

Tableau public link:

https://public.tableau.com/profile/li.jing8612#!/vizhome/Book2_15600559208700/Dashboard?publish=yes

1. Task and data source

Our task is to design an interactive and animated data visualization to reveal the changing patterns of demographic structure of Singapore population by age cohort (i.e. 0-4, 5-9,.....) and economy participation (i.e. economy active group (age 25-64) and the young (age 0-24) and the aged group (i.e. 65 and above) in Singapore by geographical hierarchy (i.e. region, planning area and planning sub-zone).

The data I used is provided in Singapore Residents by Planning Area/Subzone, Age Group and Sex, June 2000 – 2018 table. It is available digitally at <https://www.singstat.gov.sg/find-data/search-by-theme/population/geographic-distribution/latestdata>.

2. Major design challenges and suggestion

Challenge 1

There are 57 planning areas and 374 subzones, it is not possible to show all the 57 planning areas or 374 subzones' individual graph in one static graph.

Solution: we can make an interactive graph which allow users to select and view a particular planning area or subzone.

Challenge 2

The population data is from 2000 to 2018 and we want to not only select one particular year to view but also monitor how the population change pattern over past 19 years.

Solution: We can use animation to show how the population change over the time, which means when user choose animation, the graph will show some points move over the time.

Challenge 3

For particular planning area and subzone, how can we show the population distribution with demographic data such as age and sex effectively in one graph.

Solution: We can use population pyramid.

Challenge 4

The economy participation consists of 3 components, young group, economic active group and aged group, so how can we design the graph to effectively view the percentage of total for each group, make a comparison and monitor the change over time as well.

Solution: We can use ternary plot which can present 3-dimensional data in a triangle and the sum of 3 components is 1.

Challenge 5

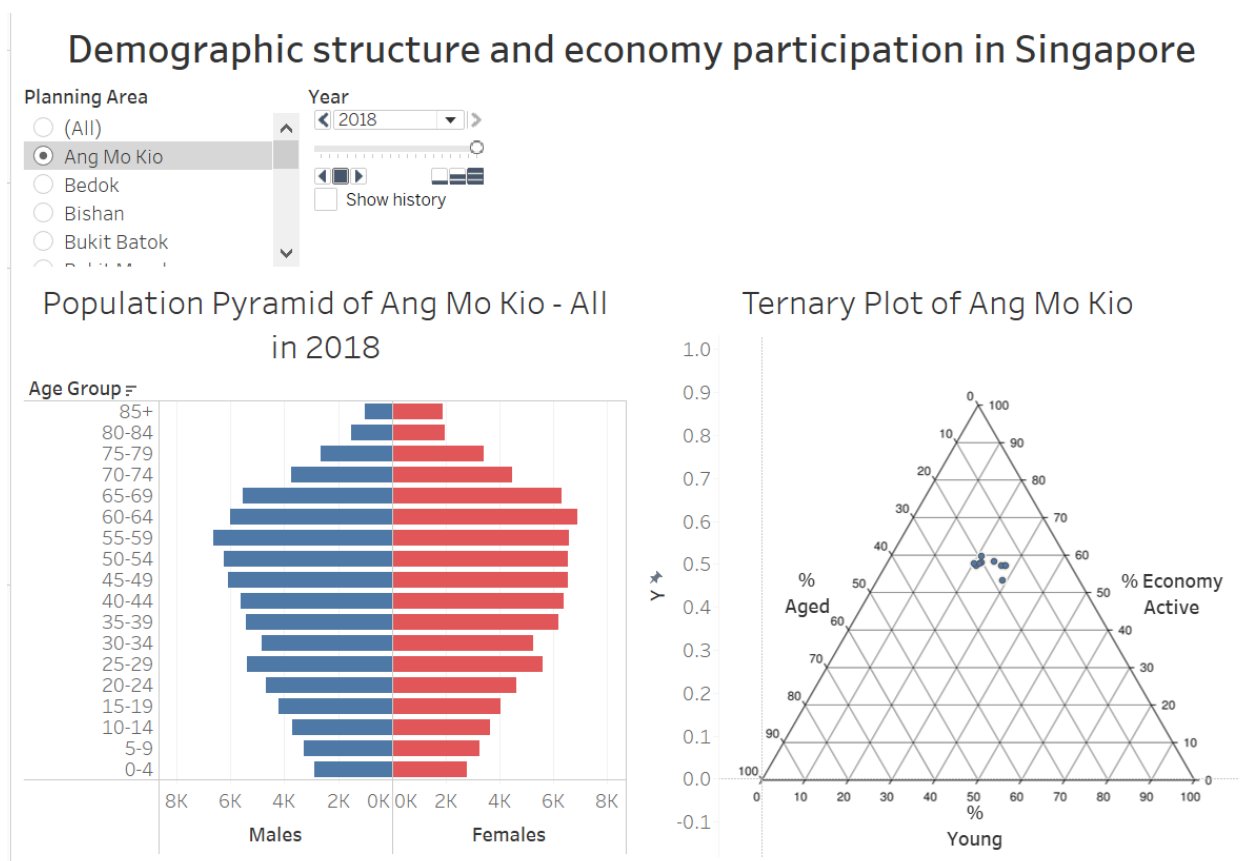
We want to select and view the ternary plot of economy participation components for one particular planning area first, and then in the graph, select the subzones which we are interested and view the population pyramid directly without select the subzone again in the filter pane.

