

**Lesson Title:** Analyzing Patterns of Human Development

**Lessons Summary:** In this lesson students will describe global **spatial patterns** of human development using HDI rankings. Students will complete a table of demographic data on selected countries so they can look for connections. Students will use that information to make comparisons and hypothesize reasons for the demographic patterns. .

Before you begin using this module, you will need to know about using the ArcGIS Server Web-based GIS viewer. You can do this by watching the server tutorial video or working through the tutorial. The tutorial video, student activity, and Web-based GIS Tutorial Viewer can be found at <http://gis.lanec.edu>. Go to the “Modules” tab and click the Tutorial link. You will need a high speed Internet connection and a current version of Adobe Flash Player.

**Prior Skills:** You will need to know how to turn layers on and off, use the ID tool and, zoom in and out of the map, toggle from layers to the legend, and perform a search (Boolean) query.

Computer steps are indicated by a ► symbol and questions you need to answer are numbered.

You can record your answers on the answer sheet.

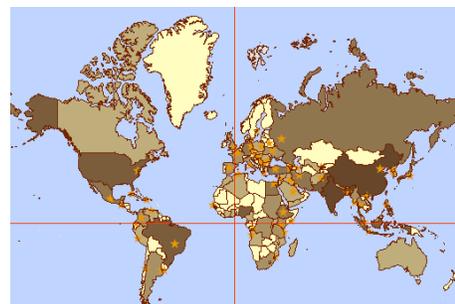
- Connect to the **MAPS-GIS webpage** at: <http://gis.lanec.edu>
- Click on the **Modules link**.
- Click on the link to **Global Demographics**.
- Choose **Link to the web-based map**



The page will take a minute or two to load. The base map will load first then the other data layers. If it stalls at 55%, just click the **refresh** button on your browser.

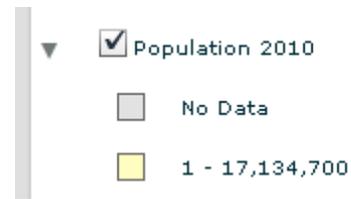


The link opens to a map of population in 2010 and world capital cities.



▶ Zoom into the map to exclude Antarctica.

▶ Expand the Population layer to see the legend.



1) Describe the distribution of world population. Where are the high population areas and where are the low population areas. Is population evenly distributed? Use geographic terms to describe population patters. For example: South of the Equator and east of the Prime Meridian the population is generally lower, but there is also less land area.

▶ Click the Identify tool and click on the United States.



A data table (the attribute table) will open with columns (fields) of information about the U.S.

2) Scroll across the table and find and record the Population in 2010.

**POP2010\_1**

You can create a query to find how many countries have a population higher than the US.

▶ Right click the layer name “Population 2010” and choose Query Layer.

In the Query Builder:

▶ Double Click POP2010\_1 to add it to the select window.

▶ Single click the > symbol

▶ Type in the number 317641000

▶ Click OK

Look at the highlighted countries on the map or find the Name\_1 field in the new attribute table.

3) Which two countries have a population greater than the U.S.

Another way to look at the population rankings is to sort the attribute table.

▶ Right click Population 210 and choose Open Attribute Table.

Find the Name\_1 field. Each time you click the field the data in the field sort from highest to lowest and then from lowest to highest.

▶ Click the find until you have the highest population at the top of the table.

4) What is the name of the country in the list that has the fourth highest population? How many people were there in 2010?

▶ Click the field again to sort from lowest to highest.

You will see several countries with the -999 or with a 0. This means there is no data in the table for that country or there is no population.

Look down the table until you see the first real population number.

5) What is the country with the lowest population in 2010? How many people were there?

▶ Close the attribute table.



▶ Turn off Population and turn on Percent Urban in 2009 and expand the legend. This layer shows the percent of people who live in urban areas. Here it means of every 100 people, how many live in an urban area?

6) Describe the pattern of urban populations. How is it similar or different from pattern of population density? How do China, India, and the US rank in terms of urban population? You may want to turn on population again to compare.

7) What areas of the world have the lowest urban populations?

▶ Turn off Urban and turn on HDI 2010 - Human Development index. Expand the layer.

