Datasets

1. Exploration
2. Practice

Data structure

Cross-sectional data capture the characteristics of a sample of comparable units at a single point in time:

- **Units** can be individual respondents, states, organizations. . .
- **Observations** vary by their characteristics, *not* by unit type
- **Sampling** will vary depending on representativity requirements

Time series capture repeated observations over time of either sampled or nonsampled units:

- **Cross-sectional time series** (CSTS) capture fixed, nonsampled units at different time intervals
- **Longitudinal data** capture sampled units (called cohort or panel) at different time intervals

Example: Industry Canada File Sharing Survey (2006)

Using individual-level 'micro' data on illegal downloading practices among a representative sample of the Canadian population aged 15+:

	id	prov	qregn	date	age	sex	download	q1	q2	q3	q4
1	1065	ON	Ontario	20060502	Less than 25 years old	Male	NON-DOWNLOADER	Yes	20	10	Very strong
2	1129	AB	Alberta	20060423	Less than 25 years old	Female	NON-DOWNLOADER	No	.	.	Somewhat strong
3	1152	QC	Quebec	20060519	Less than 25 years old	Female	DOWNLOADER	No	.	.	Somewhat strong
4	1166	ON	Ontario	20060429	Less than 25 years old	Male	NON-DOWNLOADER	Yes	20	4	Moderate
5	1191	ON	Ontario	20060423	25 years old or more	Female	NON-DOWNLOADER	Yes	20	15	Somewhat strong
6	1214	ON	Ontario	20060423	25 years old or more	Female	NON-DOWNLOADER	Don't Know/Refused	.	.	Very limited
7	1215	QC	Quebec	20060422	Less than 25 years old	Female	NON-DOWNLOADER	Yes	10	6	Very strong
8	1245	ON	Ontario	20060423	25 years old or more	Female	NON-DOWNLOADER	No	.	.	Very strong
9	1266	BC	British Columbia	20060419	25 years old or more	Female	NON-DOWNLOADER	No	.	.	Very limited
10	1315	QC	Quebec	20060430	25 years old or more	Male	NON-DOWNLOADER	No	.	.	Somewhat limited
11	1317	ON	Ontario	20060423	25 years old or more	Female	NON-DOWNLOADER	Don't Know/Refused	25	5	Very strong
12	1643	ON	Ontario	20060423	25 years old or more	Female	DOWNLOADER	Don't Know/Refused	20	3	Somewhat strong

- **Observations:** rows hold data for a single sampled unit
- **Variables:** columns hold all values for a single variable
- **Missing data:** "Do Not Know / Refused to Answer", '.'
- **Value formats:** numeric, string, encoded (values/labels)

Format requirements

Check your dataset against the following list:

- The dataset format is **DTA** (`.dta`).
  Otherwise, non-Stata format: convert.
- The data are available at **only one point in time** (e.g. year 2009).
  Otherwise, time series: subset.
- The columns do **not hold time variables** (e.g. y1960, y1961, ...)
  Otherwise, 'wide' data: reshape.

If you need to reformat your dataset before analysing it, all guidelines and operations are detailed in the Stata Guide, Sections 5–8.

