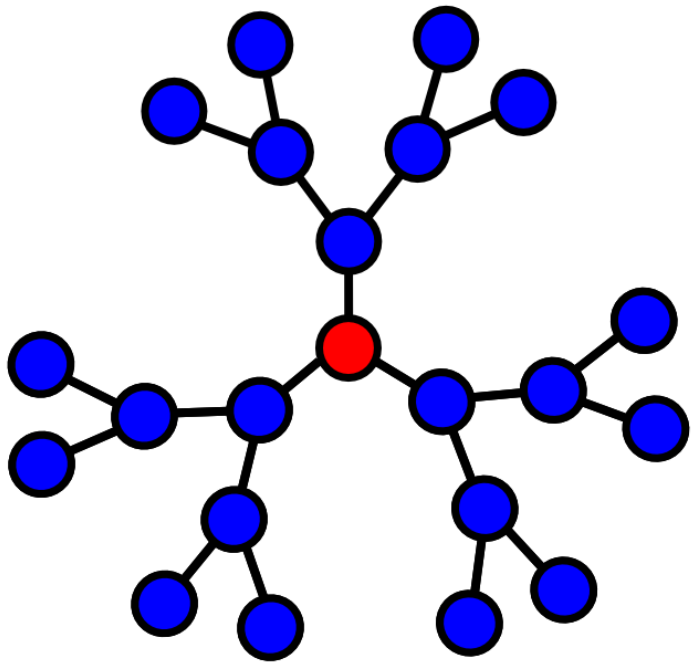
# Social contagion over adolescent friendship networks.

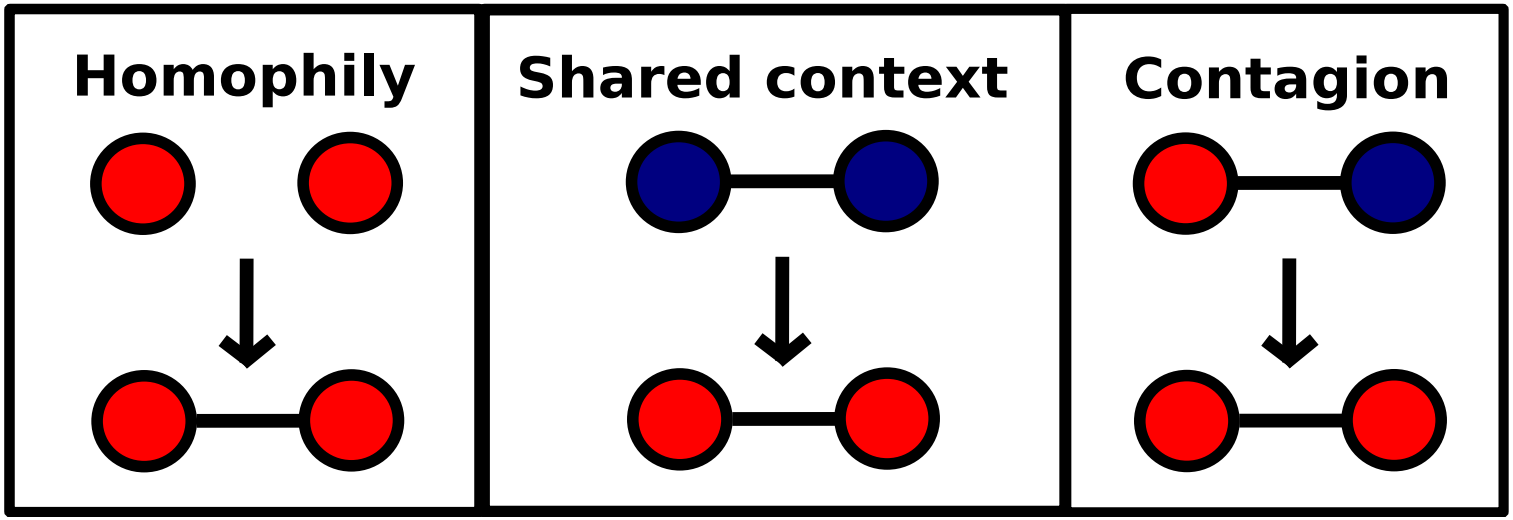
Robert Eyre [1] Thomas House [2] Edward Hill [1] Frances Griffiths [3]

