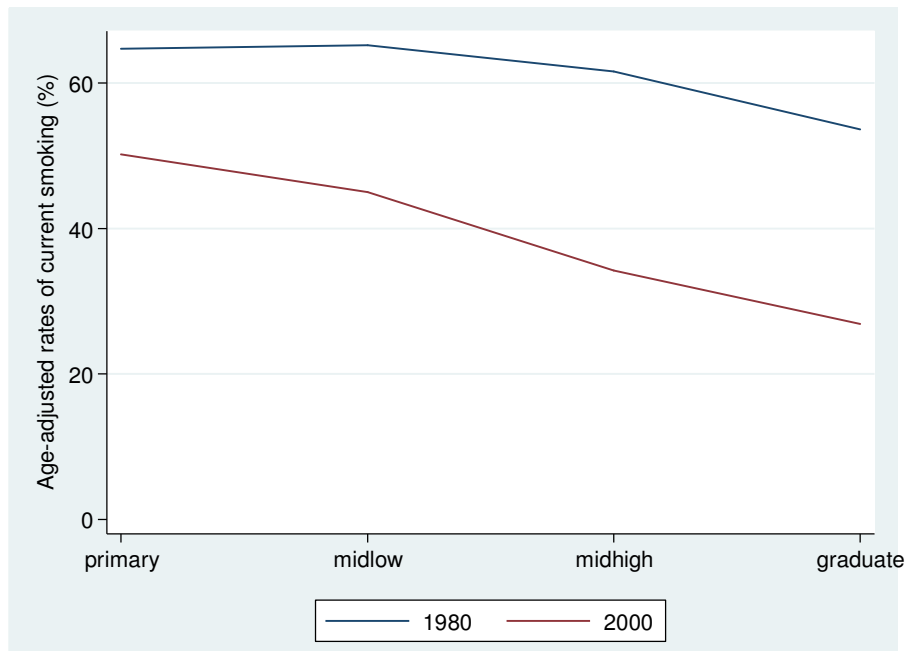# Social network and smoking:
a pilot study among high-school students

Bruno Federico

Firenze, 14 novembre 2013

The social pattern of smoking

- Smoking is an important risk factor for health

- It is socially patterned
  - This is more evident in the US and northern Europe

Percentage of current smokers by education
(males 25-49 years - Italy)

Federico, Kunst et al. "Trends in educational inequalities in smoking in northern, mid and southern Italy, 1980-2000." *Prev Med* 2004; 39:919-26.

Socioeconomic inequalities in smoking initiation

- Smoking initiation occurs mostly in adolescence

- Friends and family members may influence smoking behavior

- Other influences may be anti-tobacco policies and other social policies

The SILNE project

- Tackling Socio-economic Inequalities in smoking: Learning from Natural Experiments by time trend analyses and cross-national comparisons

- Research project funded under FP7

- The aim is to analyse several "natural experiments" available within Europe in order to generate new evidence to inform strategies to reduce socioeconomic inequalities in smoking

The SILNE project: WP5

- One specific aim is to assess, through **comparisons between European countries**, whether differences in specific **tobacco control policies** and in **educational systems** are associated with differences in **socioeconomic inequalities in smoking initiation**

Methods of SILNE WP5

- WP5 is carried out in 6 European cities
- Belgium, Netherlands, Germany, Finland, Portugal and Italy
- Sample size is about 2000 students aged 14-15 for each city (1° and 2° year of high school)
- Data are collected with a questionnaire during schooltime

The questionnaire

- Parents gave written consent
- Topics were:
  - Smoking behaviour
  - Physical activity and drinking
  - Friends, family
  - School
  - SES characteristics

Activities of WP5

- A pilot study was carried out in the school Varrone in Cassino (Nov-Dec 2013)
- Data collection was completed in 7 schools in Latina (May-Jun 2013)
  - About 2,100 questionnaires were collected
- Data entry (Sep-Oct 2013)
- Proposals of data analyses (Dec 2013-Jan 2014)
- Feedback to schools (Spring 2014)

How to map friendship network

- Students were given the questionnaire along with a separate sheet containing names and numerical codes for all 1° and 2° year students

- Students had to write down their own code as well as their best friends' codes
  - Up to 5 friends could be nominated

A. Nel riquadro sottostante, scrivi il codice che compare nell'elenco di fronte al tuo nome.

B. Con quali dei tuoi compagni di scuola del I e II anno scolastico (compresa la tua classe) preferisci studiare o a quali chiedi aiuto, ad esempio per i compiti a casa o i lavori svolti in classe?

Identifica i nomi dei compagni di scuola in questione sull'elenco (massimo 5) e scrivi il loro codice nei box sottostanti.

Codice	Hai fatto amicizia con lui/lei dal mese di Settembre?
	Se la tua risposta è "Sí" segna la casella
□ □ □ □	□
□ □ □ □	□
□ □ □ □	□
□ □ □ □	□
□ □ □ □	□

C. Quali sono i tuoi migliori amici nel I e II anno scolastico (compresa la tua classe)?

Identifica i nomi dei tuoi migliori amici sull'elenco (massimo 5) e scrivi il loro codice nei box sottostanti. Puoi elencare sia maschi che femmine, compresi fidanzati e fidanzate.