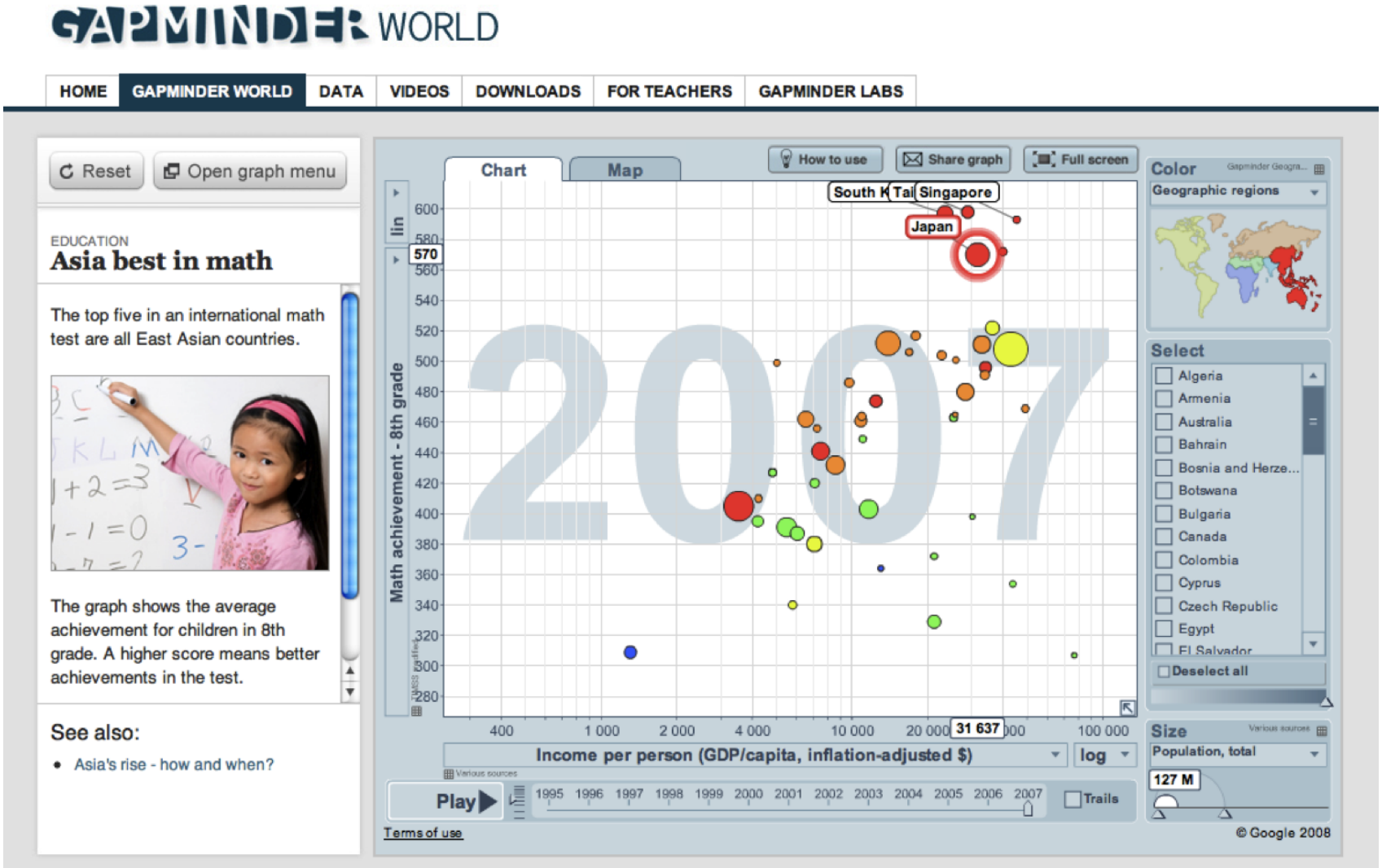
Source requirements

You need to be able to reference your dataset in full before use. This implies collecting information on:

- **the source**, with its full name and online address
  e.g. World Health Organization (WHO), [website]
- **the unit of analysis**, with its restrictions
  e.g. American adult resident population with U.S. citizenship
- **the sampling strategy**, with a reference if needed
  e.g. "cf. 'Sample Design' in the Survey Description [source]"
- **the total number of observations**
  e.g. $N = 1,524$

Note: all these characteristics need to appear in your research project.

Gapminder


GAPMINDER WORLD
HOME
GAPMINDER WORLD
DATA
VIDEOS
DOWNLOADS
FOR TEACHERS
GAPMINDER LABS
Reset
Open graph menu
EDUCATION
Asia best in math
The top five in an international math test are all East Asian countries.
The graph shows the average achievement for children in 8th grade. A higher score means better achievements in the test.
See also:
Asia's rise - how and when?
Chart
Map
How to use
Share graph
Full screen
Singapore
Japan
Math achievement - 8th grade
2007
Income per person (GDP/capita, inflation-adjusted $)
log
Play
Trails
Terms of use
Color
Geographic regions
Select
Algeria
Armenia
Australia
Bahrain
Bosnia and Herze...
Botswana
Bulgaria
Canada
Colombia
Cyprus
Czech Republic
Egypt
Deselect all
Size
Population, total
127 M
© Google 2008

Exploring the documentation

Knowing the data is not an option. You naturally do not have to 'read' through the data itself, but you need to read everything else.

The **codebook** is essential to measurement:

- Data collection and measurement are publicly documented to allow for sceptical scrutiny of sources and method.
- The unit of continuous data, scale of ordinal data or categories of nominal data are given with their construction notes.

Example: Measurement

World Development Indicators

http://go.worldbank.org/U0FSM7AQ40

wdi_fr **Fertility rate (births per woman)**

(Time-series: 1960-2007, n: 4986, N: 187, $\overline{N}$: 104, $\overline{T}$: 27)
(Cross-section: 1999-2002 (varies by country), N: 186)

Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates. Source: World Bank staff estimates from various sources including census reports, the United Nations Population Division's World Population Prospects, national statistical offices, household surveys conducted by national agencies, and Macro International

Exploring the identifiers

Data comes with identifiers: variables have names and labels, and their values can also carry a label.

Identifiers are essential to writing commands:

- Passing commands requires correct variable names, labels and values, as in su `rlgdgr if rlgdnm==6`.
- Excluding missing values frequently requires recoding them to the Stata . symbol(s) and passing the `if !mi()` selector.

Example: Coding

# dscrgrp: Member of a group discriminated against in this country	
Question	**All rounds:** Would you describe yourself as being a member of a group that is discriminated against in this country?
Question number	**ESS1, ESS2:** C 16 **ESS3, ESS4:** C 24
Comments	**ESS2:** Slovenia: Coding error. All respondents with code 2 in C16 (DSCRGRP) have got code 1 in C17 (DSCRREF).

