Chapter 2
Population

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Key Issues

1. Where is the world's population distributed?
2. Where has the world's population increased?
3. Why is population increasing at different rates in different countries?
4. Why might the world face an overpopulation problem?

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The study of population is critically important for three reasons:

- More people are alive at this time — over 6 3/4 billion — than at any time in human history;
- The world's population increased at a faster rate during the second half of the twentieth century than ever before in history;
- Virtually all global population growth is concentrated in less developed countries.

At a global ***scale***, the world's so-called **overpopulation** problem is not simply a matter of the total number of people but the relationship between number of people and available resources. At a local scale, geographers find that overpopulation is a threat in some regions of the world but not in others. Regions with the most people are not necessarily the same as the regions with an unfavorable balance between population and resources.

Key Issue 1. Where Is the World's Population Distributed?

- **Population concentrations**
- **Sparsely populated regions**
- **Population density**

We can understand how population is distributed by examining two basic properties: concentration and density.

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Population Concentrations

Approximately two-thirds of the world's population is clustered in four regions: East Asia, South Asia, Southeast Asia, and Western Europe. The four regions display some similarities. Most of their people live near an ocean or near a river with easy access to an ocean. The four population clusters occupy generally low-lying areas, with fertile soil and temperate climate. Despite these similarities, we can see significant differences in the pattern of occupancy of the land.

East Asia

One-fifth of the world's people live in East Asia, the largest cluster of inhabitants. Five-sixths of the people in this concentration live in the People's Republic of China, the world's most populous country. The Chinese population is clustered near the Pacific Coast and in several fertile river valleys. Three fourths of the people live in rural areas where they work as farmers.

In Japan and South Korea, population is not distributed uniformly either. More than three-fourths of the Japanese and Koreans live in urban areas.

South Asia

Nearly one-fourth of the world's people also live in South Asia, which includes India, Pakistan, Bangladesh, and the Island of Sri Lanka. India, the world's second most populous country, contains more than three-fourths of the South Asia population concentration. Much of this area's

population is concentrated along the plains of the Indus and Ganges rivers. Population is also concentrated near India's two long coastlines. Like the Chinese, most people in South Asia are farmers.

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Southeast Asia

A third important Asian population cluster, and the world's fourth-largest population cluster, after Europe, is in Southeast Asia, mostly on a series of islands that lie between the Indian and Pacific Oceans. The largest concentration is on the island of Java, inhabited by more than 100 million people. Indonesia, which consists of 13,677 islands, is the world's fourth most populous country. Several Philippine islands contain high population concentrations. The Indochina population is clustered along several river valleys and deltas at the southeastern tip of the Asian mainland. A high percentage of people in Southeast Asia work as farmers.

The three Asian population concentrations together comprise over half of the world's total population, but together they live on less than 10 percent of Earth's land area. The same held true 2,000 years ago.

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Europe

Europe, including the European portion of Russia, forms the world's third-largest population cluster, one-ninth of the world's people. Three-fourths of Europe's inhabitants live in cities. Europeans import food and other resources. The search for additional resources was a major incentive for Europeans to colonize other parts of the world during the previous six centuries.

Other Population Clusters

The largest population concentration in the Western Hemisphere is in the northeastern United States and southeastern Canada. About 2 percent of the world's people live in the area. Less than 2 percent are farmers.

Another 2 percent of the world's population is clustered in West Africa, especially along the south-facing Atlantic coast. Approximately half is in Nigeria, and the other half is divided among several small countries west of Nigeria. Most people work in agriculture.

Sparsely Populated Regions

Relatively few people live in regions that are too dry, too wet, too cold, or too mountainous for agriculture. Approximately three-fourths of the world's population lives on only 5 percent of Earth's surface. The portion of the Earth's surface occupied by permanent human settlement is called the **ecumene**.

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Dry Lands

Areas too dry for farming cover approximately 20 percent of Earth's land surface. Deserts generally lack sufficient water to grow crops although some people survive there by raising animals, such as camels, that are adapted to the climate. Dry lands may contain natural resources notably, much of the world's oil reserves.

Wet Lands

Lands that receive very high levels of precipitation may also be inhospitable for human occupation. These lands are located primarily near the equator. The combination of rain and heat rapidly depletes nutrients from the soil, thus hindering agriculture. In seasonally wet lands, such as those in Southeast Asia, enough food can be grown to support a large population.

Cold Lands
Much of the land near the North and South poles is perpetually covered with ice or the ground is permanently frozen (permafrost). Few animals can survive the extreme cold, and few humans live there.

High Lands
Relatively few people live at high elevations. We can find some significant exceptions, especially in Latin America and Africa.

