla Makan desert

(Language fact: "Takla Makan means "Go in, and you will not come out").



Here is the reason for the split in the road.

Population density is very low west of Dunhuang. In this nearly empty desert, robbers often tried to attack traders. It was safer to go in groups. It was even safer if the robbers were not sure which road a group would use. But only two roads had places to get food and water.

The traders also had to know another important fact:

Environmental conditions are different in different parts of the Silk Road.

- Some places are rainy, with forests full of tall trees that shade the ground.
- Some places are dry, with sandstorms rather than rain. Food and water are hard to find.
- In other places, the road goes over high mountains – the highest in the world. In fact, the gaps between mountains in western China are higher than most mountain peaks in the United States. As a result, these parts of the Silk Road were really cold.

Traders needed different clothing and travel equipment to go through forests, deserts, and mountains. As a result, trader rarely went far along the Silk Road. It was just too hard to carry all the clothing and other supplies needed to survive in many different environments. Traders would go a short distance, then stop and trade with people who did the next part of the road.

The idea of trade, however, leads logically to the next consequence of population density.

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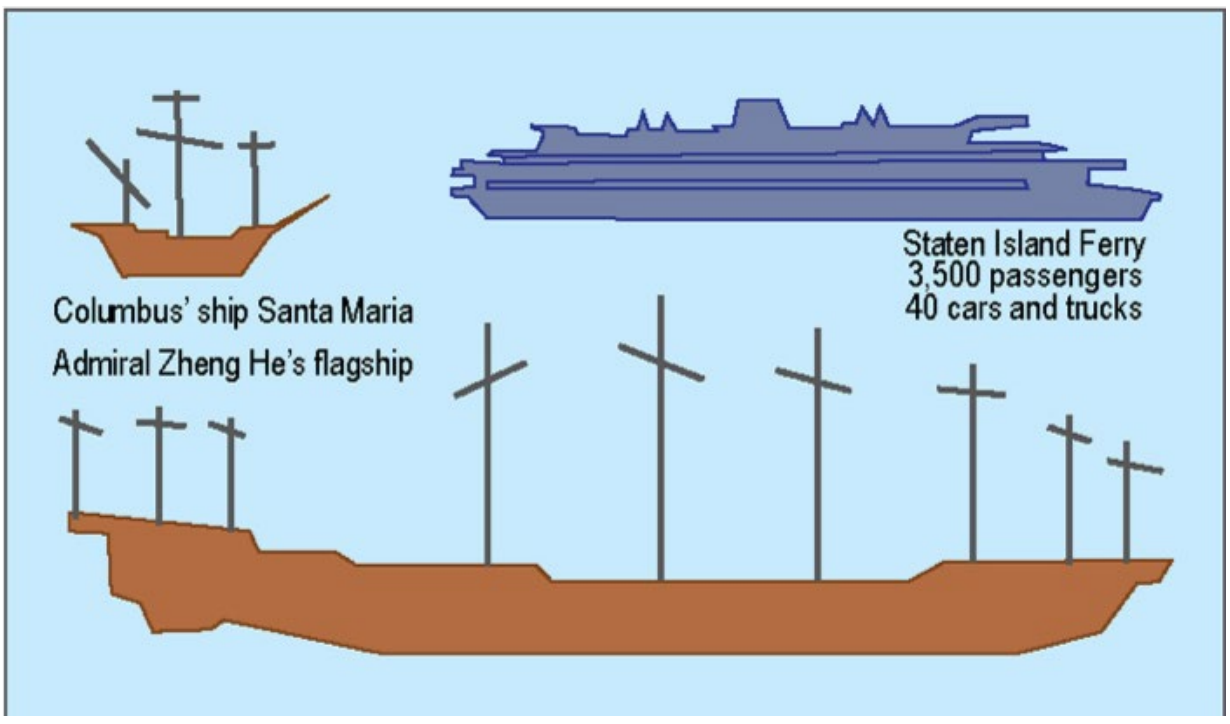
Consequence #6: **A large population might look for places where some people can move.**

Question: What happens when you put consequence #2 (building) and #5 (trade) together?

Answer: In China's case, what you get are people who knew how to build giant ships.

Here, a simple comparison is useful. In 1492, Christopher Columbus sailed across the Atlantic Ocean. His fleet had three ships. The largest, the Santa Maria, was about 60 feet long.

Meanwhile, nearly a hundred years before Columbus, Chinese emperors sent fleets of ships across the Indian Ocean to Africa. The most famous Chinese explorer was Admiral Zheng He. His fleet had more than 200 ships. Zheng He's main ship was more than 300 feet long.



Even before Zheng He, Chinese traders went to distant places like India, Arabia, and Indonesia. They set up trading posts where they could store and sell Chinese goods. Meanwhile, thousands of people from India, Arabia, and other places were moving to Chinese cities like Guangzhou.