Value	Label
1	Yes
2	No
7	Refusal
8	Don't know
9	No answer

Selections

Stata offers two ways to select observations:

- **Range selection** with `in`:
  - All observations have a row number _n between 1 and sample size _N. The number is arbitrary and non statistically meaningful.
  - Range selection is principally useful to look at a few observations.
    e.g. `list in 1/10`, `list in -25/l`
- **Logical selection** with `if`:
  - "equal to" (==) or "not equal to" (!=)
  - "greater/lesser than" (>/<) and "... or equal to" (>=/<=)
  - "and" (&), "or" (|)
  - "missing" (`mi()`) or "nonmissing" (`!mi()`)

  Logical operators apply to virtually all data operations.

Examples

Think of selecting observations as formulating linguistic statements:

- **Identification**, e.g. "I am not Sidney Poitier"
  `drop if name=="Sidney Poitier"`
- **Validity**, e.g. "Raise your hand if you're absent"
  `gen vote=1 if absent==1`
- **Conditions**, e.g. "Twist and Shout"
  `replace beatles=1 if !mi(twist) & !mi(shout)`

That logic allows to run commands on particular groups:

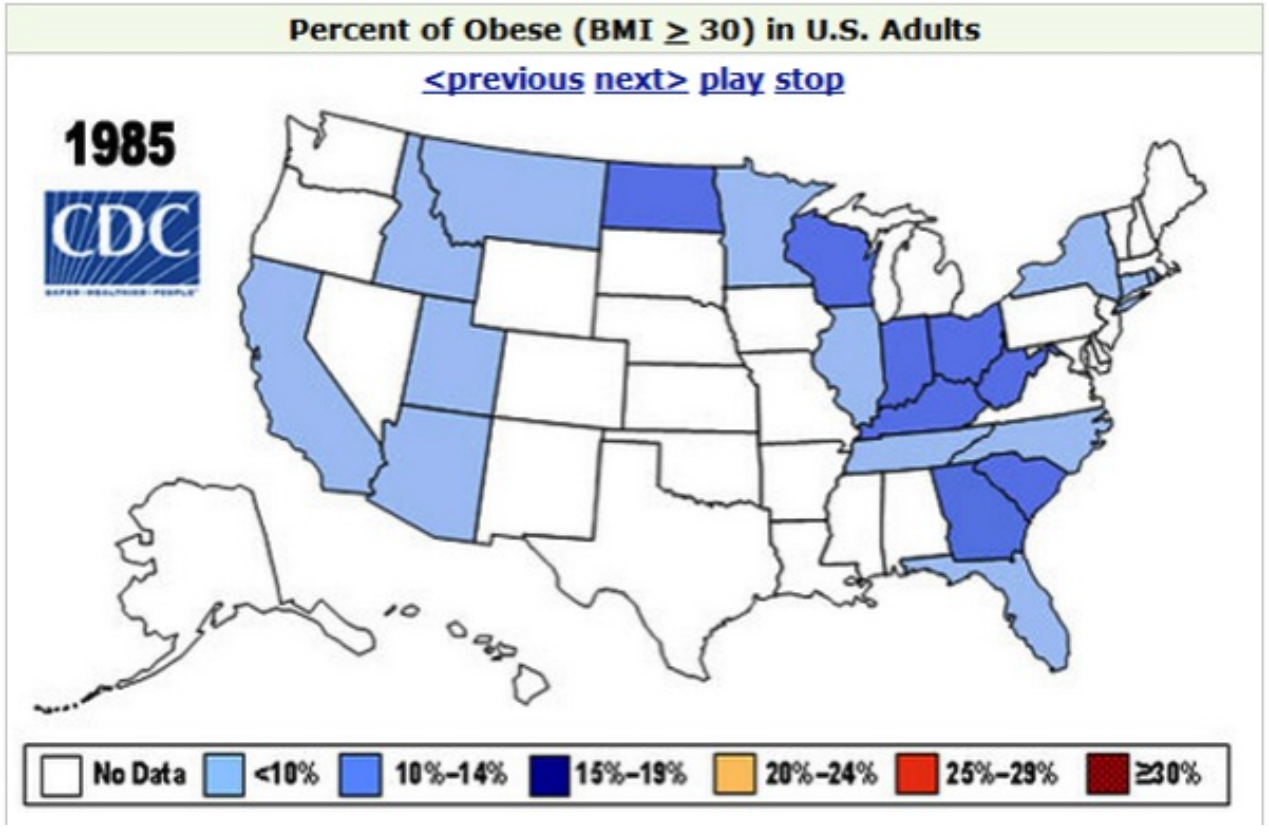
- `drop if mi(age) | age < 65` means
  "drop all observations where age is missing *or* under 65."
- `li country if gdp >= 5000 & !mi(gdp)`" means
  "list country if GDP is above or equal to 5,000 *and* nonmissing."

