Social network and health behaviour inequalities: theory and results of the SILNE-study

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Background (1). The paradox of inequalities

- Persisting inequalities : income, education, health,…
- There is no clear trends towards decreasing health inequalities
- Despite anti-discrimination laws, inequalities remain common in many western countries
- This may apply to labour market, educational market and health care
- In democratic societies
- Welfare ? Scandinivian countries do not have lower inequalities in health

- Research on inequalities may have paid little attention to mundane social interactions

Background (2). Inequalities in contact

- Separation of groups help to suppress norms and sustain «deviant » behaviours (H.Becker, 1963)
- Durable Inequality (C.Tilly, 1998)
  - «Actors rarely set out to manufacture inequality as such. Their efforts to secure accesss to valued resources by distinguishing between insiders and outsiders, ensuring solidarity and loyalty, and monopolizing important knowledge often make use of established categories in the service of facilitating organisational goals»
- Research inequalities should move from inequalities in contract to inequalities in contact
- Examples:
  - Increase/persistence of Income inequality is linked to marital homophily
  - Educational achievement inequalities are associated with early tracking and school-segregation
  - The labour market and the strenght of weak ties

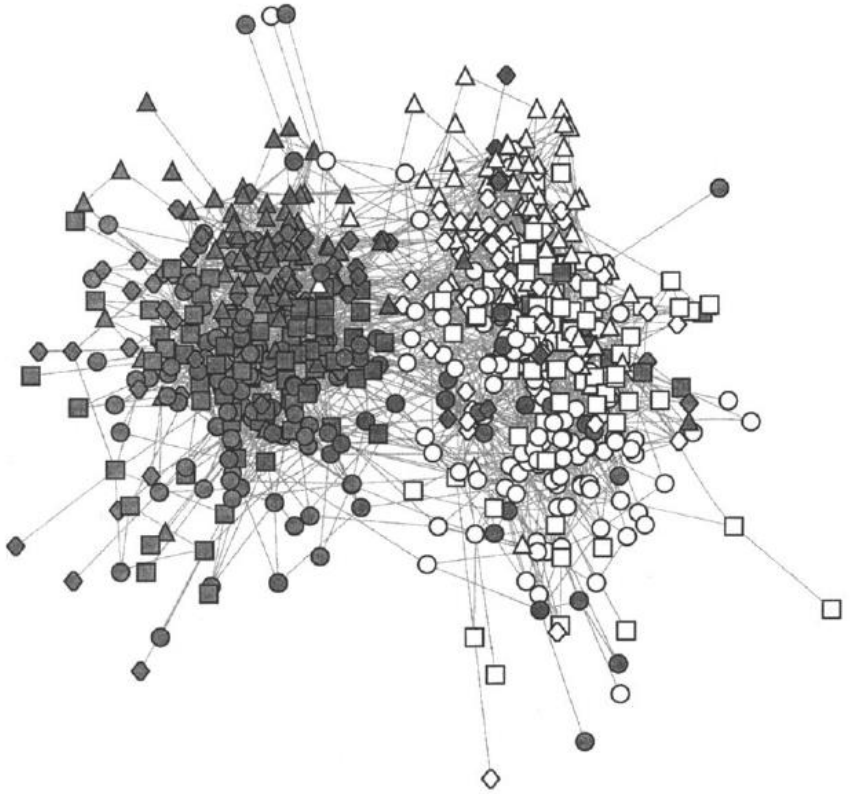

FIG. 1.—Friendship relations in "Countryside High School" by race and grade. Shaded figures represent nonwhite students. Circles = ninth graders, squares = tenth graders, hexagons = eleventh graders, and triangles = twelfth graders.

