

*National Longitudinal Study of
Adolescent Health*

Network Variables Code Book



Carolina Population Center
University of North Carolina at Chapel Hill

January 2001

This research was supported by grant P01-HD31921 from the National Institute of Child Health and Human Development. Further information may be obtained by sending email to addhealth@unc.edu.

Add Health Network Variables Code Book

PART I: Introduction

DATA COLLECTION

TECHNICAL DETAILS OF ADD HEALTH NETWORK DATA

Response Rates

Valid Nomination Data

DEFINITIONS AND CONVENTIONS

Definitions

Coding of Race and Ethnicity

Mathematical Conventions

Missing Data

PART II: Summary List of Add Health Network Variables

PART III: Construction of Add Health Network Variables

INDIVIDUAL-LEVEL MEASURES

Basic Network Descriptors

Ego-centered Network Measures

Sociometric characteristics of ego-networks

Ego-network heterogeneity measures for grade, race, and age

Ego-network behavior/attribute means for in-school
questionnaire items

SCHOOL-LEVEL MEASURES

Measures of Global Network Structure

Measures of Segregation and Group Salience for Grade, Race, and Sex

PART IV: References

Appendix: Ordered SAS *Proc Contents* Output

Additional Information about the Constructed Network Variables

PART I: Introduction

A primary aim of the Add Health study is to carefully measure the major social contexts affecting the health and well-being of adolescents. Unlike many other large-scale demographic studies, Add Health rests on a clustered design, in part to facilitate the collection of extensive social network data. Social networks are a direct link between individuals and the social structure in which they are embedded; for adolescents, networks of peers and friends are one of the most important social contexts. Because the Add Health study collected network data from all students who attended each participating school, both individual and school-level networks can be examined. This unique design enables us to comprehensively measure the structure of the extended friendship network in which each respondent is embedded, as well as to describe the overall social structure of the respondent's particular school.

In order to facilitate the use of Add Health network data, we have constructed a wide array of network variables from responses to the friendship nomination section of the Add Health in-school questionnaire. These variables measure network characteristics at both the individual and school levels.

DATA COLLECTION

The Add Health in-school questionnaire was administered to 90,118 students attending 145 schools in 80 communities. Details about the overall sample and design of the Add Health study are provided in Bearman, Jones, and Udry (1997). In the friendship section of the Add Health in-school questionnaire, the respondent was asked to nominate up to five male and five female friends from the roster of all students enrolled in the respondent's school and in the sister school. Once friends were nominated, the respondent entered each friend's identification number on the questionnaire. If the friend was not found on the roster, the respondent was asked to indicate if (1) the friend went to the school; (2) the friend went to the sister school; or (3) the friend did not go to either the respondent's school or the sister school.

TECHNICAL DETAILS OF ADD HEALTH NETWORK DATA

Response rates

Because we wish to provide substantively useful variables, only schools in which more than 50 percent of the student body completed the questionnaire are used to calculate the network measures described here. Relying on global network characteristics from schools with incomplete data would provide misleading images of the school's social structure.

Valid nomination data

To construct a friendship social network, it is necessary to uniquely identify both the respondent and the alters that he or she nominates as a friend. All students who completed the in-school questionnaire were assigned a unique identification number, and were provided with a roster that identified all enrolled students in their school and the sister school. However, not all respondents' names appeared on the roster from which friends were identified (rosters were sometimes incomplete or contained errors), and not all students whose names were on the rosters completed the questionnaire (students were absent or did not participate in the study).

Considering only those students who completed questionnaires, we define respondents whose names appeared on the school roster as *uniquely nominatable*, and respondents whose names did not appear on a school roster are defined as *uniquely non-nominatable*. For the purposes of constructing friendship networks, all friendship nominations made by both the *uniquely nominatable* and the *uniquely non-nominatable* respondents fell into one of four nomination statuses:

1. Nominations to friends whose name appeared on the respondent's school roster and who also completed the in-school questionnaire
2. Nominations to friends whose name appeared on the roster of the respondent's sister school and who also completed the in-school questionnaire.
3. Nominations to friends identified by the respondent with a special code, specifically
 - a. Friends who attended the respondent's school but whose names were not on the school roster (special code 9999)
 - b. Friends attending the sister school but whose names were not on the school roster (special code 8888)
 - c. Friends who did not attend the respondent's school or sister school, (special code 7777)
4. Nominations to friends whose names appeared on one of the school rosters but who did not fill out the questionnaire.

The cross-classification of friendship nominations from nominator type to nomination status is summarized in Table 1. This table shows that the vast majority of all friendship nominations are to other students enrolled in the same school as the respondent. Approximately 15 percent of all respondents' friends did not attend either their school or their sister school. Approximately 8 percent of all friendship nominations were to individuals whose names were not on the school rosters. These nominations may be to students new to the school, or to students known only by nicknames. Because these nominations do not uniquely identify an individual, they are not included in the construction of the friendship networks on which most of the network measures described in this code book are based.

In general, the network measures described in this code book consider only those nominations in which both the sender and receiver of the friendship nomination are uniquely identifiable students who completed an in-school questionnaire. Exceptions to this rule are identified when specific measures are described.