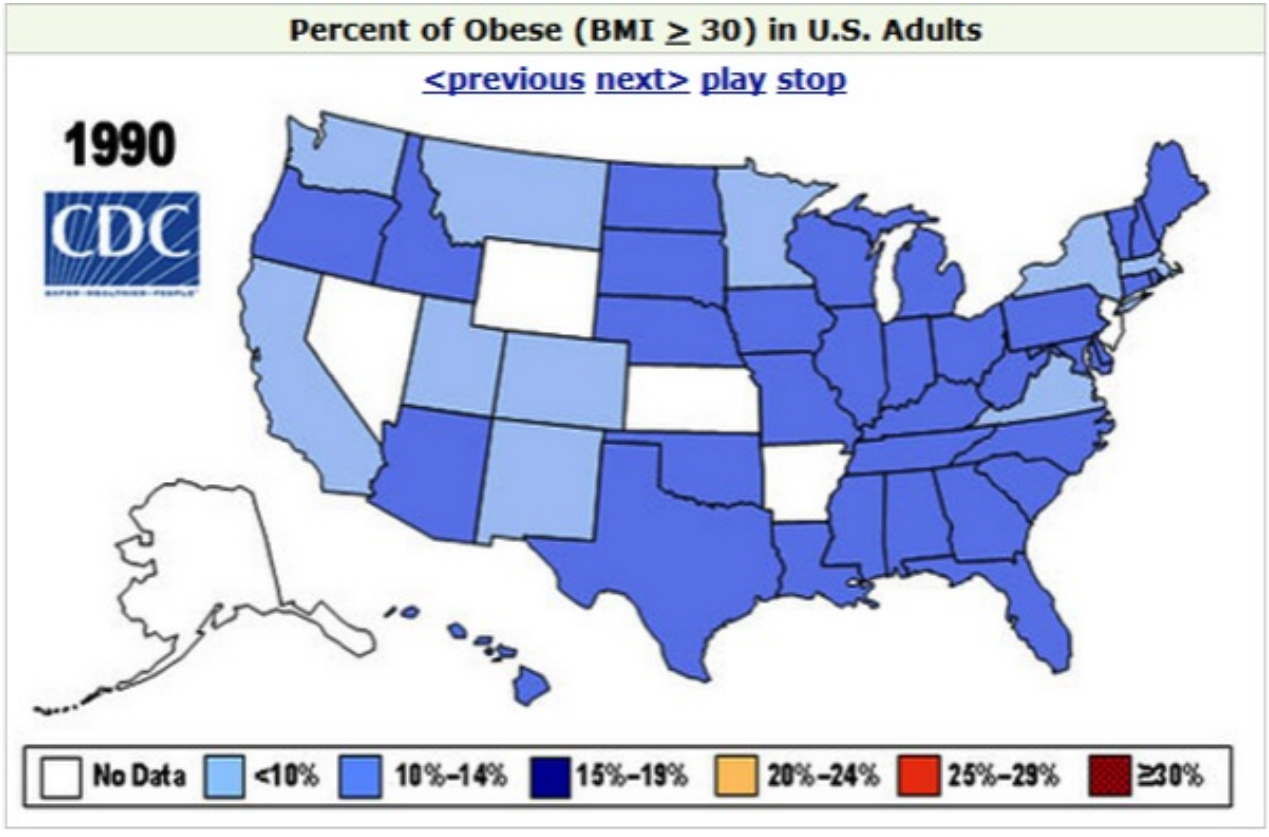
Practice: Body Mass Index

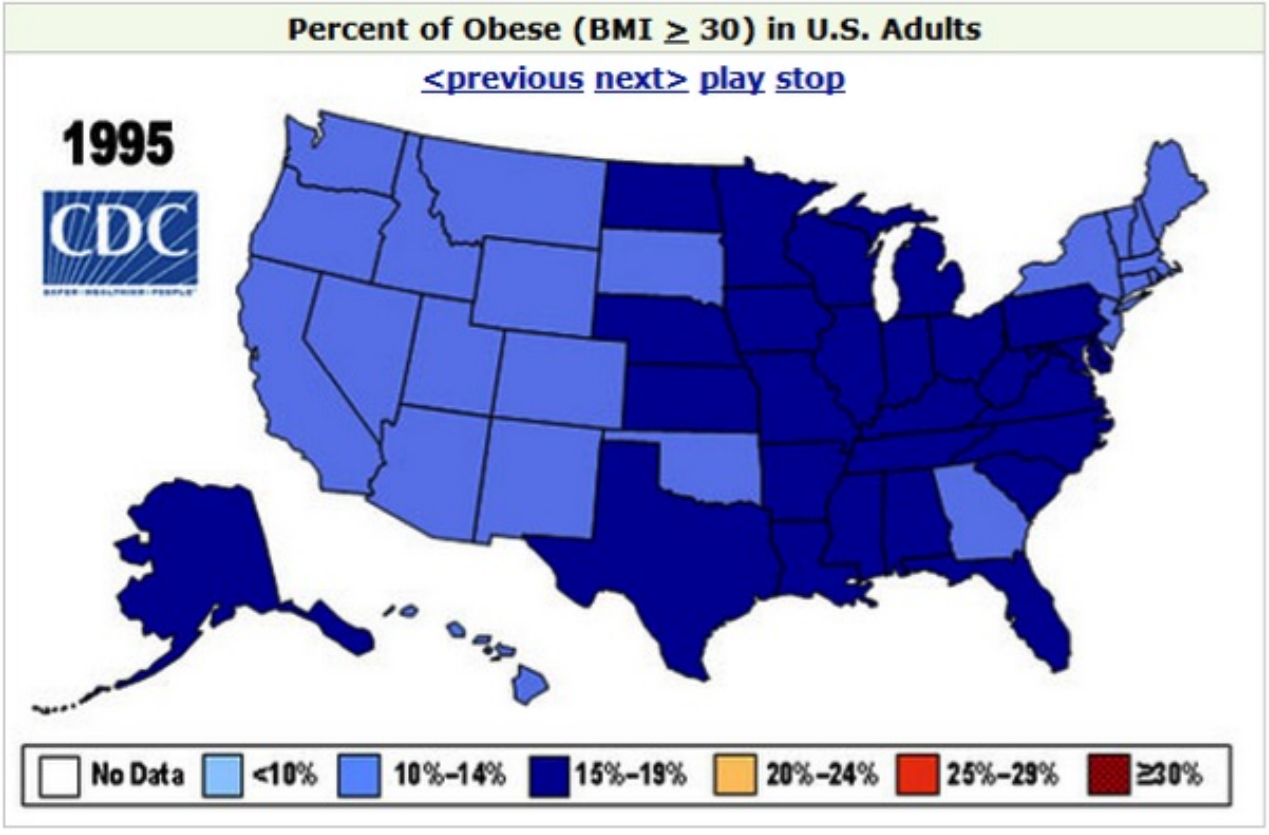
$$\text{BMI} = \frac{\text{mass (kg)}}{(\text{height(m)})^2} = \frac{\text{mass (lb)} \times 703}{(\text{height(in)})^2}$$

- For **normal weight** adults, $18.5 < \text{BMI} < 25$.
- For **overweight** adults, $25 \leq \text{BMI} < 30$.
- For **obese** adults, $\text{BMI} \geq 30$.

- National Health Interview Survey (NHIS)
- Sample: U.S. adult population, 1997–2009


Percent of Obese (BMI ≥ 30) in U.S. Adults
<previous next> play stop
1985
CDC
No Data
<10%
10%–14%
15%–19%
20%–24%
25%–29%
≥30%


Percent of Obese (BMI ≥ 30) in U.S. Adults
<previous next> play stop
1990
CDC
No Data
<10%
10%–14%
15%–19%
20%–24%
25%–29%
≥30%