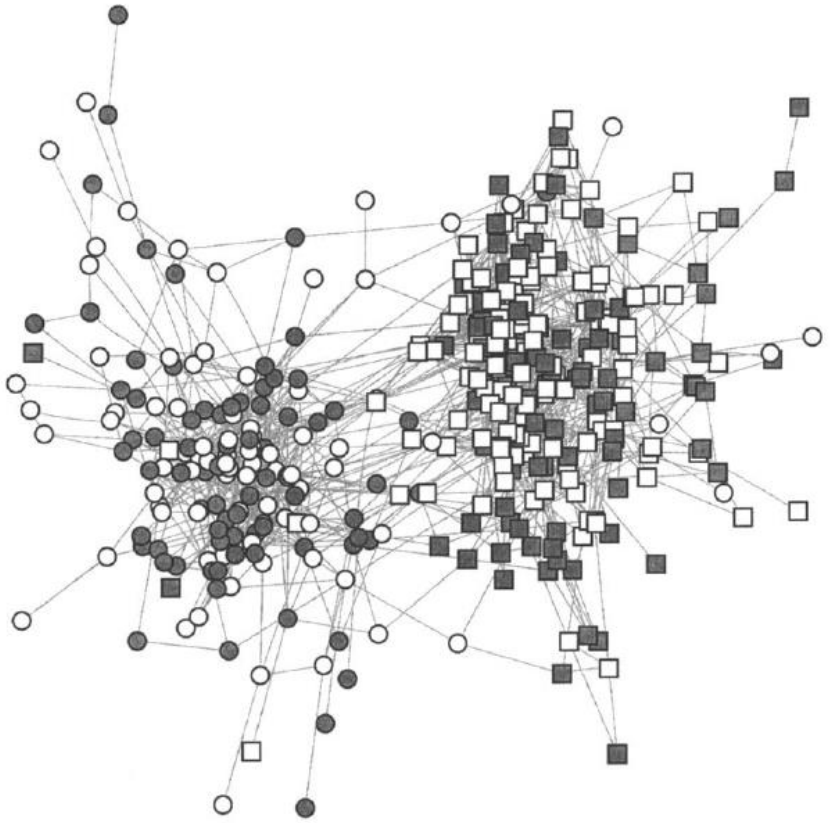

FIG. 2.—Friendship relations in "Mountain Middle School" by race and grade. Shaded figures represent nonwhite students. Circles = seventh graders and squares = eighth graders.

James Moody, Race, school integration, and friendship segregation in America, *American Journal of Sociology* **107**, 679-716 (2001).

Background (3). Theory of network-induced inequalities

- Network can exacerbate inequalities under four conditions (Dimaggio, Am j Sociol, 2011)
  - There is an initial difference accross groups (C1)
  - The behaviour has some positive externalities and/or negative externalities : peer effect (C2)
  - The network is not random accross groups: homophily. (C3)
  - The behaviour is complex: difficult to observe, require support, risky, illegitimate, complex to practice (C4)

Could this improve our understanding of health behaviours socio-economic inequalities ?

Lorant and Bhophal, JECH, 2011

Background (4). Inequalities in Health Behaviours

A third of life expectancy SE inequalities are due to different in health behaviours (HB), particularly smoking (JHA,2006)

These differences emerge very early at the adolescence but….

- There are small and unconsistent accross countries/schools.

Four main theoretical pathways (Pampel, An Rev Sociol 2010)

- Structural approach : stress, deprivation and HB
- Economic approach : diffferences in discounting of future LE
- Psychological approach : personality, latent trait, coping style
- Social capital–social distinction : HB are learnt, shared, socially sanctioned

Application of theory of network inequalities to smoking

Research questions

What is the magnitude of socio-economic inequalities in smoking among school-aged adolescents in 5 European cities ?

Are these inequalities explained by externalities of smoking (C2) and socio-economic status homophily (C3)?

~~- Are these inequalities greater where smoking is more complex (C4)~~ ?

Method : design and data

- Design: social network face-to-face survey in 50 secondary schools,
- Full network design in two grades (9th and 10th)
- Local market approach and differentation on Tobbaco control policies and educational inequalities.
- 6 European cities : Namur (BE), Tampere (Fin), Hanover (DE), Latina (IT), Amersfoort (NL), Coimbra (PT)
- Sample : 11,015 adolescent aged 15.2 (std=1.0). Participation rate of 79%
- Passive parental consent in all cities but Hanover-Italy
- Nominations : friendship and cooperation
- Roster in all cities but Finland
- Nominations per participation status

