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every one
in the picture

Births: tabulation and analysis & Crude birth rate

Data analysis and Report writing workshop for Civil registration and vital statistics data.

Importance of birth data

- ◆ As data in their own right
 - ◆ Population growth
 - ◆ Health planning facilities
 - ◆ Planning for school enrollments
 - ◆ Immunizations.
- ◆ Denominators for later mortality calculations such as the infant mortality rate (IMR) and under 5 mortality rate U5M.

Definition of a Live Birth

- ◆ The WHO defines a live birth as the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born.
- ◆ In more practical terms, a **live birth** is a birth where a newborn, regardless of the length of his or her gestation, is born and demonstrates any sign of life including a heartbeat, taking a breath, movement of voluntary muscles, or umbilical pulsation.

Still births are not live births

- ◆ Should not be included in birth data for calculating vital statistical rates.
- ◆ A **stillborn** baby is a baby born after the 24th week of pregnancy who does not show any signs of life.
- ◆ If the baby dies in the womb, it is known as an intra-uterine stillbirth.
- ◆ If the baby dies during labour, it is called an intra-partum stillbirth.
- ◆ If the baby dies before 24 weeks, it is known as a **miscarriage**.

Question:

- ◆ Which country has higher fertility?
 - ◆ Country A had 164,000 births in 2011
 - ◆ Country B had 3,000 births in 2011

Answer: We don't know

- ◆ The number of births alone does not tell us anything about the fertility of the average woman in a country.
- ◆ A large number of births may simply reflect a large population of mothers.

Data in 2011	Country A	Country B
Country	Papua New Guinea	Tonga
Population 2011	6,188,000	106,000
Births	164,000	3,000
Total Fertility Rate	3.5	3.7

Data from
the U.S.
Census
Bureau's
International
Data Base

What does birth data tell us?

- ◆ Births by age of the mother
- ◆ Place of birth
- ◆ Birth weight
- ◆ Gestation of pregnancies
- ◆ Sex ratio at birth



Births by age of the mother

- ◆ Women of childbearing age: 15-49.
 - ◆ Births do occur to mothers younger than 15 or older than 49
 - ◆ important we capture these events, especially if greater service provisions are needed for these high risk pregnancies.

Births by age of the mother

- ◆ Age of mother at birth is important from a population growth perspective
 - ◆ having children at younger ages increases population growth even if young and old women have the same number of children
 - ◆ The children that younger women are having now are able to have their own children sooner than the cohort of children born to those mothers when they are older
 - ◆ less time between generations means faster population growth

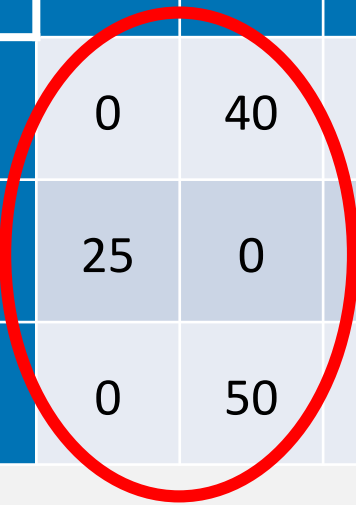
Adolescent birth rate

- ◆ the number of births per 1,000 women ages 15-19
- ◆ Note that this does not include births to women under age 15 for comparability purposes.
- ◆ For now, important to calculate the proportion of births that are occurring to girls aged <15 and 15-19.

Proportion of births by age of the mother



Periods	Age Groups									Total
	<15	15 - 19	20 -24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50+	
2008-2012	0	40	20	20	0	20	0	0	0	100
2003-2007	25	0	25	0	0	25	0	25	0	100
1998-2002	0	50	0	0	25	25	0	0	0	100



Place of birth

- ◆ Where are births occurring?
 - ◆ hospitals, clinics, other health care centers, home births, or other places
- ◆ What percent occurred in a hospital?
- ◆ What percent were attended by a doctor or health care professional?
- ◆ If the data supports it, how does this change over time?

Birth weight

- ◆ To examine how many higher risk babies are being born, we might look at the percentage of babies with low birth weights
- ◆ Determine the percent of births that are low-weight births, i.e. under 2500 grams (5.5 lbs).

