Can parks contribute to better health?

Achievement	Achievement with Merit	Achievement with Excellence
Apply spatial analysis, with consultation, to solve a geographic problem.	Effectively apply spatial analysis, with consultation, to solve a geographic problem.	Comprehensively apply spatial analysis, with consultation, to solve a geographic problem.

Requirements:

- Internet access
- Web browser (e.g. Internet Explorer, Mozilla Firefox, Google Chrome)**
- An Esri ArcGIS Online school subscription account user – provided by your teacher

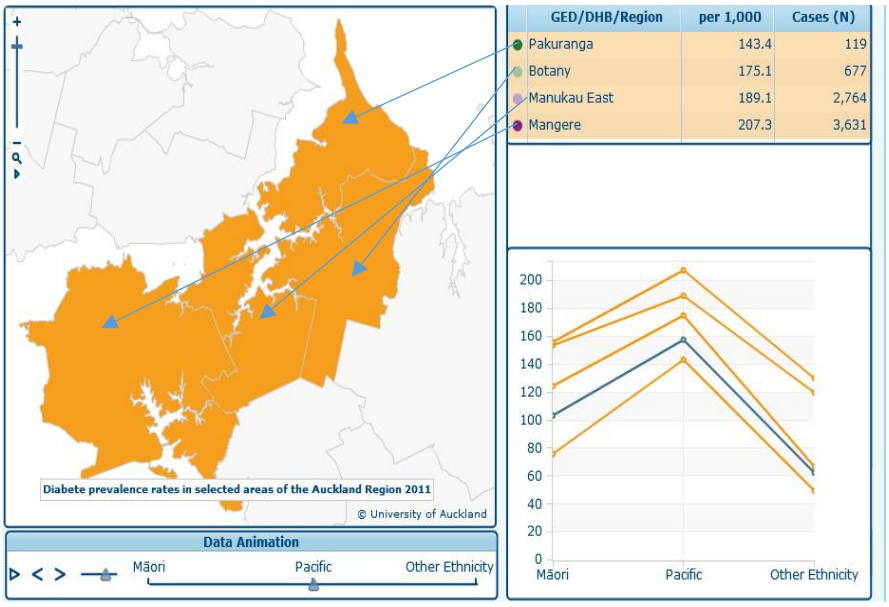
Username: _____

Password: _____

**Please insure that pop ups are not blocked for the arcgis.com site.

Introduction:

Work undertaken by the School of Population Health at the University of Auckland, shows that Mangere and Manukau East have the highest rates of diabetes and cardio-vascular disease in the Auckland Region. Mangere has the highest death rate from cardio-vascular disease in the region. In contrast, Pakuranga has amongst the lowest rates for these statistics. Diabetes prevalence is shown on the image below.



The darker line on the graph is the data for the Auckland Region as a whole.

Accessed 7/6/2015

See the web site below for details.

https://www.fmhs.auckland.ac.nz/en/soph/about/our-departments/epidemiology-and-biostatistics/research/hgd/research-themes/auckland-region-vascular-atlas.html *If the You Tube video will not play using Internet Explorer, use Google Chrome instead.*

Exercise and physical activity are known to improve physical well-being. In Auckland there are many public parks and they are free. Parks can be places where people can exercise and improve their physical and mental health. Parks can also contribute to a sense of community. Children in particular need to be active

and developing good exercise habits early in life to help reduce the risk of obesity and the related diseases of diabetes and heart conditions. However, they are more likely to frequent a park if there is playground equipment. Teenage boys may be more attracted to parks if there is a basketball hoop or court. Fitness stations can assist adults to be more active. Older people may enjoy walking in a park.

Ideally people should live within 400m (5 minutes walking time) and at most 800m (10 minutes walking time) of a park or its equipment. Parks within these distances tend to be better used by residents. But, does everyone have equal access to parks and their equipment and are all parks equally useful in promoting physical activity?

The residents of the Howick Ward want more equipment in their parks. At present there are very few playgrounds, basketball hoops or fitness stations. Residents in the Manukau Ward would also like more facilities. However, Auckland Council has a limited budget and if it provides more equipment, money will not be available for other facilities.

Using GIS the question you have to research and answer is:

Should Auckland Council provide more equipment in their parks in the Howick and/or in the Manukau Ward? If so, what, where and why? If not, why not?

