Population Pyramid

Application and Construction

Resource Note #8

September 2007

Community Social Profile Project

Preface

- The Resource Note is intended to increase our understanding of and broaden our knowledge base on key subject areas that are fundamental in building our capacity in numeric and geographic analysis.
- It is not an in-depth or comprehensive discussion of the subject matter.
- It highlights certain relevant and important areas that deserve our attention and consideration.
- It is intended to be informal and informative.

Introduction

- This is the 8th Resource Note, previous notes include:
  - # 1 – Census Geography
  - # 2 – Census Data
  - # 3 – PCensus Database
  - # 4 – Geocoding,
  - # 5 – Cartographic Principles
  - # 6 – Thematic Mapping
  - # 7 – 2006 Census
- It presents a meaningful way to study the structure and changes of a population of an area of interest (a community or municipality)
- The Population Pyramid (Age Pyramid) illustrates graphically the age and sex distribution of a population, makes it very easy to see and understand the characteristics of the population and its past and future growth potential
- This note describes a few simple steps to create a population pyramid with Microsoft Excel software
- It also shows four types of population pyramids which can serve as reference for comparison purpose
- You can construct a population pyramid for your community with the free 2006 data on age and sex released by Statistics Canada at http://www12.statcan.ca/english/census06/release/release_agesex.cfm

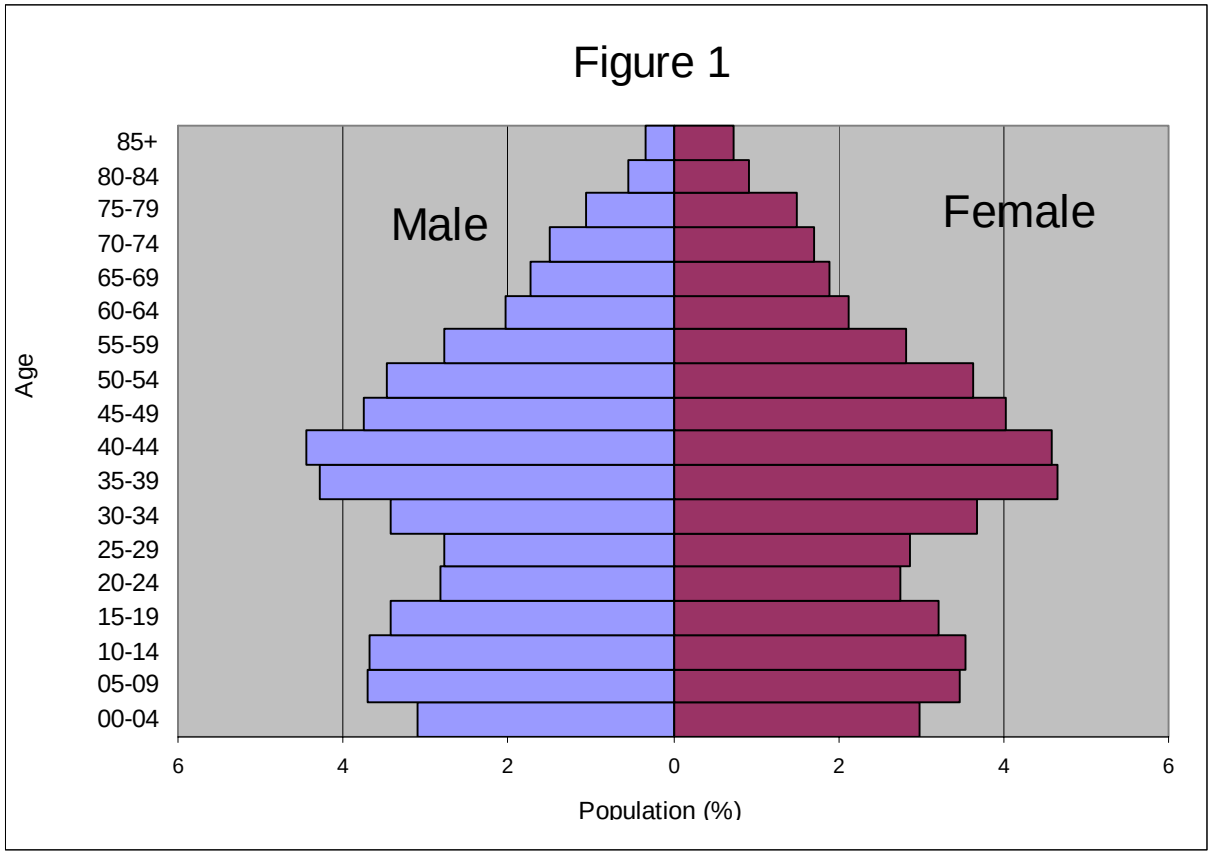
Population Pyramid - application

- A population pyramid reveals a great deal about a population at a glance
- It allows policy makers and service providers to see what kinds of people live in an area and which programs to target to meet their needs
- Its shape can provide significant clues to the past and future of the population
- Pyramids may reveal “baby boomers” as well as the echo generation
- It can show the relationship among various age groups. The relative size of one group compared to another group can have significant social, economic and political implications. For example, the relationship between the “independent” population (under 20 and over 64 years) and the “economic productive” population (between 20 and 64 years)
- By superimposing population pyramids on top of each other, one can learn more about the changes by age groups and gender
- Similar analysis can be conducted on specific population subgroups

Components of a Population Pyramid

- It is a simple horizontal bar chart (Figure 1) constructed around a central axis with bars to the left usually presenting the male population and those to the right the female population
- Each horizontal bar represents the size of the age-sex cohort expressed either in percentage or number of the total population
- The age groups are usually defined in five year intervals

Example of a Population Pyramid



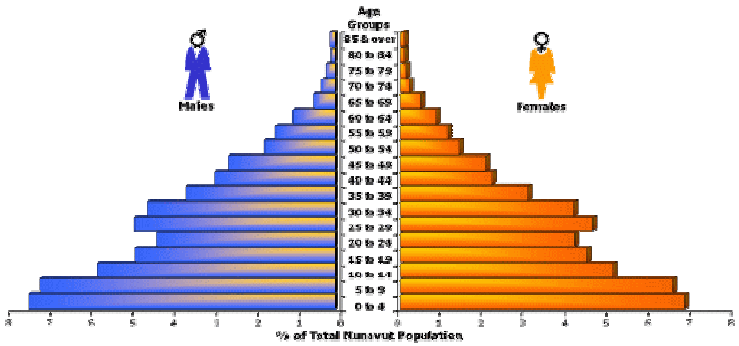
Types of the population pyramid

- The factors that determine the type or shape of a population pyramid are: births, deaths and migration
- There are generally four types of population pyramids* created from age-sex distribution: - (Figure 2)
  - Expansive – a broad base, indicating a high proportion of children, a rapid rate of population growth, and a low proportion of seniors
  - Stable growth – a structure with indentations that even out and reflect slow growth over a period
  - Stationary – a narrow base and roughly equal numbers in each age group, tapering off at the older ages
  - Declining – a high proportion of aged persons and declining numbers.