Period	Birth weight		Total
	<2500g	2500g or higher	
2007-2011	23%	77%	100%

Gestation of pregnancies

- ◆ We might also look at the percentage of babies being born before 37 weeks gestation to examine how many higher risk babies are being born.

Period	Gestation in weeks		Total
	<37	37 or above	
2007-2011	19%	81%	100%

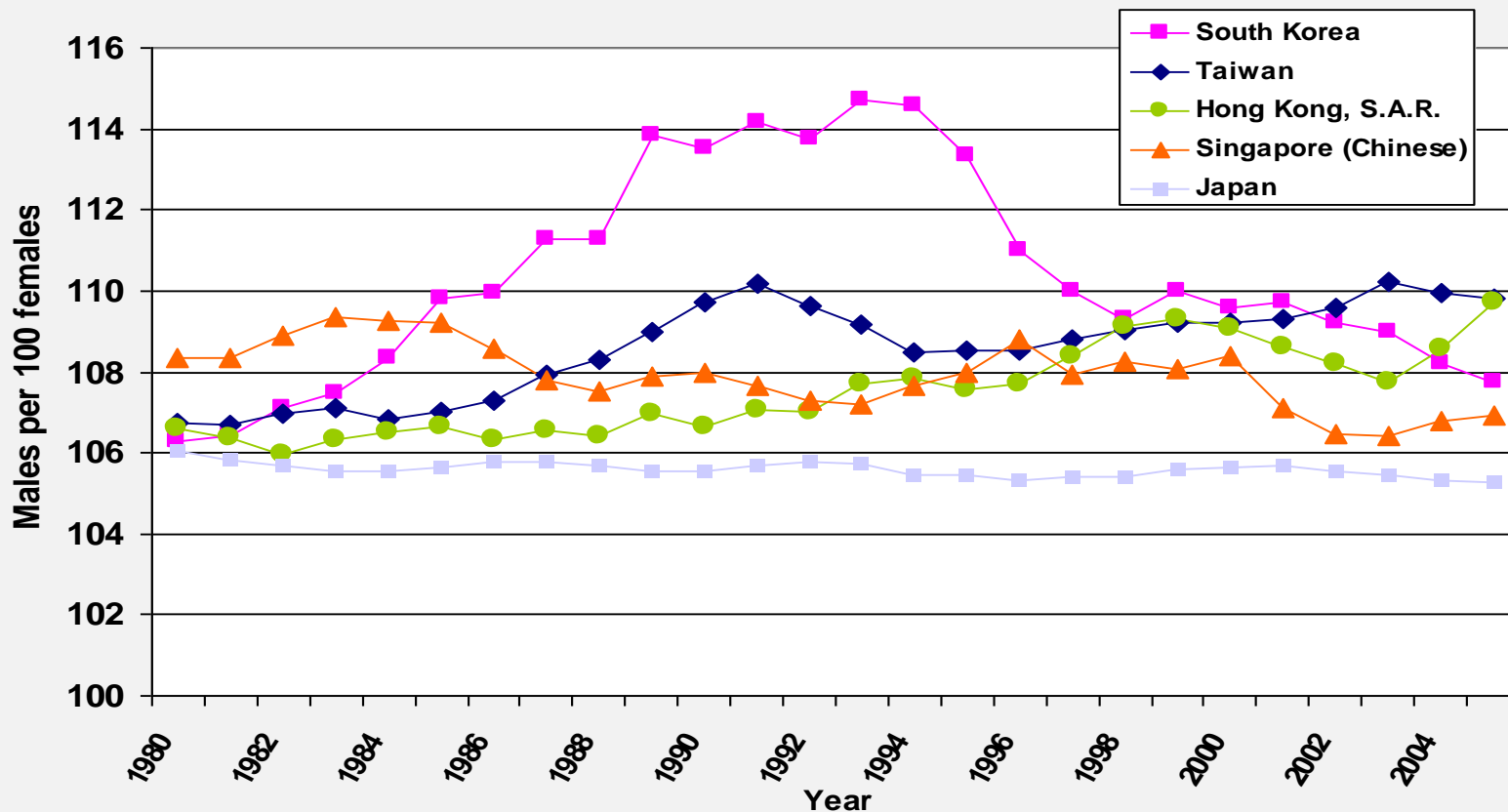
Sex ratio at birth

- ◆ The **sex ratio at birth** is the ratio of male to female babies born.
- ◆ The normal sex ratio at birth for human babies is about 103-106.
 - ◆ factors influencing conception and intra-uterine mortality
- ◆ Sex ratio can vary naturally between different countries, cultures, and geographic locations