Codice	Lo/la hai incontrato/a al di fuori della scuola per uscire nell'ultimo mese?	Hai parlato con lui/lei al telefono, chattato su Facebook, Google Talk, Skype, ecc. oppure gli/le hai inviato lettere, SMS o e-mail nell'ultima settimana?	Hai fatto amicizia con lui/lei dal mese di Settembre?
	Se la tua risposta è "Sí" segna la casella	*Se la tua risposta è "Sí" segna la casella*	*Se la tua risposta è "Sí" segna la casella*
▢▢▢▢	▢	▢	▢
▢▢▢▢	▢	▢	▢
▢▢▢▢	▢	▢	▢
▢▢▢▢	▢	▢	▢
▢▢▢▢	▢	▢	▢

Key questions on smoking

- Have you ever tried smoking, even a few puffs?
  - Yes
  - No
- How many cigarettes have you smoked until now?
  - 1, 2-50, 51-100, >100
- Would you smoke if you were offered a cigarette by a friend?
 - Yes
  - No

Classification of smoking

- Four categories
  - Never smokers
  - Those who tried and say they would NOT accept a cigarette if offered (exp. not susceptible)
  - Those who tried and say they would accept a cigarette if offered (exp. susceptible)
  - Current smokers
- For some analyses, a dichotomous variable was created
  - Smoker/exp. susc. vs never/exp not susc.

Statistical analyses

- Descriptive statistics
- Proportion of smokers
  - SES correlates of smoking
- Proportion of friends that are smokers
- Description of social network
  - **netplot** (Corten 2010)
- Computation of centrality indexes
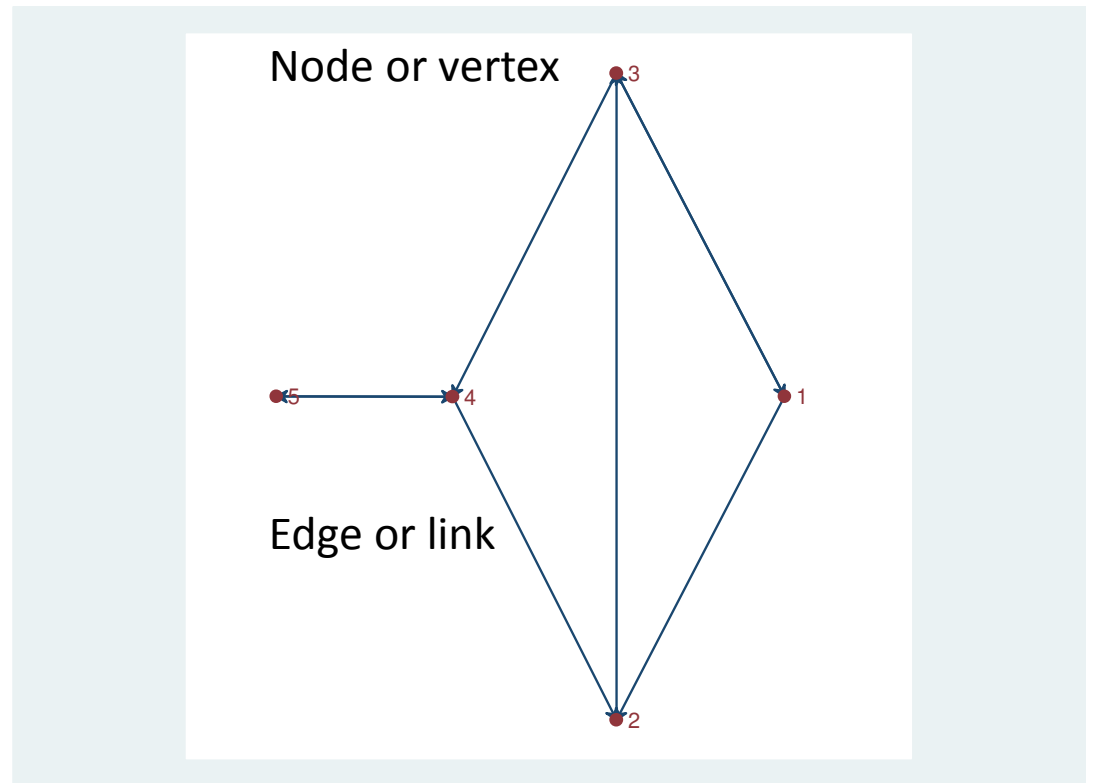 - **netsis** and **netsummarize** (Miura 2011)