Table 1: Distribution of friendship nominations by nominator and nomination status

<i>From Nominator</i>	<i>To Nomination Status</i>				
	UNIQUELY NOMINATABLE SAME SCHOOL	UNIQUELY NOMINATABLE SISTER SCHOOL	SPECIAL CODES	UNMATCHED NOMINATIONS	TOTAL N OF NOMINATIONS SENT
UNIQUELY NOMINATABLE RESPONDENT <i>Respondent's name was on the roster (N = 75,871 respondents)</i>	314,938	5,481	124,689	64,835	509,943
ROW %	62%	1%	24%	13%	100%
COLUMN %	96%	94%	91%	94%	
UNIQUELY NON- NOMINATABLE RESPONDENT <i>Respondent's name was not on the roster (N = 6,758 respondents)</i>	13,527	354	12,674	4,141	30,696
ROW %	44%	1%	41%	14%	100%
COLUMN %	4%	6%	9%	6%	
TOTAL N = 82,629 respondents	100%	100%	100%	100%	
	328,465	5,835	137,363	68,976	540,639

For further information about the distribution of nominations in the Add Health network data, see Bearman and Moody 1997.

DEFINITIONS AND CONVENTIONS

Definitions

EGO	Respondent
ALTER	Student in the same school as ego who is eligible to be nominated as a friend
SISTER SCHOOL	Sample school in the same community as ego's school. If ego attends a high school, the sister school is generally the junior high or middle school that sends the majority of its students to ego's high school. If ego attends a junior high or middle school, the sister school is the high school ego is most likely to attend. If ego's school contains grades 7-12 there is no sister school.
NODE	Unique member of a network
TIE	Nomination of j as a friend of i
DYAD	Pair of tied nodes
SYMMETRIC DYAD	Dyad in which ego's nomination of alter is reciprocated
ASYMMETRIC DYAD	Dyad in which ego's nomination of alter is not reciprocated
GEODESIC	The shortest path between two nodes
OUT-DEGREE	Number of alters nominated by ego
IN-DEGREE	Number of alters who nominate ego
EGO'S SEND-NETWORK	Ego and the set of alters nominated by ego
EGO'S RECEIVE-NETWORK	Ego and the set of alters who nominate ego
EGO'S SEND- AND RECEIVE-NETWORK	The union of ego's send-network and ego's receive-network
TOTAL FRIENDSHIP NETWORK	Complete school-level friendship matrix
CATEGORICAL ATTRIBUTE	An attribute which divides a population into mutually exclusive sub-populations. Categorical attributes used here are sex, race, grade, and age.
TRAIT	A characteristic which defines a sub-population in terms of a categorical attribute. Examples are male, female, black, white, 8th graders, 16 year olds.
IN-GROUP PREFERENCE	The tendency for persons sharing a trait to nominate each other.
OUT-GROUP PREFERENCE	The tendency for persons to nominate those who do not share a particular trait with them.

Coding of Race and Ethnicity

The race and ethnicity questions in the Add Health study allowed respondents to choose multiple racial and ethnic backgrounds. In order to calculate ego-network heterogeneity measures and school-level segregation indices, we created a categorical race/ethnicity variable, using the following logic.

Respondent was classified as:

WHITE	if he/she marked white as his/her only race and did not claim a Hispanic background
BLACK	if he/she marked black as his/her only race and did not claim a Hispanic background
HISPANIC	if he/she claimed a Hispanic background, regardless of racial background
ASIAN	if he/she marked Asian as their only race and did not mark Hispanic background
OTHER	all other responses

If any of the four specific racial/ethnic groups comprised less than 2 percent of the total population of a particular school, that group was recoded to OTHER for all school-level segregation indices.

Mathematical Conventions

The formulas used to construct all variables are provided in the variable description section of this code book, along with the appropriate references. Within formulas, **bold** typeface refers to matrices, normal typeface to scalars. Subscripts are in row-column order. Thus \mathbf{D}_{ij} refers to the cell located in the i th row and j th column of the matrix \mathbf{D} .

Missing Data

As noted above, network measures were not calculated for schools with low response rates or for individual respondents with problematic identification numbers. Beyond these cases, particular network measures are missing for certain respondents, due to substantive or mathematical reasons. For example, the female saliency index is missing for those students who attend all-male schools. The conditions under which particular measures will be missing are outlined in the variable description section of this code book.

PART II: Summary List of Add Health Network Variables

INDIVIDUAL-LEVEL MEASURES

Basic Network Descriptors

In-degree	IDGX2
Out-degree.....	ODGX2
Number of nominations outside of school	NOUTNOM
Number of nominations to sister school	TAB113
Bonacich centrality, $\beta = 0.1$	BCENT10X
Reach.....	REACH
Reach in three steps	REACH3
Mean geodesic distance	IGDMEAN
Proximity prestige	PRXPREST
Influence domain (in-reach).....	INFLDMN
Ego has a best male friend	HAVEBMF
Ego has a best female friend	HAVEBFF
Best male friend reciprocates.....	BMFRECI
Best male friend reciprocates as best friend	BMFRECBF
Best female friend reciprocates.....	BFFRECI
Best female friend reciprocates as best friend	BFFRECBF

Ego-centered Network Measures

Sociometric characteristics of ego-networks

Ego send-network density	ESDEN
Size of ego send-network.....	NES
Ego receive-network density.....	ERDEN
Size of ego receive-network.....	NER
Ego send- and receive-network density	ESRDEN
Size of ego send- and receive-network	NESR

Ego-network heterogeneity measures for grade, race, and age

Grade

Ego send-network	
Network heterogeneity	EHSGRD
Proportion of grades represented.....	ERSNGRD
Number of cases used to calculate heterogeneity...	NEHSGRD
Ego receive-network	
Network heterogeneity	EHRGRD
Proportion of grades represented.....	ERRNGRD
Number of cases used to calculate heterogeneity..	NEHRGRD
Ego send- and receive-network	
Network heterogeneity	EHGRD
Proportion of grades represented.....	ERNGRD
Number of cases used to calculate heterogeneity.....	NEHGRD