Sex ratio at birth

- ◆ Preference for at least one son and decreasing fertility (and thus fewer “chances” to have a son) led to an increase in prenatal sex selections.
- ◆ Technology allows parents to know baby’s sex from an early age, parents may selectively abort female fetuses.
- ◆ Aside from the ethical issues of sex selection, sociological problems can result
 - ◆ Shortage of eligible women (compared to men) for marriage –effect on fertility
 - ◆ Men behave differently than women – voting, economic purchasing, career tracks etc.

**Figure 5. Sex ratios at birth reported in East Asia
(3-year averages 1980-2005*)**



*Vital statistics used for 3-year averages extend from 1979 through 2006. Confidence interval above and below 3-year average in 2005 exceeds 1.0 per 100 for Hong Kong, 1.5 per 100 for Singapore Chinese.

Sources: National Statistical Office, 2008; Department of Statistics, 2008; Li, 18 September 2002, 07 September 2004, 16 January 2008; Department of Statistics National Institute of Population and Social Security Research, 2004; Ministry of Health, Labour and Welfare, 21 January 2008.

Slide figure from U.S. Census Bureau

Exercises

- ◆ Perform basic birth tabulations on the test data and calculate:
 - ◆ Sex ratio at birth
 - ◆ Percent distribution of births by:
 - ◆ Mother's age
 - ◆ Place of birth
 - ◆ Low birth weight vs. non-low birth weight
 - ◆ Gestational period (<37 weeks vs. 37+ weeks)

- ◆ Repeat birth tabulations for your country data.

Crude Birth Rate (CBR)

Other measures of fertility

- ◆ Birth data are important
 - ◆ As data in their own right for planning & Denominators for other rates
 - ◆ But recall: births alone do not tell us about fertility of the average woman, and a large number of births may reflect a large population
- ◆ A common measure of fertility is the **crude birth rate (CBR)**:
 - ◆ the number of births per 1,000 population over a given period of time.

Crude Birth Rate

- ◆ Why we use the CBR:
 - ◆ easy to understand
 - ◆ requires the least amount of information
 - ◆ helps use understand fertility's contribution to population growth

Crude birth rate



$$\text{Crude birth rate} = \frac{\text{Number of births in a given period}}{\text{midpoint population of that same period}} * 1000$$

- ◆ Expressed as number of births per 1,000 population

A note about the midpoint population

- ◆ Not logistically possible to follow a distinct cohort in a large population throughout their lives, so we use the midpoint population
- ◆ To accurately calculate rates, the midpoint population should be used in the denominator.
 - ◆ The midpoint of a single year is generally considered to be the population on July 1
 - ◆ If you are analyzing data over a several year period (aggregating data), use the midpoint year. For example, data from 2008-2012, the midpoint would be July 1, 2010.

Determining midpoint population

- ◆ If you have midpoint pop from your NSO – use this
- ◆ If not, you can use UNDP Statistical Yearbook estimates
- ◆ If you don't have the midpoint population (or your midpoint is 1999 or before) you can estimate it by interpolating between 2 censuses using AGEINT.xls
- ◆ If your midpoint comes after your last census and you don't have projections, you can use estimates from other sources or extrapolate forward