[1]Centre for Complexity Science, University of Warwick

[2]School of Mathematics, University of Manchester

[3]Warwick Medical School, University of Warwick



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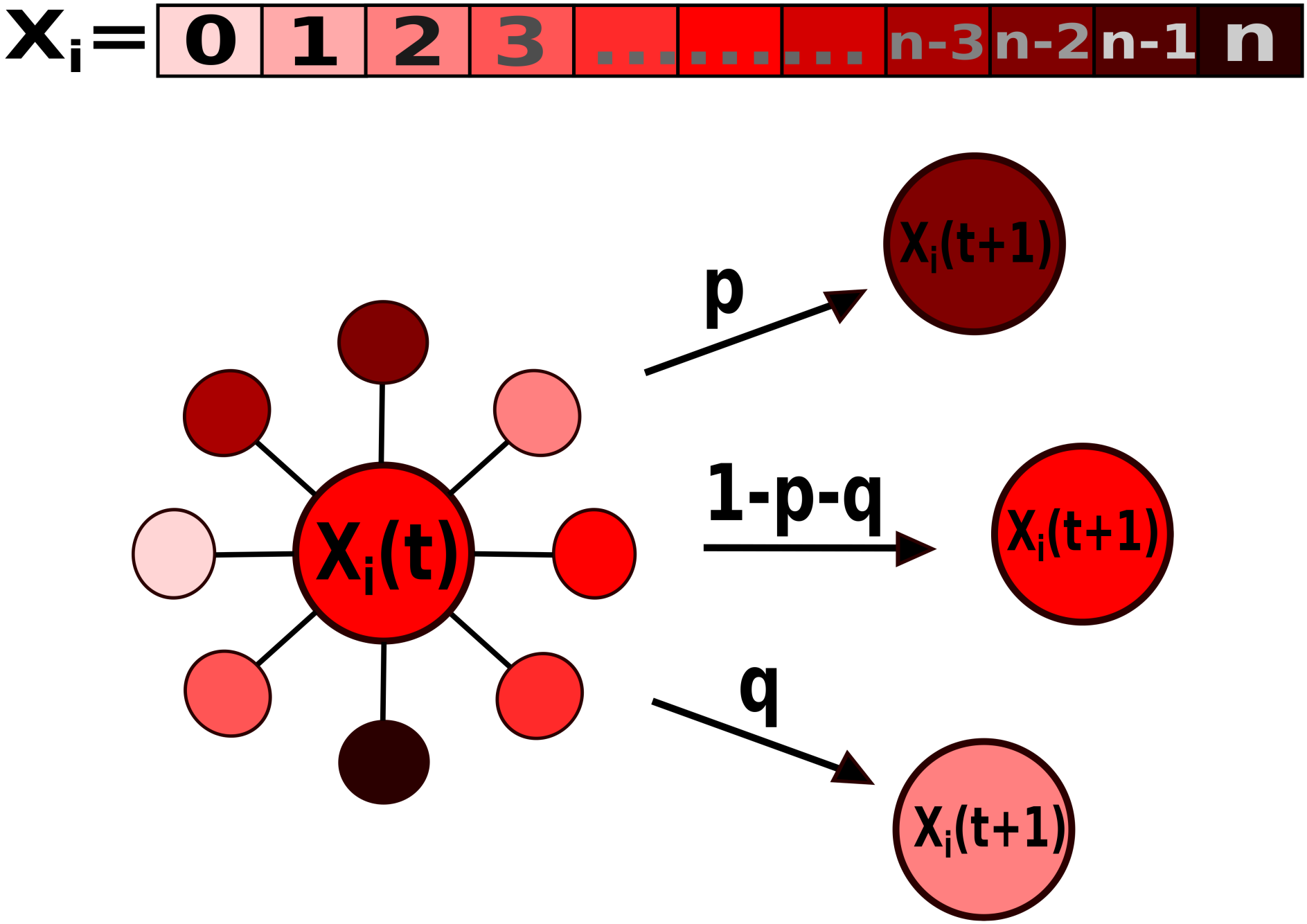
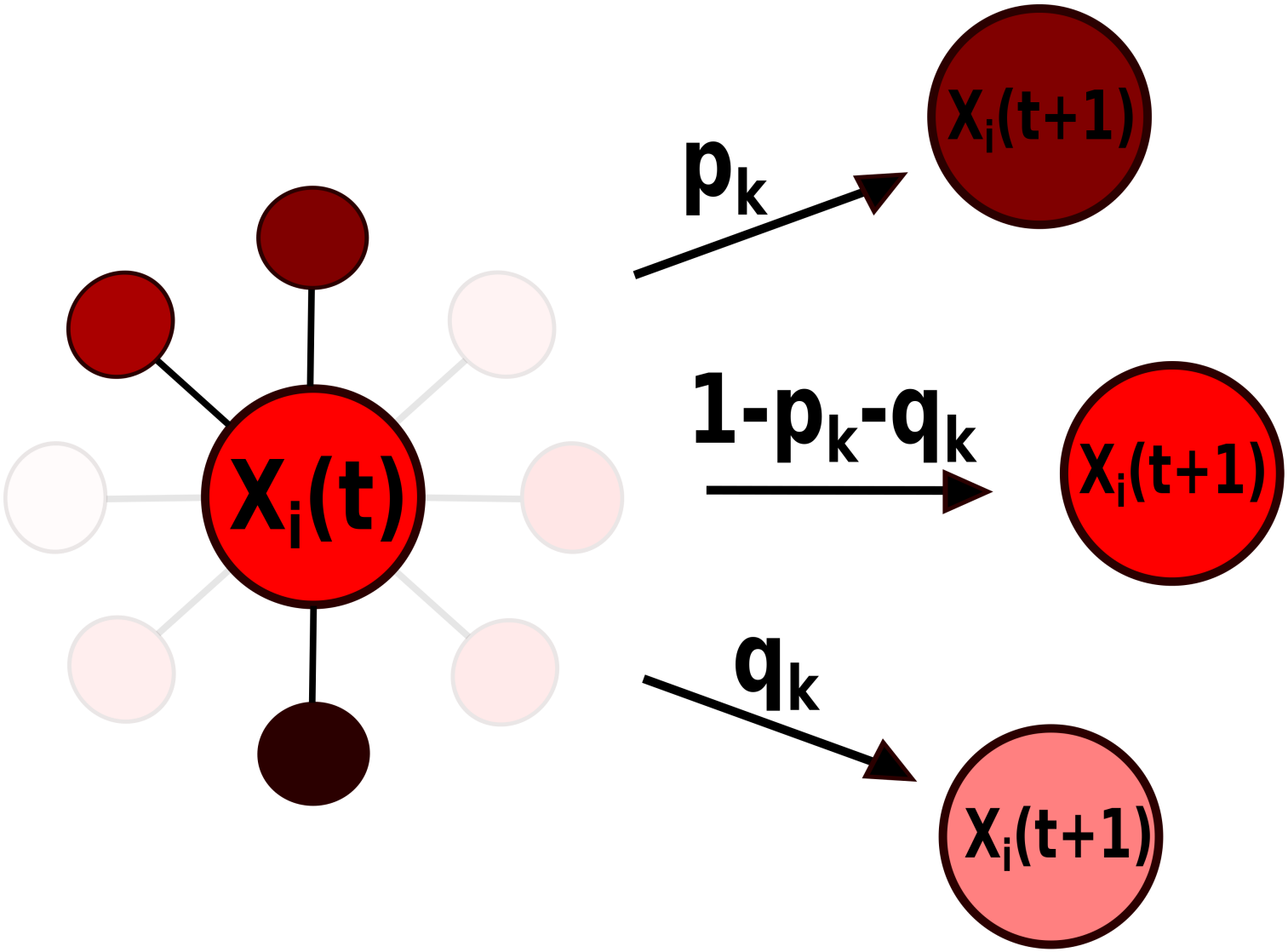
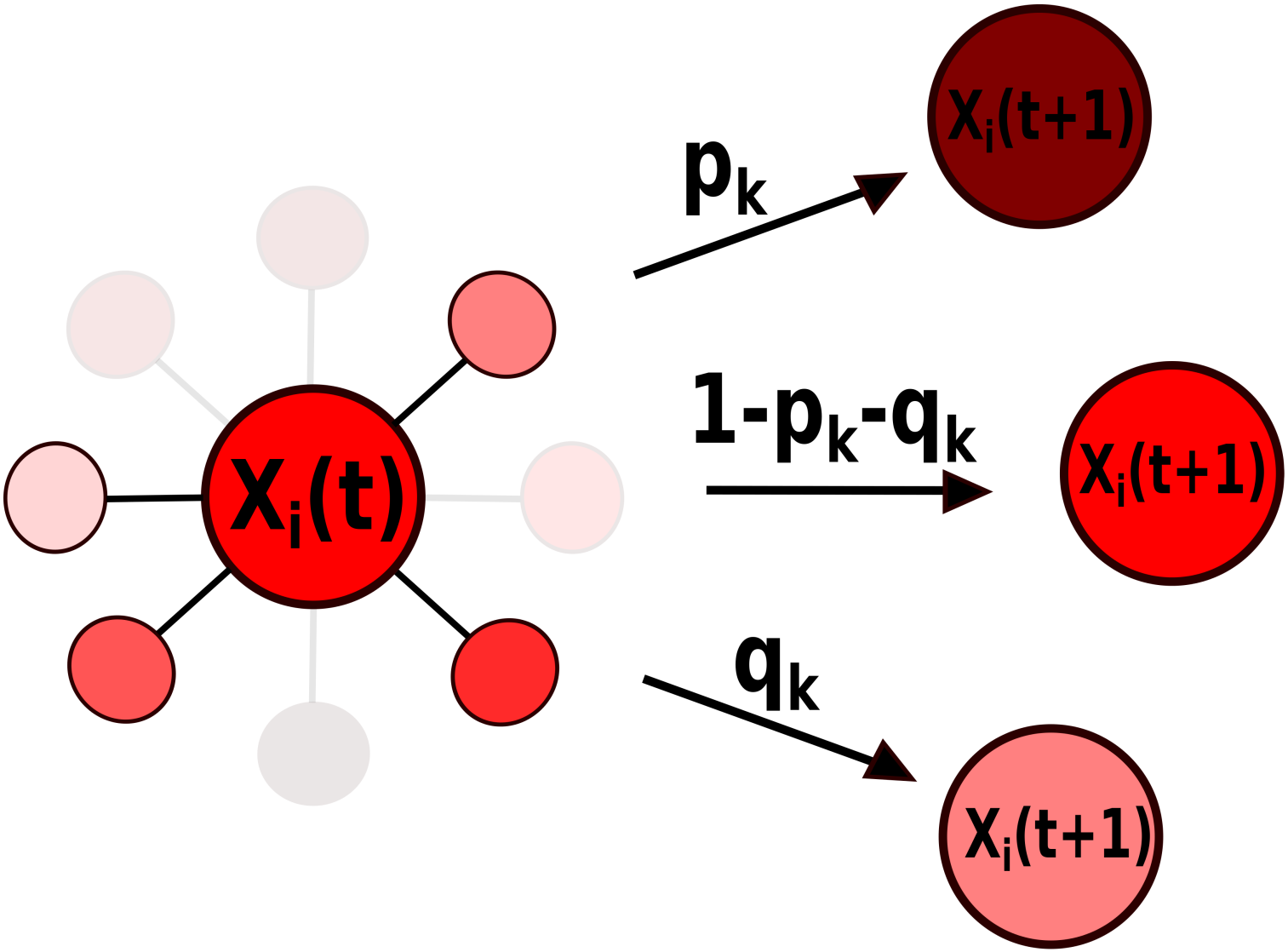
# Social contagion theory: examining dynamic social networks and human behavior