Race

Ego send-network	
Network heterogeneity	EHSRC5
Proportion of races represented	ESRNC5
Number of cases used to calculate heterogeneity.....	NEHSRC5
Egos receive-network	
Network heterogeneity	EHRC5
Proportion of races represented	ERNRC5
Number of cases used to calculate heterogeneity...	NEHRC5
Ego send- and receive-network	
Network heterogeneity	EHSRC5
Proportion of races represented	ESRNC5
Number of cases used to calculate heterogeneity.....	NEHSRC5

Age

Ego send-network	
Network heterogeneity	EHSAGE
Proportion of ages represented	ERSNAGE
Number of cases used to calculate heterogeneity...	NEHSAGE
Ego receive-network	
Network heterogeneity	EHORAGE
Proportion of ages represented	ERNAGE
Number of cases used to calculate heterogeneity..	NEHORAGE
Ego send- and receive-network	
Network heterogeneity	EHSAGE
Proportion of ages represented	ERSNAGE
Number of cases used to calculate heterogeneity.....	NEHSAGE

Ego-network behavior/attribute means for in-school questionnaire items
(where the in-school questionnaire item number, as shown in the appendix replaces <x>.)

Based on ego's send-network:	
Behavior/attribute mean	AXS<x>
Number of alters with valid data on attribute.....	NAS<x>
Based on ego receive-network:	
Behavior/attribute mean	AXR<x>
Number of alters with valid data on attribute.....	NAR<x>
Based on ego send- and receive-network:	
Behavior/attribute mean	AX<x>
Number of alters with valid data on attribute.....	NA<x>

SCHOOL-LEVEL MEASURES

Measures of Global Network Structure

Density	DENX2
Density at maximum reach	RCHDEN
Relative density	RELDEN
Proportion symmetric dyads	PTCMUT
Proportion asymmetric dyads	PTCASY
Mutuality index	RHO2

Measures of Segregation and Group Salience for Grade, Race, and Sex

Grade segregation index	SEG1S3
7th grade salience index	SS37
8th grade salience index	SS38
9th grade salience index	SS39
10th grade salience index	SS310
11th grade salience index	SS311
12th grade salience index	SS312
Race segregation index	SEG1RCE5
White salience index	SRCE51
Black salience index	SRCE52
Hispanic salience index	SRCE53
Asian salience index	SRCE54
Other salience index	SRCE55
Sex segregation index	SEG1S2
Male salience index	SS20
Female salience index	SS21

PART III: Construction of Add Health Network Variables

INDIVIDUAL-LEVEL MEASURES

Basic Network Descriptors

In-degree (IDGX2)

The number of times ego is nominated by other students in the school.

$$IDGX2_i = \sum_j X_{ji}$$

Where:

$$\sum_j X_{ji} = \text{the sum of the } i\text{th column of the total friendship network } \mathbf{X}$$

Out-degree (ODGX2)

The number of people respondent nominates in the school.

$$ODGX2_i = \sum_j X_{ij}$$

Where:

$$\sum_j X_{ij} = \text{the sum of the } i\text{th row of the total friendship network } \mathbf{X}$$

Students were allowed to nominate up to 10 people. If a student skipped this entire section, ODX2= 0.

Number of nominations outside the school (NOUTNOM)

The number of people ego nominates from outside the school.

$$NOUTNOM_i = \sum t7777_i, t8888_i, tpaired_i$$

Where:

$t7777_i$ = tie to student who attends neither ego's school nor the sister school

$t8888_i$ = tie to student who attends the sister school but is not on the roster

$tsister_i$ = tie to student who attends the sister school and is on roster

Number of matched nominations to sister school (TAB113)

The number of valid alters ego nominates from the sister school.

$$TAB113_i = \sum tpaired_i$$

Where:

$tpaired_i$ = tie to student who attends the paired school

Cases are missing if there is no sister school. Ties are omitted if they do not reference a valid student identification number.

Bonacich centrality, $\beta=0.1$ (BCENT10X)

Ego's centrality, weighted by the centrality of those to whom he/she sends ties (Bonacich 1987).

$$BCENT10X(\alpha, \beta)_i = \alpha(I - \beta X)^{-1} X \mathbf{1}$$

Where:

α = a scaling vector
 β = power weight (here = 0.1)
 \mathbf{I} = identity matrix
 \mathbf{X} = total friendship network
 $\mathbf{1}$ = column of 1s

If ODGX2 = 0 then BCENT10X = 0.

Reach (REACH)

Maximum number of alters ego can reach in the total friendship network.

$$REACH_i = \sum_j B_{ij}$$

Where:

\mathbf{B} is the reachability matrix of \mathbf{X}

such that:

\mathbf{D} = geodesic distance matrix of the total friendship network \mathbf{X}

and

$B_{ij} = 1$ if $D_{ij} > 0$

If ODGX2 = 0 then REACH = 0.

Reach in three steps (REACH3)

A step refers to the length of a path from i to j . If i nominates j and j nominates k and k nominates l , then i and l are three steps apart. The value of the variable REACH3 is the total number of alters ego can reach in three steps.

$$REACH3_i = \sum_j B_{ij}$$

Where:

B is a variant of the reachability matrix of **X**
such that:

D = geodesic distance matrix of the total friendship network **X**
and

$$B_{ij} = 1 \text{ if } 0 < D_{ij} < 4$$

If ODGX2 = 0 then REACH3=0.