Percent of Obese (BMI ≥ 30) in U.S. Adults
<previous next> play stop
1995
CDC
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<10%
10%–14%
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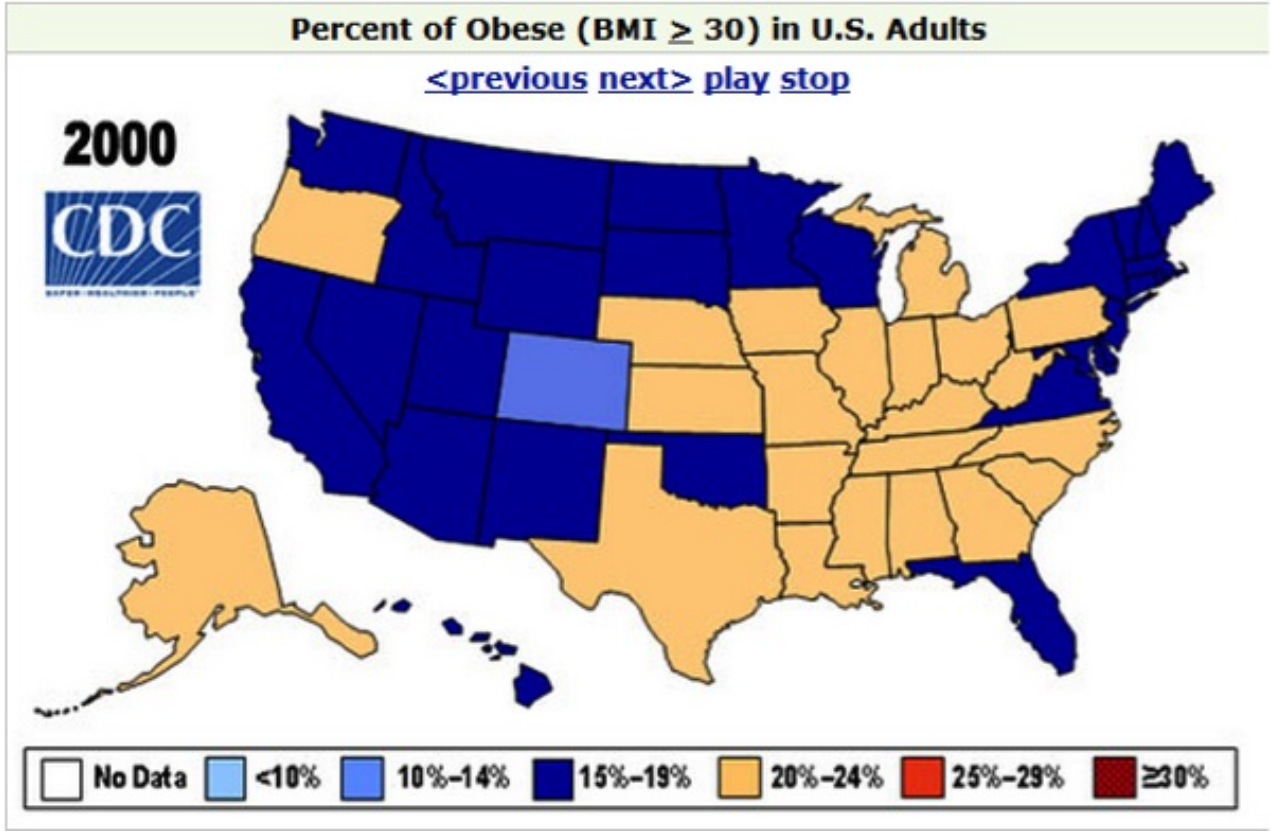
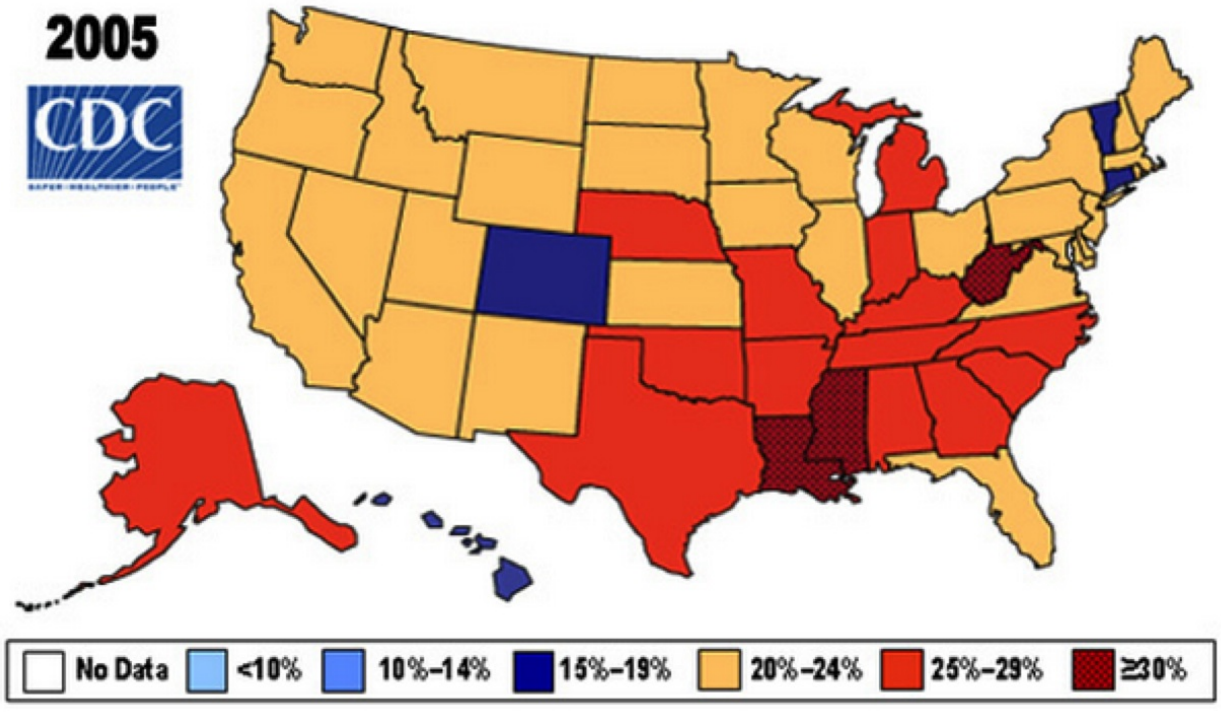
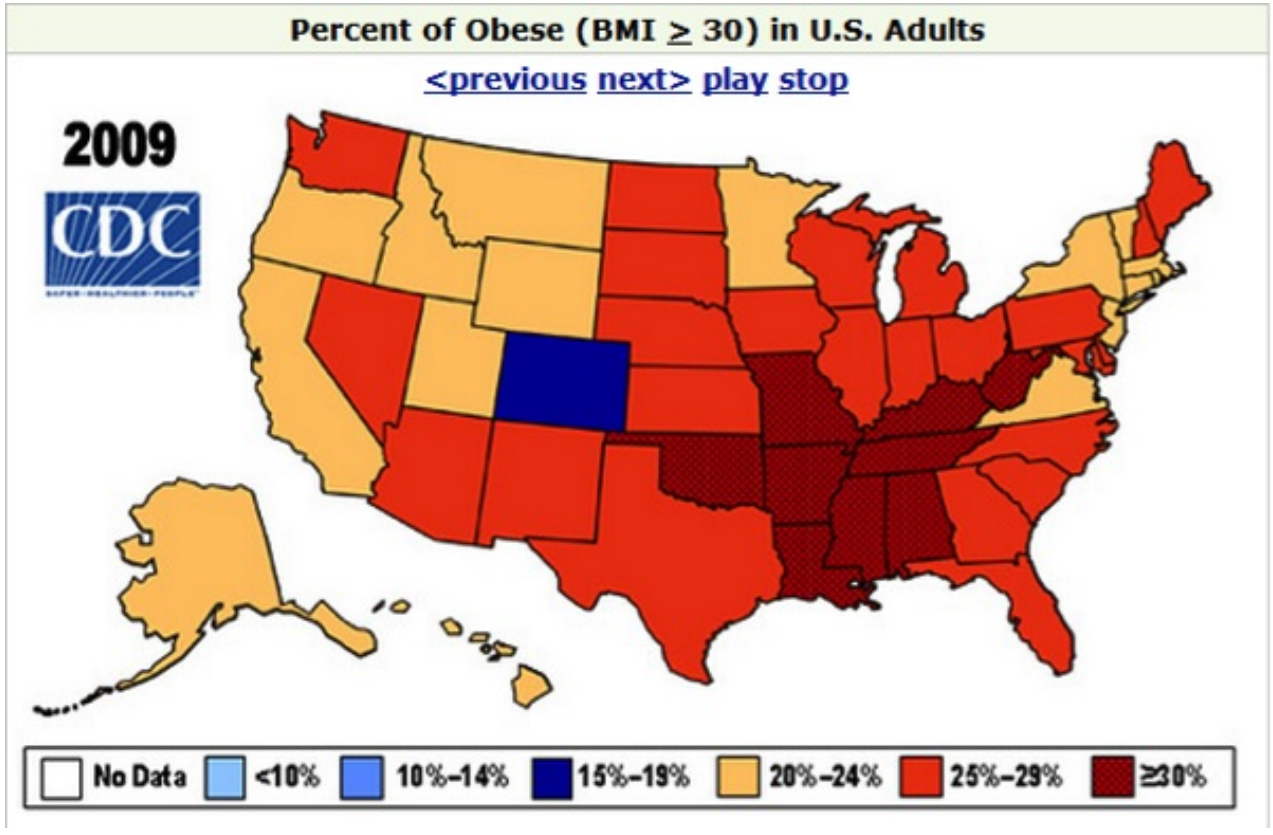
≥30%