Adjacency matrix

	1	2	3	4	5
1	0	1	1	0	0
2	0	0	1	0	0
3	1	0	0	1	0
4	0	1	0	0	1
5	0	0	0	1	0

Node or vertex

Edge or link
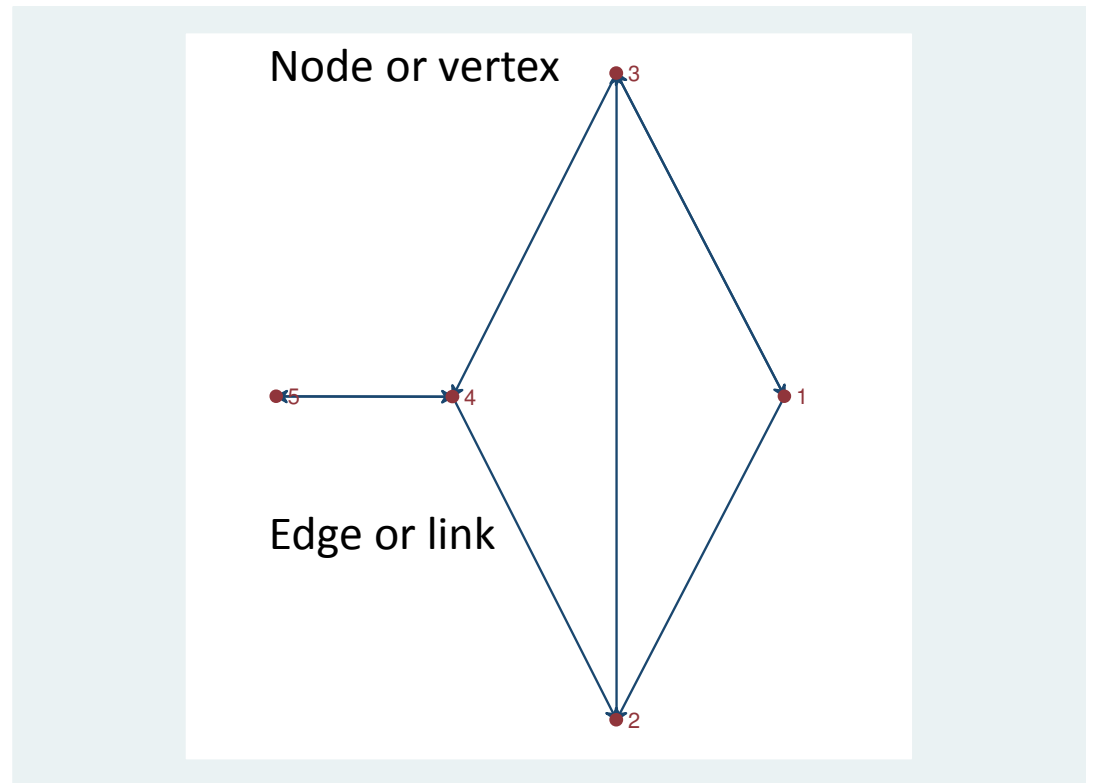
Edge list

from	to
1	2
1	3
2	3
3	1
3	4
4	2
4	5
5	4

Node or vertex

Edge or link

netplot (Stata command)

netplot -- Social network visualization

netplot produces a graphical representation of a network stored as an extended
edgelist or arclist in var1 and var2.

netplot *var1 var2* [if] [in] [, type(mds|circle) label arrows iterations(#)]

Options
    type(mds|circle) specifies the type of layout. Valid values are mds and circle.

    mds calculates positions of vertices using multidimensional scaling. This is
the default if type() is not specified.

    circle arranges vertices on a circle.

    label specifies that vertices be labeled using their identifiers in var1 and
var2.

Centrality indexes

- Degree measures the importance of a vertex by the number of connection the vertex has

- Betweenness centrality gives larger centrality scores on vertices that lie on a higher proportion of shortest paths linking vertices other than itself

netsis (Stata command)

```
netsis -- Network analysis

netsis generates matrices, centrality measures, and clustering coefficients, and
solves the maximum-flow minimum-cut problem for directed or undirected one-mode
networks containing edges that are unweighted or weighted with positive values.
```

netsis *varname_source varname_target* [if] [in], measure(network_measure) [options]

```
        where network_measure can be one of the following:


            adjacency              adjacency matrix
            distance               distance matrix
            path                   path matrix
            betweenness            betweenness centrality
            clustering             local and overall/average clustering coefficients
            eigenvector            eigenvector centrality
            maxalpha               maximum free parameter alpha
            katzbonacich           Katz-Bonacich centrality
            maxflow                maximum-flow minimum-cut
```

netsummarize (Stata command)

netsummarize -- Postcomputation tool for netsis

netsummarize merges network statistics to Stata dataset.

netsummarize *mata_exp*, generate(*newvar_prefix*) statistic(*stat_name*)

    mata_exp must be a Mata matrix or a Mata expression, and it must evaluate to either a scalar, a |V| x 1 column vector, or a |V| x |V| matrix, where |V| equals the number of vertices in the network. See [M-5] sum(), [M-5] mean(), [M-5] missing(), and [M-5] minmax().

    stat_name can be one of the following:

mean	mean(mean(mata_exp)')
min	min(mata_exp)
max	max(mata_exp)
sum	sum(mata_exp)
…	

Calculation of betwenness centrality

```
. use toy, clear
. sort from to
. bysort from: gen n=_n

. netsis from to, measure(betweenness) name(b,replace)

Betweenness centrality calculation completed
matrix b saved in Mata

. netsummarize b/((rows(b)-1)*(rows(b)-2)), generate(betweenness) statistic(rowsum)

. list from betweenness_source if n==1,clean noobs


     from    betwee~e
        1           0
        2    .1666667
        3    .1666667
        4          .5
        5           0
```