Lorant et al, BMC Research Note 2015

Nominations by participation status

Table 5 SILNE 2013 Survey: number of friendship nominations per country and participation status

Citation Status	Namur-Belgium		Tampere-Finland		Hannover-Germany		Latina-Italy		Amersfoort-Netherlands		Coimbra-Portugal		All cities	
	Ties	%	Ties	%	Ties	%	Ties	%	Ties	%	Ties	%	Ties	%
Nominated, not participating	1,196	10.8	745	10.7	1,582	21.2	1,761	15.1	1,345	13	991	10	7,620	13.3
Nominated, participating	9,916	89.2	6,195	89.3	5,880	78.8	9,915	84.9	9,021	87	8,547	90	49,474	86.7
Total	11,112	100	6,940	100	7,462	100	11,676	100	10,366	100	9,538	100	57,094	100

Method : measures and analysis

- Dependent : regular smoking (18.7%)
- Independent SES status:
  - Father and mother education
  - Family affluence scale
  - McArthur scale of subjective social status
  - Mother and father not working last week
  - Nber of low SES categories (0-6).
- Exposure to peer smoking : $\text{Exposure}_i = \frac{\sum_{j=1}^{g-1}(W_{ij}Y_j)}{\sum W_{ij}}$
- Coleman index of Homophily (-1, +1) with 0= random network
- Statistical analysis : nested logistic regressions with random coefficients
- Stratification by global Moran' I and by tobacco control

Result (1/3) SES, peer'smoking, parental smoking and friendship' homophily

Condition 2 Condition 1 Condition 3

Table 3. Exposure to regular smoking and social homophily in the adolescent school and parental network, by SES groups, SILNE international survey among adolescents, 2013 *.

SE groups	Exposure to regular smoking in 1st degree friends(%)			Exposure to regular smoker in 2nd degree friends(%)			Exposure to regular smoker in 3rd degree friends(%)			Relative distance to regular smoker (%)			Smoking members in household (nber)			Coleman index of homophily** (-1,1)		
	%	F-test	P	%	F-test	P	%	F-test	P	%	F-test	P	Nber	F-test	P	Index	F-test	P
Lowest SES categories (nber):		15.9	<.001		18.8	<.001		15.7	<.001		1.3	0.273		26.2	<.001		108.9	<.001
0	16.5			17.1			16.6			93.6			1.2			0.47		
1	16.7			18.2			18.2			94.2			1.3			0.30		
2	18.4			17.8			17.6			94.3			1.5			0.19		
3	17.9			19.0			19.2			94.0			1.6			0.09		
4	19.5			22.0			19.7			93.8			1.6			0.06		
5	23.1			22.3			21.5			93.4			1.8			0.01		

*Results of the ANOVA controlled for age and sex;** on parental education;

Results (2/3) : Modelling smoking inequalities

Table 4. Effect of exposure to smoking on regular smoking: odds ratio from the logistic regressions, SILNE international Survey of adolescents, 2013.