**Nicholas A. Christakis**[a,b*†] **and James H. Fowler**[c,d]


$X_i$=
0
1
2
3
n-3
n-2
n-1
n
$X_i(t)$
p
$X_i(t+1)$
1-p-q
$X_i(t+1)$
q
$X_i(t+1)$

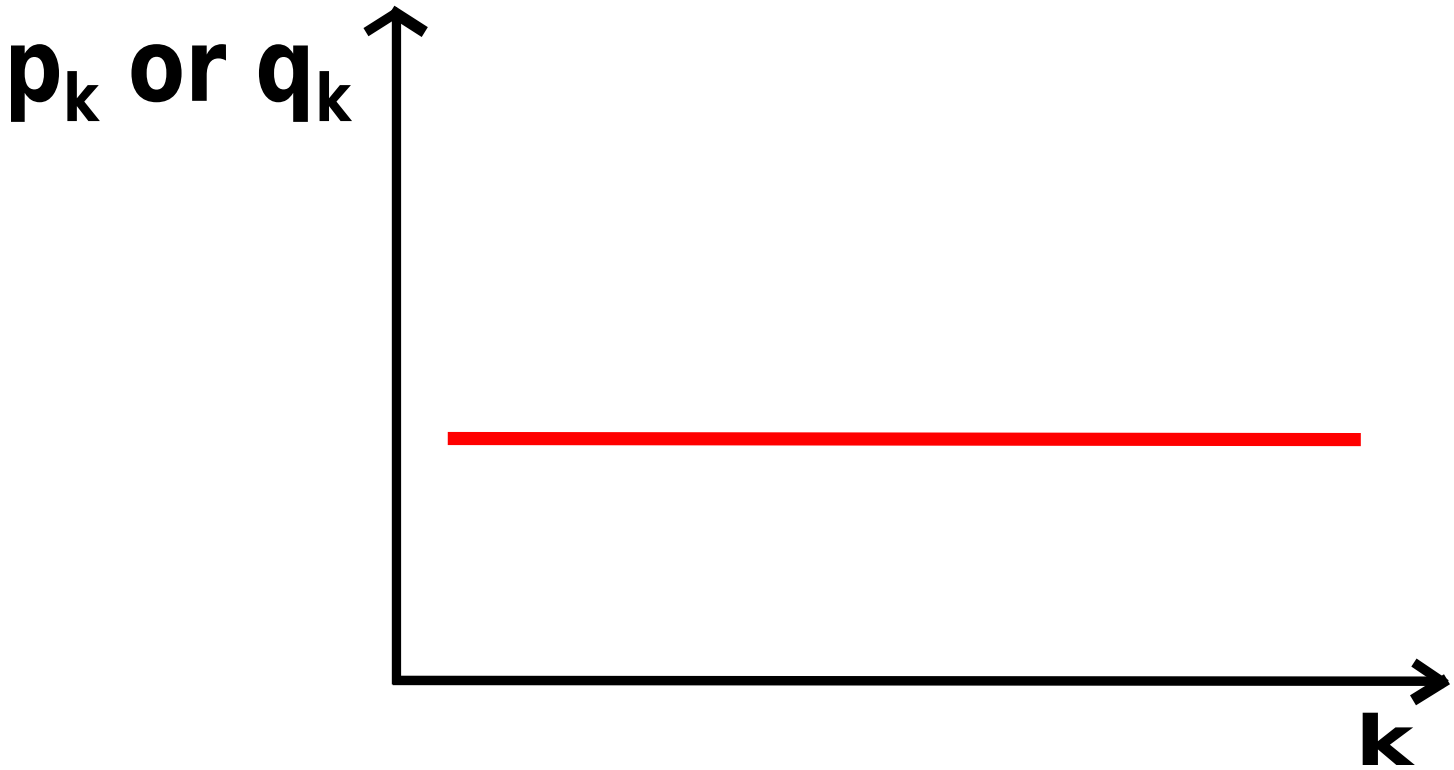



**k = Number higher scoring friends**



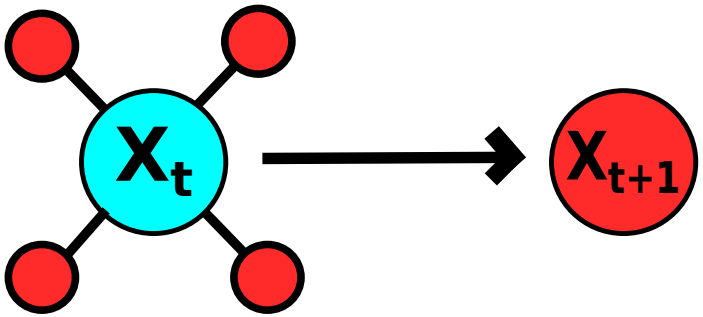

**k = Number lower scoring friends**

$$p_k = \alpha$$
$$q_k = \delta$$



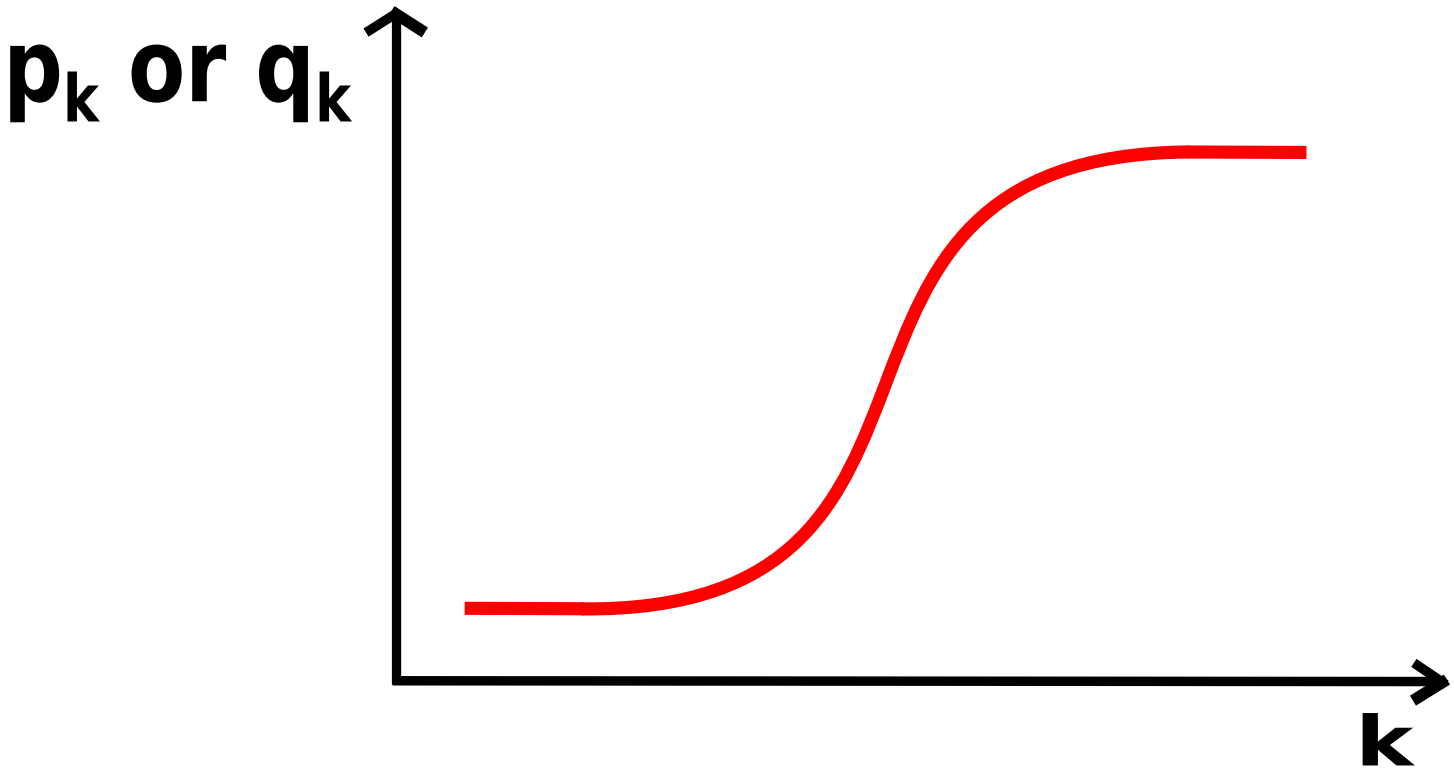

E. M. Hill, F. E. Griffiths, T. House, *Spreading of healthy mood in adolescent social networks*, to appear.

D. Centola, M. Macy, *Complex contagions and the weakness of long ties*, Am. J. Sociol. 112 (3) (2007) 702-734.




$$p_k = \alpha + \beta \sum_{l=0}^{k} \binom{10}{l} \gamma^l (1-\gamma)^{10-l}$$

$$q_k = \delta + \epsilon \sum_{l=0}^{k} \binom{10}{l} \zeta^l (1-\zeta)^{10-l}$$




E. M. Hill, F. E. Griffiths, T. House, *Spreading of healthy mood in adolescent social networks*, to appear.

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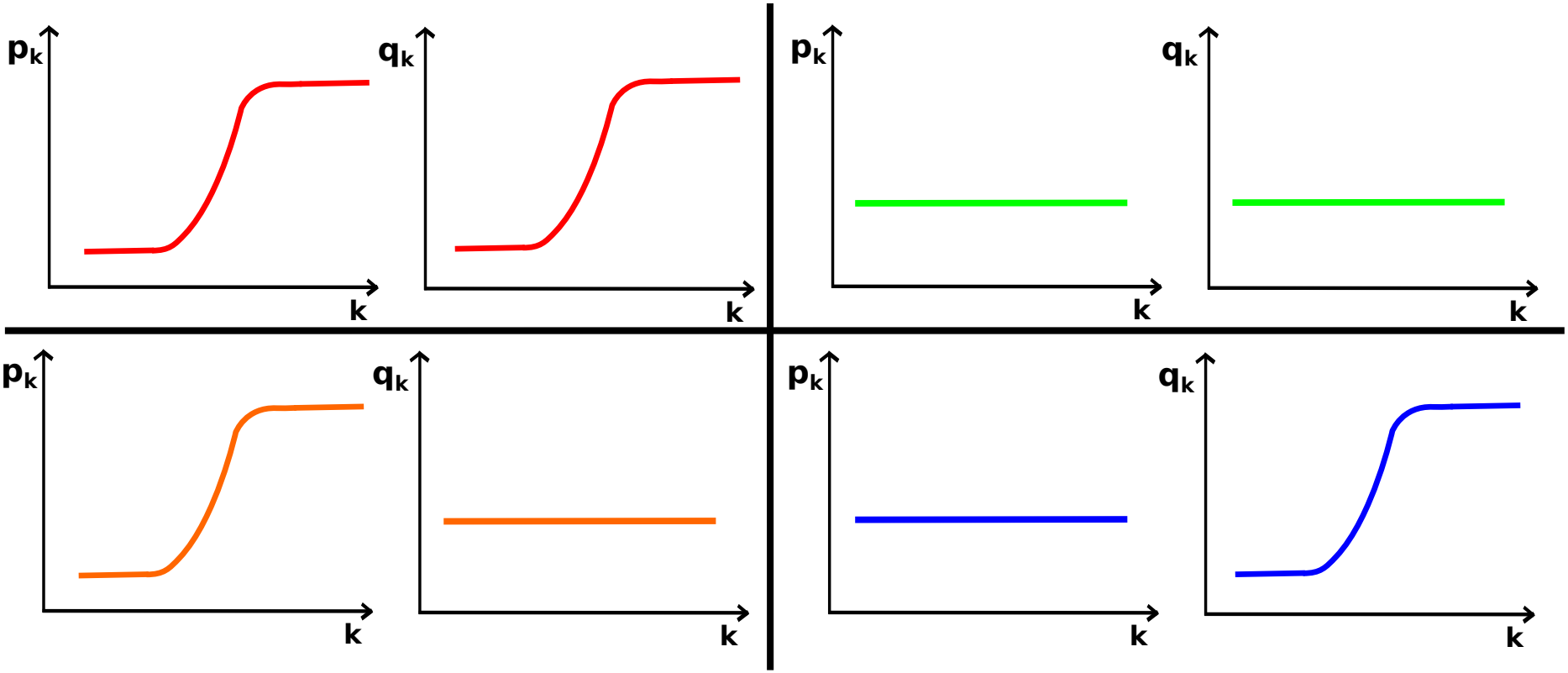
# Models




Compare with Akaike Information Criterion (AIC) values.