Betweeness centrality
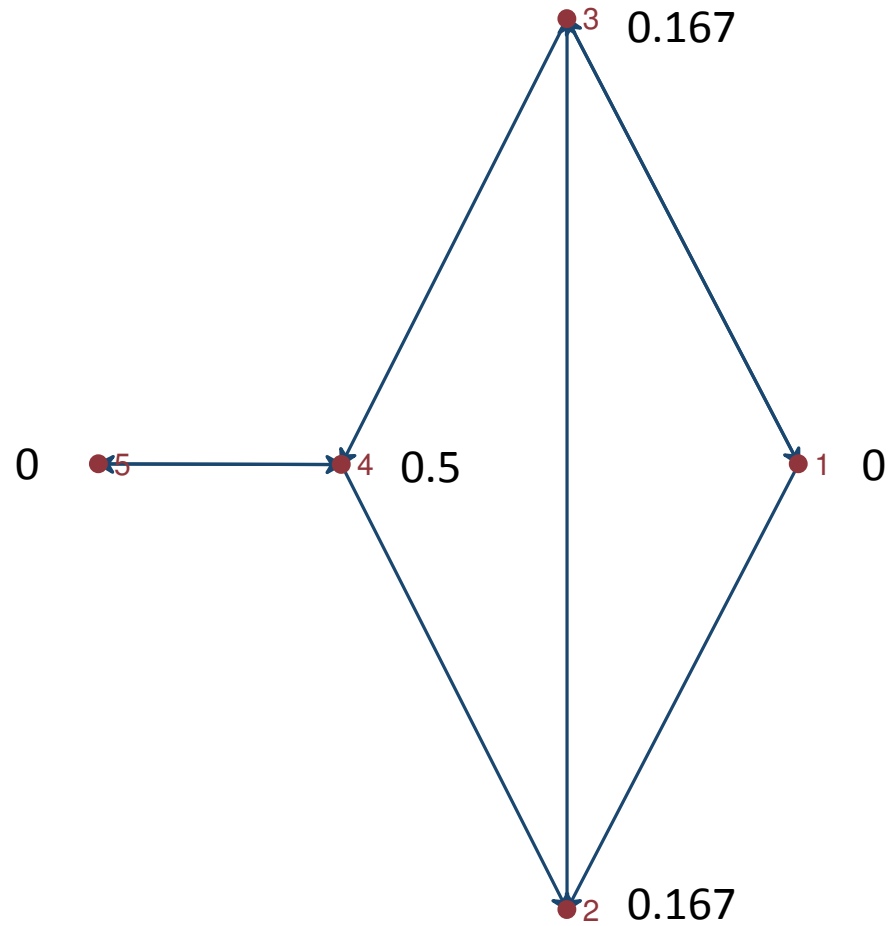
The sample of the pilot study

Class id	N. students	N. positive consents	N. questionnaires	Response rate (%)
1ASU	21	17	16	76.2
1BSU	19	14	14	73.7
1CART	26	22	22	84.6
1AL	23	15	10	43.5
1ASEC	25	23	22	88.0
2ASU	23	19	13	56.5
2BSU	20	16	15	75.0
2CART	27	26	25	92.6
2AL	21	17	17	81.0
2ASEC	22	22	21	95.5
Total	227	191	175	77.1

Descriptive statistics

	N	%			N	%
Sex				**Own house**		
Female	158	90.3		No	23	13.3
Male	17	9.7		Yes	150	86.7
Age				**Own bedroom**		
13 – 14	88	50.3		No	70	40.2
15 – 16	87	49.7		Yes	104	59.8
Mother's education				**Holidays previous year**		
Low	44	26.8		0	64	36.6
Mid	75	45.7		1	71	40.6
High	45	27.4		>= 2	40	22.9
Father's education				**Money to spent per week**		
Low	61	38.6		<= 10 euros	124	72.9
Mid	69	43.7		< 10 euros	46	27.1
High	28	17.7				
Mother worked				**Family members who smoke**		
No	61	35.3		None	35	20.0
Yes	111	64.2		One or more	140	80.0
Father worked				**Friends who smoke**		
No	22	12.8		None/some	130	76.0
Yes	150	87.2		Most/all	41	24.0