Population Density
Density, the number of people occupying an area of land, can be computed in several ways, including arithmetic density, physiological density, and agricultural density.

Arithmetic Density. Geographers most frequently use **arithmetic density**, which is the total number of people divided by total land area. Arithmetic density enables geographers to make approximate comparisons of the number of people trying to live on a given piece of land in different regions of the world.

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Physiological Density. A more meaningful population measure is afforded by looking at the number of people per area of a certain type of land in a region. Land suited for agriculture is called *arable land.* The number of people supported by a unit area of arable land is called the physiological density.

Comparing physiological and arithmetic densities helps geographers to understand the capacity of the land to yield enough food for the needs of people.

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Agricultural Density. Two countries can have similar physiological densities, but they may produce significantly different amounts of food because of different economic conditions. **Agricultural density** is the ratio of the number of farmers to the amount of arable land. To understand the relationship between population and resources in a country, geographers examine its physiological and agricultural densities together.

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The Netherlands has a much higher physiological density than does India but a much lower agricultural density.

Key Issue 2. Where Has the World's Population Increased?

- **Natural increase**
- **Fertility**
- **Mortality**

Population increases rapidly in places where many more people are born than die, increases slowly in places where the number of births exceeds the number of deaths by only a small margin, and declines in places where deaths outnumber births.

The population of a place also increases when people move in and decreases when people move out.

Natural Increase

Geographers most frequently measure population change in a country or the world as a whole through three measures: **Crude birth rate (CBR)** is the total number of live births in a year for every 1,000 people; **Crude death rate (CDR)** is the total number of deaths in a year for every 1,000 people; and **Natural increase rate (NIR)** is the percentage by which a population grows in a year. The term *natural* means that a country's growth rate excludes migration. The world NIR during the twenty-first century was 1.2 percent. The world NIR is lower today than at its all-time peak of 2.2 percent in 1963. However, the NIR during the second half of the twentieth century was high by historical standards. The number of people added each year has dropped much more slowly than the NIR, because the population base is much higher now than in the past. The rate of natural increase affects the **doubling time**, which is the number of years needed to double a population. When the NIR was 2.2 percent back in 1963, doubling time was 35 years.

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More than 95 percent of the natural increase is clustered in LDCs. To explain these differences in growth rates, geographers point to the regional differences in fertility and mortality rates.

Fertility

The highest crude birth rates are in sub-Saharan Africa, and the lowest are in Europe. The word *crude* in *crude birth rate* and *crude death rate* means that we are concerned with society as a whole rather than a refined look at particular individuals or groups. Geographers also use the **total fertility rate (TFR)** to measure the number of births in a society. The TFR is the average number of children a woman will have throughout her childbearing years. The total fertility rate for the world as a whole is approximately three. The TFR exceeds six in many countries of sub-Saharan Africa, compared to less than two in nearly every European country.

Mortality

Two useful measures of mortality in addition to the crude death rate are the infant mortality rate and life expectancy. The **infant mortality rate (IMR)** is the annual number of deaths of infants under one year of age, compared with total live births, usually expressed as the number of deaths per 1,000 births rather than as a percentage. Infant mortality rates exceed 100 in some LDCs.

In general, the IMR reflects a country's healthcare system. Minorities in the United States have infant mortality rates that are twice as high as the national average, comparable to levels in Latin America and Asia.

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Life expectancy at birth measures the average number of years a newborn infant can expect to live at current mortality levels. Babies born today can expect to live to around 80 in Western Europe but only to around 50 in sub-Saharan Africa.

Higher natural increase, crude birth, total fertility rates, IMRs, and lower average life expectancy are found in LDCs. The final world map of demographic variables—crude death rate—does not follow the familiar pattern. The combined crude death rate for all less developed countries is actually lower than the combined rate for MDCs. Furthermore, the variation between the world's highest and lowest CDRs is much less extreme than the variation in CBRs. The populations of different countries are at various stages in an important process known as the demographic transition.

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Key Issue 3. Why Is Population Increasing at Different Rates in Different Countries?

- **The demographic transition**
- **Population pyramids**

- **Countries in different stages of demographic transition**
- **Demographic transition and world population growth**

Although rates vary among countries, a similar process of change in a society's population, known as the **demographic transition,** is operating.

The Demographic Transition
The demographic transition has a beginning, middle, and end. Historically, once a country has moved from one stage to the next, it has not reverted to an earlier stage. However, a reversal may be occurring in some African countries because of the AIDS epidemic.

Stage 1: Low Growth
Most of humanity's several-hundred-thousand-year occupancy of Earth was characterized by stage 1 of the demographic transition. Crude birth and death rates varied considerably from one year to the next and from one region to another, but over the long term they were roughly comparable, at very high levels.