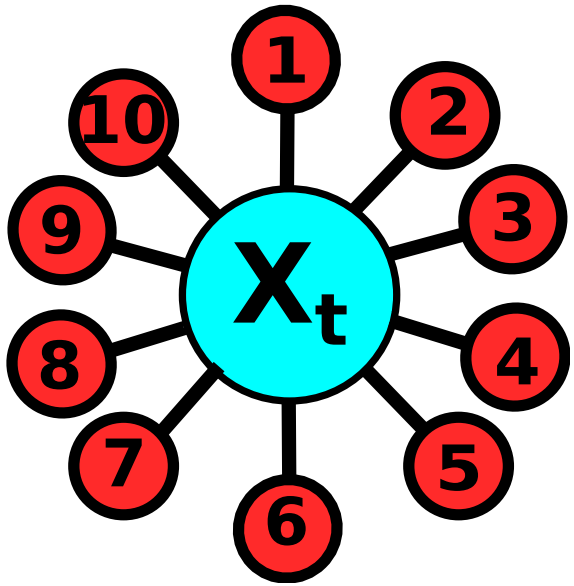
H. Akaike, *A new look at the statistical model identification*, IEEE Transactions on Automatic Control, 19 (6) (1975) 716-723.

Add Health

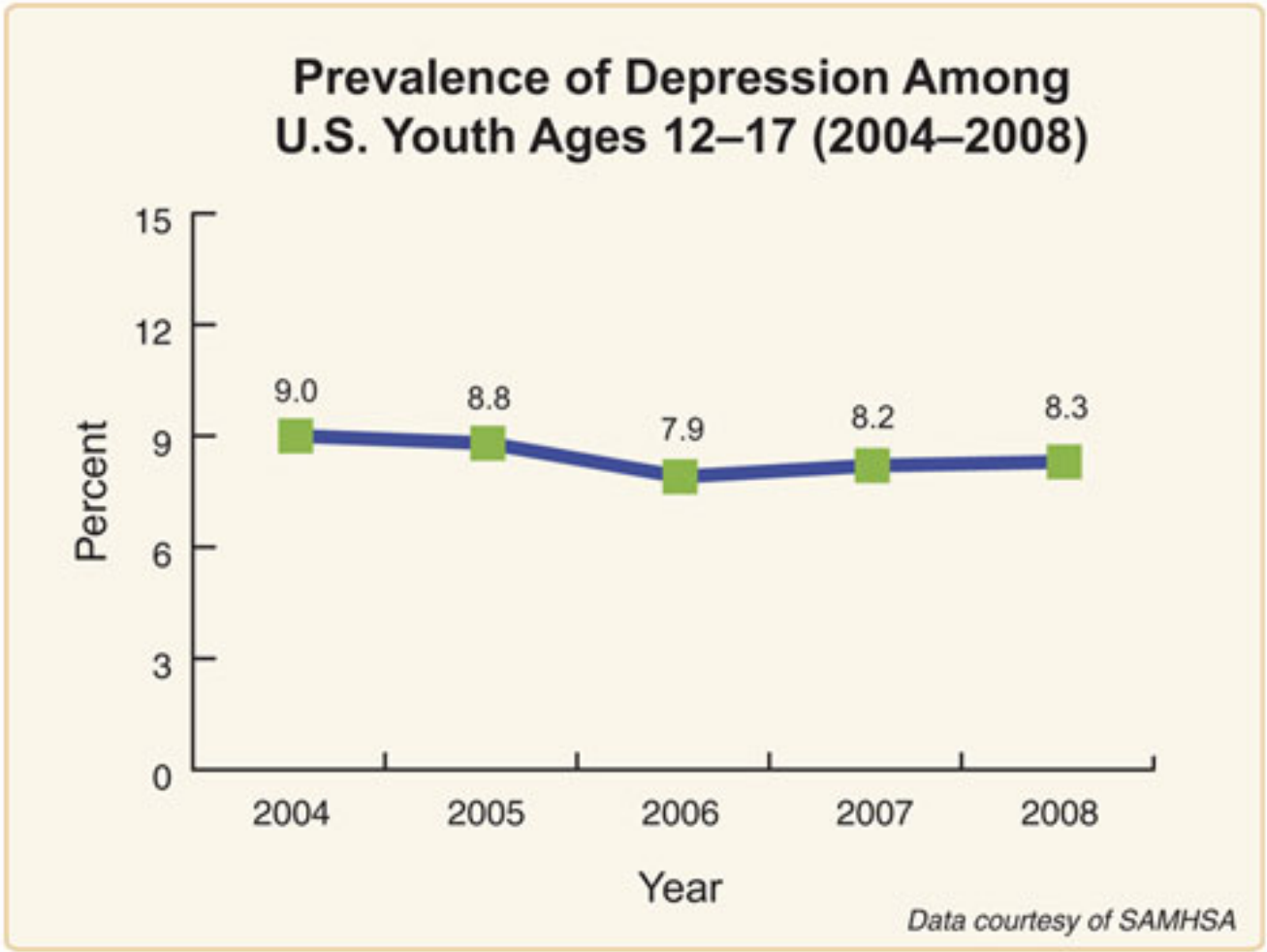
The National Longitudinal Study of Adolescent to Adult Health

http://www.cpc.unc.edu/projects/addhealth/

Wave 1 - 1995. Wave 2 - 1996.



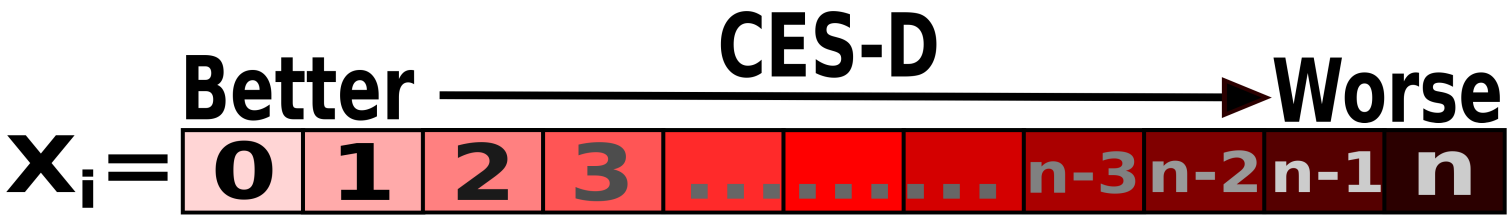
# Depression - mood change contagion




Produced by the Substance Abuse and Mental Health Services Administration.

# Centre for Epidemiological Studies Depression Scale

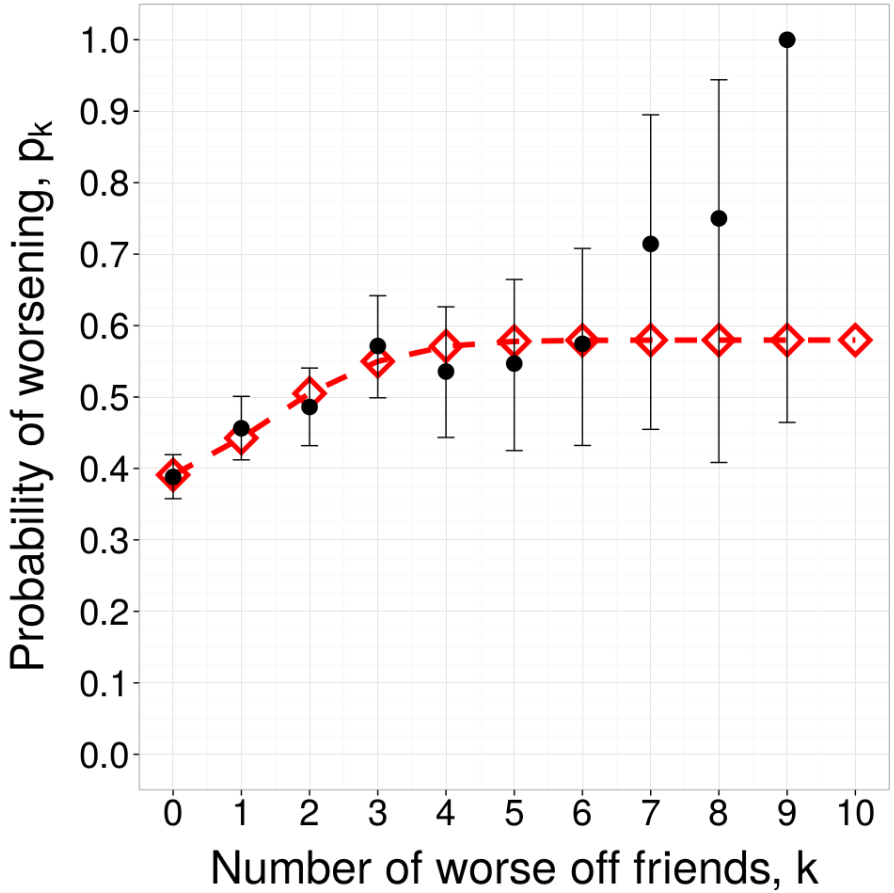
| | | During the past week: | | | |
|---|---|---|---|---|---|
| | | Rarely or none of the time (less than 1 day) | Some or a little of the time (1-2 days) | Occasionally or a moderate amount of time (3-4 days) | Most or all of the time (5-7 days) |
| 1 | *I was bothered by things that usually don't bother me.* | 0 | 1 | 2 | 3 |
| 2 | *I did not feel like eating; my appetite was poor.* | 0 | 1 | 2 | 3 |
| 3 | *I felt that I could not shake off the blues even with help from my family or friends.* | 0 | 1 | 2 | 3 |
| 4 | *I felt that I was just as good as other people.* | 3 | 2 | 1 | 0 |
| 5 | *I had trouble keeping my mind on what I was doing.* | 0 | 1 | 2 | 3 |