You will have in-class and out-of-class time to complete this assessment. How much time is up to how you allocate your time during the weeks allocated for working on internal assessments.

You will present your findings as a report that advises the Auckland Council about whether or not they should provide more equipment in parks in the Howick and/or Manukau Wards and if so what and where.

You need to fully justify why providing more equipment (and the type of equipment) is a better option than not providing it, (or vice versa) and justifying why you have advised them to locate it in one ward and not the other, if that is the case.

Your report will include:

- layouts (these could consist of maps, graphs, or tables) and may be included in the text like a textbook, or on separate pages. However, you must also present them all together on one or more A3 pages. They must contain the appropriate conventions and be displayed in a logical order.
- a fully justified explanation about whether or not the Council should provide more equipment in parks in the Howick and/or Manukau Wards and if so what and where.
- Justification explaining why your recommendation is better than the other options
- a written explanation and evaluation of the manipulations of the spatial data. You must include specific details and evidence from your layout(s). You must comment on the usefulness of GIS in producing your recommendation.

You will be assessed on how comprehensively you apply spatial analysis to provide recommendations for the Auckland Council.

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The extract below is sourced from http://www.ij-healthgeographics.com/content/8/1/34 and is about access to parks and physical activity sites in New York City in 2009. It is an excellent reference for the work you are going to do. It contains examples of analysis carried out using GIS and the presentation of the results of this analysis. It also comments on strengths and weaknesses of the approaches used.

Abstract

Background

Proximity to parks and physical activity sites has been linked to an increase in active behaviours, and positive impacts on health outcomes such as lower rates of cardiovascular disease, diabetes, and obesity. Since populations with a low socio-economic status as well as racial and ethnic minorities tend to experience worse health outcomes in the USA, access to parks and physical activity sites may be an environmental justice issue. Geographic Information systems were used to conduct quantitative and qualitative analyses of park accessibility in New York City, which included kernel density estimation, ordinary least squares (global) regression, geographically weighted (local) regression, and longitudinal case studies, consisting of field work and archival research. Accessibility was measured by both density of park acreage and density of physical activity sites. Independent variables included percent non-Hispanic black, percent Hispanic, percent below poverty, percent of adults without high school diploma, percent with limited English-speaking ability, and population density.

Results The ordinary least squares linear regression found weak relationships in both the park acreage density and the physical activity site density models (R_a^2 = .11 and .23, respectively; AIC = 7162 and 3529, respectively). Geographically weighted regression, however, suggested spatial non-stationarity in both models, indicating disparities in accessibility that vary over space with respect to magnitude and directionality of the relationships (AIC = 2014 and -1241, respectively). The qualitative analysis supported the findings of the local regression, confirming that although there is a geographically inequitable distribution of park space and physical activity sites, it is not globally predicted by race, ethnicity, or socio-economic status.

Conclusion The combination of quantitative and qualitative analyses demonstrated the complexity of the issues around racial and ethnic disparities in park access. They revealed trends that may not have been otherwise detectable, such as the spatially inconsistent relationship between physical activity site density and socio-demographics. In order to establish a more stable global model, a number of additional factors, variables, and methods might be used to quantify park accessibility, such as network analysis of proximity, perception of accessibility and usability, and additional park quality characteristics. Accurate measurement of park accessibility can therefore be important in showing the links between opportunities for active behaviour and beneficial health outcomes.

Ensure that you regularly SAVE your map to ArcGIS Online and save your report to your folder.