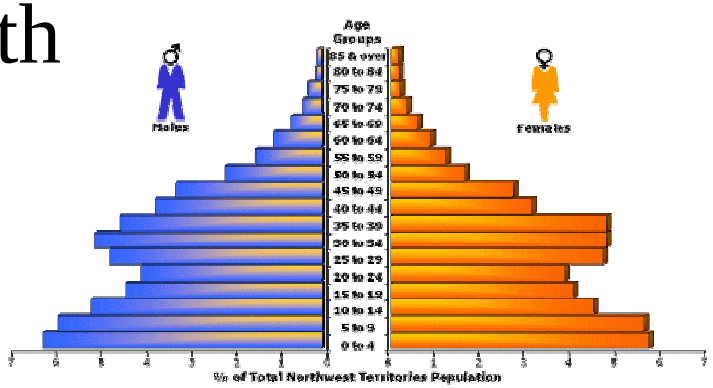
* Vivian Z. Klaff, 1992, *Dem-Lab: Teaching Demography Through Computers*, Prentice Hall:

*Type of Population Pyramids (Figure 2)**

Expansive



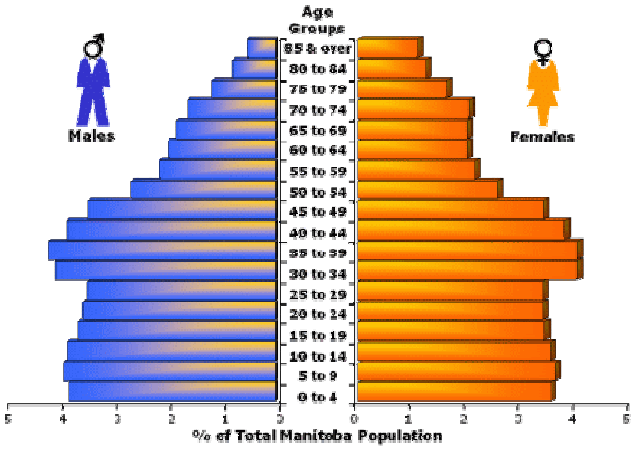
Stable Growth



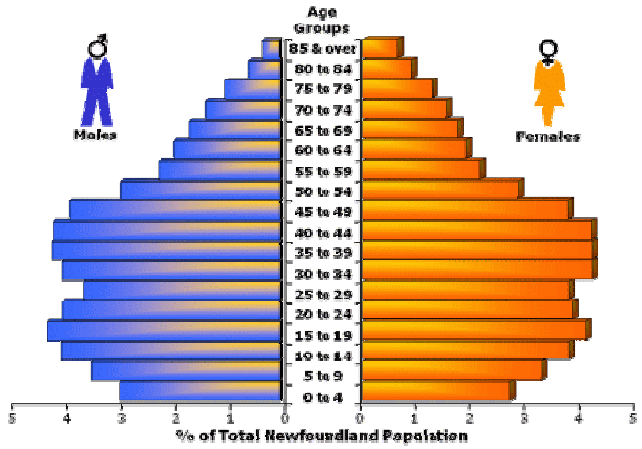
* Natural Resources Canada, The Atlas of Canada

Type of Population Pyramids (Figure 2)

Stationary



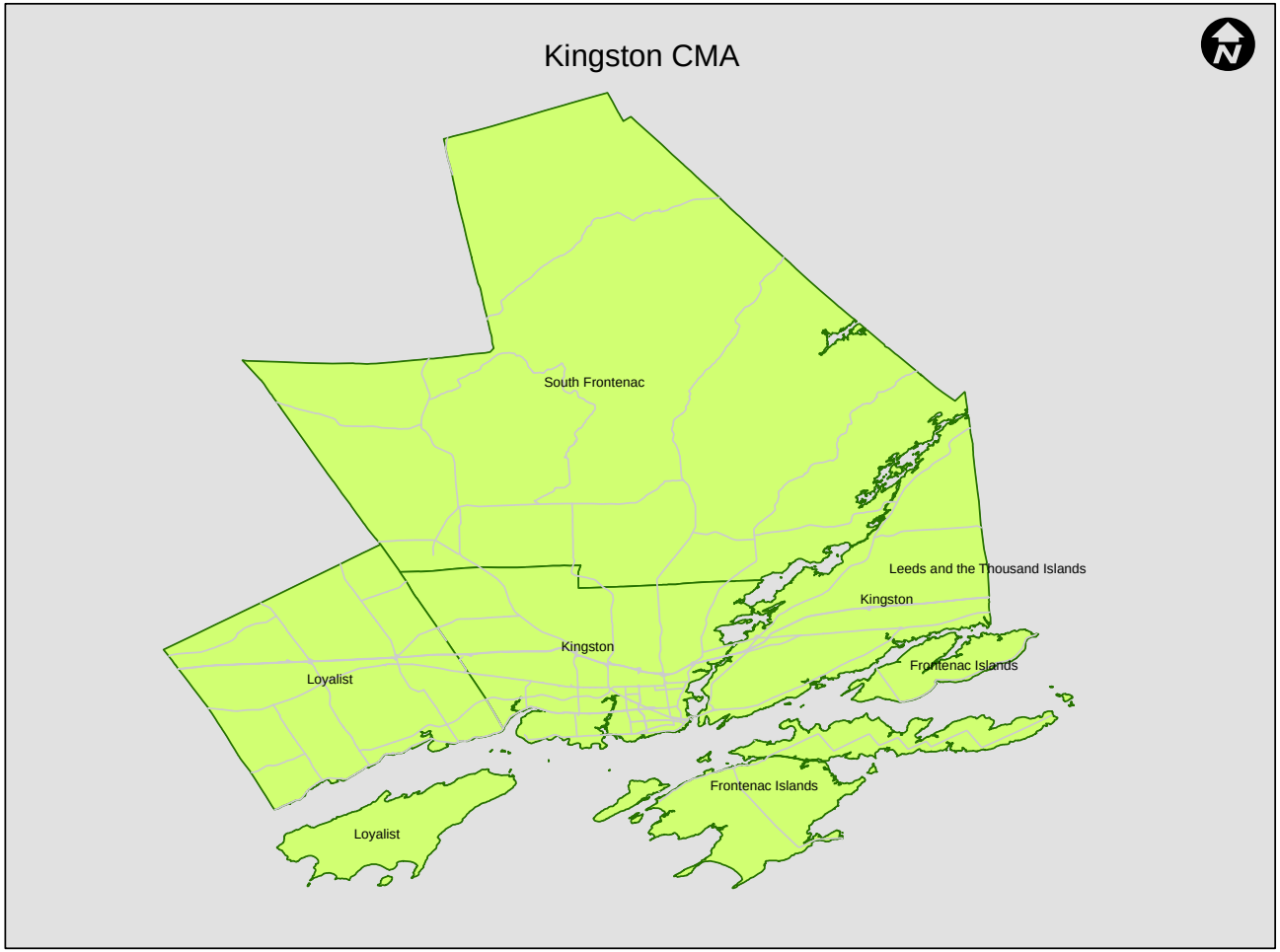
Declining



How to construct a Population Pyramid using Microsoft Excel?

- As an illustration, a population pyramid is constructed for the City of Kingston and Area (Kingston CMA)
- The age-gender data from the 2006 Census will be used
- There are seven steps involved

Kingston CMA



Step 1

- Data Input
- Enter age and sex data into an Excel spreadsheet
- Search for Kingston CMA under 2006 Community Profile (http://www12.statcan.ca/english/census06/data/profiles/community/Index.cfm?Lang=E)
- List the number of females and males separately by 5 year age cohort

Statistics Canada website

www12.statcan.ca/english/census06/data/profiles/community/Index.cfm?Lang=E

Statistics Canada website

www12.statcan.ca/english/census06/data/profiles/community/Index.cfm?Lang=E

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New search > Search results for "Kingston" > Community highlights for Kingston

All data

Kingston
Ontario
(Census metropolitan area)
Select another region

Ontario
(Province)
Select another region

Population and dwelling counts	Kingston (CMA) Total	Male	Female	Ontario Total	Male	Female
Population in 2006[1]	152,358			12,160,282†		
Population in 2001[1]	146,838			11,410,046†		
2001 to 2006 population change (%)	3.8			6.6		
Total private dwellings[2]	70,003			4,972,869		
Private dwellings occupied by usual residents[3]	61,978			4,554,251		
Population density per square kilometre	79.9			13.4		
Land area (square km)	1,906.69			907,573.82		