GeoFact: Guangzhou is called "Canton" on some maps. It is located near Hong Kong. Many people work in factories there today. Probably, at least one thing that you are wearing or carrying in your backpack today was made near Guangzhou.

In short, Guangzhou was already a major trading city more than a thousand years ago. That was long before the United States became a country. Then, about 50 years before Columbus left Spain, Chinese exploration and overseas trade nearly stopped. After a really bad attack by the northern nomads, Chinese leaders made a sudden change. They stopped paying for ships and sailors. They hired soldiers and started to rebuild the Great Wall along the northern border. That took a lot of money. It also took workers away from other jobs.

This new policy started a long period of isolation. During this time, China avoided contact with other countries. To be **isolated** is to be alone, all by yourself, with no contact with others.

New rules made it hard for people to travel. They emphasized conformity (everybody acting alike). The situation was made even worse by another consequence of population density.

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Consequence #7: **A large population is more likely to have diseases that spread rapidly.**

Most human diseases are caused when bacteria or viruses get in your body and cause damage.

Brief scientific summary (you can get more explanation in a science book or website).

1. You have billions of bacteria inside you. Bacteria and viruses are always changing. Sometimes, one changes in a way that makes it dangerous. Perhaps it can survive a little longer after being sneezed out of one person's nose. Or perhaps the bacteria can grow faster. Or it can make a poison that attacks your body.
2. People also change. Some people develop resistance to new bacteria or viruses. Others get weaker because of lack of food or safe water.

In other words, life is like a race between tiny disease germs and human resistance.

Question: What is the geography part of this story?

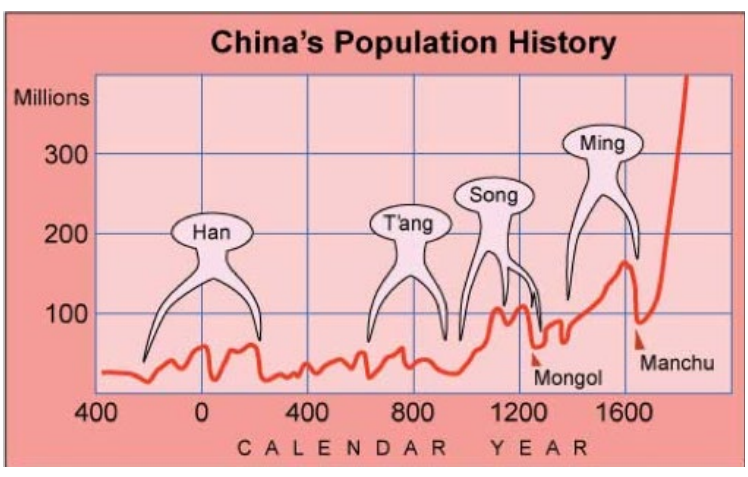
Answer: Places with a lot of people can develop more new kinds of disease germs.

This is just another example of the probability principle that we described back in part #4. (Remember? – if you take one card out of a deck, you probably will not get an ace; take 25 cards, and you are almost certain to get an ace.) In a small population, a new disease might appear only once in a hundred years. A large population might get a new disease every month.

New diseases can be really scary. Several times in history, serious plagues started in China. For example, about 150 years before Columbus, a disease from China spread around the world. Millions died. Others got so sick that they could not plant or harvest crops. People were afraid to travel. They didn't even want to buy things from other places. They thought the plague might come with the traders.

When the disease got to Europe, more than a third of the people died.

Look at this graph again. This time, notice all the times when the population of China went down by at least one third.



In fact, several ruling dynasties ended when a lot of people died from disease or starvation. The rest of the people often blamed the government. The resulting riots and civil wars made population go down even more. We will leave it to historians to trace the complex causes and effects in the population history of China. Here, we just note that a loss of population has two geographical consequences:

1. China became less able to defend itself. Xiongnu, Mongol, and Manchu warriors came into China after a loss of population and wealth made it harder to defend the border against invasion (even with the help of a Great Wall). Moreover, the fall of the Ming Dynasty happened just when European countries were claiming colonies in other parts of the world. (The Europe chapter has more about this time, called the colonial era.)
2. China became less productive and inventive. People had fewer good jobs. Lack of money made it harder for people to invest in new farms or other businesses.

This discussion about disease leads to an even more complicated effect of population density.

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Consequence #8: **Population density can affect freedom, crime, and human rights.**

If I am all alone on a big island, I am free to do just about anything. I can play my trombone at midnight. I can run around naked. I can burn old shoes and bicycle tires in an open fire.

None of that is allowed in New York City, where I am writing this chapter. This crowded city has many rules about things like noise, clothing, and air quality. Here is a generalization: more people in an area means less freedom for each individual.