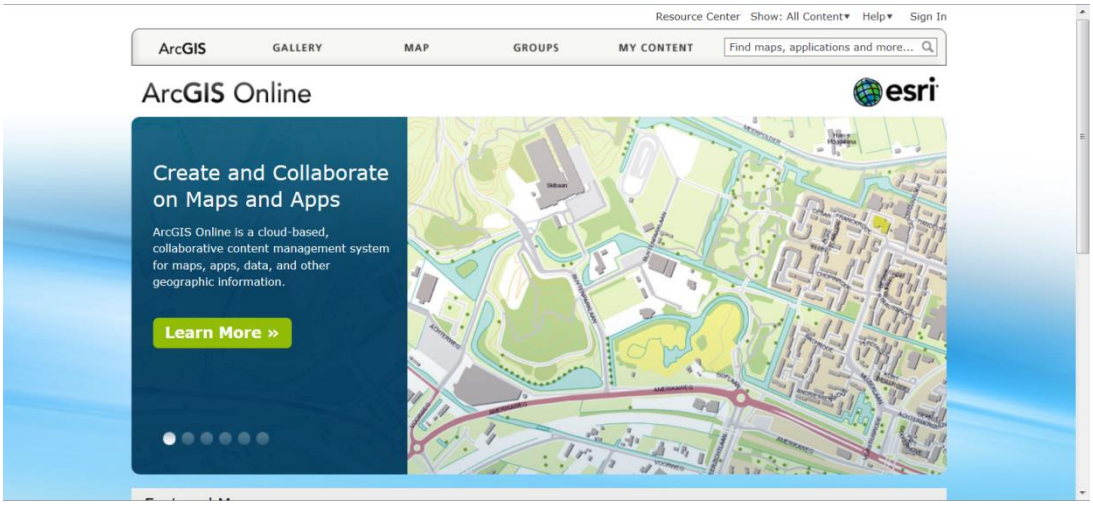
Your final work is due on:

Setup

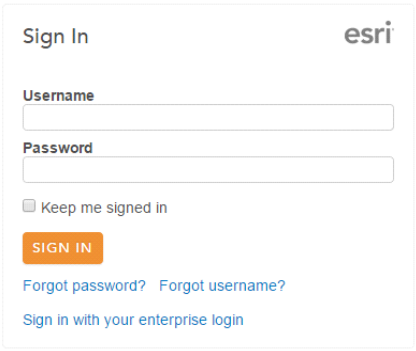
Task A: Setup ArcGIS Online

- Using the ArcGIS Online school subscription account user, provided by your teacher, setup and save a map for this exercise

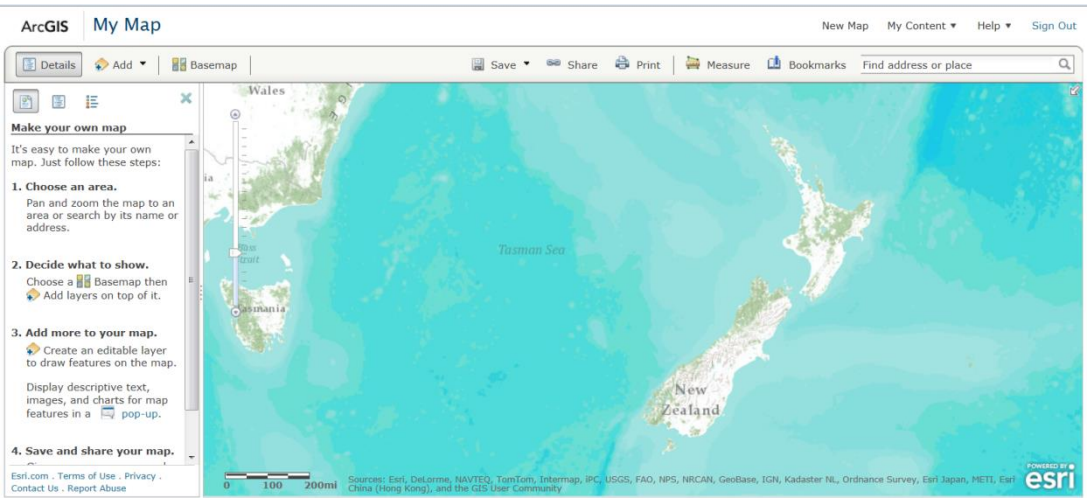
Open ArcGIS Online (http://www.arcgis.com/home/).



Click Sign In to ArcGIS Online and sign in using the account details provided by your teacher.



Click on Map to open a new map.



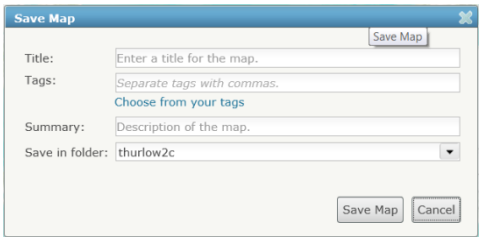
Using the basemap option change the basemap. Try the World Imagery and the World Topographic basemap.

For help changing basemaps visit http://arcg.is/1IbtQ2X

Save your map.

Click the Save button.

Fill in the Save Map dialog that appears with the appropriate information. You should prefix your title with your name; tags are words that are used to search for a WebMap.