Mean geodesic distance (IGDMEAN)

Average path length between ego and ego's complete set of reachable alters.

$$IGDMEAN_i = \frac{\sum_j D_{ij}}{\sum_j B_{ij}}$$

Where:

B is the reachability matrix of **X**
such that

D = geodesic distance matrix of the total friendship network **X**
and

$$B_{ij} = 1 \text{ if } D_{ij} > 0$$

If ODGX2= 0 then IGDMEAN is missing.

Proximity prestige (PRXPREST)

Measures the prestige of ego relative to the number of people who can reach ego (Wasserman and Faust 1994:203-205).

$$PRXPREST_i = \frac{\frac{I_i}{(g-1)}}{\sum_j \frac{d(n_j, n_i)}{I_i}}$$

Where:

- I_i = influence domain of i , which is equal to the number of alters who can reach i (*see below*)
 g = number of nodes in \mathbf{X}
 $d(n_j, n_i)$ = length of the geodesic distance between actor j to actor i

If IDGX2 = 0 then PRXPREST is missing.

Influence domain (INFLDMN)

Number of alters who can reach ego.

$$INFLDMN_i = \sum_j B_{ji}$$

Where:

- \mathbf{B} is the reachability matrix of \mathbf{X}
such that:
 \mathbf{D} = geodesic distance matrix of the total friendship network \mathbf{X}
and
 $\mathbf{B}_{ij} = 1$ if $\mathbf{D}_{ij} > 0$

If IDGX2 = 0 then IGFLDMN = 0.

Ego has a best male friend (HAVEBMF)

Dummy variable indicating whether ego nominated a male friend in the school as his/her best friend.

- HAVEBMF_i = 0 ego did not nominate a male best friend
HAVEBMF_i = 1 ego nominated a male best friend

Ego has a best female friend (HAVEBFF)

Dummy variable indicating whether ego nominated a female friend in the school as his/her best friend.

HAVEBFF _i = 0	ego did not nominate a female best friend
HAVEBFF _i = 1	ego nominated a female best friend

Best male friend reciprocates (BMFRECIPI)

Dummy variable indicating whether the person ego nominated as his/her best male friend nominated ego a friend.

BMFRECIPI _i = 0	ego's best friend did not reciprocate a friendship nomination
BMFRECIPI _i = 1	ego's best friend reciprocated with a friendship nomination

If ego has no best male friend, or if the best male friend did not complete the questionnaire, BMFRECIPI is missing.

Best male friend reciprocates as best friend (BMFRECBF)

Dummy variable indicating whether the person ego nominated as his/her best male friend nominated ego as his best friend.

BMFRECBF _i = 0	ego's best friend did not reciprocate as best friend
BMFRECBF _i = 1	ego's best friend reciprocated as best friend

If ego has no best male friend, or if the best male friend did not complete the questionnaire, BMFRECBF is missing.

Best female friend reciprocates (BFFRECIPI)

Dummy variable indicating whether the person ego nominated as his/her best female friend nominated ego as any type of friend.

BFFRECIPI _i = 0	ego's best friend did not reciprocate a friendship nomination
BFFRECIPI _i = 1	ego's best friend reciprocated with a friendship nomination

If ego has no best female friend, or if the best female friend did not complete the questionnaire, BFFRECIPI is missing.

Best female friend reciprocates as best friend (BFFRECBF)

Dummy variable indicating whether the person ego nominated as his/her best female friend nominated ego as her best friend.

BFFRECIP _i = 0	ego's best friend did not reciprocate as best friend
BFFRECIP _i = 1	ego's best friend reciprocated as best friend

If ego has no best female friend, or if the best female friend did not complete the questionnaire, BFFRECBF is missing.

Ego-centered Network Measures

Ego-centered networks are composed of ego and a set of alters directly tied to ego. The set of alters in a particular type of ego network is defined in one of three ways: (1) those alters nominated by ego, the *ego send-network*; (2) alters nominating ego, the *ego receive-network*; or (3) the union of ego's send- and receive-networks (the *ego send- and receive-network*). All three types of ego networks include ties sent from any node in the network to any other node in the ego network. Thus if ego sends ties to *j* and *k*, a tie from *j* to *k* is part of ego's send-network (as are ties from *k* to *j*, *j* to ego, and *k* to ego). We have calculated sociometric characteristics, heterogeneity measures, and attribute means for each of the three types of ego networks.

Sociometric characteristics of ego-networks. For each ego with valid network data, we have calculated the density and size of each of the three types of ego networks.

Ego send-network density (ESDEN)

Density of the network composed of ego and the set of alters nominated by ego

$$ESDEN_i = \frac{\sum S}{s \bullet (s - 1)}$$

Where:

S = total ego send-network
s = number of nodes in **S**

If ODGX2 = 0 then ESDEN is missing.

Size of ego send-network (NES)

Number of alters nominated by ego, plus ego.

$$NES_i = s$$

Where:

s = the number of nodes in **S**

If ODGX2 = 0 then NES = 1.

Ego receive-network density (ERDEN)

Density of the network composed of ego and the set of alters who nominate ego

$$ERDEN_i = \frac{\sum R}{r \bullet (r - 1)}$$

Where:

R = total ego receive-network

r = number of nodes in **R**

If IDGX2 = 0 then ERDEN is missing.

Size of ego receive-network (NER)

Number of alters who nominate ego, plus ego.

$$NER_i = r$$

Where:

r = the number of nodes in **R**

If IDGX2 = 0 then NER = 1.

Ego send- and receive-network density (ESRDEN)

Density of the network composed of ego, the set of alters nominated by ego, and the set of alters who nominate ego.

$$ESRDEN_i = \frac{\sum SR}{sr \bullet (sr - 1)}$$

Where:

SR = total ego send- and receive-network

sr = number of nodes in **SR**

If ODGX2 = 0 and IDGX2 = 0 then ESRDEN is missing.