In the real world, the tradeoff between population and personal freedom is not simple.

For example, should skateboards be banned on a sidewalk where ten people are walking? How about if there are a hundred walkers? How crowded can a beach get before people would like a law to make it illegal to play a radio as loud as you want to?

To complicate things further, remember Consequences #2 and #4. I may have a lot of freedom on an empty island, but I cannot go to a movie there. I can't play a football game or sing in a choir. I can't enjoy a dinner at a famous restaurant. These things all require a lot more people!

China has four times as many people as the United States. This has an influence on the amount of personal freedom each person has.

Warning: comparisons of whole countries are always generalizations.

Local differences within each country can be greater than the average differences between them.

- China has some areas where people have more individual freedom than most Americans.
- China also has many rules that other people have called abuses of human rights. For example, people in many parts of China do not have a right to free speech. Some have been put in jail (or even killed) because they spoke or wrote against the government.

Here is the geographical point that we should remember when we read about China:

> There is a tradeoff between population density and individual freedom.
>
> If there are more people in an area, each person usually has less freedom.

Think about the things you like to do:

> What things would be easier if your community had ten times as many people?
>
> Which ones would be harder to do?
>
> What things would be easier if your community had only one tenth as many people?
>
> Which ones would be harder to do?

There is one more reason why China is a good place to study the effects of population density.

Some scholars say that China's religious tradition helps people deal with a large population. The main religion of ancient China was Confucianism. Confucius was a teacher about 500 BCE. Even that long ago, China already had many millions of people. Confucius said people should respect older people and cooperate with other people around them.

China has a Communist government today. Even though Communists do not support religions like Confucianism, many people in China still follow the ancient Confucian ideas.

A history book or website can give you more information about religions and their influence on people. In this book, we just want to make it very clear that the cause-and-effect links between population density and individual freedom are important but very complicated.

Interactive 8.3:
Population Density in China

Test your knowledge of population density in China with this activity from GIANTS.

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Consequence #9: More people usually have more environmental impact.

Chinese people buy more than 20 million cars every year. They build a new electric power plant every few weeks. Burning fuel in all those cars and generators has a big impact on air quality. According to some reports, 16 of the world's 20 most polluted cities are in China.

Remember the picture at the beginning of this chapter?

Economists say, "air is a resource that is held in common."

Definition: Held in common means no person owns it. It belongs to everyone.

Environmental effects often depend on population density. The principle is simple:

Many things are OK if only a few people do them.

They can become a problem if many people do them.

Example: One car or truck does not do much damage to the air. Millions of cars and trucks, however, can pollute the air and cause health problems.

Example: A few billboards next to a highway can attract attention. A large number of billboards, however, can be so cluttered that none of them gets noticed.

Example: A few cabins on a lake can dump trash into the water without much harm. Pollution from a large number of cabins can kill fish and make swimming dangerous.

Can you think of some more examples?

In crowded China, air pollution has been called "an abuse of the commons." It causes thousands of deaths every year. Millions of people have lung diseases caused by pollution.

Air pollution in China is also a problem at a global scale. This map is based on satellite images from the National Aeronautics and Space Administration. The tan color shows smoky air from China (the country is labelled with the word "population"). This smoky air goes east all the way across the Pacific Ocean.

Here is another fact: China recently passed the United States as the number-one source of greenhouse gases in the world. (These are the gases that cause global warming.)

In short, air pollution is a lot like the diseases described in Consequence #7. Both pollution and disease are more likely to start in crowded places and then spread all around the world.

Putting it all together: A large population eventually has to limit its growth in some way.

China's economy has grown very large. You have probably seen some of the headlines:

> "China is now the world's largest producer of iron."
>
> "China is building the world's fastest supercomputer."
>
> "China built as many miles of road as the U. S. Interstate Highway system in ten years."
>
> And so forth. (P.S. It took more than 50 years to build the American Interstates.)