Click Save Map.

Task B: Create a folder

- Create a folder on your personal drive to save your data

Task C: Prepare a document for your layout

- Using Word, setup a word document for your layout (of landscape orientation and size A4 or A3, depending the page size the school printer can print) and save it to the folder created in Task B.

  Open a new word document. Save it to the folder you created in Task B using a name of "yourname_parkhealth".

  Change the orientation of the document to landscape, and the page size if you can print at A3 size. This document will be your LAYOUT.

  Save the document.

Data Collection and Manipulation

Task D: Collect and add your data to a map

In consultation with your teacher find, download and add the following layers of spatial information to your map in ArcGIS Online

- NZ Deprivation Index 2013 for Manukau and Howick (the Deprivatio field contains the Deprivation Index value)
    - For just Manukau and Howick or http://arcg.is/2oRC1IY
    - For all of NZ http://arcg.is/2CGomqd
- Auckland Council Boundary http://arcg.is/2D6eeZ1
- Ward Boundaries for Manukau and Howick http://arcg.is/2BzaSgx
- Neighbourhood Parks http://arcg.is/2BJX0Tr
- Auckland Council Public transport routes http://arcg.is/2BB6Rbx

Task E: Data manipulation

Working on your own, use geospatial techniques to analyse your data. You may wish to consider:

- Providing a map of the wider Auckland Region that sets the study areas in context.
- How many parks there are in each ward, what type and how large are they?
- The key socio-economic data e.g. relevant age groups, income, ethnicity
    - This could be as numbers or percentages
    - How many categories? Classification method?
    - Population density?
    - Deprivation?
- Which areas have good accessibility to the parks and therefore play equipment

You may wish to consider using the techniques below to manipulate the data. You can consult with your teacher about this.

- Buffer
    - Locate and click the Perform Analysis option under the appropriate layer if this option does not appear the students user name needs to have its role changed to be the default ArcGIS Online publisher role or a role that has permission to run analysis. For help changing a user's role see http://arcg.is/2fojq2Y. For help understanding roles see http://arcg.is/2kPkuw2

    - Click the sideways arrow beside the Use Proximity option
    - Click Create Buffers

    - Make sure you set the result layer name to '*layername*_Buffer', add an underscore (_) and your initials to the end of the layer name e.g. *layername*_Buffer_jxh
      Note: The Create Buffer Tool should only consume less than 1 credit per student for one tool run.
      Note: The buffer tool can take a few minutes so be patient.
      For help running the buffer analysis tool visit http://arcg.is/1hIOoyF

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- Apply a filter
    - Locate and click the filter option under the appropriate layer – this option will only be available for feature layers added from ArcGIS Online not for shapefiles or layers added from tables
    - Create an expression and apply the filter.

      For help applying a filter visit http://arcg.is/2gR3qVn

- Create new data sets
- Create a choropleth map(s)
    - Using different styles for different layers. For help see, http://arcg.is/1OuxBNE
- Use the intersect tool
    - Locate and click the Perform Analysis option under the appropriate layer 
    - Click the sideways arrow beside the Manage Data option
    - Click Overlay Layers
    - Make sure that the overlay method is set to intersect
    - Make sure you set the result layer name to '*layername*_Intersect', add an underscore (_) and your initials to the end of the layer name e.g. *layername*_Intersect_jxh
      Note: The Overlay Later tool should only consume approximately 1 credit per student for one tool run.
      Note: The overlay layers tool can take a few minutes so be patient.
      For help running the overlay layers tool visit http://arcg.is/2gHsivy

- Adding columns to attribute tables and calculating percentages

  For help adding columns to a table visit http://arcg.is/2hSJ38M

  For help calculating a field visit http://arcg.is/2hBgbnS

- Create pop ups with links to a photograph e.g. photographs you took on the field trip

  For help adding images to pop ups visit http://arcg.is/1xeT70n

- Create a density surface.
    - Locate and click the Perform Analysis option under the appropriate layer 
    - Click the sideways arrow beside the Analyze Patterns option
    - Click Calculate Density
    - Only point and line layers can be used in this tool
    - Make sure you set the result layer name to '*layername*_Density', add an underscore (_) and your initials to the end of the layer name e.g. *layername*_Density_jxh
      Note: The Calculate Density tool should only consume approximately 2 credits per student for one tool run.
      Note: The Calculate Density tool can take a few minutes so be patient.
      For help running the Calculate Density tool visit http://arcg.is/2i2wVW8

What is the course of action that Auckland Council should take?