Age characteristics	Kingston (CMA) Total	Male	Female	Ontario Total	Male	Female
Total population[4]	152,360	74,175	78,185	12,160,285	5,930,700	6,229,580
0 to 4 years	7,275	3,785	3,495	670,770	343,475	327,290
5 to 9 years	7,880	4,025	3,850	721,590	369,670	351,920
10 to 14 years	9,445	4,845	4,595	818,445	420,705	397,740
15 to 19 years	10,180	5,175	5,005	833,115	427,185	405,925
20 to 24 years	11,200	5,510	5,690	797,255	400,445	396,815
25 to 29 years	9,780	4,845	4,930	743,695	360,525	383,170
30 to 34 years	8,890	4,495	4,395	791,955	382,030	409,925
35 to 39 years	10,020	4,985	5,030	883,990	430,220	453,770
40 to 44 years	12,350	6,120	6,230	1,032,415	507,130	525,280
45 to 49 years	12,140	5,830	6,310	991,970	486,390	505,585
50 to 54 years	11,165	5,405	5,760	869,400	423,345	446,060
55 to 59 years	10,490	5,045	5,440	774,530	378,530	395,995
60 to 64 years	8,185	3,965	4,220	581,985	283,545	298,440
65 to 69 years	6,420	3,155	3,260	466,240	222,640	243,600
70 to 74 years	5,690	2,595	3,100	401,950	187,510	214,445
75 to 79 years	4,760	2,100	2,665	338,910	149,585	189,325
80 to 84 years	3,665	1,390	2,270	250,270	97,240	153,035
85 years and over	2,830	895	1,930	191,810	60,555	131,260
Median age of the population[5]	40.7	39.4	41.8	39.0	38.1	39.9
% of the population aged 15 and over	83.9	82.9	84.7	81.8	80.9	82.7

Step 1 (cont'd)

	Total	Male	Female
0-4	7,275	3,785	3,495
5-9	7,880	4,025	3,850
10-14	9,445	4,845	4,595
15-19	10,180	5,175	5,005
20-24	11,200	5,510	5,690
24-29	9,780	4,845	4,930
30-34	8,890	4,495	4,395
35-39	10,020	4,985	5,030
40-44	12,350	6,120	6,230
45-49	12,140	5,830	6,310
50-54	11,165	5,405	5,760
55-59	10,490	5,045	5,440
60-64	8,185	3,965	4,220
65-69	6,420	3,155	3,260
70-74	5,690	2,595	3,100
75-79	4,760	2,100	2,665
80-84	3,665	1,390	2,270
85+	2,830	895	1,930
	152,365	74,165	78,175

Step 2 – Edit Data

- Calculate the percentage of both male and female population in each age cohort
  - for female population
    - (=female population/152365)*100)
  - for male population (convert % into negative numbers
    - (=male population /152365)*-100)

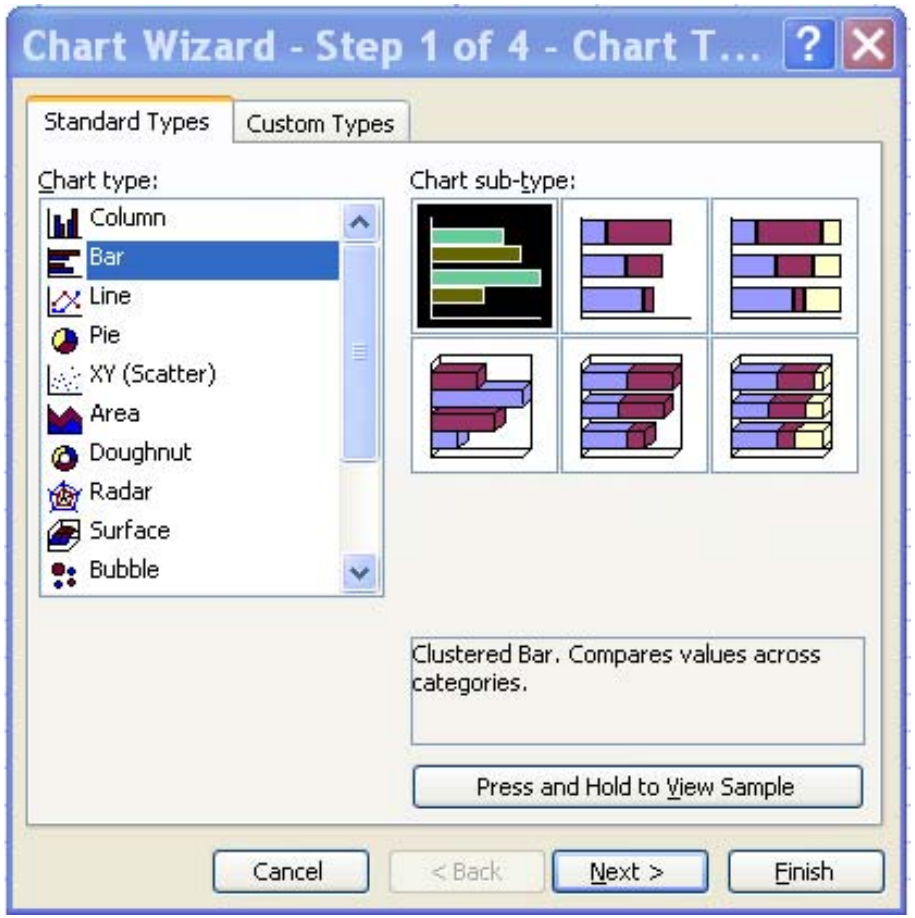
Step 2 – Edit data

	Male	Female
0-4	-2.48417	2.293834
5-9	-2.64168	2.526827
10-14	-3.17986	3.015784
15-19	-3.39645	3.284875
20-24	-3.61632	3.734453
24-29	-3.17986	3.235651
30-34	-2.95015	2.884521
35-39	-3.27175	3.301283
40-44	-4.01667	4.088866
45-49	-3.82634	4.141371
50-54	-3.5474	3.780396
55-59	-3.31113	3.570374
60-64	-2.6023	2.769665
65-69	-2.07069	2.139599
70-74	-1.70315	2.034588
75-79	-1.37827	1.749089
80-84	-0.91228	1.489843
85+	-0.58741	1.266695

Step 3 Create Chart

- Select the data field, including the column titles and data label (e.g. male, female)
- Select **Insert** from the menu, choose option**-Chart**
- A Chart wizard will appear.
  - 1. Standard Types > **Bar**
  - 2. Chart sub type > **Clustered bar**
  - 3. Left-click **Next>**
  - 4. Go through the subsequent steps until you finish the chart wizard

Step 3 – Chart Wizard

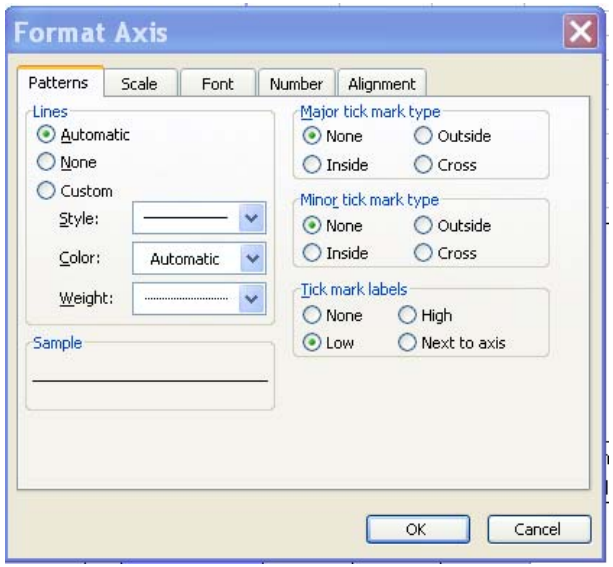


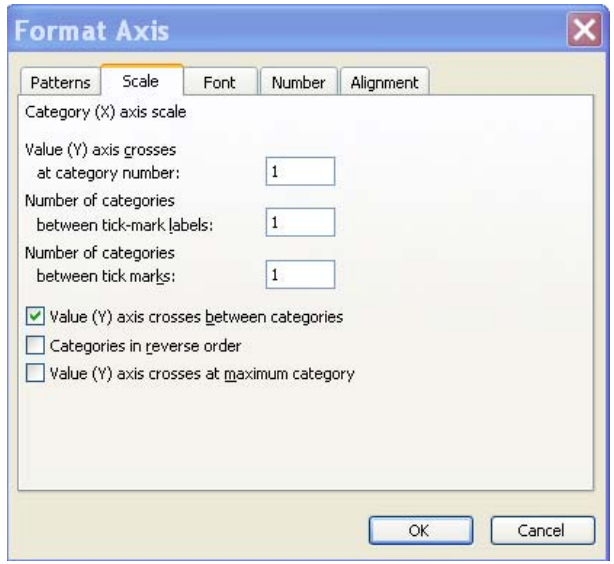
Step 3 – Chart Wizard

Step 4 – Arrange the vertical axis

- Do the following to the chart created;
  - 1. Move the cursor over the vertical axis
  - 2. Right-click and choose **Format Axis** – from the pop-up menu
  - 3. From the Format Axis dialog box
    - Left-click on the **Patterns** tab and do the following:
    - Major tick mark type > Select **None**
    - Minor tick mark type > Select **None**
    - Tick mark labels > Select **Low**
    - Left-click on the **Scale** tab and set Number of categories between tick mark to "**1**"
  - 4. Left-click **OK** to exit