Covariates :	Model 1			Model 2			Model 3			Model 4		
	OR	95%CI		OR	95%CI		OR	95%CI		OR	95%CI	
Number of lowest SES categories (ref=none):												
1	1.09	(0.95-1.25)		1.10	(0.94-1.29)		1.08	(0.91-1.26)		1.06	(0.90-1.25)	
2	1.21	(1.04-1.41)	*	1.19	(1.00-1.43)	*	1.15	(0.97-1.38)		1.09	(0.91-1.31)	
3	1.29	(1.08-1.54)	**	1.24	(1.01-1.53)	*	1.19	(0.96-1.46)		1.08	(0.87-1.33)	
4	1.44	(1.14-1.82)	**	1.28	(0.97-1.70)		1.23	(0.93-1.63)		1.13	(0.85-1.50)	
5	1.52	(1.08-2.14)	*	1.15	(0.76-1.75)		1.10	(0.73-1.67)		0.95	(0.62-1.46)	
Exposure to smoking and homophily :												
Exposure to regular smoking degree 1 (10%,§)				1.26	(1.24-1.29)	***	1.26	(1.24-1.29)	***	1.25	(1.23-1.28)	***
Exposure to regular smoking degree 2 (10%)				1.22	(1.18-1.25)	***	1.22	(1.18-1.25)	***	1.21	(1.18-1.25)	***
Exposure to regular smoking degree 3 (10%)				0.97	(0.94-1.00)	*	0.97	(0.94-1.00)	*	0.97	(0.94-1.00)	
Relative distance to smoking(%)				0.79	(0.75-0.83)	***	0.79	(0.75-0.83)	***	0.79	(0.75-0.84)	***
Parental education homophily (-1,+1)							0.88	(0.80-0.96)	**	0.91	(0.83-1.00)	
Smokers in the household (Nber)										1.44	(1.38-1.50)	***
Sociodemographics :												
Age 14-15 (reference <14)	2.30	(1.26-4.19)	**	1.95	(0.96-3.94)		1.90	(0.94-3.84)		1.80	(0.89-3.64)	
Age 16+	6.26	(3.44 - 11.40)	***	3.99	(1.97-8.09)	***	3.87	(1.91-7.84)	***	3.79	(1.87-7.68)	***
Sex (reference=female)	1.13	(1.01-1.26)	*	1.06	(0.94-1.20)		1.06	(0.94-1.20)		1.08	(0.96-1.23)	
Country covariance component mean (std) :	0.11(0.07)			0.06(0.04)			0.05(0.04)			0.12(0.08)		

***p<0.001; **p<0.01; * 0.01=<p<0.05; The models are controlled for the variables displayed in the table; § 10% prevalence of regular smoking;

Results (3/3): Smoking inequalities : stratification analysis

Stratification Variable	Stratifcation group	Composite index of Low SES group (ref=0)	Odds ratio Model 1	95%CI	Odds ratio Model 3	95%CI
Moran Coefficient	<0.22	1	1.3	(1.12 - 1.52)	1.18	(0.99 - 1.40)
	<0.22	2	1.27	(1.04 - 1.55)	0.94	(0.74 - 1.18)
	<0.22	3	1.55	(1.16 - 2.07)	1.28	(0.92 - 1.79)
	<0.22	4	1.28	(0.69 - 2.36)	0.52	(0.25 - 1.10)
High Moran Coefficient	>=0.22	1	1.23	(1.04 - 1.46)	1.05	(0.85 - 1.29)
	>=0.22	2	1.54	(1.26 - 1.87)	1.19	(0.93 - 1.52)
	>=0.22	3	1.71	(1.25 - 2.33)	1.1	(0.73 - 1.66)
	>=0.22	4	2.42	(1.39 - 4.23)	1.64	(0.75 - 3.58)
Tobacco control policies	High control	1	1.05	(0.88 - 1.26)	0.91	(0.73 - 1.14)
	High control	2	1.33	(1.03 - 1.73)	1.26	(0.92 - 1.72)
	High control	3	2	(1.29 - 3.09)	1.99	(1.17 - 3.38)
	High control	4	1.51	(0.57 - 4.03)	0.4	(0.07 - 2.28)
Tobacco control policies	Low control	1	1.29	(1.11 - 1.49)	1.24	(1.04 - 1.48)
	Low control	2	1.17	(0.99 - 1.39)	0.98	(0.80 - 1.20)
	Low control	3	1.23	(0.96 - 1.58)	1.05	(0.78 - 1.42)
	Low control	4	1.47	(0.93 - 2.32)	0.99	(0.57 - 1.73)

Conclusions

- Higher parental exposure to smoking in low SES adolescents (C1).
- Higher exposure to peers' smoking in the network was associated with increased risk of smoking (C2)
- Homophily increases with SES (C3) and slightly decreases smoking
- C1+C2+C3 explains most of smoking inequalities
- Stratification analysis showed that SES difference in smoking were stronger in the school with higher smoking clustering in the social network compared with schools with low smoking clustering.
- Tobacco control policies was not associated with differences by socio-economic group.

Limitations

- Cross-sectional data : peer-selection versus peer-influence
- But ….distinction meaningful from a sociological point of view ?
  - “individuals are more susceptible to influence from those who are similar to them” (Centola 2011)
- Modelling choice: fixed or random model to account for between heterogeneity