Between 8000 B.C. and A.D. 1750, Earth's human population increased from approximately 5 million to 800 million. The burst of population growth around 8000 B.C. was caused by the **agricultural revolution**. Despite the agricultural revolution, the human population remained in stage 1 of the demographic transition because food supplies were still unpredictable.

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Stage 2: High Growth
For nearly 10,000 years after the agricultural revolution, world population grew at a modest pace. After around A.D. 1750 the world's population suddenly began to grow ten times faster than in the past. In stage 2, the crude death rate suddenly plummets, while the crude birth rate remains roughly the same as in stage 1.

Some demographers divide stage 2 into two parts. During the second part, the growth rate begins to slow, although the gap between births and deaths remains high. Countries entered stage 2 of the demographic transition after 1750 as a result of the **Industrial Revolution**. The result of this transformation was an unprecedented level of wealth, some of which was used to make communities healthier places to live.

Countries in Europe and North America entered stage 2 of the demographic transition around 1800, but stage 2 did not diffuse to most countries in Africa, Asia, and Latin America until around 1950. The late twentieth-century push of countries into stage 2 was caused by the **medical revolution**. Improved medical practices suddenly eliminated many of the traditional causes of death in LDCs and enabled more people to experience longer and healthier lives.

Stage 3: Moderate Growth
A country moves from stage 2 into stage 3 of the demographic transition when the crude birth rate begins to drop sharply. European and North American countries moved from stage 2 to stage 3 during the first half of the twentieth century. Most countries in Asia and Latin America have moved to stage 3 in recent years, while most African countries remain in stage 2. A society enters stage 3 when people choose to have fewer children. Medical practices introduced in stage 2 societies greatly improved the probability of infant survival, but many years elapsed before families reacted by conceiving fewer babies. Economic changes in stage 3 societies also induce people to have fewer offspring. Farmers often consider a large family to be an asset. In contrast, children living in cities are generally not economic assets.

Stage 4: Low Growth
A country reaches stage 4 when the crude birth rate declines to the point where it equals the crude death rate. The condition is called **zero population growth (ZPG)**. Demographers more precisely define zero population growth as the total fertility rate (TFR) that results in a lack of change in the total population over a long term. A TFR of approximately 2.1 produces ZPG, although a country that receives many immigrants may need a lower total fertility rate to achieve ZPG.

Most European countries have reached stage 4 of the demographic transition. The United States has moved slightly below ZPG since 2000. Several Eastern European countries, most notably Russia, have negative natural increase rates, a legacy of a half-century of Communist rule.

As memories of the Communist era fade, Russians and other Eastern Europeans may display birth and death rates more comparable to those in Western Europe. Alternatively, demographers in the future may identify a fifth stage, characterized by higher death rates than birth rates and an irreversible population decline.

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Population Pyramids
Population in a country is influenced by the demographic transition in two principal ways: the percentage of the population in each age group, and the distribution of males and females. A country's population can be displayed by age and gender groups on a bar graph called a **population pyramid**. The shape of the pyramid is determined primarily by the CBR.

Age Distribution
The age structure of a population is extremely important in understanding similarities and differences among countries. The most important factor is the **dependency ratio**, which is the number of people who are too young or too old to work, compared to the number of people in their productive years.

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Young dependents outnumber elderly ones by 10:1 in stage 2 countries, but the numbers of young and elderly dependents are roughly equal in stage 4 countries. The large percentage of children in sub-Saharan Africa and other stage 2 countries strains the ability of poorer countries to provide needed services. As countries pass through the stages of the demographic transition, the percentage of elderly people increases. More than one-fourth of all government expenditures in the United States, Canada, Japan, and many European countries go to Social Security, health care, and other programs for the older population.

Sex Ratio
The number of males per hundred females in the population is the sex ratio. The ratio of men to women is about 93:100 in Europe and 97:100 in North America. In LDCs the ratio is 103:100.

In stage 2 countries, the high mortality rate during childbirth partly explains the lower percentage of women. The difference also relates to the age structure. The shape of a community's population pyramid tells a lot about its distinctive character.

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Countries in Different Stages of Demographic Transition
No country today remains in stage 1 of the demographic transition, but it is instructive to compare countries in each of the other three stages.

Cape Verde: Stage 2 (High Growth). Cape Verde, a collection of 12 small islands in the Atlantic Ocean off the coast of West Africa, moved from stage 1 to stage 2 about 1950. During the first half of the twentieth century Cape Verde's population declined.