Step 4 – Format Axis

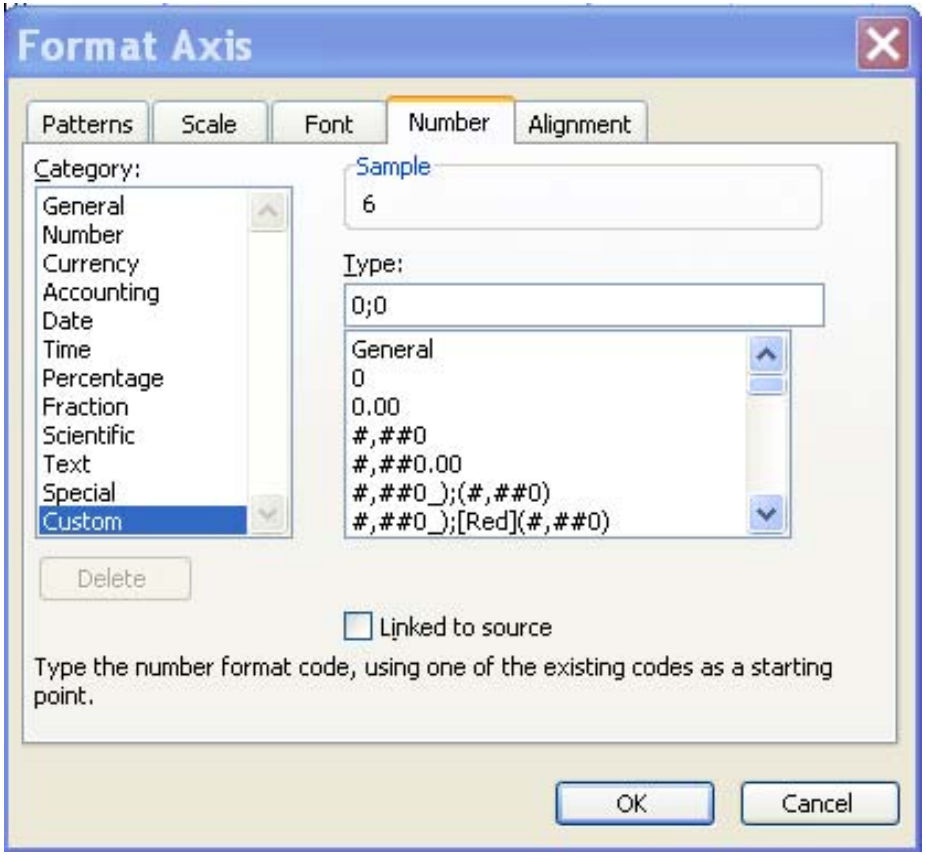




Step 5 – Adjust the Horizontal Axis

- Do the following
  - 1. Move the cursor over the horizontal axis
  - 2. Right-click on it, and select **Format Axis**, from the pop-up menu
  - 3. From the Format Axis dialog box
    - Left-click on the **Number** tab and do the following
      - Category: > Select the **Custom** option
      - Type: > Type in **0;0** in the Type box (this will take care of the negative numbers on the male-side axis)
  - 4 Left-click **OK** to exit