Distribution of smoking

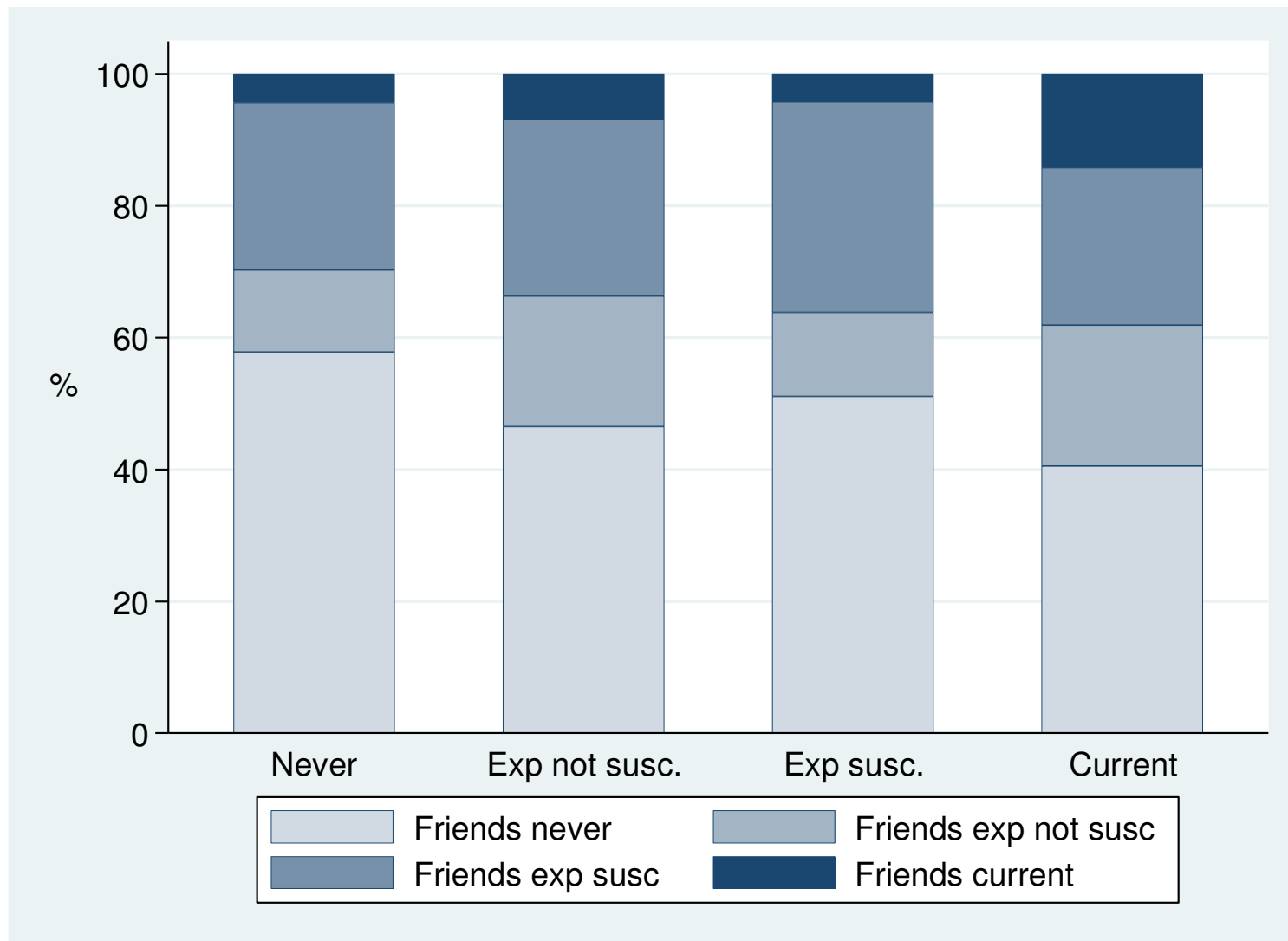| Smoking status	n	%
current	12	6.9
Exp. Suscept	41	23.7
Exp. Not suscept	22	12.7
never	98	56.7
Total	173	100.0

