

Population dynamics

Audience: Year 11 Geography

Time Required: 15 minutes

- Activity:** Students will compare country-age structures to long-term population growth.
- Standards:** Some possible links to NZ Curriculum in this inquiry
Geography AS 91008
- change over time including: population totals, age-sex structure, natural increase
- Learning Outcomes:** Students will
- predict total historical population trends from age-structure information.
 - relate population growth to k (carrying capacity) or r (reproductive factor) selective environmental conditions.

Map URL: <https://arcg.is/jT91v>

Engage

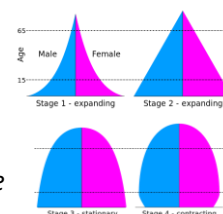
What is growth rate?

- Click the map URL link above to open the map.
 - Use the search box in the upper-right corner to find the countries listed below.
 - Click each country for growth rates. Hover over graphs to determine a doubling time.
 - New Zealand [1% growth rate - approximately 75 years to double]
 - Costa Rica [2% growth rate - approximately 37 years, but it ranges]
 - Mozambique [3% growth rate - approximately 25 years to double]
 - Qatar [15% growth rate - approximately 5 years, depending on when measured]
- ? What is the product of a country's growth rate and doubling time? [The product should be close to 75.]
- ? How is the doubling time determined from the growth rate? [$75 / \text{Growth Rate} = \text{Doubling Time}$]

Explore

What can a population pyramid tell you about a country's growth?

- Click on the dark blue countries to explore their population graphs.
- ? What is typical of the shape of the population graph in high-growth-rate countries? [They curve up-wards triangle shaped or exponential curves.]
- ? How do low-growth-rate population graphs compare? [Low-growth-rate countries are straight-upward, "beehive" shaped.]
- ? How long would it take to double Nigeria's population? [$75/4 \sim 18$ years (answers range from 15 to 30 if using graph), so it has doubled in most students' lifetime.]



Explain

What causes such rapid growth in certain countries?

- Countries experience fast growth curves when life expectancies suddenly increase due to improvements in health services. It generally takes a generation to realise large families are not as crucial for family well-being.
- Follow the Current link in the pop-up of a few fast-growth countries to see their population pyramid.
- ? What does this pyramid shape imply about the size of the reproductive class of the population? *[It is just about to take off and grow quickly.]*

Elaborate

How are shrinking populations distributed?

- Click Russia's population graph and compare this population pyramid to the fast-growth country's graphs that you just examined.
- ? What aspect of the population pyramid hints at why the overall population is changing as the graph suggests? *[There is a diminishing number of young adults.]*

Evaluate

Is the population pyramid shape a good indicator of growth or decline?

- ? How do pyramid shapes relate to diminishing-growth countries? *[Diminishing-growth countries have top-heavy, V-shaped pyramids.]*
- ? How do pyramid shapes relate to slow-but-steady-growth countries? *[Slow-growth countries are more straight towers.]*
- ? How do fast-growth country pyramids compare? *[Fast-growth countries are quite wide at the base.]*
- Write a conclusion: Is the population pyramid shape a good indicator of growth or decline?

Key Skills

Identify a map feature

- Click any feature on the map, and a pop-up window will open with information.
- Links and images in the window are often clickable.
- An arrow icon in the upper-right of the window indicates that multiple features have been selected. Click the arrow button to scroll through the features

Change the data style

- Using the Details pane, click the button, Show Contents of Map.
- Hover over the layer name.
- Under the layer name, select the button, Change Style.
- For Choose An Attribute To Show, select an attribute to map.
- For Select A Drawing Style, select the best symbology for the data.

Next Steps

DID YOU KNOW?: ArcGIS Online is a mapping platform freely available to New Zealand public and private schools. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at <http://www.eagle.co.nz/gis-schools>

THEN TRY THIS...

- Using an ArcGIS Online organization subscription for schools, add the population density or the human footprint from the Living Atlas collection.
- Change symbols on the Growth Rate layer to show fertility (TFR) and life expectancies (LifExp). What relationships and patterns can you infer.
- Explore the story map, The Age of Humans: The Anthropocene, at <http://esriurl.com/Geo4201>.

Text References

- Anderson Lois Population Concepts. Pearson 2013
- Peat, Justin and Lockyer, John. Geography on the Edge. Cengage Learning Australia 2011

NEW ZEALAND GEOINQUIRIES

<http://arcg.is/1GPDXe>