Solution: We can show all the subzones' point in the ternary plot and add action function, so that when we click a subzone in the ternary plot, the population pyramid graph will automatically present the selected subzone's population pyramid.

3. Proposed data visualization

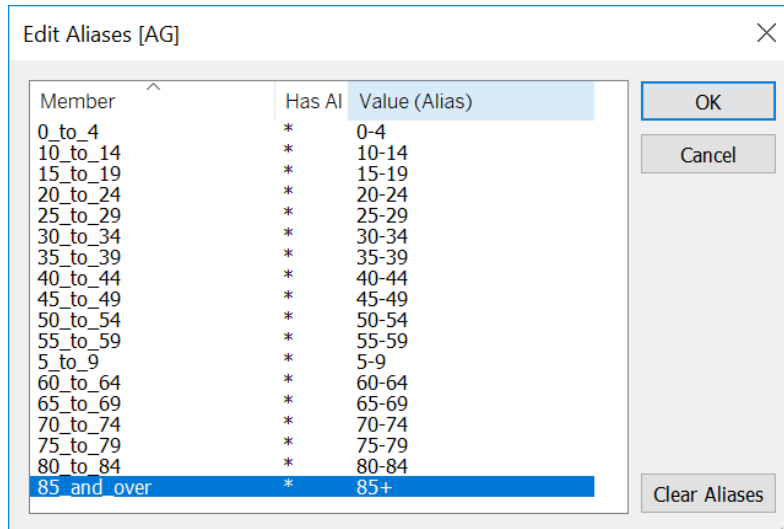
The proposed data visualization is shown as below. Basically, there are 2 graphs, Population Pyramid on the left-hand side and ternary plot on the right-hand side. User can filter the data by planning area by selecting the planning Area pane and filter the year or take a look at changing pattern over year by Year pane for both population pyramid and ternary plot.

Furthermore, when click the point which are the subzones in this planning area in the ternary plot, the population pyramid will accordingly by the selection of subzone.

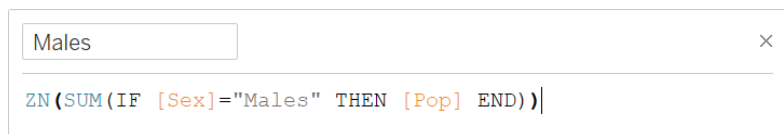


4. Step-by-step description

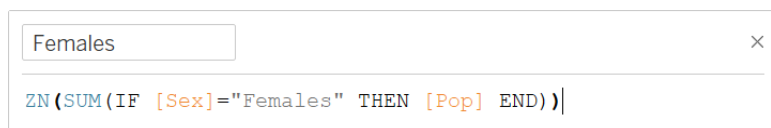
1. Remove the rows where Pop is equal to zero in the file.
Then import the updated csv file into tableau.
2. Right click the triangle on the top left corner of AG column and select Aliases.... Then we recode the value from "0_to_4" to "0-4". Recode the same way for the rest of values.