Size of ego send- and receive-network (NESR)

Number of alters who are nominated by ego or who nominate ego, plus ego.

$$NESR_i = sr$$

Where:

sr = the number of nodes in **SR**

If ODGX2 = 0 and IDGX2 = 0 then NER = 1.

Ego-network heterogeneity measures for grade, race, and age. For each of the three types of ego networks, we calculate a heterogeneity measure for three categorical attributes: grade, race, and age. Three variables are associated with each network/attribute combination: a heterogeneity score, the proportion of all traits present in the school which are represented in the ego network, and the number of nodes in the network used to calculate the heterogeneity score.

Heterogeneity measures. This family of variables assesses the heterogeneity of an ego network with respect to the traits of a categorical attribute. The formula used to calculate ego-network heterogeneity with respect to attribute A is:

$$HETEROGENEITY_{iA} = 1 - \left[\sum_1^n \left(\frac{A_k}{en} \right)^2 \right]$$

Where:

A = the categorical attribute

A_k = the number of nodes with trait *k* in the ego network

en = the number of nodes in the ego network with valid data on A

n = the total number of traits of A represented in the ego network

HETEROGENEITY_{iA} is missing if ego is the only member of the underlying ego network, or if all members of the ego network (including ego) have missing data on attribute A. If all members of the ego network who have valid data on attribute A share the same trait, HETEROGENEITY_{iA} = 0.

Proportion of possible traits represented in ego network. This family of variables is a measure of the sheer diversity of the ego network, with respect to the number of traits present in ego's school.

$$PROPORTION_{iA} = \frac{n_i}{n_s}$$

Where:

- A = the categorical attribute
- n_i = the total number of traits of A represented in the ego network
- n_s = the total number of traits of A represented in ego's school

PROPORTION_{iA} is missing if HETEROGENEITY_{iA} is missing.

Number of cases used to calculate heterogeneity. This family of variables is a sheer count of the number of cases in the ego network with valid data on attribute A.

$$NofCASES_{iA} = en$$

Where:

- en = the number of nodes in the ego network with valid data on A

NofCASES_{iA} is missing if HETEROGENEITY_{iA} is missing.

Variable names for heterogeneity and related measures. Variable names are shown in the table below, where within each cell, the first variable is the heterogeneity score, the second is the proportion of traits represented, and the third is the number of cases used to calculate heterogeneity.

<i>Type of Ego Network</i>	<i>Attribute</i>		
	GRADE	RACE	AGE
EGO SEND-NETWORK	EHSGRD ERSNGRD NEHSGRD	EHSRC5 ESRNRC5 NEHSRC5	EHSAGE ERSNAGE NEHSAGE
EGO RECEIVE-NETWORK	EHRGRD ERRNGRD NEHRGRD	EHRRC5 ERRNRC5 NEHRRC5	EHRAGE ERRNAGE NEHRAGE
EGO SEND- AND RECEIVE-NETWORK	EHGRD ERNGRD NEHGRD	EHRC5 ERNRC5 NEHRC5	EHAGE ERNAGE NEHAGE

Ego-network behavior/attribute means for in-school questionnaire items. For most of the behavior and attribute variables on the Add Health in-school questionnaire, means are provided for each of three types of ego networks (send, receive, and send and receive). Mean values exclude ego and any alters with missing values on the attribute or behavior variable. We also provide the number of alters in the ego network with valid data on x as a separate variable, to aid in reliability checks. Additionally, we have calculated mean values for two variables constructed from the in-school questionnaire: grade point average (GPA) and the number of extracurricular activities (NUMACT).¹

Mean values on behavior and attribute measures. This family of variables provides the mean value of ego's peers (defined by a particular ego network) on behavior and attribute measures from the in-school questionnaire. The range of $MEAN_{ix}$ is the same as the range of x .

$$MEAN_{ix} = \frac{\sum x_j}{nj}$$

Where:

- x = the in-school behavior or attribute variable
- x_j = the value of x for the j th member of the ego network
- nj = the number of nodes in the ego network with valid data on x (excluding ego)

Missing values are a function of missing values on x and the degree of the actor. If $ODGX2 = 0$, then all means calculated on ego's send-network are missing. If $IDGX2 = 0$, then all means calculated on ego's receive-network are missing. If both $ODGX2 = 0$ and $IDGX2 = 0$, then means calculated on ego's send- and receive-network are missing.

¹ GPA is the mean grade across four core subjects from the in-school questionnaire (items S10a - S10d). Grades are weighted as follows: A = 4, B = 3, C = 2, D or F = 1. GPA was calculated using only valid responses.

NUMACT is the number of extra curricular activities reported by the respondent. NUMACT is top-coded at 10, since inspection of the responses of those reporting more than 10 extra curricular activities (approximately 1 percent of the sample) appeared unreliable. For example, many of these students reported that they participated in every activity listed; others claimed to participate in every sport.

N of alters in the ego network with valid data on x . This family of variables reports the number of alters in the ego network with valid data on x .

$$NofCASES_{ix} = ej$$

Where:

ej = the number of nodes in the ego network with valid data on x ,
(excluding ego)

NofCASES_{ix} is missing if MEAN_{ix} is missing.

Variable names for mean values and related measures. The conventions used to form the variable names for the mean values on the in-school behavior and attribute measures are shown in the table below. To form actual variable names, replace $\langle x \rangle$ by the in-school item number. A complete list of these variables is included in the Appendix.