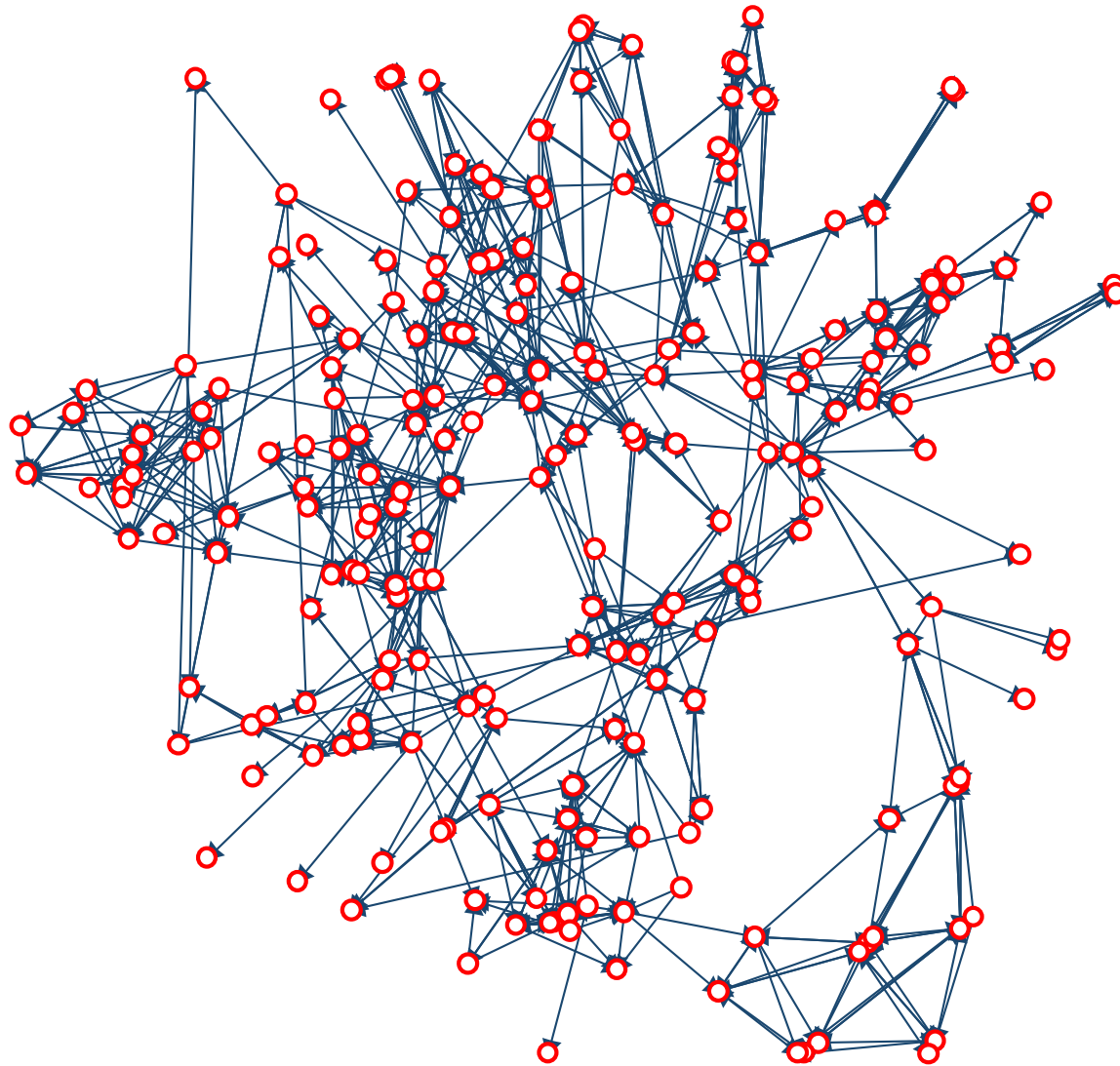# Percentage smokers/exp. susc. by SES
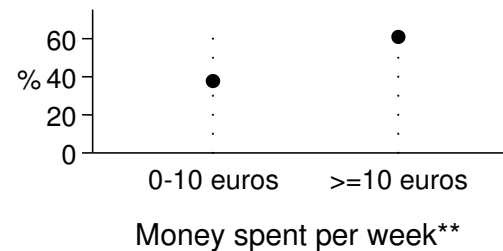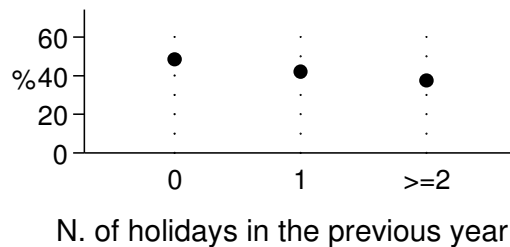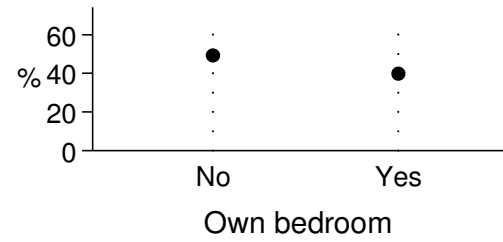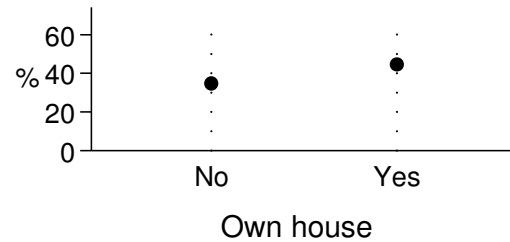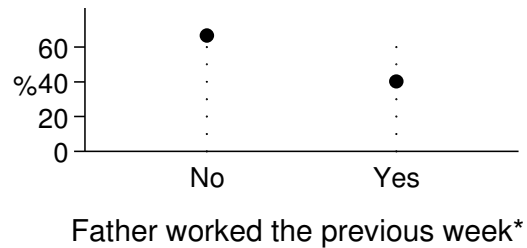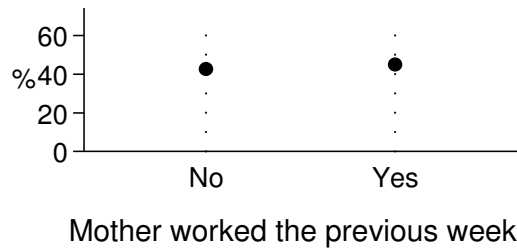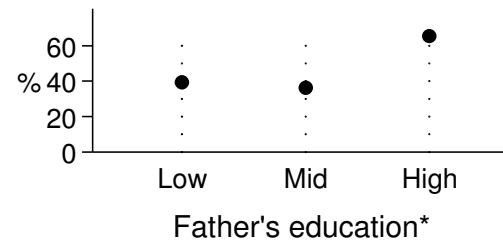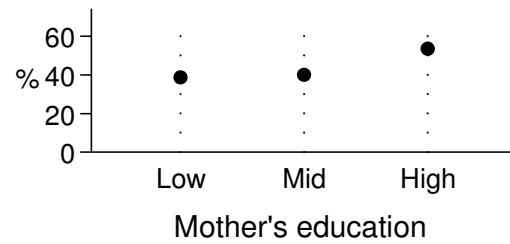
* p<0.05