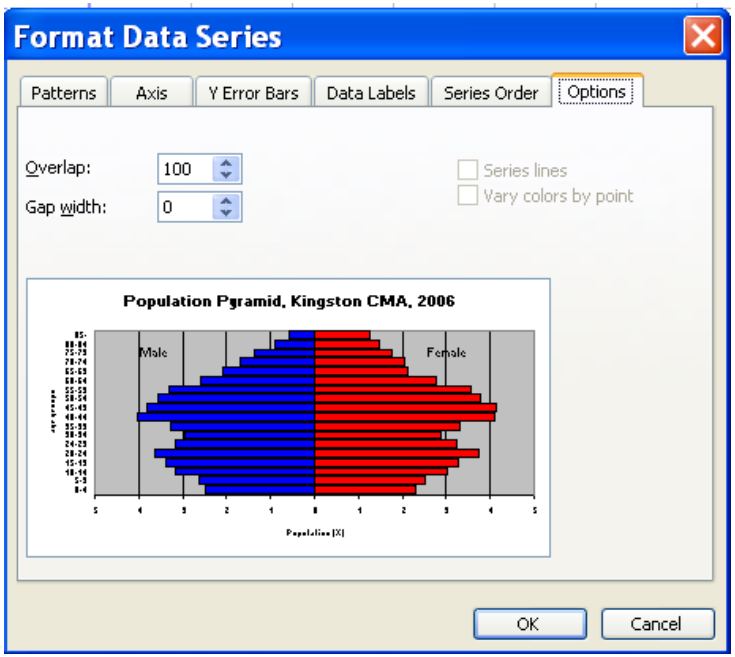
Step 5 – Format Axis

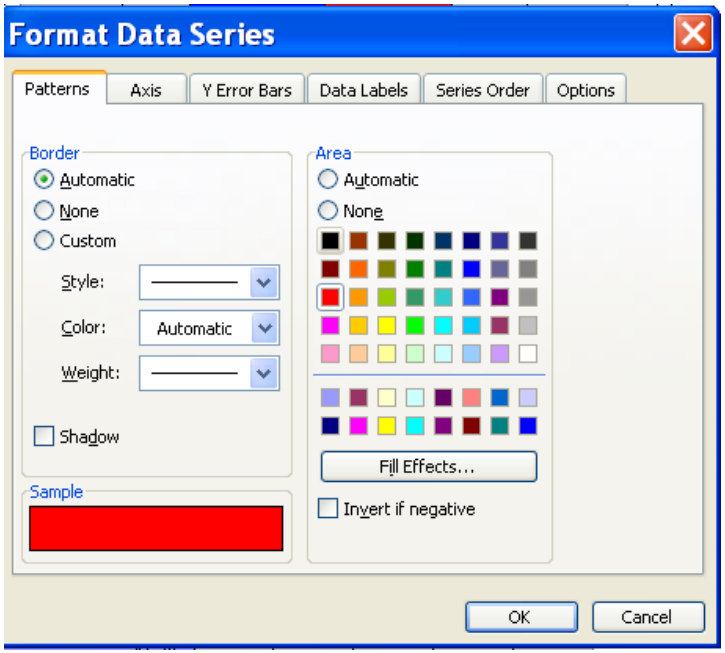


Step 6 Adjusting the bars

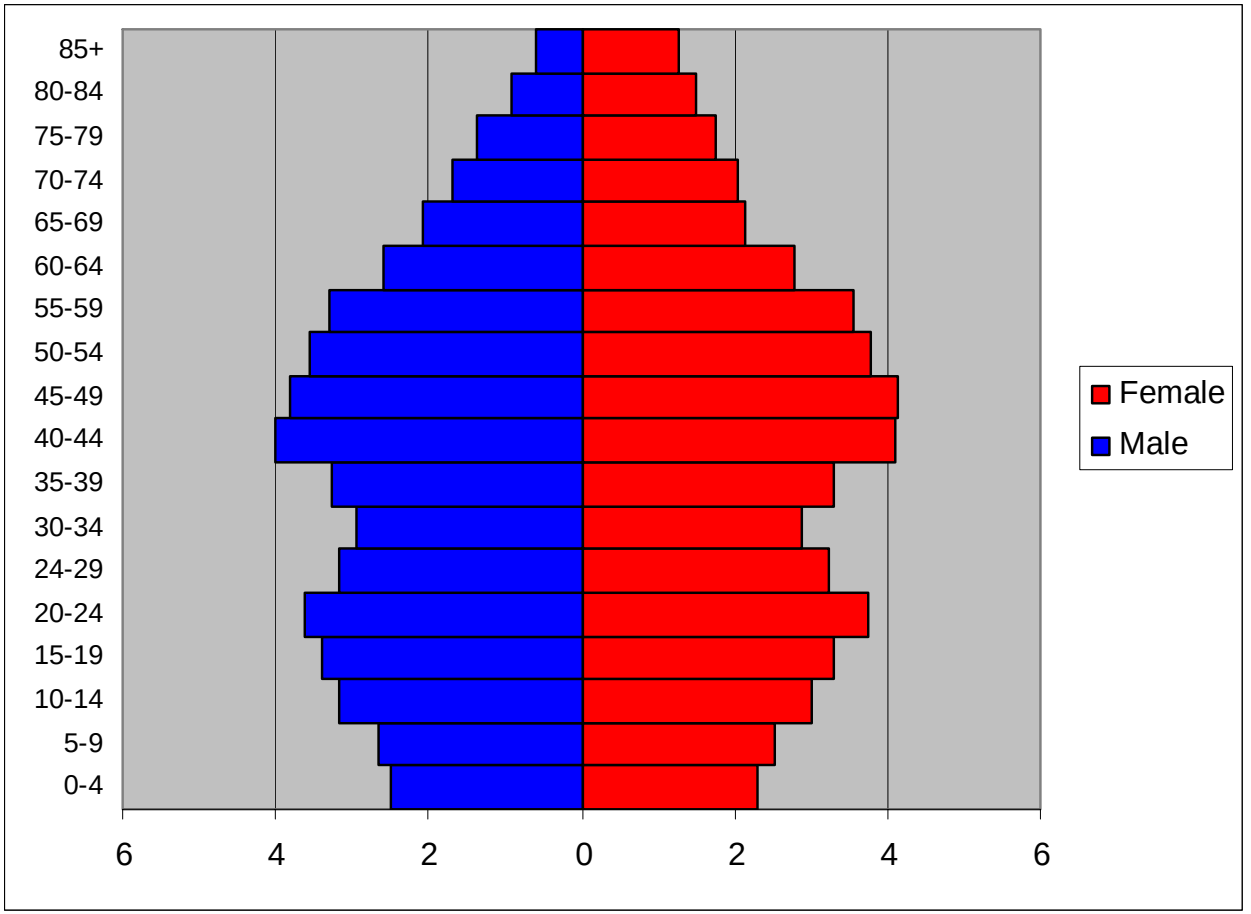
- Do the following
  1. Move the cursor over to the bars (i.e. data series)
  2. Right-click and select Format Data Series, from the pop-up menu, either male or female data series will do.
  3. From the Format Data Series dialog box
     - Left-click on the **Options** tab and do the following
       - Overlap:> Type **100** in the text box
       - Gap width:> Type **0** in the text box
     - Left-click on the **Patterns** tab and choose the colour for the bar
  4. Left-click **OK** to exit