<i>Type of Ego Network</i>	<i>Behavior or Attribute x</i>	
	MEAN OF ALTER SET	N OF VALID ALTERS
EGO SEND-NETWORK	AXS$\langle x \rangle$	NAS$\langle x \rangle$
EGO RECEIVE-NETWORK	AXR$\langle x \rangle$	NAR$\langle x \rangle$
EGO SEND- AND RECEIVE-NETWORK	AX$\langle x \rangle$	NA$\langle x \rangle$

SCHOOL-LEVEL MEASURES

School-level measures are calculated using all valid nominations from students at the school to other students at the school. All students from a single school will have the same values for all school-level measures.

Measures of Global Network Structure

Density (DENX2)

The number of actual ties in the total friendship network divided by the number of possible ties in the total friendship network.

$$DENX2 = \frac{\sum X}{(g \bullet (g - 1))}$$

Where:

X = total friendship network

g = number of nodes in **X**

Density at maximum reach (RCHDEN)

The proportion of all ties filled when reach maximized.

$$RCHDEN = \frac{\sum B}{g \bullet (g - 1)}$$

Where:

B is the reachability matrix of **X**

such that:

D = geodesic distance matrix of the total friendship network **X**

and

B_{ij} = 1 if **D**_{ij} > 0

g = number of nodes in **X**

Relative density (RELDEN)

Observed density divided by maximum possible density given out-degree = 10.

$$RELDEN = \frac{DENX2}{[(10 \bullet g) / (g \bullet (g - 1))]}$$

Where:

g = number of nodes in the total friendship network **X**

Proportion symmetric dyads (PTCMUT)

Proportion of all dyads that are symmetric.

$$PTCMUT = \frac{M}{D}$$

Where:

M = number of mutual dyads within the total friendship network **X**

D = number of dyads within the total friendship network **X**

Proportion asymmetric dyads (PTCASY)

Proportion of all dyads that are asymmetric.

$$PTCASY = \frac{A}{D}$$

Where:

A = number of asymmetric dyads within the total friendship network **X**

D = total number of dyads within the total friendship network **X**

Mutuality index (RHO2)

Katz and Powell's (1955) mutuality index. Measures the tendency for actors in a group to reciprocate choices. The index is based on the expected number of mutual dyads given a random network with the same distribution of out-ties as that observed in the data (Wasserman and Faust 1994, formula 13.14).

$$RHO2 = \frac{2(g-1)^2 M - L^2 + L_2}{L(g-1)^2 - L^2 + L_2}$$

Where:

g = number of nodes in the total friendship network **X**

M = number of mutual dyads

L = sum of the out-degree of the total friendship network **X**

L₂ = sum of the squares of the out-degree of the total friendship network **X**

Measures of Segregation and Group Salience for Grade, Race, and Sex

One useful way to compare the social structure of schools is in terms of how much students sharing categorical attributes tend to choose each other as friends. For three fundamental categorical attributes, sex, grade, and race, we have constructed measures of school-level segregation and trait-specific measures of salience. The school-level measures assess the overall level of inter-group segregation, relative to a null of random mixing across groups. The trait specific measures of salience assess the strength of the in-group preference of students with a

particular trait to choose other students with the same trait as friends (i.e., girls' preference for girls as friends, blacks' preference for blacks as friends, seniors' preference for seniors as friends).

Segregation indices. The segregation indices are a modification of Freeman's (1978) index; for the Add Health data, we generalize from two traits to multiple traits and allow for positive out-group preference. Segregation indices are calculated as follows:

$$SEGREGATION_A = \frac{Expected(CrossTraitTies) - Observed(CrossTraitTies)}{Expected(CrossTraitTies)}$$

where *cross trait ties* refers to the total number of ties sent from each set of nodes sharing one trait to all nodes not sharing that trait, summed across all traits.

The expected number of *cross trait ties* is the sum of the expected values for each possible trait-trait combination, omitting ties between nodes sharing a trait. The expected number of ties sent from trait k to trait l is equal to the total number of ties sent by those with trait k multiplied by the probability that a tie from a node with trait k is sent to a node with trait l . This probability is a function of the relative size of the groups sharing each trait, and is calculated as:

$$p(g_{kl}) = \frac{g_k \bullet g_l}{g_k \bullet (g - 1)}$$

Where:

- g_k = the number of nodes with trait k
- g_l = the number of nodes with trait l
- g = the number of nodes in the total friendship network \mathbf{X}

Thus,

$$Expected(CrossTraitTies) = \sum_k \sum_l (T_k) \bullet (p(g_{kl}))$$

Where:

- T_k = total number of ties sent by those with trait k
- p_{kl} = probability that a tie from a node with trait k is sent to a node with trait l
- and
- $k \neq l$

The segregation index has a theoretical minimum of -1 (pure out-group preference) and a theoretical maximum of 1 (pure in-group preference, or total segregation). A value of 0 indicates no group-preference: ties are sent randomly with respect to this categorical attribute.

In general, rare traits have large influences on the segregation indices. Therefore, we required that at least 2 percent of a school's population must have exhibited a trait before we included it in the segregation index calculations. We note, however, that 2 percent of a small school is only a few students, and therefore urge caution when using these measures.

Where applicable, we provide grade (**SEG1S3**), race (**SEG1RCE5**), and sex (**SEG1S2**) segregation indices for all schools with valid network data.

Salience indices. Salience indices measure trait-specific in-group preferences. We define in-group preference as the extent to which persons with a particular trait tend to nominate other persons with the same trait as their friends.