If you need to adjust your population data to the midpoint date

AGEINT.xls from the U.S. Census Bureau's PASEX suite

	A	B	C	D
4	-----			
5	Item or	Earlier	Later	Interpolated
6	age	population	population	population
7	-----			
8	Type of interpolation		1	Exponential
9	(Enter "0" for linear or "1" for exponential)			
10	-----			
11	Year	2000	2010	2007
12	Month	4	10	7
13	Day	7	6	1
14		07-Apr-00	06-Oct-10	01-Jul-07
15	-----			
16	All ages	4,343,519	8,687,038	7,001,678
17	-----			
18	Under 1	100,958	201,916	162,743
19	1 to 4	466,275	932,550	751,627
20	5 to 9	624,134	1,248,268	1,006,094
21	10 to 14	559,559	1,119,118	902,000
22	15 to 19	446,736	893,472	720,131
23	20 to 24	370,653	741,306	597,486
24	25 to 29	301,862	603,724	486,596
25	30 to 34	249,409	498,818	402,043
26	35 to 39	247,473	494,946	398,922
27	40 to 44	223,014	446,028	359,495
28	45 to 49	172,260	344,520	277,680
29	50 to 54	149,338	298,676	240,730
30	55 to 59	127,242	254,484	205,112
31	60 to 64	105,715	211,430	170,411
32	65 to 69	79,614	159,228	128,336
33	70 to 74	53,660	107,320	86,499
34	75 to 79	31,021	62,042	50,005
35	80+	34,596	69,192	55,768
36	-----			

Keep this as '1' to interpolate exponentially

Enter midpoint population year here. Month will stay '7' and day will remain '1'

CBR Example

- ◆ There were 32,500 births in 2015. We will need to divide this by our midpoint population.
- ◆ Our midpoint is July 1, 2015. (Why?)
- ◆ Let's assume the population was 1,564,500 on July 1, 2005. We then perform the calculation:
- ◆ $1000 * (32,500/1,564,500)$ to get a CBR of 20.8
- ◆ We can say there were 20.8 births per 1,000 population in 2015.

Question:

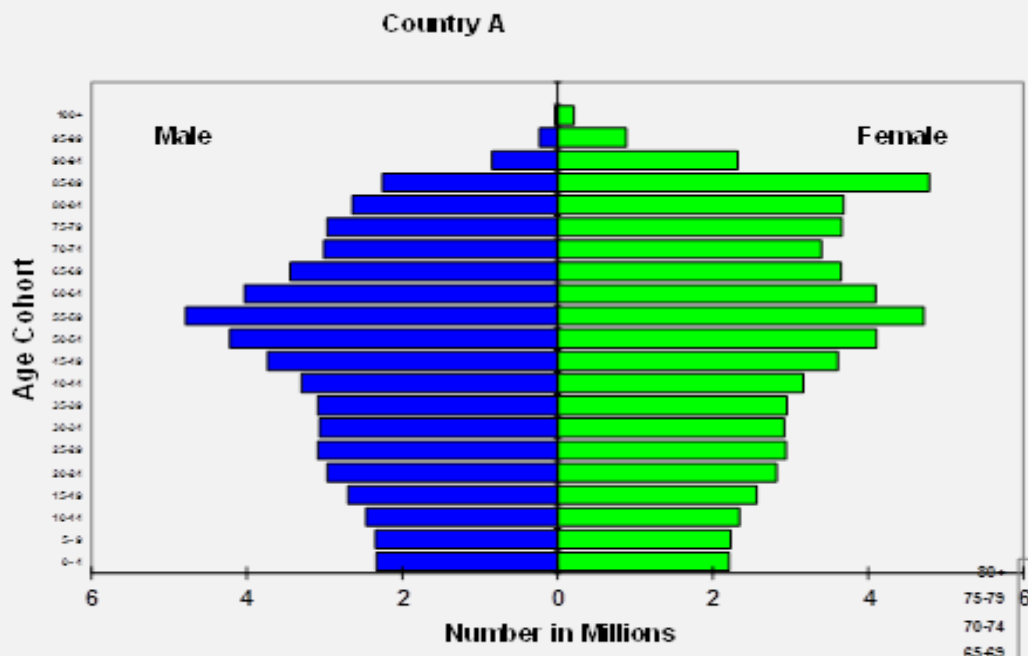
- ◆ Which country has higher fertility?
 - ◆ Country X had a CBR of 29 in 2011
 - ◆ Country Y had a CBR of 25 in 2011