** p<0.01

Friendship ties

- 175 questionnaires (ego)
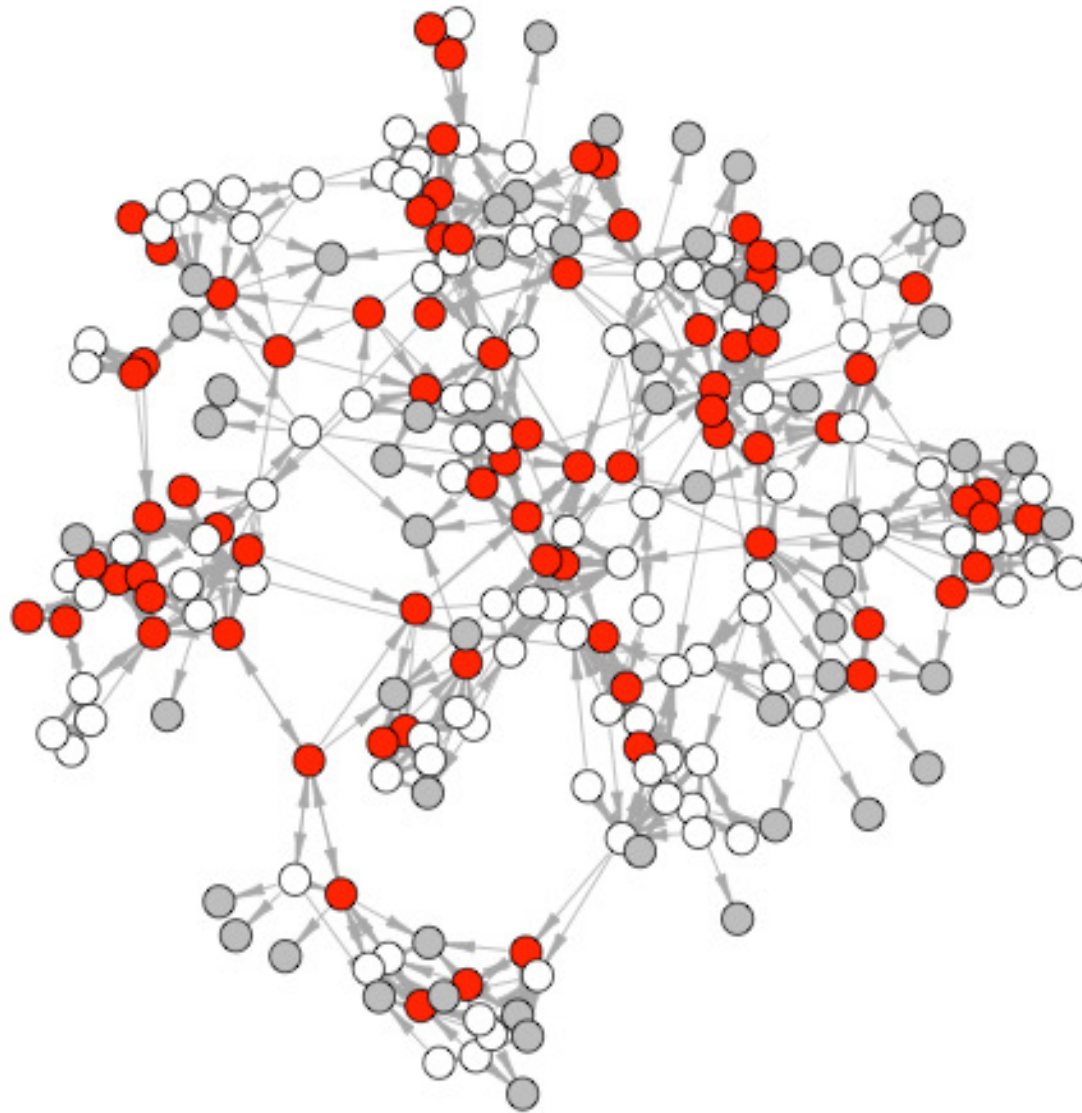- 218 nominated friends (alter)
- Total number of links (L) is 794