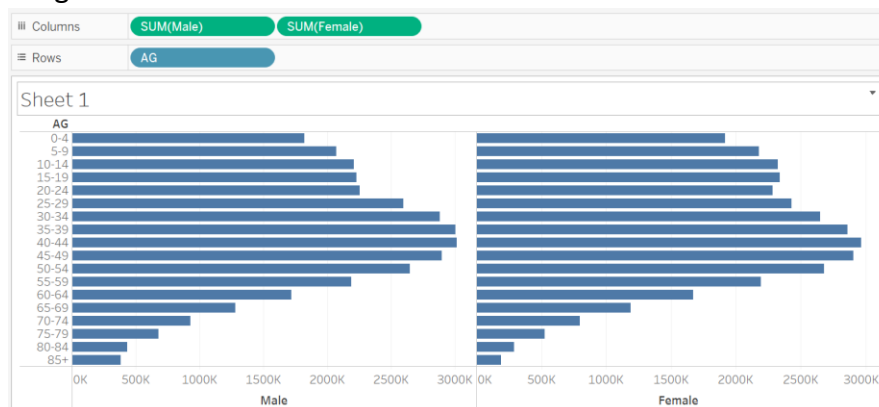
3. Create a new sheet and name it as Population Pyramid. Right click the Measures area and select Create Calculated Fields...
Name the new variable as Male and fill in the formula as below to get the population for male



4. Similar to the previous step, create another variable as Female to get the population for female.

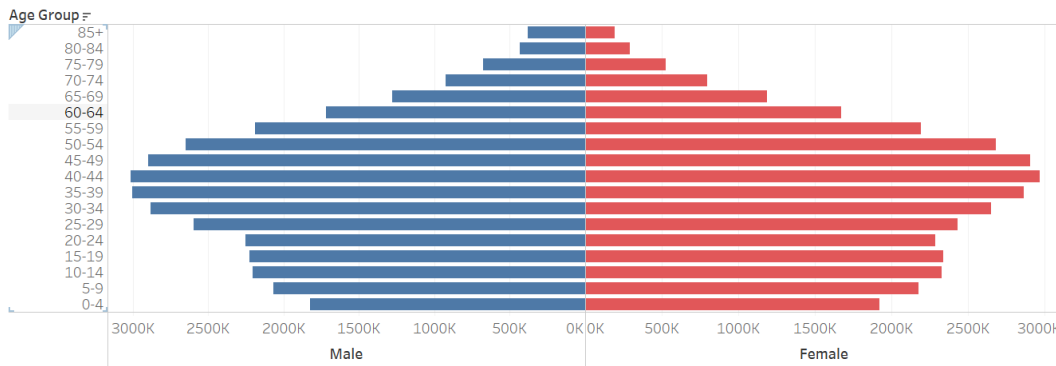


5. Drag Male and Female to Columns and AG to Rows.



6. Right click the Male pane and select Edit Axis..., tick Reversed for Scale. Then change the female color to red. After that, sort the AG in descending order. Finally, right click AG and select rename to rename the dimension as **Age Group**.

Population Pyramid



7. Create a new sheet and name it as Ternary Plot.
8. We will create some new variables in Ternary plot sheet. Right click the Measures area and select Create Calculated Fields... Name the new variable as **% Young** and fill in the formula as below to calculate the percentage of young people in the population.

% Young

×

```

SUM(IF [Age Group]='0_to_4' OR
[Age Group]='5_to_9' OR
[Age Group]='10_to_14' OR
[Age Group]='15_to_19' OR
[Age Group]='20_to_24'
then [Pop] END)
/
SUM([Pop])*100

```

Similar, use the same method to create another 2 variables **% Economic active** and **% Aged**. The formula is shown as below.