The HDI (human development Index) is a composite (a combination) of four demographic statistics [life expectancy](#), [literacy](#), [educational attainment](#), and [GDP per capita](#). It is sometimes used to measure the standard of living or well being of a place. The rankings are from 1 to .01. For example, a rank of .93 is a higher standard of living than a rank of .35.

▶ Open the attribute table and sort the HDI\_2010\_2011 from High to low.

8) Two Countries are in the highest HDI (round up to .94) Name them.

▶ Look down the name fields, where does the US rank?

▶ Sort from lowest to higher. Scroll down until you find the HDI of .14. and click in that cell to highlight the row.

▶ Scroll over to the Name Field to read the country name.

-999	-999	11
-999	-999	-999
-999	1441	6107
3235	15128	2630
-999	19	499

9) What country has the lowest HDI?

To get a clearer picture of global HDI you can use queries to other countries rank.. You can group countries based on how they rank compared to the global average. The average HDI in 2010 was .64. The HDI between .55 – .70 is a good mid range.

Look at the spatial pattern of the HDI for areas that are rank above .55 – .70 and areas that rank below .55 – .70 HDI.

For the above the average HDI:

- ▶ Right click HDI
- ▶ Query Layer
- ▶ Find HDI\_2010\_2011 in the Field Name list



- ▶ Double click HDI\_2010\_2011.
- ▶ Single click >
- ▶ Type in .70
- ▶ Click OK

10) How many countries are selected?

11) Describe the pattern of higher than the global average HDI. When describing the pattern of high and low HDI consider the following ideas:

- a) Is it clustered (grouped together) or dispersed (spread out)?
- b) Is it in one particular area over another? (For example, is the above average HDI seen in the southern hemisphere or only in countries with coastal boundaries, perhaps around the Mediterranean Sea? Provide a description of the relative location.)

- ▶ Use the Identify tool to find the name of three counties with a higher than average HDI.

12) List three counties.

- ▶ Right click HDI and Clear Selection.

The less than average HDI will need a compound query because you will want to eliminate all the -999 or no data values from your query

For the below the average HDI:

- ▶ Right click HDI
- ▶ Query Layer
- ▶ Find HDI\_2010\_2011 in the Field Name List -
- ▶ Double click HDI\_2010\_2011.
- ▶ Single click <
- ▶ Type in .50
- ▶ Double click HDI\_2010\_2011 a second time to add it to the query field
- ▶ Single click >
- ▶ Type in 0

Your query statement should look like this. HDI\_2010\_2011 < .5 And HDI\_2010\_2011 > 0

- ▶ Choose OK.

13) How many countries are selected?

14) Describe the pattern of lower than the global average HDI. When describing the pattern of high and low HDI consider the following ideas: a) Is it clustered (grouped together) or dispersed (spread out)? b) Is it in one particular area over another? (For example, is the above average HDI seen in the southern hemisphere or only in countries with coastal boundaries, perhaps around the Mediterranean Sea? Provide a description of the relative location.)

- ▶ Use the Identify tool to find the name of three countries that are below the global average.

15) List the three countries with lower than the global average HDI.

- ▶ Clear your selections and open the attribute table.

There are many other demographic fields that can be used to understand a countries development and to predict future social and economic needs. The field in this data layer is explained below.

Locate the following demographic data fields:

Name – Country name.

LEXP Life Expectancy for 2005 and 2010 – Average life expectancy.

FRATE – Fertility rate 2005 and 2001 – Average number of children a woman will have.

HDI 2010 – Human Development Index - Remember the average range 55-70

BRATE – Birth Rate 2005 and 2010. Number of births per 1000 people each year.

IRATE – Infant Mortality Rate Number of deaths of infants under 1 year per 1000 births.

DRATE – Death Rate 2005 and 2010. Number of deaths per 1000 people each year.

Colonizer (a country)

IMORT2010 – Infant Mortality - is the number of deaths of babies under one year of age per 1,000 live births.

GDP 2008- Average GDP/Capita for high income countries 27, 000 for low income countries 211).

PDEN2010 – Population density – The number of people per square area.

PURB(year) Percent Urban – The percent of the population that is living in urban areas.