- What are your recommendations based on the work done using GIS?
- Create visuals – layout(s) that includes maps, tables, and graphs – as appropriate to support your analysis and your recommendation. Use appropriate mapping and graphing conventions. Include them in your report where appropriate. However, you are required to present them all on one or more A3 pages in a logical order.
    - Graphs may be constructed in ArcGIS or in Excel
    - If clearer imagery is available in Google Earth, use it
- Fully justify your recommendation providing detailed supporting evidence from your spatial analysis.
    - This must include an evaluation of why your recommendation is better than the other option
    - Refer to your layout(s) frequently

The written component should be about 2 pages.

Evaluating the manipulations of data

Explain in detail and ***evaluate*** the manipulations you made to the spatial data. You may prefer to include this in your recommendation rather than as a separate section. You must include specific details from and refer to, your layout(s). Screen shots might be useful. Comment on the usefulness of GIS in producing your recommendation.

This should take about 1 page.

Submit your work by the due date.

Ensure that you:

1. Share your map with your teacher.
2. Hand a layout to your teacher.
3. Hand a written report to your teacher.
    - Your written report must include a cover sheet with your name and assessment details on it
4. You must hand your booklet in on the due date too.

How will you know the level of your own work in relation to the requirements of the standard?

Achieved

You will *apply spatial analysis* which involves:

- collecting spatial data relevant to the geographic question
- completing manipulations of the spatial data to produce a layout related to the question or problem
- explaining an appropriate solution based on the manipulations, that is supported by evidence

Merit

You will *effectively apply spatial analysis* which involves:

- collecting sufficient spatial data to address the geographic problem
    - as above
- completing manipulations of the spatial data to produce an accurate layout related to the question or problem
    - criteria more accurately and completely identified
- explaining, in detail, appropriate solutions, based on the manipulations, that is supported by evidence and justifies one solution as a better than the alternatives.

Excellence

You will *comprehensively apply spatial analysis* which involves:

- fully explaining a valid solution, based on the manipulations, that is supported by detailed evidence, including a holistic understanding to demonstrate why one solution is belter that the alternatives

Assessment schedule: Geography 91433 - Can parks contribute to better health?

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
The student applies spatial analysis, with consultation, to solve a geographic problem. This means the student: • Able to locate appropriate / relevant spatial data to enable solving the geographic problem and adds this to a GIS. They process the data using some relevant geospatial techniques • produces a layout(s) that includes some of the following: maps, tables, and graphs. Geographic conventions have been followed • explains their manipulations of the data • presents a written analysis of the problem that recommends a solution which is supported by evidence from the student's spatial analysis • uses geographic terminology and concepts.	The student effectively applies spatial analysis, with consultation, to solve a geographic problem. This means the student: • Able to locate appropriate / relevant spatial data to enable solving the geographic problem and adds this to a GIS. The student also collects or digitises further data that is relevant. Overall sufficient data is collected to address the geographic problem identified • processes the data using a range of relevant geospatial techniques • produces an accurate layout(s) that includes some of the following: maps, tables, and graphs, following geographic conventions and there is evidence of cartographic layout • presents a detailed explanation of their manipulations of the data • presents a justified solution to the geographic problem. The solution is supported by evidence from the student's spatial analysis. The justification demonstrates why it is better when it is consideredd against alternative solutions • uses geographic terminology and concepts. .	The student comprehensively applies spatial analysis, with consultation, to solve a geographic problem. This means the student: • Able to locate appropriate / relevant spatial data to enable solving the geographic problem and adds this to a GIS. The student also collects or digitises further data that is relevant. Overall sufficient data is collected to address the geographic problem identified • processes the data using a range of geospatial techniques • produces an accurate layout(s) that includes some of the following: maps, tables, and graphs, following geographic conventions and there is evidence of cartographic layout • evaluates the manipulations of the data • presents a fully justified solution to the geographic problem. The solution is supported by detailed evidence from the student's spatial analysis. The strengths and weaknesses of the recommendation are evaluated in comparison with alternative courses of action • demonstrates clarity of argument and holistic understanding using appropriate geographic terminology and concepts.

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the Achievement Standard.

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