% Economy Active

×

```

SUM(IF [Age Group]='25_to_29' OR
[Age Group]='30_to_34' OR
[Age Group]='35_to_39' OR
[Age Group]='40_to_44' OR
[Age Group]='45_to_49' OR
[Age Group]='50_to_54' OR
[Age Group]='55_to_59' OR
[Age Group]='60_to_64'
THEN [Pop] END)
/
SUM([Pop])*100

```

% Aged

×

```

SUM(IF [Age Group]='65_to_69' OR
[Age Group]='70_to_74' OR
[Age Group]='75_to_79' OR
[Age Group]='80_to_84' OR
[Age Group]='85_and_over'
THEN [Pop] END)
/
SUM([Pop])*100

```

- Export the data and add 3 referential points into dataset as shown below. And then import the updated file into tableau.

Age Gr	Males	Female	% Aged	% Econ	% Youn	Number	PA	Pop	SZ	Sex	Year
			0	0	100		AAA				
			0	100	0		BBB				
			100	0	0		CCC				

- We will create X and Y to transform % Young % Economic active and % Aged to a 2-dimension plot so that we can plot them in X and Y axis. The formula of X and Y are show as below.

X

×

```

ZN((0.5*(2*[% Young]+[% Economy Active])
/
|([% Young]+[% Economy Active]+[% Aged]))

```

Y

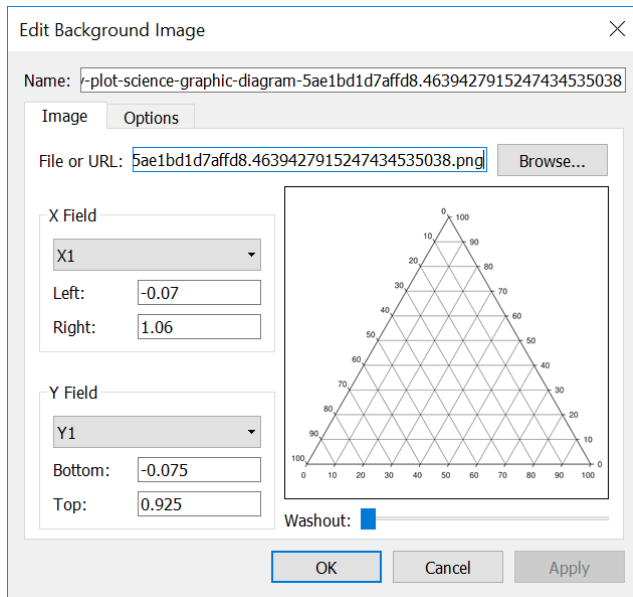
×

```

ZN(((SQRT(3)/2)*([% Economy Active]
/
|([% Young]+[% Economy Active]+[% Aged]))))

```

- Drag X and Y to Columns and Rows and right click x axis and y axis. Then drag Subzone into Detail.
- Select Map>Background Images>Add Image and select the image we want to add. Then adjust the image's size and location to make the 3 referential points AAA, BBB and CCC the vertices of the entire triangle.