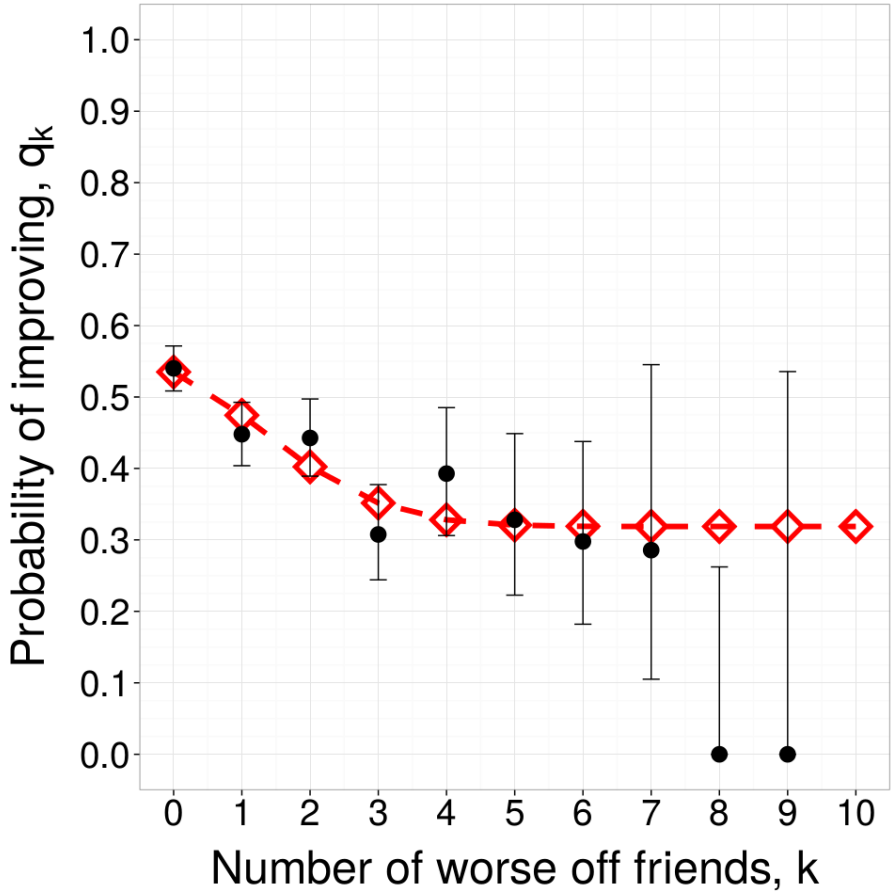



Sample size = 2194

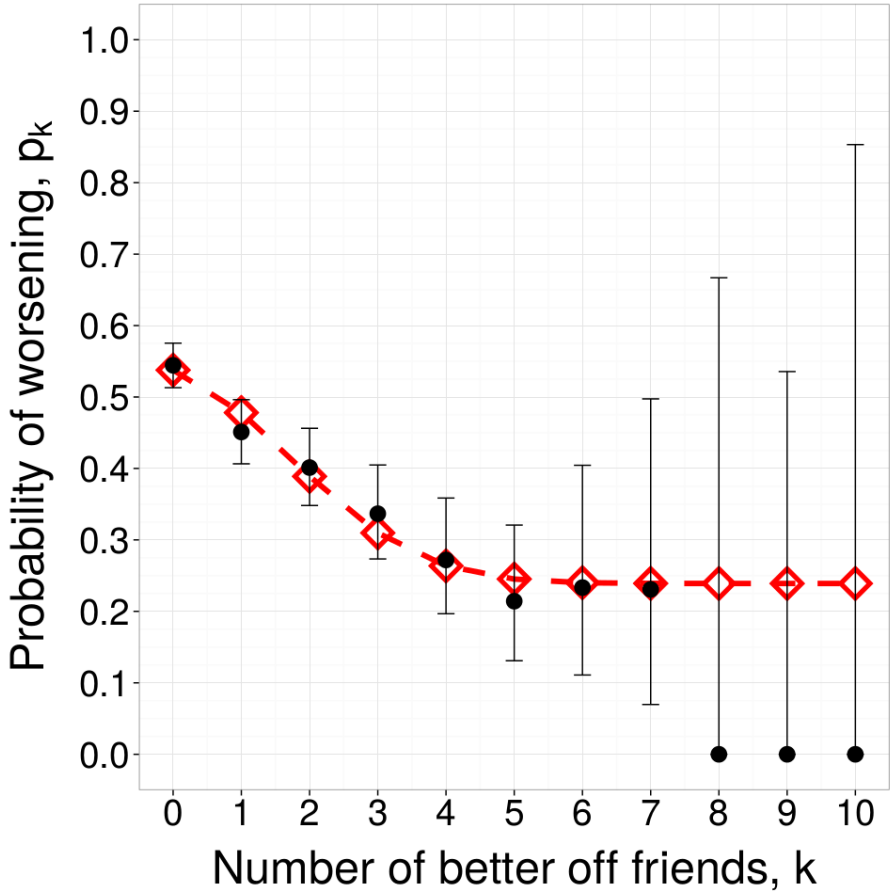
L. S. Radloff, *The ces-d scale: a self-report depression scale for research in the general population*, Appl Psych Meas 1 (3) (1977) 385-401.