Step 6 Adjusting the bars





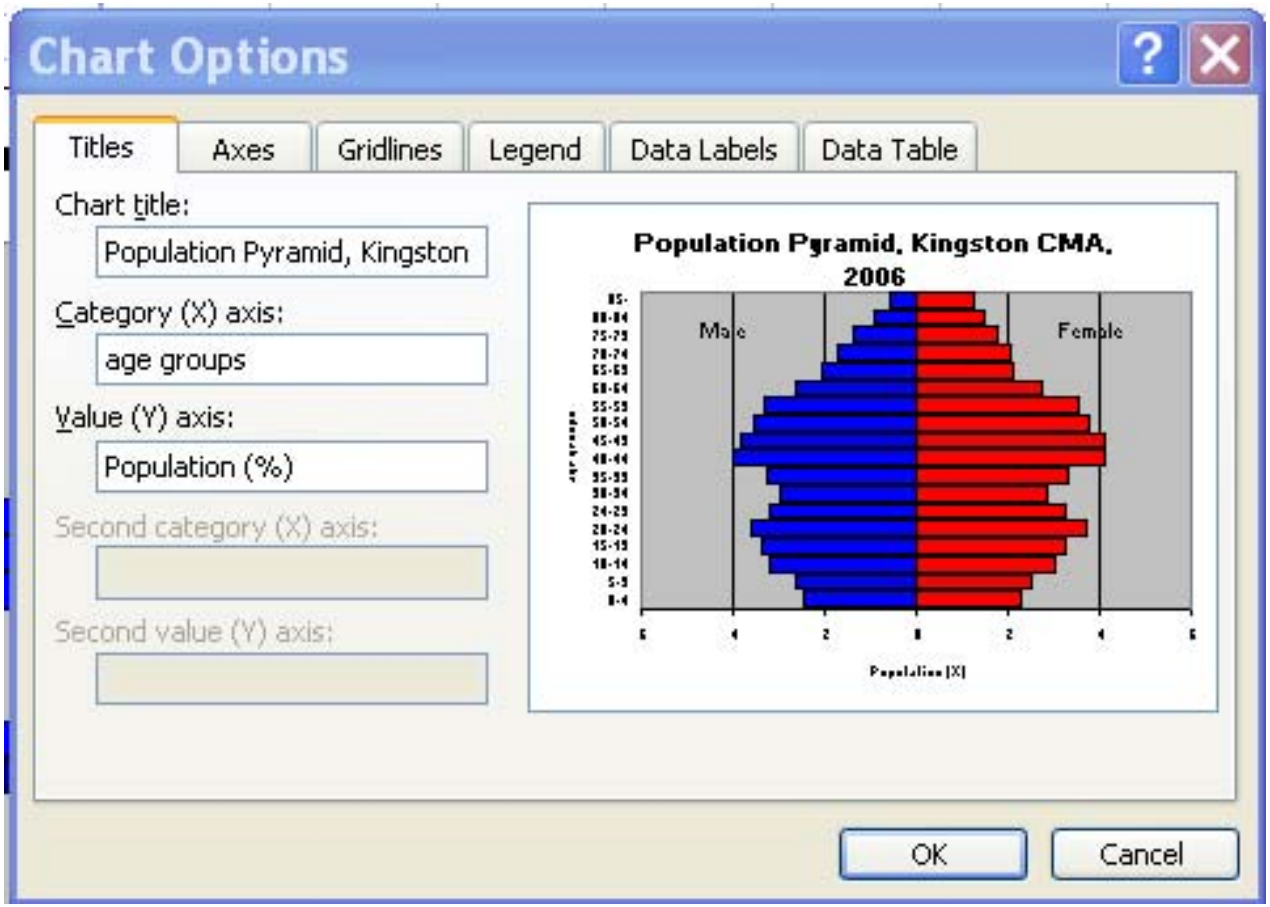
Step 6 Adjusting the bars



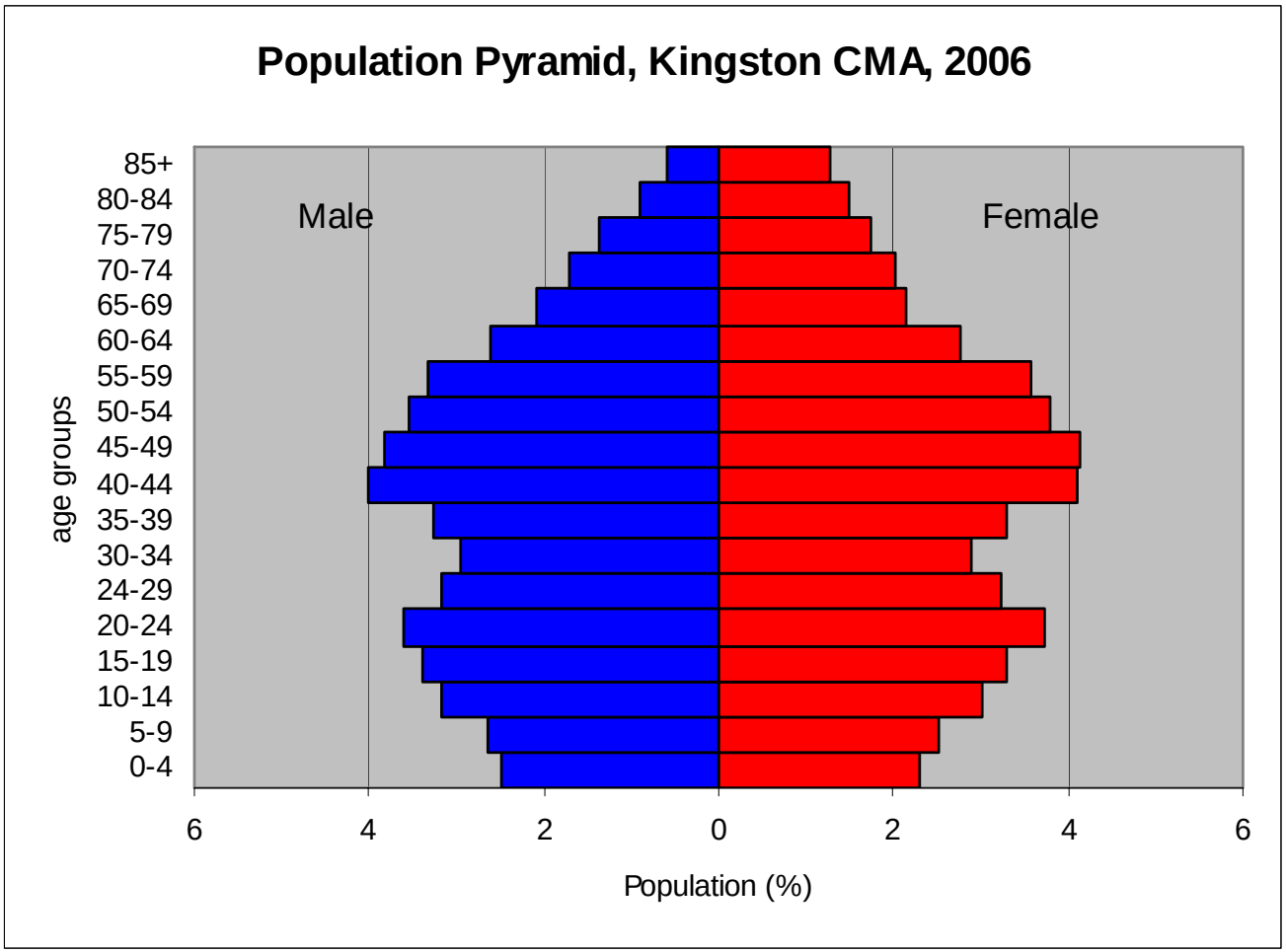
Step 7: Finishing Touch

- Add titles to the chart
  1. Move the cursor over to plot area
  2. Left-click and select **Chart Options**
  3. Enter information to Chart Title, Category (X) axis and Value (Y) axis
- Add “Female” and “Male” text boxes to chart – delete legend
- Adjust font size for titles

Step 7 Add Titles



Population Pyramid for Kingston CMA



Comparing two population pyramids

- By superimposing one pyramid on top of another, visual comparison of the changes in age-sex structure of a population over time can be easily made
- To construct a superimposed pyramid, follow most of steps as outlined earlier with some modifications.
- To illustrate the process, the 2001 population for Kingston CMA will be added and compared with the 2006 population

Adding 2001 Data

- Extract 2001 population data by age and gender for Kingston CMA from PCensus database
- Calculate the percentages of both male and female population in each age cohort
- Add 2001 data to the table with the 2006 data

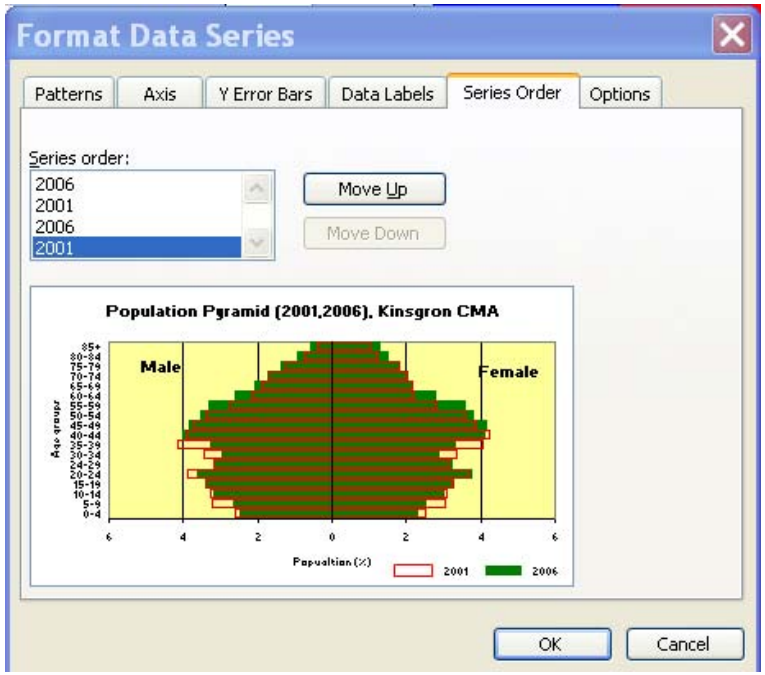
Adding 2001 data (cont'd)

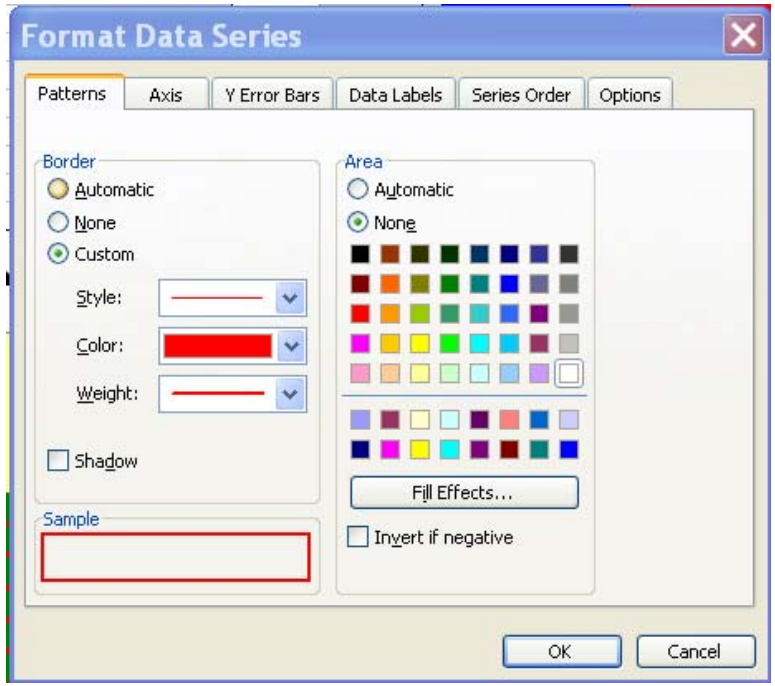
	Male		Female	
	2001	2006	2001	2006
0-4	-2.61277	-2.48417	2.510174	2.293834
5-9	-3.20098	-2.64168	3.064191	2.526827
10-14	-3.26596	-3.17986	3.08813	3.015784
15-19	-3.3583	-3.39645	3.272802	3.284875
20-24	-3.86786	-3.61632	3.683185	3.734453
24-29	-3.16679	-3.17986	3.146267	3.235651
30-34	-3.44721	-2.95015	3.361718	2.884521
35-39	-4.14487	-3.27175	4.059369	3.301283
40-44	-3.93967	-4.01667	4.2543	4.088866
45-49	-3.70028	-3.82634	3.861017	4.141371
50-54	-3.4096	-3.5474	3.55323	3.780396
55-59	-2.72904	-3.31113	2.807702	3.570374
60-64	-2.14767	-2.6023	2.195547	2.769665
65-69	-1.91512	-2.07069	2.14425	2.139599
70-74	-1.65521	-1.70315	2.010875	2.034588
75-79	-1.22773	-1.37827	1.809104	1.749089
80-84	-0.75921	-0.91228	1.234568	1.489843
85+	-0.40012	-0.58741	0.995178	1.266695