The formula used to calculate the salience index is drawn from Rytina and Morgan (1982).

$$SALIENCE_k = \frac{t_{kk} / T_k}{g_k / g}$$

Where:

- k = relevant trait
- t_{kk} = number of ties sent by those with trait *k* to those with trait *k*
- T_k = total number of ties sent by those with trait *k*
- g_k = number of nodes with trait *k*
- g = total number of nodes in the network

For each school with valid network data, we provide salience indices for the following traits (variable names are in parentheses):

GRADE	RACE	SEX
7th(SS37)	White.....(SRCE51)	Male(SS20)
8th(SS38)	Black(SRCE52)	Female.....(SS21)
9th(SS39)	Hispanic(SRCE53)	
10th(SS310)	Asian(SRCE54)	
11th(SS311)	Other(SRCE55)	
12th(SS312)		

If less than 2 percent of the school has a particular trait, the associated salience index is set to missing. When students with the same trait do not send any ties to one another, the salience index = 0.

PART IV: References

- Bearman, Peter S., Jo Jones, and J. Richard Udry, J. 1997. The National Longitudinal Study of Adolescent Health: Research Design. [WWW document]. URL: <http://www.cpc.unc.edu/projects/addhealth/design.html>
- Bearman, Peter S. and James Moody. 1997. "Add Health Network Data." Unpublished.
- Bonacich, Philip. 1987. "Power and Centrality: A Family of Measures." *American Journal of Sociology* 92:1170-1182.
- Freeman, Linton C. 1978. "Segregation in Social Networks." *Sociological Methods and Research* 6(4):411-430.
- Katz, Leo and Powell, James H. 1955. "Measurement of the Tendency Toward Reciprocation of Choice." *Sociometry* 18:659-665.
- Rytina, Steve and David L. Morgan. 1982. "The Arithmetic of Social Relations: The Interplay of Category and Network." *American Journal of Sociology* 88:88-113.
- Wasserman, Stanley and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications*. Cambridge and New York, Cambridge University Press.

APPENDIX: Ordered SAS Proc Contents Output

-----Variables Ordered by Position-----

#	Variable	Type	Len	Pos	Label
1	AID	Char	8	0	Respondent Identifier
3	SIZE	Num	8	18	Number of questionnaires in school
4	IDGX2	Num	8	26	In-Degree: TFN
5	ODGX2	Num	8	34	Out-Degree: TFN
6	NOUTNOM	Num	8	42	Number of ties sent outside the school
7	TAB113	Num	8	50	Ties: Matchable to Other School
8	BCENT10X	Num	8	58	Bonacich Centrality P=.1
9	REACH	Num	8	66	N reachable alters: TFN
10	REACH3	Num	8	74	N reachable alters 3 steps: TFN
11	IGDMEAN	Num	8	82	mean dist to reachable alters
12	PRXPREST	Num	8	90	Proximity Prestige
13	INFLDMN	Num	8	98	Influence Domain
14	HAVEBMF	Num	8	106	R has a Best Male Friend
15	HAVEBFF	Num	8	114	R has a best Female friend
16	BMFRECI	Num	8	122	Best Male Frnd Recip (any)
17	BMFRECBF	Num	8	130	Best Male Frnd Recip. as BF
18	BFFRECI	Num	8	138	Best Female Frnd Recip.(any)
19	BFFRECBF	Num	8	146	Best Female Frnd Recip as BF
20	ESDEN	Num	8	154	Density: Ego Send Net
21	NES	Num	8	162	Size: Ego Send Net
22	ERDEN	Num	8	170	Density: Ego Recieve Net
23	NER	Num	8	178	Size: Ego Recieve Net
24	ESRDEN	Num	8	186	Density: Ego S&R net
25	NESR	Num	8	194	Size: Ego Send & Recv Net
26	EHSGRD	Num	8	202	Ego SEND net Heterogeneity: GRADE
27	ERSNGRD	Num	8	210	Prop. GRD rep in ego network
28	NEHSGRD	Num	8	218	# of cases used: EHSGRD
29	EHRGRD	Num	8	226	Ego RECV net Heterogeneity: GRD
30	ERRNGRD	Num	8	234	Prop. GRD rep in ego RECV network
31	NEHRGRD	Num	8	242	# of cases used: EHRGRD
32	EHGRD	Num	8	250	Ego S&R net Heterogeneity: GRADE
33	ERNGRD	Num	8	258	Prop. GRADE rep in ego network
34	NEHGRD	Num	8	266	# of cases used: EHGRD
35	EHSRC5	Num	8	274	Ego SEND net Heterogeneity: Race(5)
36	ESRNRC5	Num	8	282	Prop. Race(5) rep in ego SEND network
37	NEHSRC5	Num	8	290	# of cases used: EHSRC5
38	EHRRC5	Num	8	298	Ego RECV net Heterogeneity: Race(5)
39	ERRNRC5	Num	8	306	Prop. Race(5) rep in ego RECV network
40	NEHRC5	Num	8	314	# of cases used: EHRRC5
41	EHRC5	Num	8	322	Ego S&R net Heterogeneity: Race(5)
42	ERNRC5	Num	8	330	Prop. Race(5) rep in ego network
43	NEHRC5	Num	8	338	# of cases used: EHRC5
44	EHSAGE	Num	8	346	Ego SEND net Heterogeneity: AGE
45	ERSNAGE	Num	8	354	Prop. AGE rep in ego network
46	NEHSAGE	Num	8	362	# of cases used: EHSAGE
47	EHRAGE	Num	8	370	Ego RECV net Heterogeneity: AGE
48	ERRNAGE	Num	8	378	Prop. AGE rep in ego RECV network
49	NEHRAGE	Num	8	386	# of cases used: EHRAGE
50	EHAGE	Num	8	394	Ego S&R net Heterogeneity: AGE
51	ERNAGE	Num	8	402	Prop. AGE rep in ego network
52	NEHAGE	Num	8	410	# of cases used: EHAGE
53	AXSGPA	Num	8	418	Send alter mean: gpa
54	AXSNACT	Num	8	426	Send alter mean: numact
55	AXSS1	Num	8	434	Send alter mean: s1
56	AXSS2	Num	8	442	Send alter mean: s2
57	AXSS3	Num	8	450	Send alter mean: s3