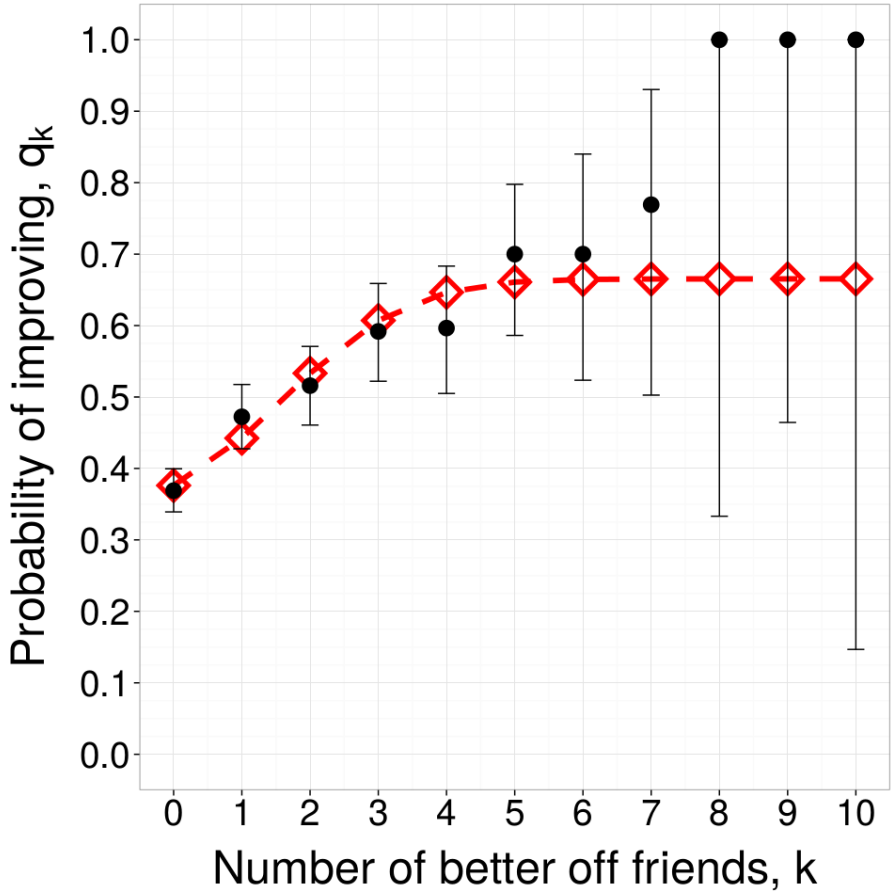
# Mood change - preferred model



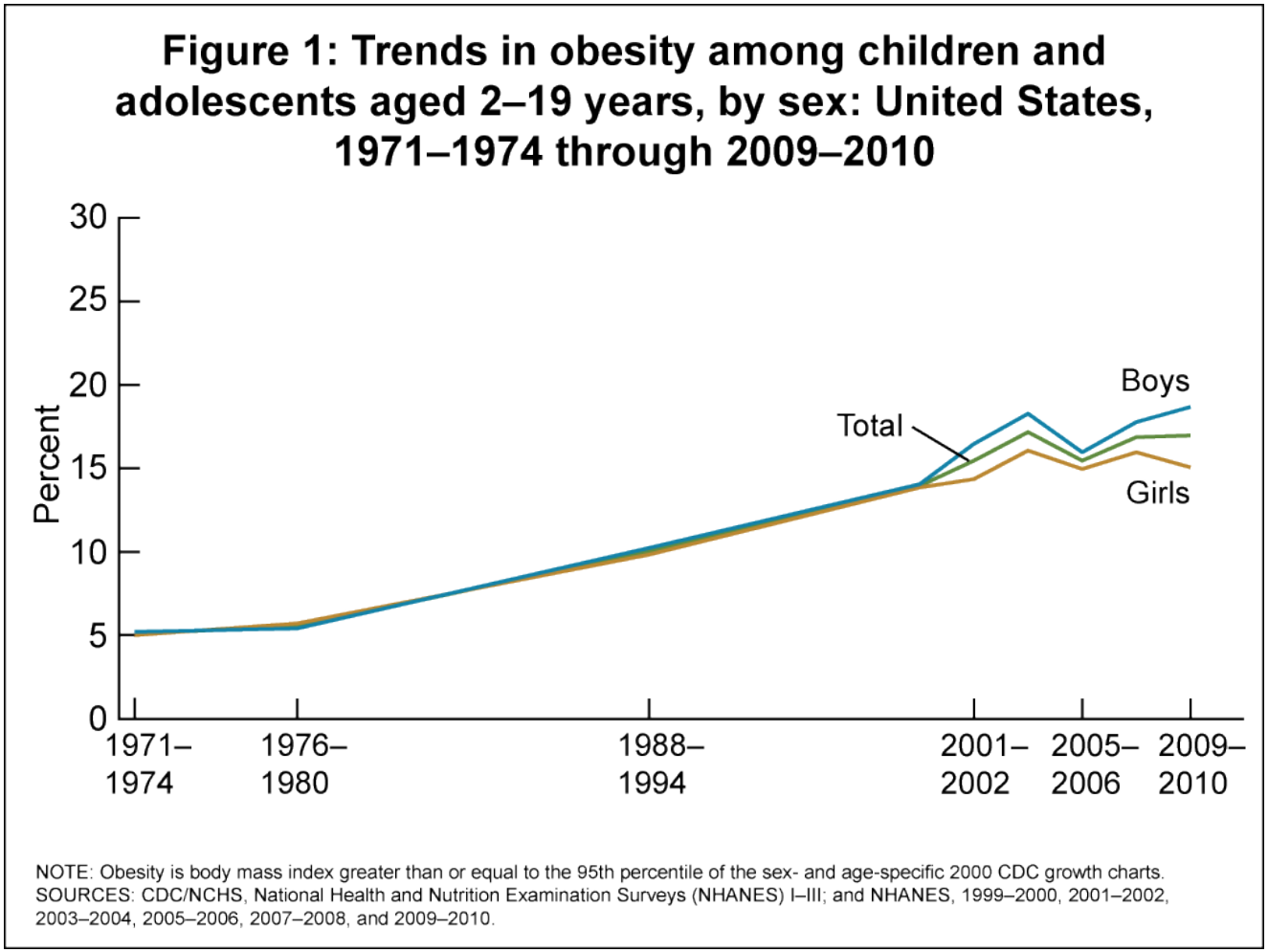



# Mood change - preferred model



# Obesity - weight change contagion



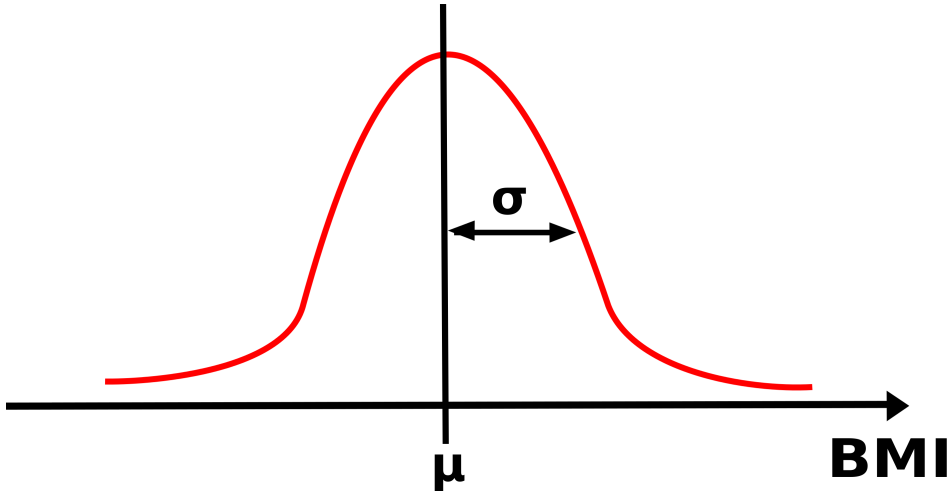

Fryar, C. D. et al. (2012). *Prevalence of obesity among children and adolescents: United States, trends 1963–1965 through 2009–2010.* National Center for Health Statistics, 1960-2002.

# Body Mass Index

$$\text{BMI} = \frac{\text{weight [lb]}}{(\text{height [in]})^2} \times 703$$

$\boldsymbol{X_i = \text{BMIz}}$

Sample size $= 2161$




CDC, *Percentile data files with lms values*, (2009), URL `http://www.cdc.gov/growthcharts/percentile_data_diles.htm`.

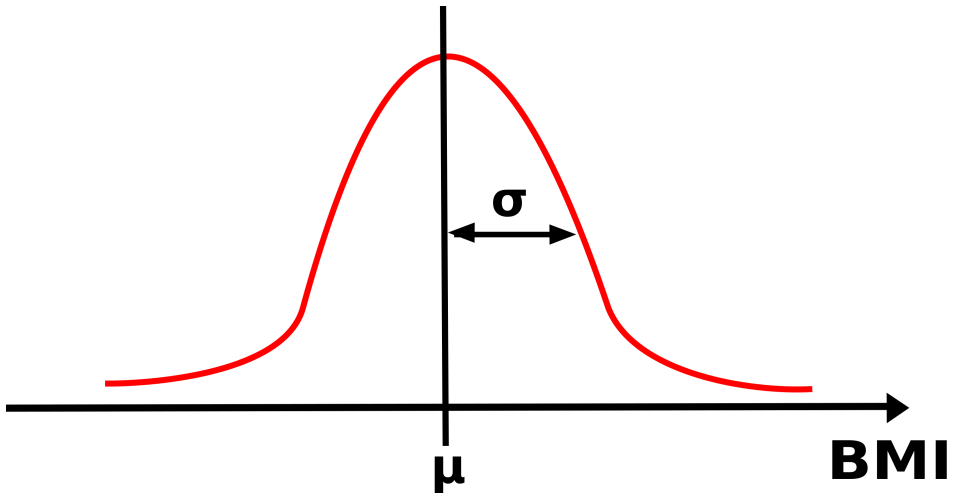
Sacher, P. M. et al., *Randomized controlled trial of the MEND program*, (2010) Obesity, 18: S62-S68.