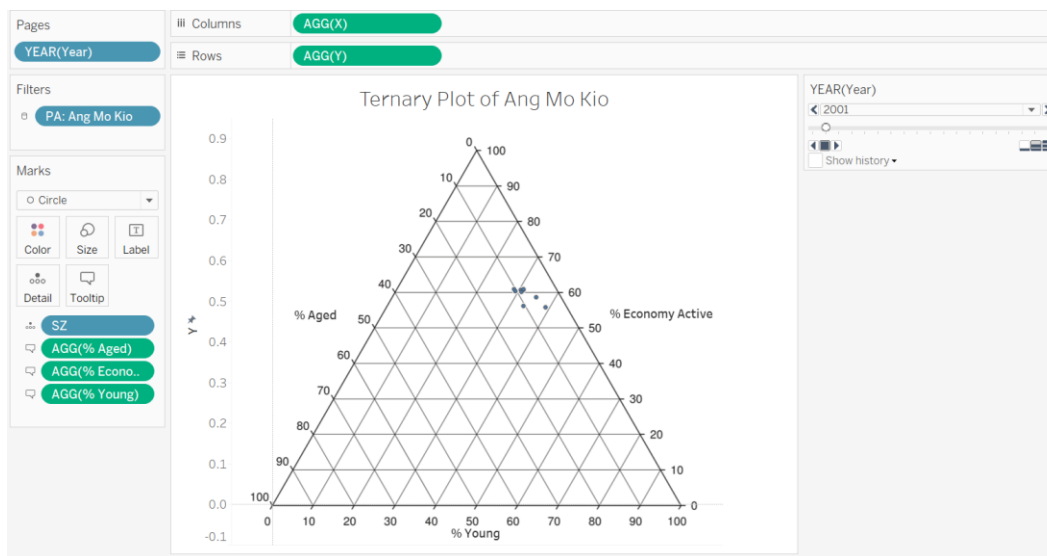


13. Right click the x axis and y axis, then unselect Show Header.

14. Drag the % Young, % Economy Active and % Aged into Tooltip

Then drag Year to Pages and PA to filter to make the graph interactive.

Moreover, add 3 annotates “% Young”, “% Economy Active” and “% Aged” and put them into suitable location.



15. Create a dashboard and put population pyramid, ternary plot, filter and page into dashboard.

16. Select Dashboard>Actions...>Add action. Add a filter action with the configuration as shown below.

Add Filter

Source

Data Source: respopagsex2000to2018_new

Field: SZ

Target

Data Source: respopagsex2000to2018_new

Field: SZ

OK Cancel

Add Filter Action

Name: Filter1

Source Sheets

Dashboard 1

Run action on:

Population Pyramid

☒ Ternary Plot

Hover

Select

Menu

☐ Run on single select only

Target Sheets

Dashboard 1

Clearing the selection will:

☐ Leave the filter

☒ Show all values

☐ Exclude all values

Target Filters

☒ Selected Fields ☐ All Fields

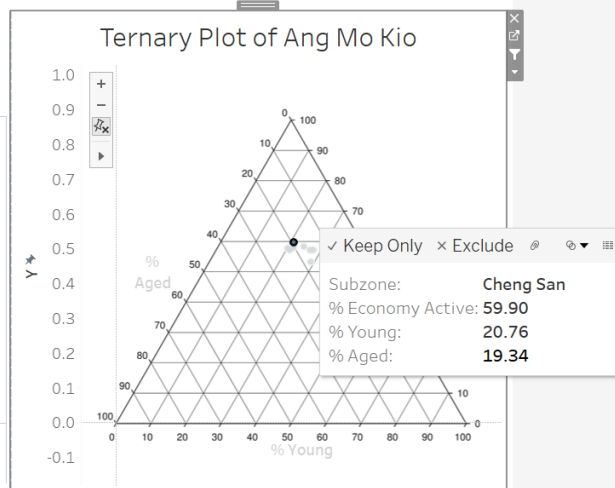
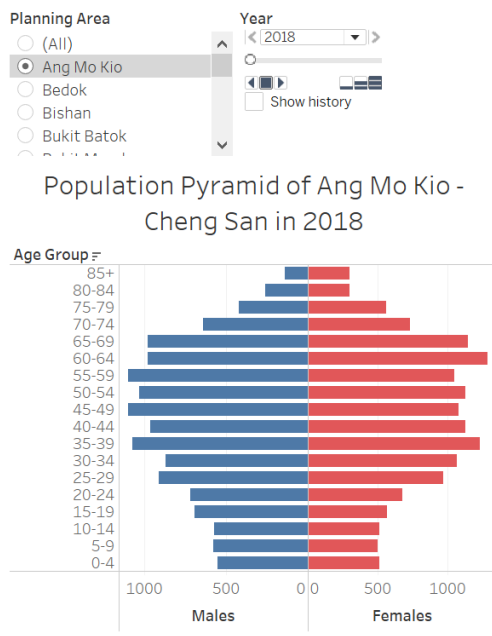
Source Field	Target Field	Target Data Source
SZ	SZ	respopagsex2000to2018_new

Add Filter... Edit... Remove

OK Cancel

And with the action, when we select one point/subzone in the ternary plot, the population pyramid will be updated to the corresponding subzone so that users are able to view the population pyramid in this subzone directly.