POVIND2000 – Poverty Index – Like the HDI it is a combination of several indicators (longevity, knowledge, people living below 50% median income, long-term unemployment. It ranges from 1 to 100.

Colonization - ( Date\_Col date colonized – Date\_IND, date of independence )

There are other fields in this table related to A) disease (Cholera CHOL, and Malaria MAL)  
B) Coffee production and exportation ( excocoa, imcocoa). These columns are used in other web-based lessons.

**Data Analysis** - Using the six countries you identified (three above the average HDI and three below the HDI), you are going to compare various indicators - social and economic traits and global location – to see if you can identify co-existing traits in above average HDI and below average HDI.

- ▶ Use the Identify tool to click on each country and record the demographic information on the collection sheet. See alternative method at the end of the lesson.

16) Use the data collection sheet to record the information.

17) Describe the general location of these six countries. Consider which hemisphere and if they are costal, inland, above or below the equator ...

18) Evaluate the data you collected. Is there a correlation (connection) between any of the statistics? If so which statistics seem to be connected? For example: are countries with lower life expectancies countries with higher or lower GDP per capita? Discuss your finding. If you were a member of an NGO, such as the United Nations, what cultural trait would you address to improve the HDI in countries with a low HDI. Support your answer.

## Career Extension

- ▶ Go to the website: <http://www.esri.com/industries.html>
- ▶ Find a career from those listed here that would use demographic information and maps to solve problems and make decisions.
- ▶ Prepare a half-page summary of the types of things that someone would do in this career using GIS.
- ▶ Search the internet and look for job possibilities, salary, and locations.

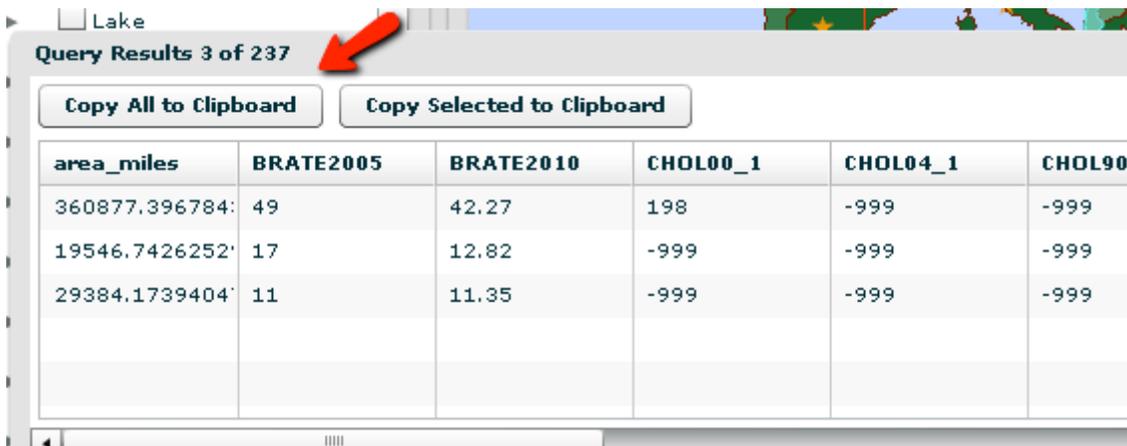
## Download Method to Collect Data

A second way is to query all six countries and download the attribute table.

- ▶ For this query use the Name\_1 field and choose the name from the Get Unique Values list. Then Chose **OR** between each part of your query. The example below shows the query for three countries.

**NAME\_1 = 'Afghanistan' Or NAME\_1 = 'Albania' Or NAME\_1 = 'Belgium'**

- ▶ When your attribute table shows up (you will have 6 of 237) choose Copy All to Clipboard.



Query Results 3 of 237

Copy All to Clipboard    Copy Selected to Clipboard

area_miles	BRATE2005	BRATE2010	CHOL00_1	CHOL04_1	CHOL90
360877.396784	49	42.27	198	-999	-999
19546.7426252	17	12.82	-999	-999	-999
29384.1739404	11	11.35	-999	-999	-999

- ▶ Open a spreadsheet and paste the data in the sheet. You will want to delete some of the fields that are not needed for this lab – Colonization, Disease, Coffee and Cocoa, Shape Length , Shape Area, Object ID are not needed)