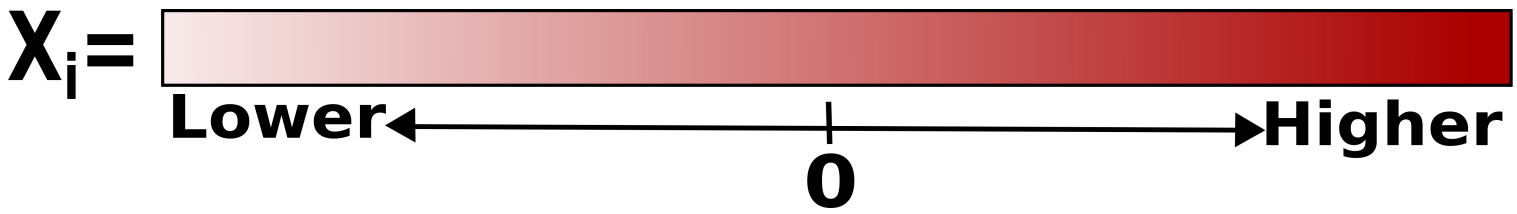
# Body Mass Index

$$\text{BMI} = \frac{\text{weight [lb]}}{(\text{height [in]})^2} \times 703$$

**$X_i$ = BMIz**

Sample size = 2161



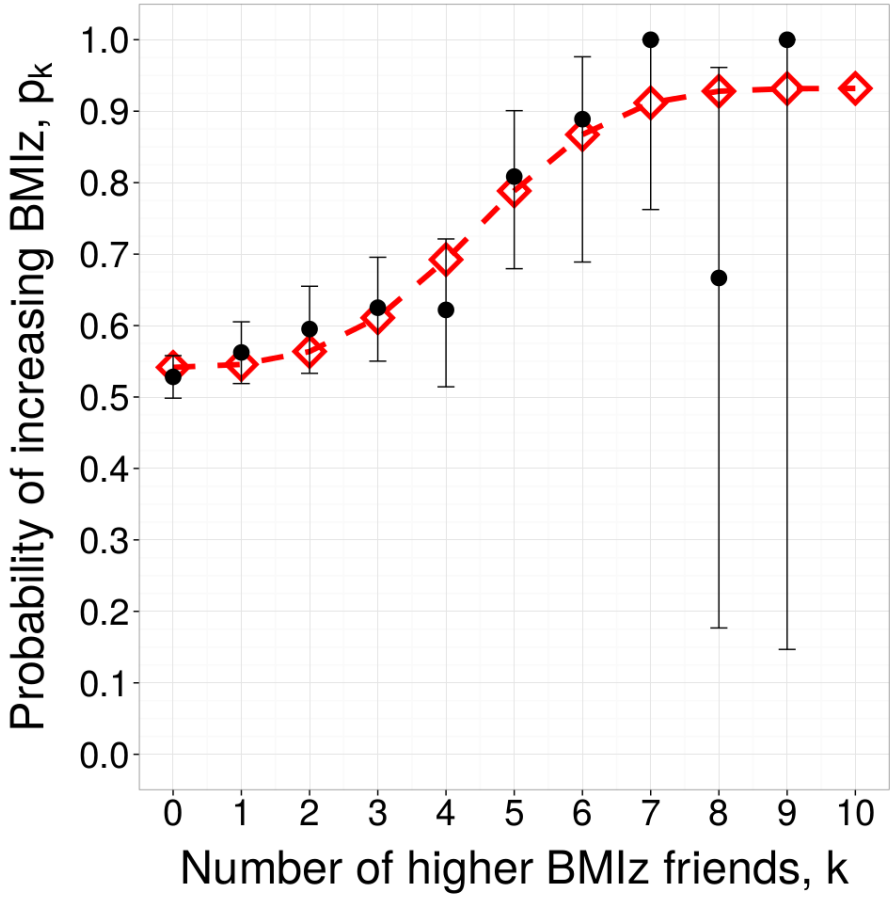

**(1) No threshold** $|X_i(t+1) - X_i(t)| > 0$

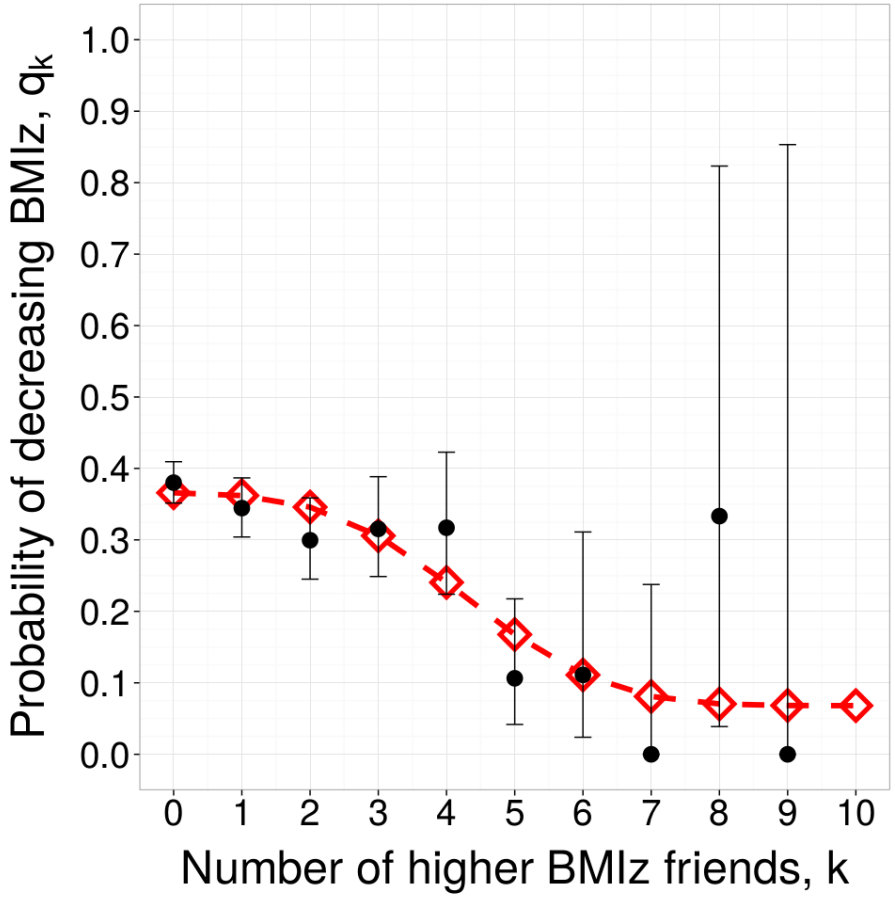
**(2) 0.2 threshold** $|X_i(t+1) - X_i(t)| \geq 0.2$


CDC, *Percentile data files with lms values*, (2009), URL `http://www.cdc.gov/growthcharts/percentile_data_diles.htm`.

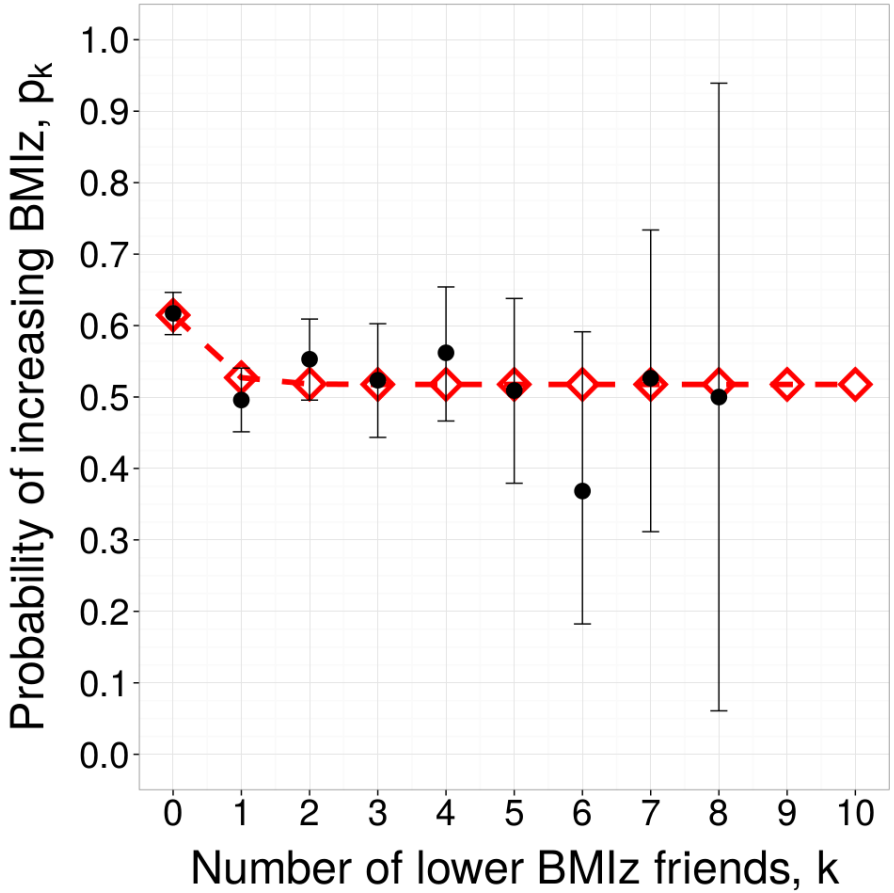
Sacher, P. M. et al., *Randomized controlled trial of the MEND program*, (2010) Obesity, 18: S62-S68.

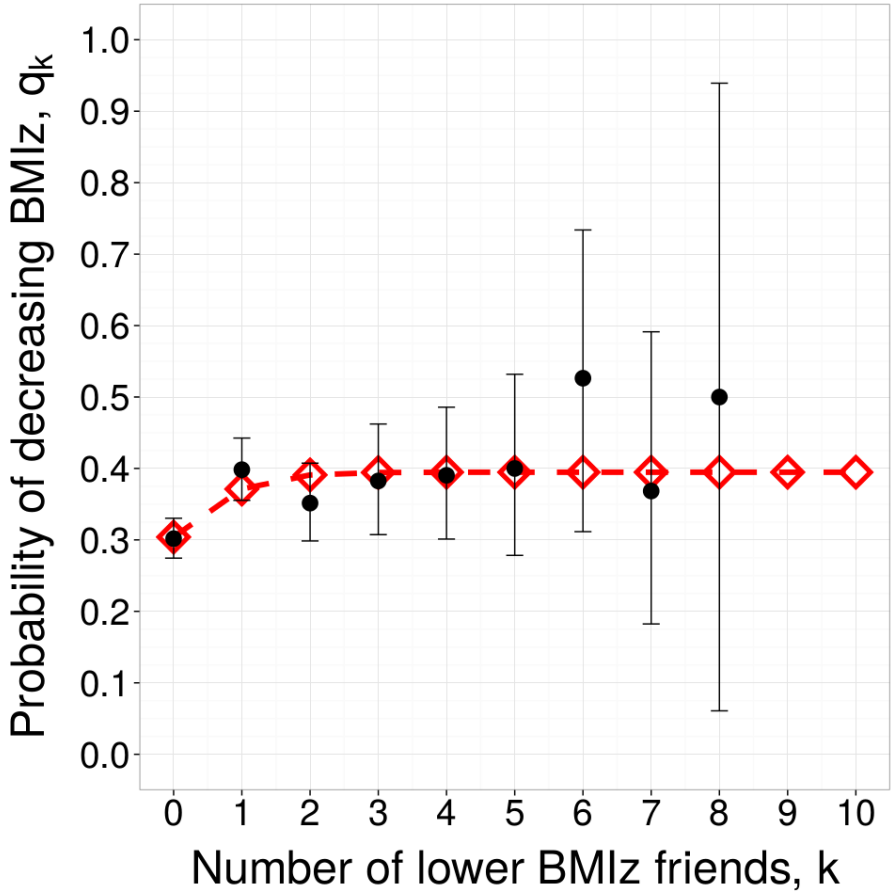
# Weight change (no threshold) - preferred model