Demographic structure and economy participation in Singapore

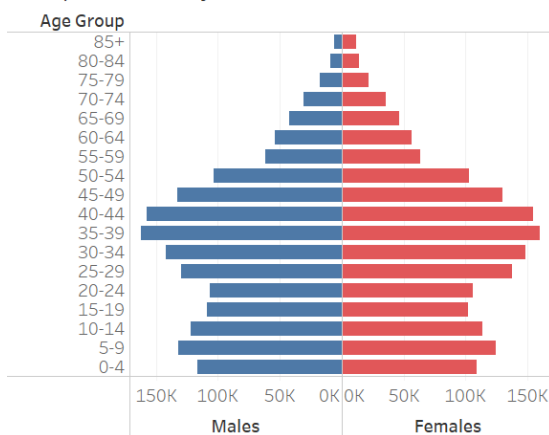


5. Insights

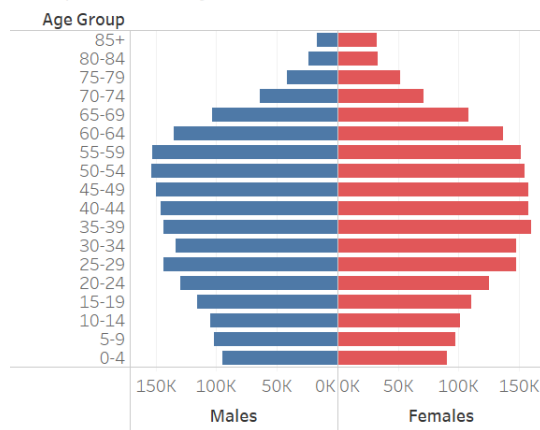
From the interactive and animated data visualization, we notice that the whole Singapore population's demographic structure has change a lot from 2000 to 2018. As time goes by, the majority population is moving upwards, which means the aged population increase but the young population reduce, and residents have longer lifespan than before. As a result, Singapore is facing the same issues as many other countries that the birth rate is continuously decreasing, and the ageing population is continuously increase.

Furthermore, we also noticed that in the age cohort of which reveals that female have longer lifespan than male. It maybe due to that male have more pressure than female.

Population Pyramid of All - All in 2000

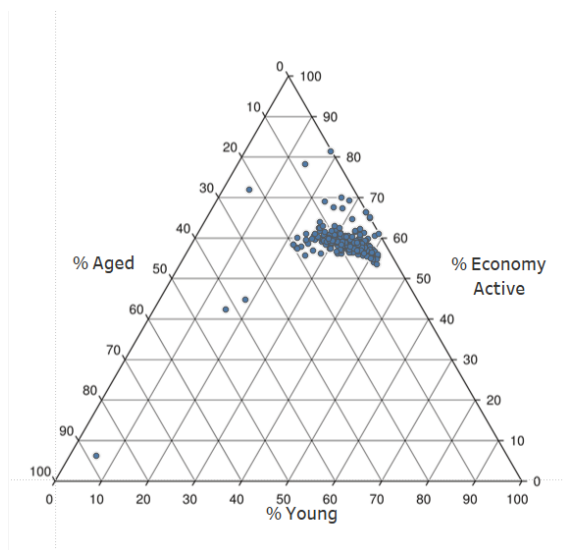


Population Pyramid of All - All in 2018

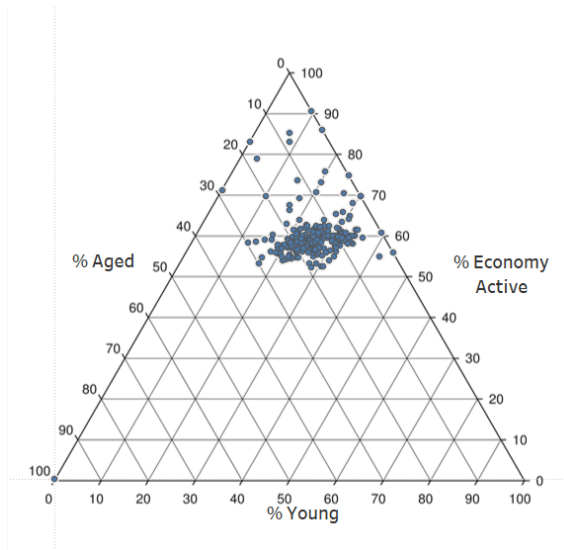


And let's take a look at the ternary plot for all subzones from 2000 to 2018. Although we face aged population problem, but it doesn't affect much on economy participation's components. In fact, the percentage of economy active has increased in the past 19 years.