The large gap between births and deaths most years produced a high natural increase rate typical of stage 2, yet Cape Verde remained in stage 1 because famines dramatically disrupted the typical patterns of birth, death, and natural increase.

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Cape Verde moved on to stage 2 when an antimalarial campaign was launched.

Cape Verde's crude birth rate has remained relatively high and still fluctuates wildly.

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The wild fluctuations in Cape Verde's crude birth rate are a legacy of the severe famine during the 1940s. The population pyramid shows that Cape Verde has a large number of females age 5-14 who will soon start moving into their prime childbearing years. For Cape Verde to enter stage 3 these females must bear considerably fewer children than did their mothers.

Chile: Stage 3 (Moderate Growth). Like most countries outside Europe and North America, Chile entered the twentieth century still in stage 1. Much of Chile's population growth resulted from European immigration. Chile's crude death rate declined sharply in the 1930s, moving the country into stage 2. Chile's crude death rate was lowered by the infusion of medical technology from MDCs. Chile has been in stage 3 since about 1960 primarily because of a vigorous government family planning policy.

Reduced income and high unemployment also induced couples to delay childbearing. The country is unlikely to move into stage 4 in the near future. Chile's government reversed its policy and renounced support for family planning during the 1970s. The government policy was that population growth could help promote national security and economic development. Also most Chileans belong to the Roman Catholic Church, which opposes the use of what it calls artificial birth-control techniques.

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Denmark: Stage 4 (Low Growth). Denmark entered stage 2 in the nineteenth century, when the CDR began its permanent decline. The CBR then dropped in the late nineteenth century, and the country moved on to stage 3.

Since the 1970s the country has reached ZPG, and the population is increasing almost entirely because of immigration. Instead of a classic pyramid shape, Denmark has a column, demonstrating that the percentages of young and elderly people are nearly the same.

Demographic Transition and World Population Growth
Worldwide population increased rapidly during the second half of the twentieth century. The demographic transition is characterized by two big breaks with the past. The first break—the sudden drop in the death rate — has been accomplished everywhere. The second break —t he sudden drop in the birth rate — has yet to be achieved in many countries.

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Medical technology was injected from Europe and North America into Africa, Asia, and Latin America instead of arising within those regions as part of an economic revolution. In the past, stage 2 lasted for approximately 100 years in Europe and North America, but today's stage 2

countries are being asked to move through to stage 3 in much less time to curtail population growth.

Key Issue 4. Why Might the World Face an Overpopulation Problem?

- **Malthus on overpopulation**
- **Declining birth rates**
- **World health threats**

Why does global population growth matter? Geographers observe that diverse local culture and environmental conditions may produce different answers in different places.

Malthus on Overpopulation

English economist Thomas Malthus (1766–1834) was one of the first to argue that the world's rate of population increase was far outrunning the development of food supplies. In *An Essay on the Principle of Population*, published in 1798, Malthus claimed that population increased geometrically, while food supply increased arithmetically. He concluded that population growth would press against available resources in every country, unless "moral restraint" produced lower crude birth rates or unless disease, famine, war, or other disasters produced higher crude death rates.

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Contemporary Neo-Malthusians. Malthus's views remain influential today because of the unprecedented rate of natural increase in LDCs. Neo-Malthusians argue that two characteristics of recent population growth make Malthus' thesis more frightening than when it was first written. First, Malthus failed to anticipate that poor countries would have the most rapid population growth. The gap between population and resources is wider in some countries than even Malthus anticipated. The second argument made by neo-Malthusians is that population growth is outstripping such resources as clean air, suitable farmland, and fuel as well as food.

Malthus's Critics. Criticism has been leveled at both the population growth and resource depletion sides of Malthus's equation. Contemporary analysts such as Esther Boserup and Julian Simon argue that a larger population could stimulate economic growth and therefore the production of more food. The Marxist theorist Friedrich Engels argued that the world possessed sufficient resources to eliminate global hunger and poverty, if only these resources were shared equally. Malthus' critics argue that a large population of consumers can generate a greater demand for goods, which results in more jobs. Some political leaders, especially in Africa, argue that more people will result in greater power.

Malthus Theory and Reality

Vaclav Smil has shown that Malthus was fairly close to the mark on food production but much too pessimistic on population growth. Many people in the world cannot afford to buy food or do not have access to sources of food, but these are problems of distribution of wealth rather than insufficient global production of food, as Malthus theorized. Population has been increasing at a much slower rate during the past two decades than it was during the previous half-century. However, neo-Malthusians point out that despite the lower NIR during the 1990s, the world added approximately the same number of people as during the 1980s.