Percent of Obese (BMI ≥ 30) in U.S. Adults
<previous next> play stop
2000
CDC
No Data
<10%
10%–14%
15%–19%
20%–24%
25%–29%
≥30%

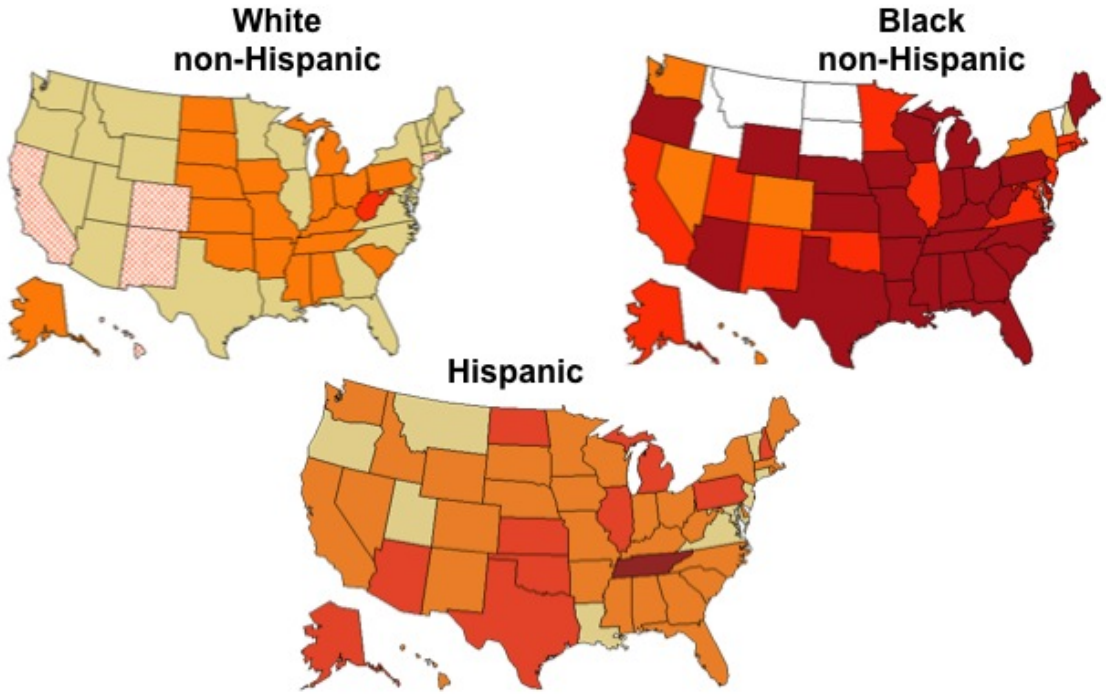
Percent of Obese (BMI ≥ 30) in U.S. Adults