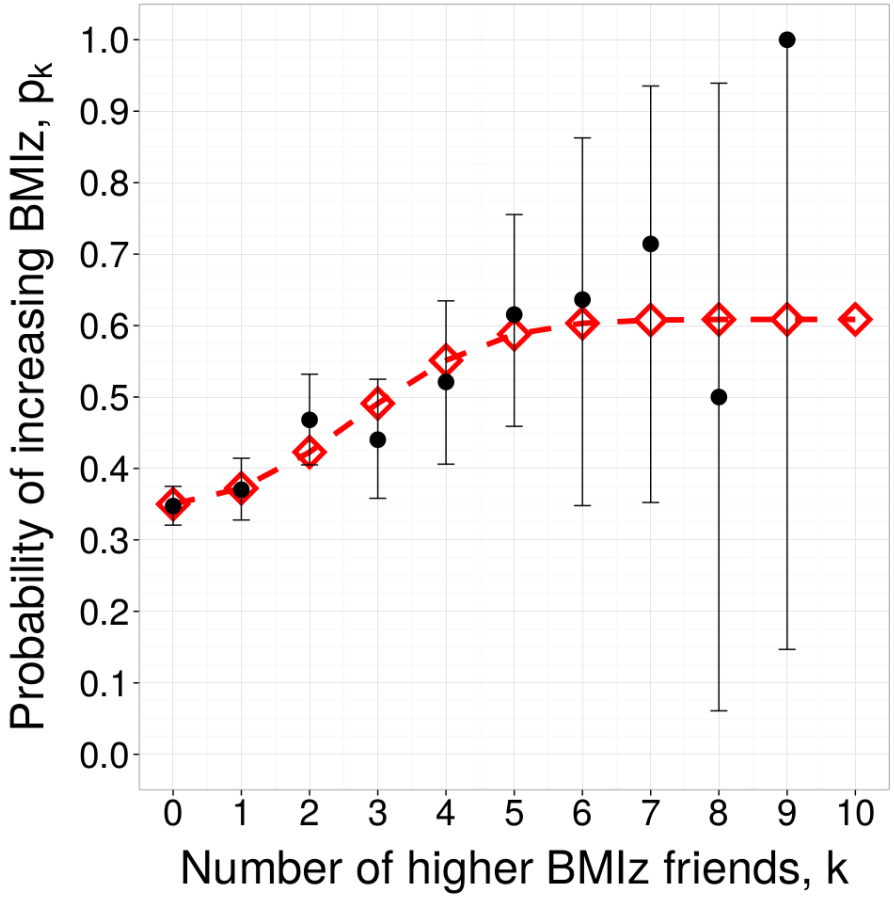



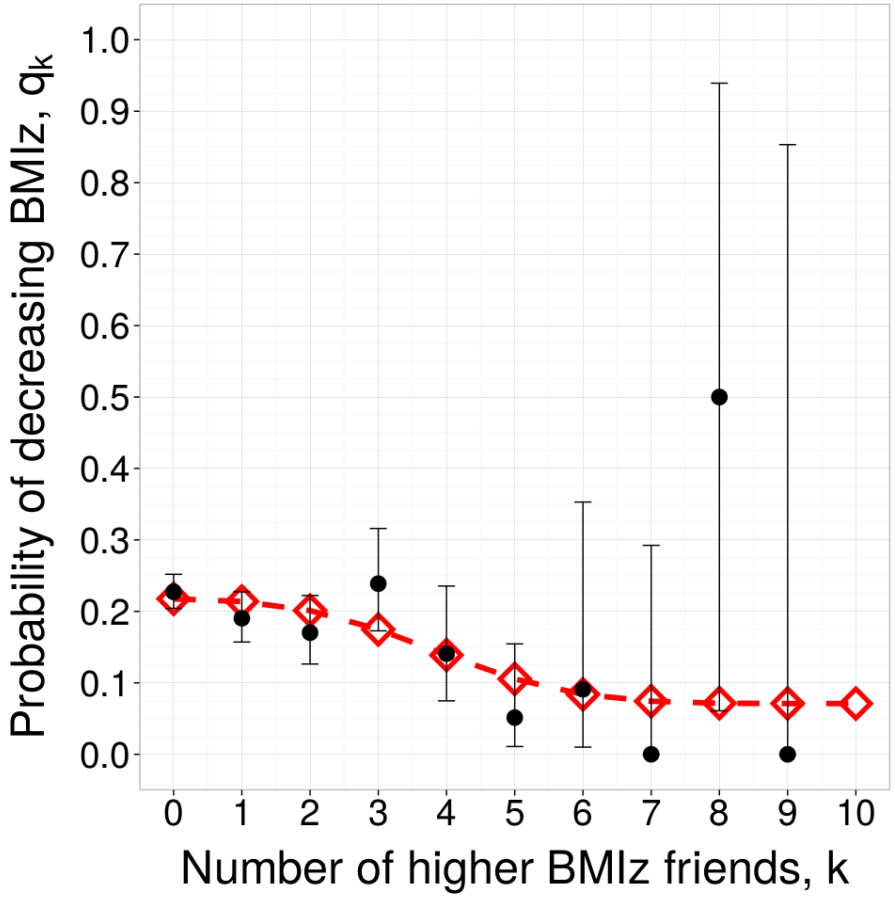
# Weight change (no threshold) - preferred model



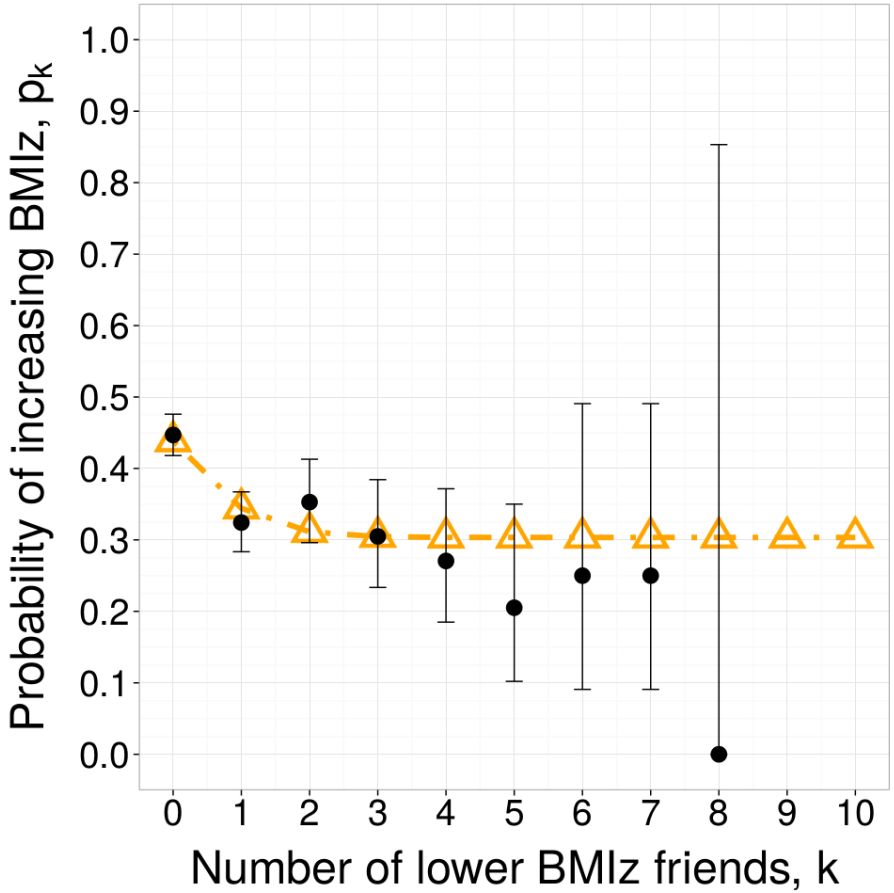



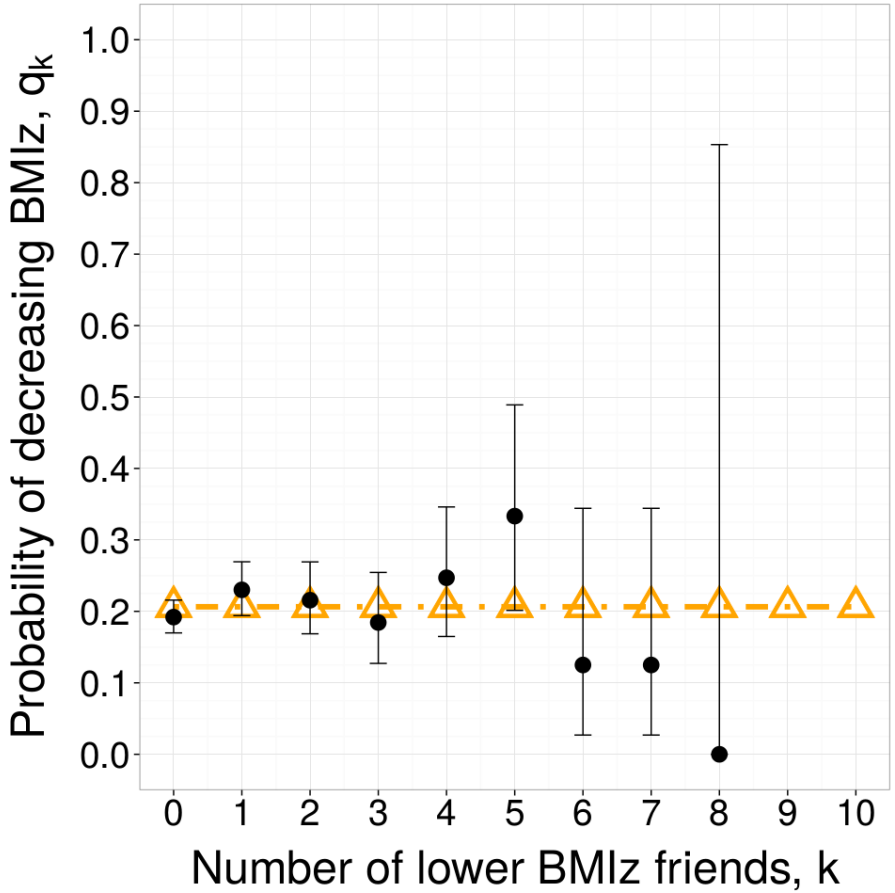
# Weight change (0.2 threshold) - preferred model



# Weight change (0.2 threshold) - preferred model



r.w.eyre@warwick.ac.uk

http://go.warwick.ac.uk/reyre

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