Ternary Plot of All



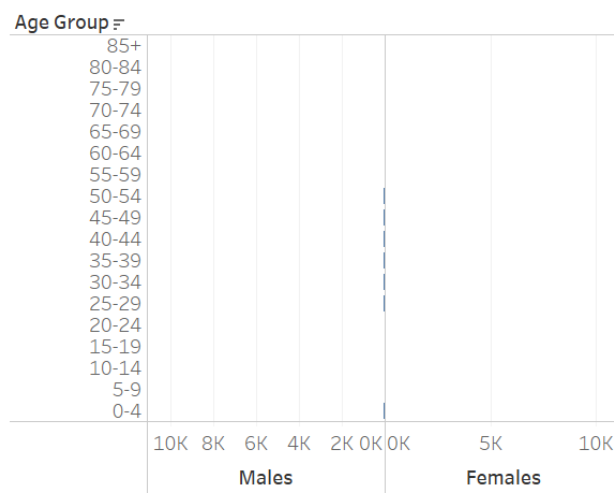
Ternary Plot of All



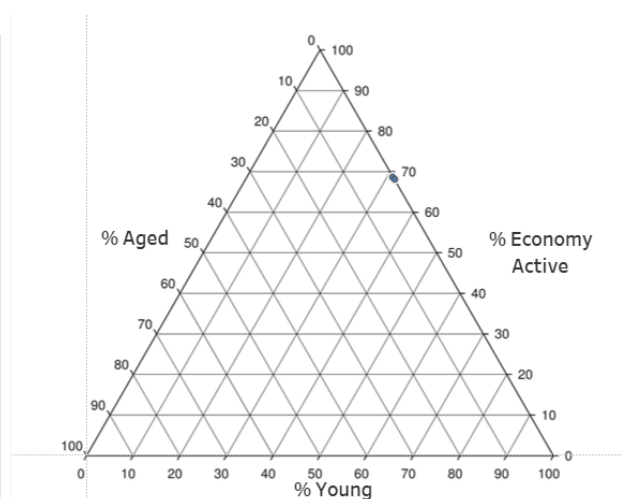
Now, let's zoom into particular planning area and have a look at their changing pattern over 19 years.

Punggol is a new town and start to have residents since 2001, and the population continuously increase until 2005. However, from 2005 to 2010, the population in Punggol doesn't increase a lot. After 2010, the population in Punggol start to increase again. While the population increase, the percentage of economy active actually decreased. This is because most people live in Punggol are young couples with children and the percentage of young increase during past 19 years.

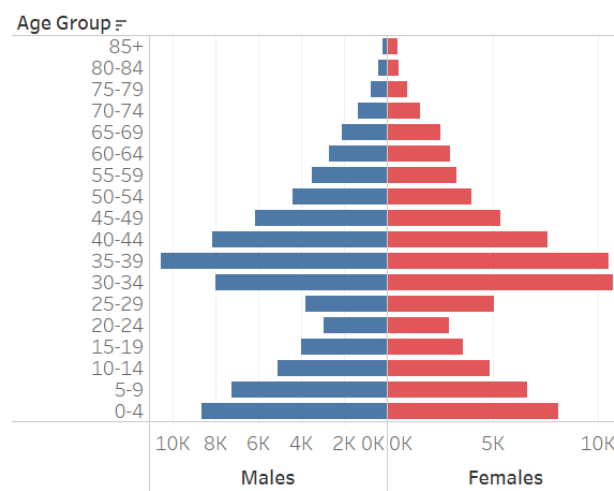
Population Pyramid of Punggol - All in 2001