Adjusting the bars

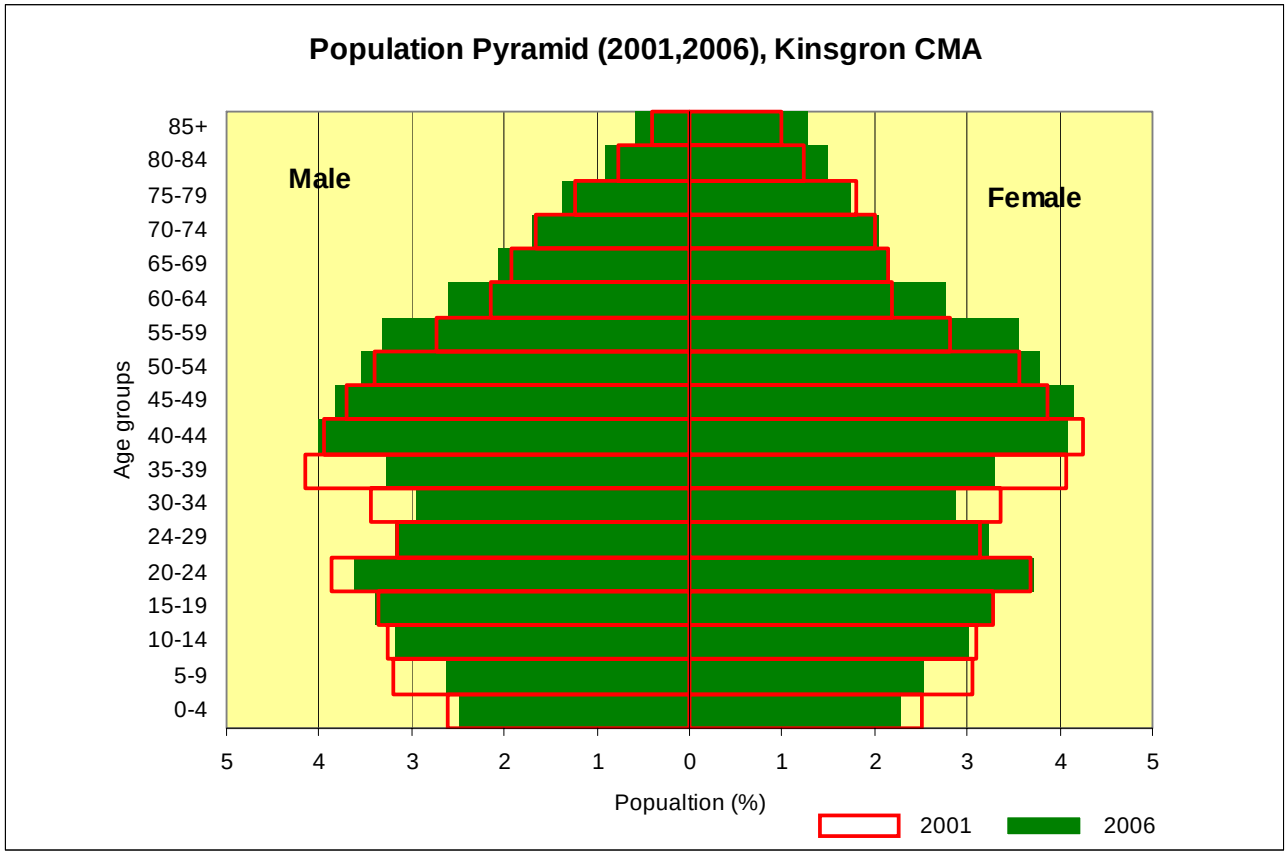
- In order to show the differences between the two years (2001 and 2006), choose a solid colour for one year and an outline with "hollow" colour for the other year
- From Data Format Series
  - Click **Series Order** to arrange the order of the bars to correspond to the colour or pattern of your choice