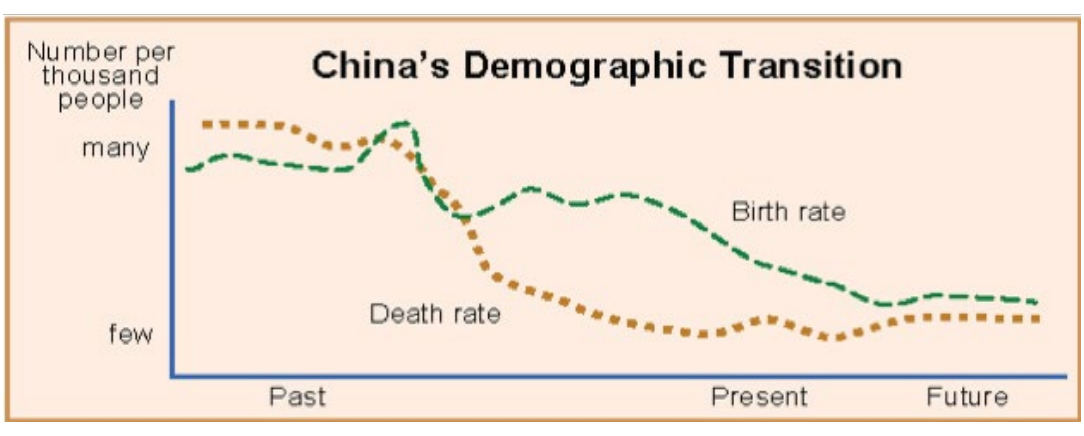
Here is an odd fact: rapid economic growth may be a result of efforts to control population.

How can this be true?

When a population is growing, families have many children. Caring for them takes time and money. If people have fewer children, they have more money to invest in other things. They can build new factories or roads. They can go to college, or travel more.

The birth rate is now very low in Europe, North America, and Japan. Demographers (people who study population) call the change from high to low birth rate the demographic transition. The **demographic transition** is the change from high birth rate and short life expectancy (high death rate) to low birth rate and long lifetimes. In the middle of the demographic transition, medical care has lowered the death rate, but the birth rate is still high. The population grows very rapidly at this time.

As with any graph, you should first ignore the little ups and downs and focus on the general trends that you see.



In the 1970s, Chinese leaders decided the country could not afford to keep growing. They wrote the "policy of birth planning." This policy has a nickname: the "one-child policy." Basically, the government made it illegal for most couples to have more than one child.

The birth rate went way down.

Here's the big bonus: People had fewer children to feed, but they still had the same income.

Benefits of extra money were soon obvious. More people could afford to buy phones, TVs, even cars. Thousands of Chinese people traveled to other countries. Others went to colleges, often in other countries. Many communities invested in new powerplants, roads, and factories.

The one-child policy has a lot of problems. You can find details in an economics book or website. Here, we note that the one-child policy is just an extreme version of something that eventually has to happen in every country. Population simply cannot keep growing forever. Eventually, the bad effects of continued population growth outweigh the good effects.

People can decide when and how to limit population growth. They can do it voluntarily, or by obeying a law. Or they can wait for a famine or disease to do it for them. In this chapter, we simply tried to outline some of the geographic effects of population density.

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Summary: How can the big idea about population density help us understand China?

Ultimate cause: Populations tend to grow unless growth is stopped in some way. Population growth can be stopped by diseases, by wars with other people, or by the people themselves.

Big idea: The population density of a place (number of people per square mile) has a large influence on the success of many kinds of human activity there.

Study area: China is a good place to study the effects of population density. China had a large population thousands of years ago. It now has about four times as many people as the United States, even though the two countries are about the same size.

China also has large areas that are cold, dry, or mountainous. As a result, it has only half as much good cropland as the United States. Do the math: China has about eight times as many people as the United States, per square mile of good land.

Consequences of population density

1. **Production**

   Large populations can produce more than small populations.

2. **Large projects**

   China's large population could do large and complex projects (like the Grand Canal or the Great Wall) a long time ago.

3. **Defense**

   A large population is usually able to defend itself better against attack.

4. **Inventions**

   Large populations are likely to have many smart people;

   these people can invent things that make life better.

5. **Trade**

   A large population is more likely to trade with other people.

6. **Migration**

   A large population often looks for places where people might move.

7. **Disease**

   A large population is more likely to develop diseases that spread rapidly.

8. **Human rights**

   Population density has a complex influence on things like freedom, crime, and human rights.

9. **Environmental impact**

   A large population has more environmental impact than a small one (IF it has the same income and technology!).

Putting it all together: Eventually, a large population has to limit its own growth in some way. China tried to limit the growth of population by passing a law. The "One-Child Policy" had problems, but it also set the stage for rapid economic growth.

China, however, has now gone through a process that population experts call the demographic transition. Medical care is better. Fewer people die young. Families have fewer children than before. People are getting older. Soon, old people will make up a large fraction of the population. This can have effects in many parts of the economy, including health care, education, and factory production.

Interactive 8.3: Big Ideas Review

Review the Big Idea of Chapter 8 with the accompanying presentation.

Population Density

the number of people in a unit of area (e.g. a square mile).

BACK

Probability

the mathematical study of luck.

BACK

Isolation

to be alone, all by yourself, with no contact with others.

BACK

Ethnic Group

a group of people who have common ancestors, speak the same language, and have the same religion.

BACK

Demographic Transition

the change from high birth rate and short life expectancy (high death rate) to low birth rate and long lifetimes

BACK