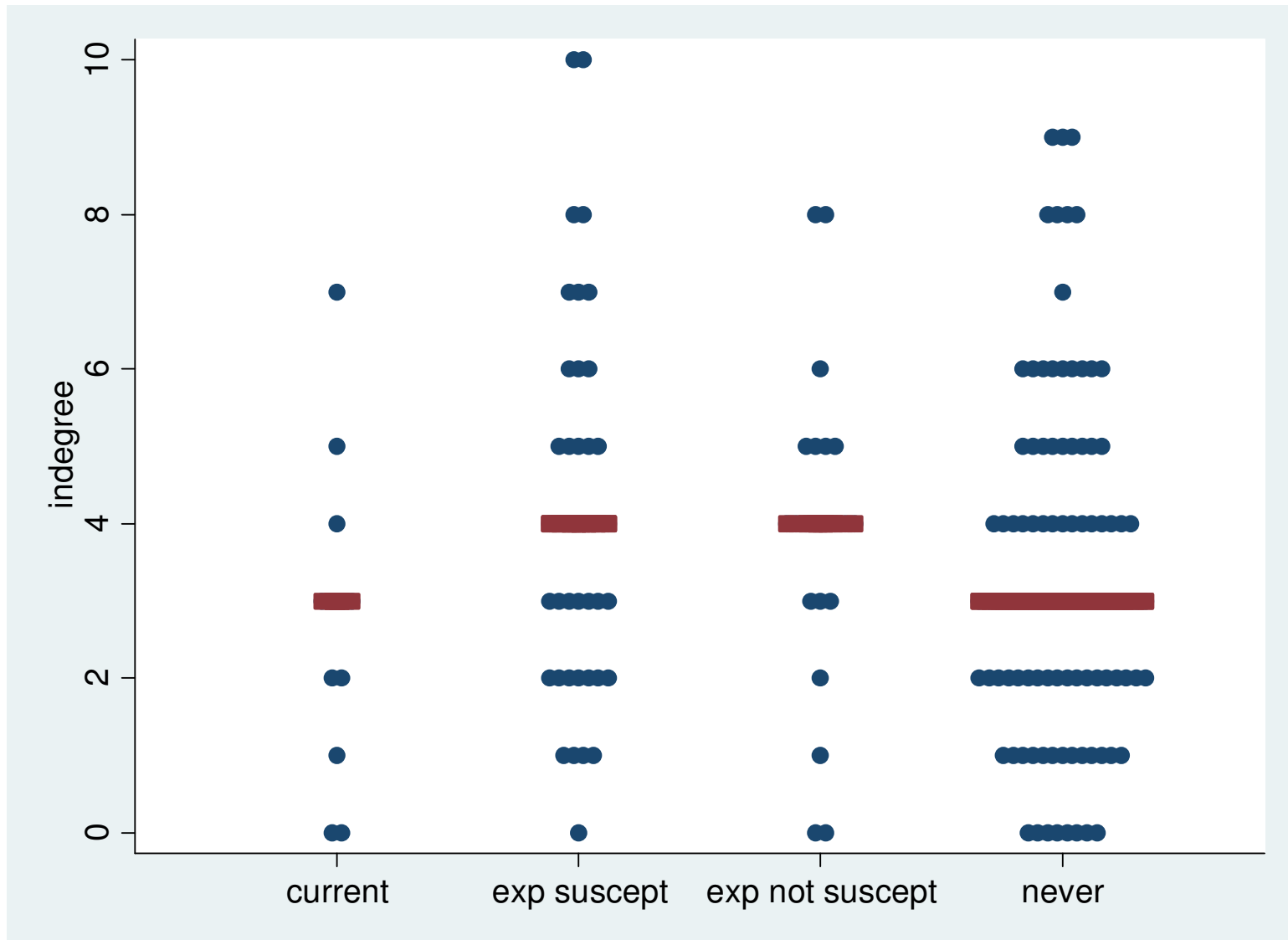Percent distribution of friends' smoking habits by ego's smoking behaviour
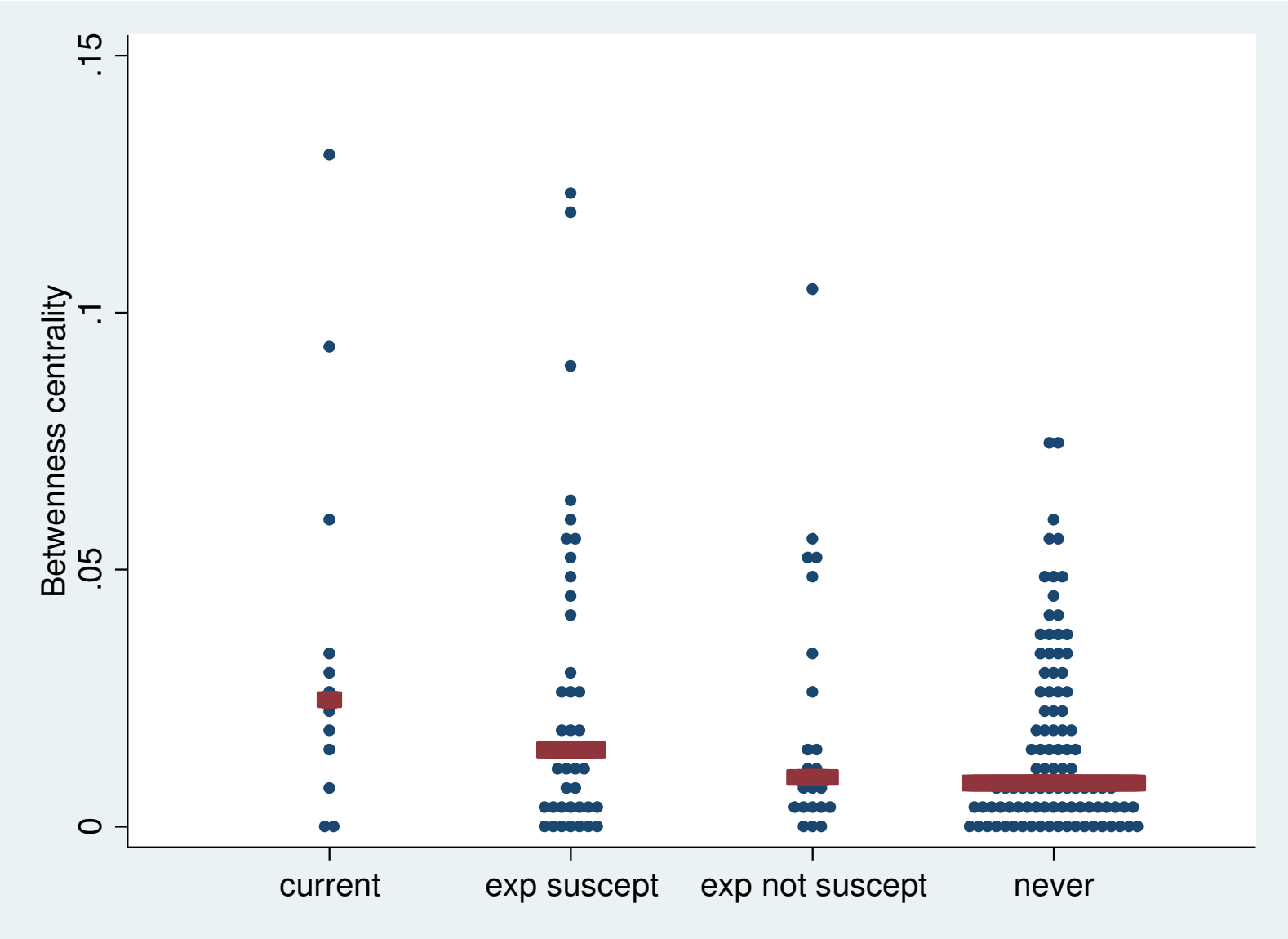
School friendship network with netplot

School friendship network using R

Indegree by smoking

Betweeness centrality by smoking

Discussion

- The pilot study was succesful
  - Missing data
- Several research questions can be addressed in the full study
- Data analyses
  - Social network data can be handled with Stata, but
    - Computation procedure is low
    - Visual description of network may be improved by changing marker shape, size and colour according to variables of interest