Declining Birth Rates

Although the world as a whole may not be in danger of "running out" of food, some regions with rapid population growth do face shortages of food. Two strategies have been successful in reducing birth rates. One alternative emphasizes reliance on economic development, the other on

distribution of contraceptives. Because of varied economic and cultural conditions, the most effective method varies among countries.

Reasons for Declining Birth Rates

One approach to lowering birth rates emphasizes the importance of improving local economic conditions. With improved healthcare programs, IMRs would decline and with the survival of more infants ensured, women would be more likely to limit the number of children.

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Reducing Births Through Contraception

In LDCs, demand for contraceptive devices is greater than the available supply.

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About one-fourth of African women employ contraceptives, compared to about two-thirds in other less developed countries. Very high birth rates in Africa and southwestern Asia also reflect the relatively low status of women.

Many oppose birth control programs for religious and political reasons. Analysts agree that the most effective means of reducing births would employ both alternatives.

But LDC governments and international family planning organizations have limited funds so they must set priorities.

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World Health Threats

Lower CBRs have been responsible for declining NIRs in most countries. However, in some countries of sub-Saharan Africa lower natural increase rates have also resulted from higher crude death rates, especially through the diffusion of AIDS. Medical researchers have identified an **epidemiologic transition** that focuses on distinctive causes of death in each stage of the demographic transition.

Epidemiologic Transition Stages 1 and 2

Stage 1 of the epidemiologic transition has been called the stage of pestilence and famine. Infectious and parasitic diseases were principal causes of human deaths.

Black Plague. The Black Plague, or bubonic plague, originated in present-day Kyrgyzstan and was brought from there by a Tatar army when it attacked an Italian trading post on the Black Sea. About 25 million Europeans died between 1347 and 1350, at least one-half of the continent's population. Five other epidemics in the late fourteenth century added to the toll in Europe. In China, 13 million died from the plague in 1380.

Stage 2 of the epidemiologic transition has been called the stage of receding pandemics. A **pandemic** is disease that occurs over a wide geographic area and affects a very high proportion of the population. Cholera became an especially virulent epidemic in urban areas during the Industrial Revolution.

Construction of water and sewer systems eradicated cholera by the late nineteenth century. However, cholera reappeared a century later in rapidly growing cities of less developed countries as they moved into stage 2 of the demographic transition.

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Epidemiologic Transition Stages 3 and 4

Stage 3 of the epidemiologic transition, the stage of degenerative and human-created diseases, is characterized by a decrease in deaths from infectious diseases and an increase in chronic disorders

associated with aging. The two especially important chronic disorders in stage 3 are cardiovascular diseases, such as heart attacks, and various forms of cancer.

The decline in infectious diseases has been sharp in stage 3 countries. Effective vaccines were responsible for these declines. As less developed countries have moved recently from stage 2 to stage 3, infectious diseases have also declined.

The epidemiologic transition was extended to stage 4, the stage of delayed degenerative diseases. The major degenerative causes of death — cardiovascular diseases and cancers — linger, but the life expectancy of older people is extended through medical advances.

Epidemiologic Transition Possible Stage 5
Some medical analysts argue that the world is moving into stage 5 of the epidemiologic transition, the stage of reemergence of infectious and parasitic diseases. Infectious diseases thought to have been eradicated or controlled have returned, and new ones have emerged. Three reasons help to explain the possible emergence of a stage 5 of the epidemiologic transition

1. Evolution. Infectious disease microbes have continuously evolved and changed in response to environmental pressures by developing resistance to drugs and insecticides.

2. Poverty. Tuberculosis (TB) is an example of an infectious disease that has been largely controlled in relatively developed countries like the United States but remains a major cause of death in less developed countries.

3. Improved travel. As they travel, people carry diseases with them and are exposed to the diseases of others. Several dozen "new" infectious diseases have emerged over the past three decades and have spread through travel. Most prominent currently is H1N1, commonly known as swine flu, which was first identified in Mexico in early 2009 and spread around the world rapidly.

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AIDS. The most lethal epidemic in recent years has been AIDS (acquired immunodeficiency syndrome), caused by the human immunodeficiency virus (HIV). The impact of AIDS has been felt most strongly in sub-Saharan Africa. With one-tenth of the world's population, sub-Saharan Africa has two-thirds of the world's HIV-positive population and nine-tenths of the world's infected children. CDRs in many sub-Saharan Africa countries rose sharply during the 1990s as a result of AIDS, from the mid-teens to the low twenties.

Key Terms
Agricultural density (p.52)
Agricultural revolution (p.57)
Arithmetic density (p.50)
Census (p.62)
Crude birth rate (CBR) (p.53)
Crude death rate (CDR) (p.53)
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