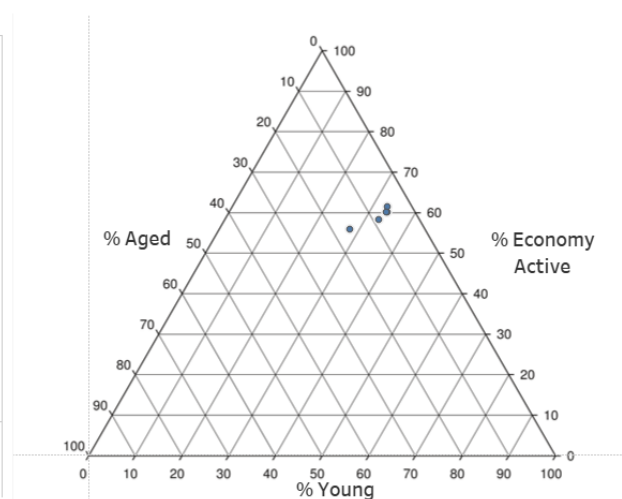
Ternary Plot showing Economy Participation in Punggol



Population Pyramid of Punggol - All in 2018



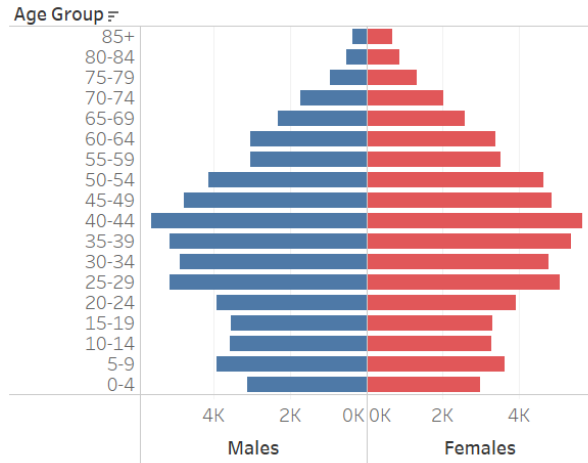
Ternary Plot showing Economy Participation in Punggol



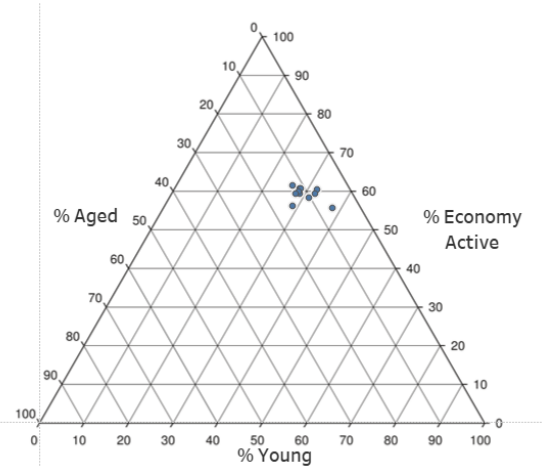
In the mature town such as Queenstown and Toa Payoh, the aging problem is more serious in these planning areas. For example, in Toa Payoh, the age population increase a lot while the

young population decrease. The ternary plot also reveals that the percentage of age increase and percentage young decrease, but the percentage of economy active actually increase.

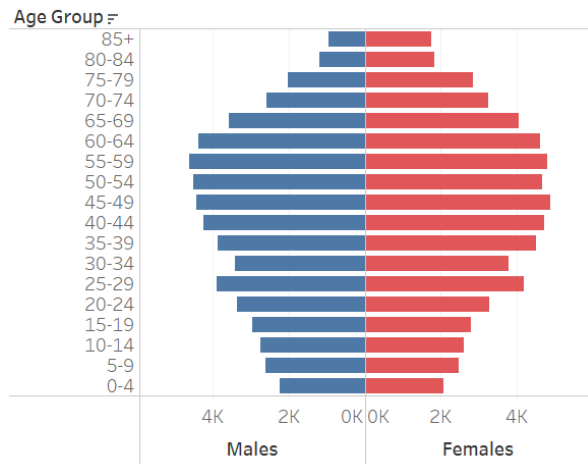
Population Pyramid of Toa Payoh - All in 2000



Ternary Plot showing Economy Participation in Toa Payoh



Population Pyramid of Toa Payoh - All in 2018



Ternary Plot showing Economy Participation in Toa Payoh