Answer: We don't know

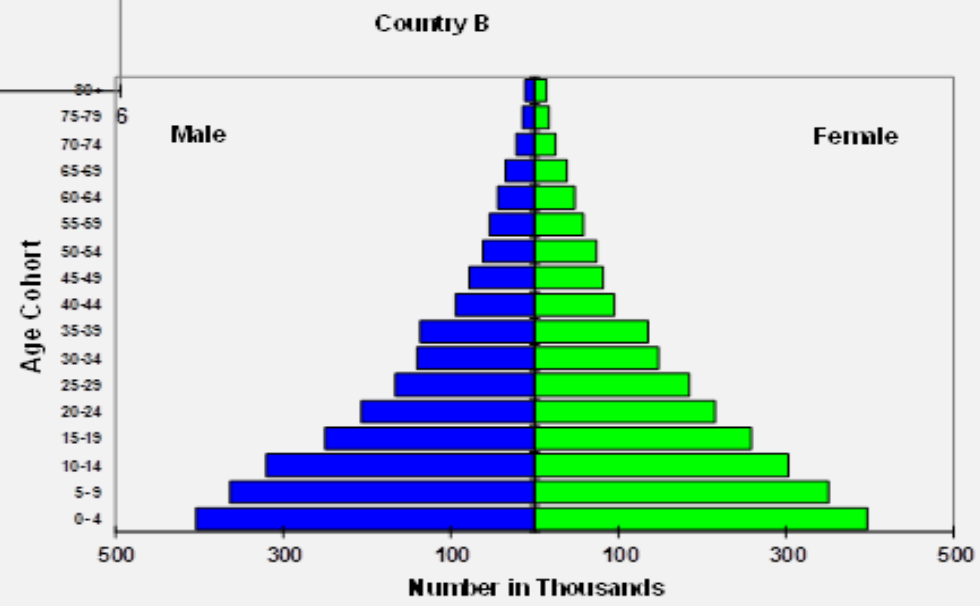
- ◆ The CBR has some limitations.
- ◆ Misleading due to the composition of its denominator.
 - ◆ includes children, men, and women outside of childbearing ages.
- ◆ The CBR is affected by the proportion of the population who cannot have children.
- ◆ A very young or very old population or one that has many more males than females would affect the CBR.
- ◆ Even when the frequency of having children among women of reproductive ages is the same in two countries, each country may have different crude birth rates.



Population pyramids are a useful way of seeing the age and sex structure of our population.



The CBR is larger in populations where women of reproductive age comprise a larger proportion of its people.



Comparison of Crude Birth Rates by proportions of the population that are women of childbearing age for 2 fictitious countries

Country	Country A	Country B
Midpoint Population	10,000	100,000
Prop. that are women 15-49	0.30	0.15
Total women aged 15-49	3,000	15,000
Number of births*	3,000	15,000
CBR	300	150

*For calculation purposes, we assume all of these women had one child each in the year we are performing our calculation. I.E. Total fertility is the same between countries.