<previous next> play stop




Percent of Obese (BMI ≥ 30) in U.S. Adults
<previous next> play stop
2009
CDC
No Data
<10%
10%–14%
15%–19%
20%–24%
25%–29%
≥30%

Another dimension of the issue



State-specific Prevalence of Obesity (BMI $\geq$ 30) Among U.S. Adults, by Race/Ethnicity, 2006–2008. Source: CDC.

Prologue

Set up Stata if you have not done so yet:

```
set mem 500m // if Stata 11-
set more off // add , perm on
```

Now select your main SRQM folder as the working directory by adapting this command to your system and personal folder hierarchy:

```
cd "/Users/fr/Documents/SRQM/"
```

Finally, log the session and open the NHIS dataset:

```
log using "Replication/week2.log", replace
use "Datasets/nhis2009.dta", clear
```

Data exploration

Our first step verifies whether the survey is cross-sectional. If we find that the data spans over several years, we will suppress observations for all but one year of data.

```
* List all variables in the dataset.
describe
* Check whether the survey is cross-sectional.
tab year
* Delete all observations except for one survey year.
drop if year != 2009
* Locate variables of interest.
lookfor height weight
list height weight in 1/10
```

Variable transformation

Our next step is to compute the Body Mass Index for each observation in the dataset (i.e. for each respondent to the survey) from their height and weight by using the `height` and `weight` variables, and the formula for BMI.

```
* Create the Body Mass Index from height and weight.
gen bmi = weight*703/(height^2)
* Add a description label to the variable.
label variable bmi "Body Mass Index"
describe bmi
* List a few values.
list bmi in 50/60
list bmi in -10/l
```

Summary statistics

We now turn to analysing the newly created `bmi` variable, using the `summarize` command (shorthand su) to obtain its mean, min and max values, as well as standard deviation, which we will cover later on.

```
su bmi
* Add the 'detail' option for precise statistics.
su bmi, detail
* Create a histogram for the distribution of BMI.
histogram bmi, normal name(bmi, replace)
```

The **histogram** describes the distribution of the variable in the sample, i.e. the distribution of different values of BMI among the respondents to the survey. The `freq` option specifies to use percentages; the `normal` option overlays a normal distribution to the histogram bars; and the `name` option temporarily saves the graph

Independent variables

Body Mass Index is our dependent variable, i.e. the one that we want to explain. We have reason to believe that some independent variables like gender, health status and race could be influencing BMI.

```
lookfor sex health race
* Summarize BMI for each value of ‘sex’.
bysort sex: su bmi height weight
* Read the frequencies for the ‘health’ variable.
fre health
* Summarize BMI for each value of ‘health’.
bysort health: su bmi weight
* Graph the mean BMI of each ethnic group.
gr dot bmi, over(raceb) ytitle("Average Body Mass
Index") name(bmi_race, replace)
```

Note: Logical operators

`drop if year != 2009`
This command deletes all observations for which the variable year is **different** (!=) from 2009. An equivalent command would be:

`keep if year==2009`
This command keeps only observations for which the year variable is **equal** (==) to 2009. Notice that the "equal to" operator in Stata is a double equal sign (==).

`su bmi weight if age >= 18 & age < 25`
This command reads as: "run the summarize command on the bmi variable for observations with an age value **greater than or equal to** 18 **and** (&) **lesser than** 25." We will learn logical operators shortly.

Note: Graph options

```
gr dot bmi, over(raceb) ytitle("Average Body Mass
Index") name(bmi_race, replace)
```

- `over(raceb)` creates a line and a dot at the mean value of BMI for each category of the `raceb` variable.
- `ytitle("Average... Index")` provides a legible title for the axis on which BMI appears.
- `name(bmi_race, replace)` names the graph `bmi_race` and keeps it in memory; it will `replace` any previous graph with that name.

You might object:

> *"So many commands! So many options! This is madness!"*

But no...

Welcome, and thank you.