Adjusting the bars

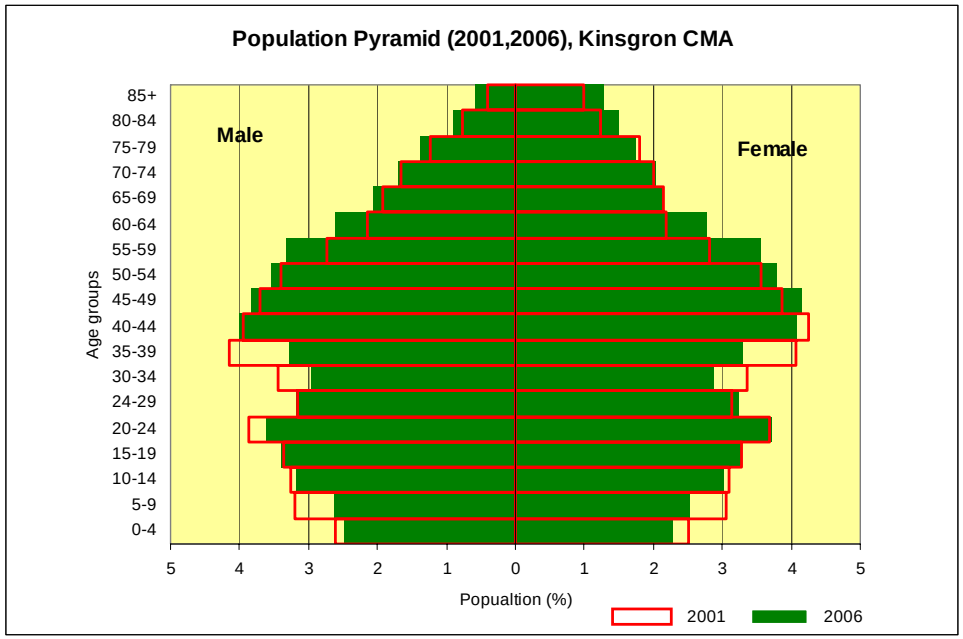




Superimposed pyramids



Some observations



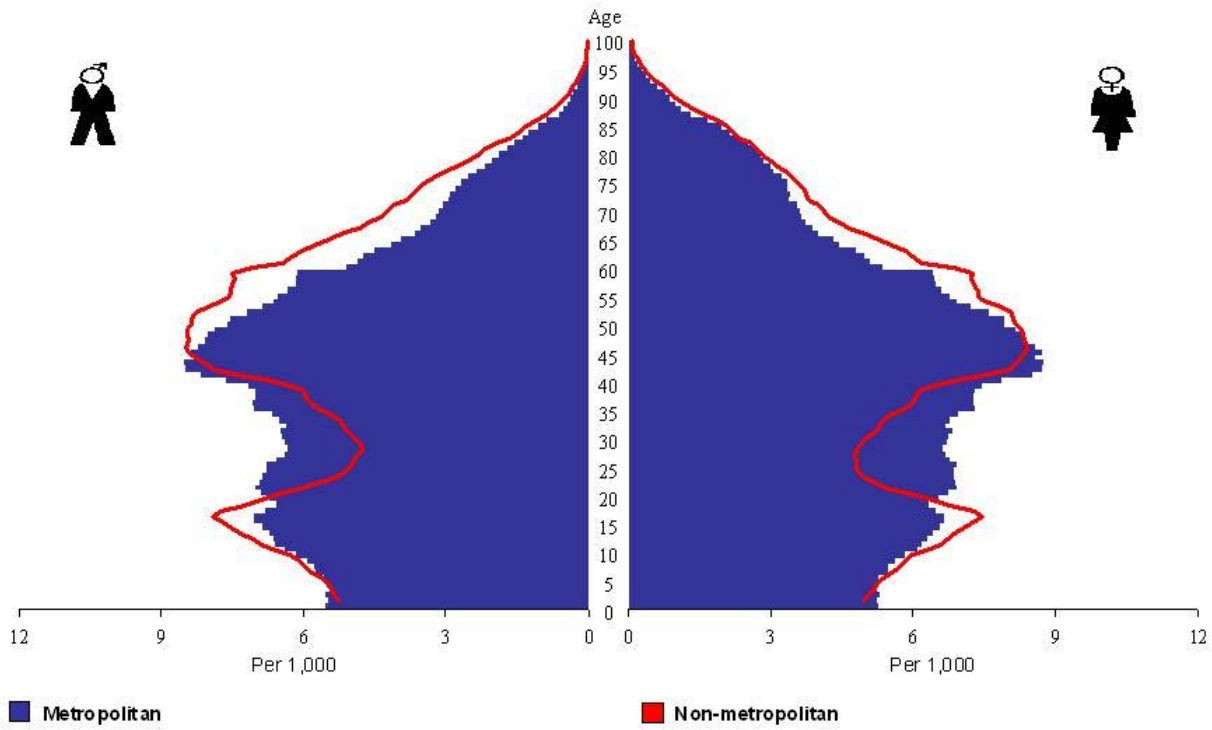
Between 2001 and 2006

- almost all age groups below 39 yrs old experienced decline regardless of gender
- biggest decrease – 35-39 yrs age group
- two age groups (55-59 and 60-64) had the greatest increase
- the imbalance between male and female emerged above 55 yrs, most pronounced at 85yrs+

Comparing Population Pyramids

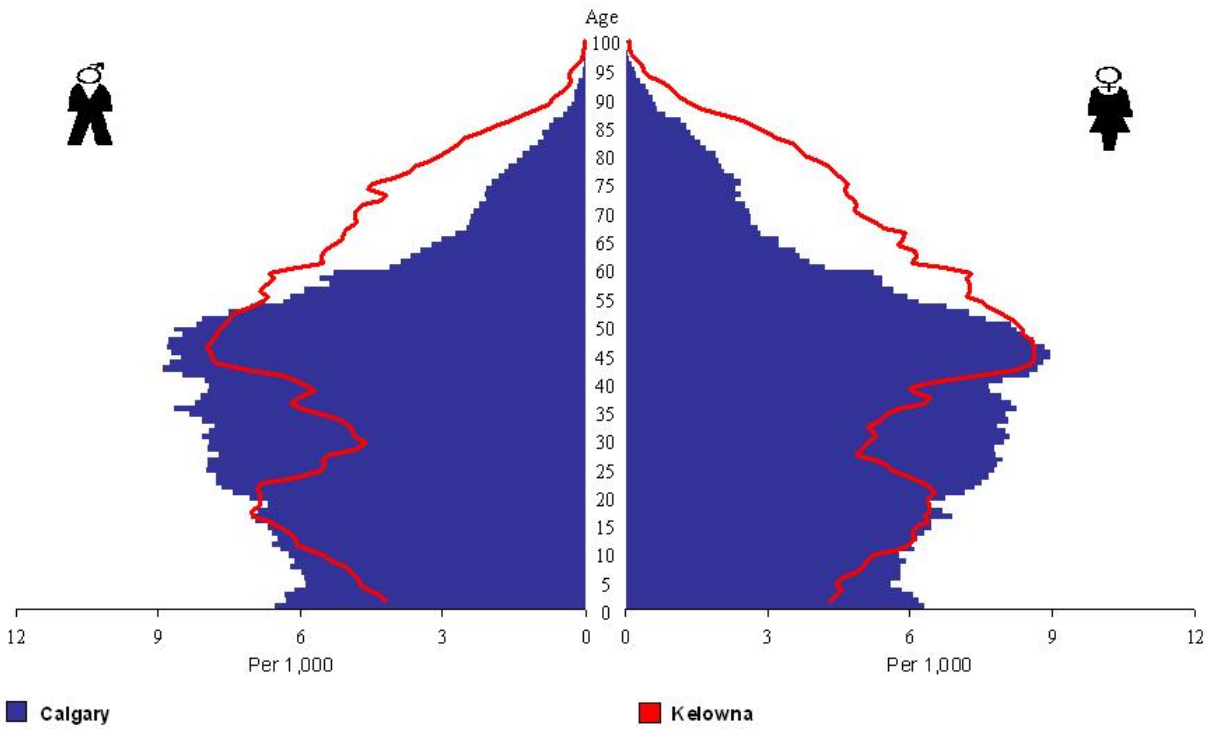
- Here are some samples of comparative age pyramids (between areas instead of time periods) produced by Statistics Canada
- The overall shape of the pyramid is the result of using single year cohorts instead of age groups
- Source: Statistics Canada, Portrait of the Canadian Population in 2006, by age and sex, 2006 Census (catalogue no 97-551-XIE) – free of charge

Comparing Population Pyramids



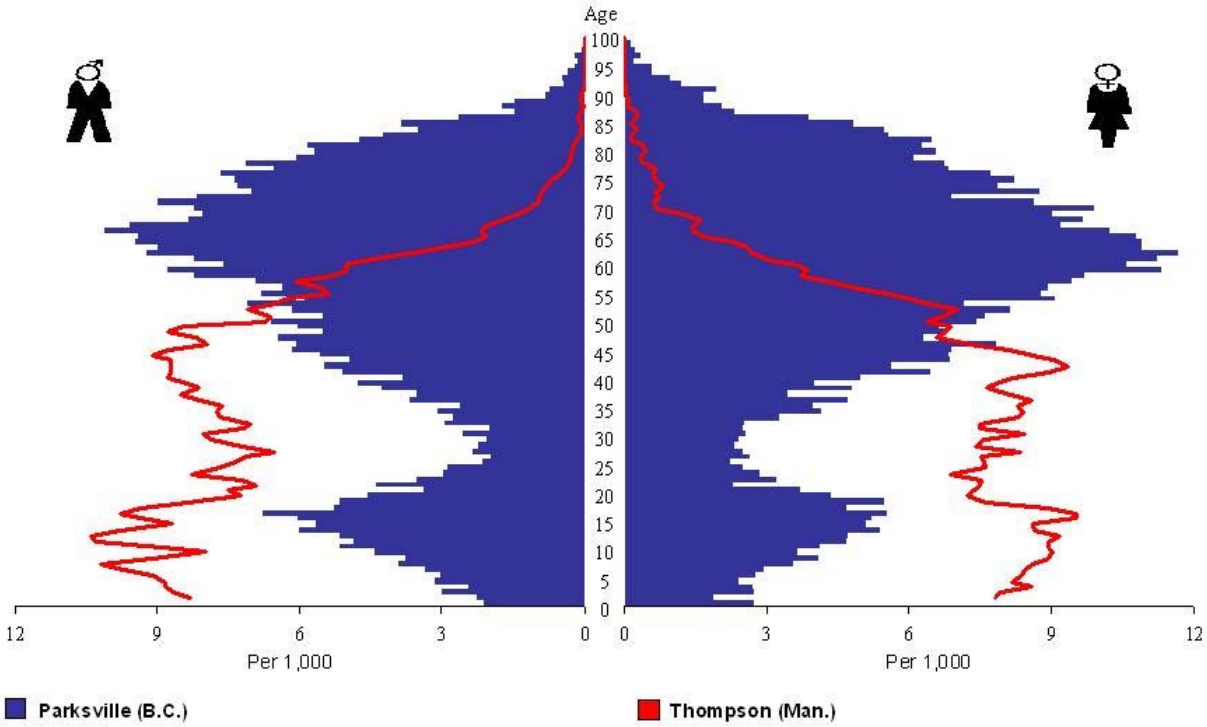
Age pyramid of the Canadian population living in metropolitan
And non-metropolitan areas in 2006

Comparing Population Pyramids



Age pyramid of the population in Kelowna (B.C.) and Calgary (Alta) CMA in 2006

Comparing Population Pyramids



Age pyramid of the mid-size urban centres population of Parksville (B.C.) and Thompson (Man.) in 2006

What Have We Learned?

- Use of Population Pyramid to study the age and gender structure of a population
- Four different shapes of population pyramid indicating expansive, stable growth, stationary and declining state of the population
- How to construct a population pyramid using Microsoft Excel spreadsheet
- How to superimpose one pyramid on top of another and interpret the differences

Any questions or comments?

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Thank you