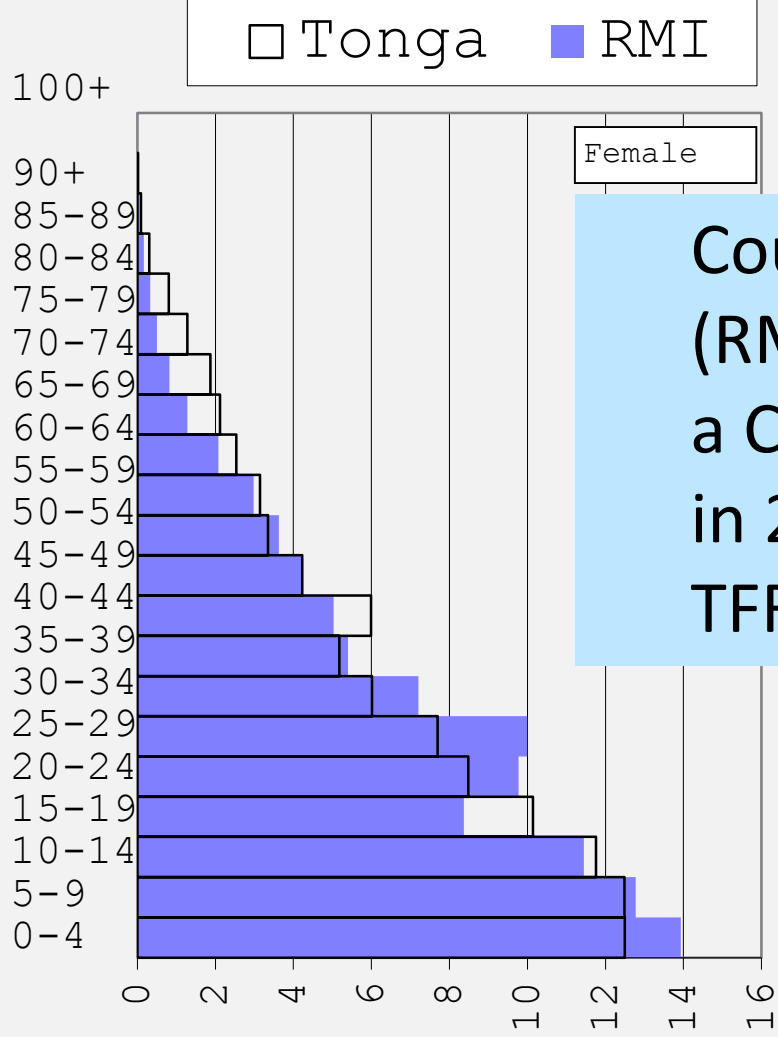
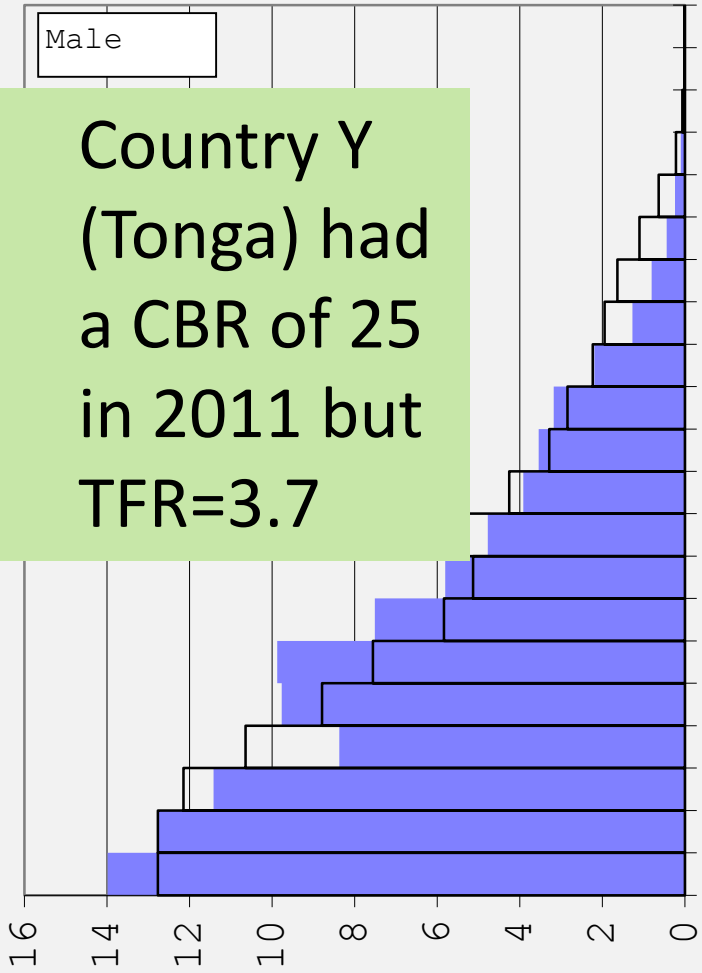
It's worth noting:

- ◆ Two populations may have different crude birth rates even if fertility of women at each age is the same.
- ◆ It is possible for one country to have a higher crude birth rate than another country even though fertility could be lower at each age.





The CBR is larger in populations where women of reproductive age comprise a larger proportion of its people.



Population data from the U.S. Census Bureau's International Data Base

Why do we care about the CBR?

- ◆ Why we use the CBR:
 - ◆ easy to understand
 - ◆ requires the least amount of information
 - ◆ helps us understand fertility's contribution to population growth
- ◆ We can standardize the CBR to compare between 2 populations (different countries or same country over time).
 - ◆ More about this in the later sessions

Exercises

- ◆ Calculate the CBR for your test data
 - ◆ Do you use the adjusted or unadjusted number of births? Why?
- ◆ Calculate the CBR for your country data.
 - ◆ Do you have population estimates for the same year(s) as your birth data?
 - ◆ Are the estimates for July 1?