58	AXSS45A	Num	8	458	Send alter mean: s45a
59	AXSS45B	Num	8	466	Send alter mean: s45b
60	AXSS45C	Num	8	474	Send alter mean: s45c
61	AXSS45D	Num	8	482	Send alter mean: s45d
62	AXSS45E	Num	8	490	Send alter mean: s45e
63	AXSS45F	Num	8	498	Send alter mean: s45f
64	AXSS46A	Num	8	506	Send alter mean: s46a
65	AXSS46B	Num	8	514	Send alter mean: s46b
66	AXSS46C	Num	8	522	Send alter mean: s46c
67	AXSS46D	Num	8	530	Send alter mean: s46d
68	AXSS47	Num	8	538	Send alter mean: s47
69	AXSS48	Num	8	546	Send alter mean: s48
70	AXSS49	Num	8	554	Send alter mean: s49
71	AXSS50	Num	8	562	Send alter mean: s50
72	AXSS59A	Num	8	570	Send alter mean: s59a
73	AXSS59B	Num	8	578	Send alter mean: s59b
74	AXSS59C	Num	8	586	Send alter mean: s59c
75	AXSS59D	Num	8	594	Send alter mean: s59d
76	AXSS59E	Num	8	602	Send alter mean: s59e
77	AXSS59F	Num	8	610	Send alter mean: s59f
78	AXSS59G	Num	8	618	Send alter mean: s59g
79	AXSS60A	Num	8	626	Send alter mean: s60a
80	AXSS60B	Num	8	634	Send alter mean: s60b
81	AXSS60C	Num	8	642	Send alter mean: s60c
82	AXSS60D	Num	8	650	Send alter mean: s60d
83	AXSS60E	Num	8	658	Send alter mean: s60e
84	AXSS60F	Num	8	666	Send alter mean: s60f
85	AXSS60G	Num	8	674	Send alter mean: s60g
86	AXSS60H	Num	8	682	Send alter mean: s60h
87	AXSS60I	Num	8	690	Send alter mean: s60i
88	AXSS60J	Num	8	698	Send alter mean: s60j
89	AXSS60K	Num	8	706	Send alter mean: s60k
90	AXSS60L	Num	8	714	Send alter mean: s60l
91	AXSS60M	Num	8	722	Send alter mean: s60m
92	AXSS60N	Num	8	730	Send alter mean: s60n
93	AXSS60O	Num	8	738	Send alter mean: s60o
94	AXSS62A	Num	8	746	Send alter mean: s62a
95	AXSS62B	Num	8	754	Send alter mean: s62b
96	AXSS62C	Num	8	762	Send alter mean: s62c
97	AXSS62D	Num	8	770	Send alter mean: s62d
98	AXSS62E	Num	8	778	Send alter mean: s62e
99	AXSS62F	Num	8	786	Send alter mean: s62f
100	AXSS62G	Num	8	794	Send alter mean: s62g
101	AXSS62H	Num	8	802	Send alter mean: s62h
102	AXSS62I	Num	8	810	Send alter mean: s62i
103	AXSS62J	Num	8	818	Send alter mean: s62j
104	AXSS62K	Num	8	826	Send alter mean: s62k
105	AXSS62L	Num	8	834	Send alter mean: s62l
106	AXSS62M	Num	8	842	Send alter mean: s62m
107	AXSS62N	Num	8	850	Send alter mean: s62n
108	AXSS62O	Num	8	858	Send alter mean: s62o
109	AXSS62P	Num	8	866	Send alter mean: s62p
110	AXSS62Q	Num	8	874	Send alter mean: s62q
111	AXSS62R	Num	8	882	Send alter mean: s62r
112	AXSS63	Num	8	890	Send alter mean: s63
113	AXSS64	Num	8	898	Send alter mean: s64
114	NASGPA	Num	8	906	Ego Net Denominator axsgpa
115	NASNACT	Num	8	914	Ego Net Denominator axsnact
116	NASS1	Num	8	922	Ego Net Denominator axss1
117	NASS2	Num	8	930	Ego Net Denominator axss2
118	NASS3	Num	8	938	Ego Net Denominator axss3
119	NASS45A	Num	8	946	Ego Net Denominator axss45a
120	NASS45B	Num	8	954	Ego Net Denominator axss45b

121	NASS45C	Num	8	962	Ego Net Denominator	axss45c
122	NASS45D	Num	8	970	Ego Net Denominator	axss45d
123	NASS45E	Num	8	978	Ego Net Denominator	axss45e
124	NASS45F	Num	8	986	Ego Net Denominator	axss45f
125	NASS46A	Num	8	994	Ego Net Denominator	axss46a
126	NASS46B	Num	8	1002	Ego Net Denominator	axss46b
127	NASS46C	Num	8	1010	Ego Net Denominator	axss46c
128	NASS46D	Num	8	1018	Ego Net Denominator	axss46d
129	NASS47	Num	8	1026	Ego Net Denominator	axss47
130	NASS48	Num	8	1034	Ego Net Denominator	axss48
131	NASS49	Num	8	1042	Ego Net Denominator	axss49
132	NASS50	Num	8	1050	Ego Net Denominator	axss50
133	NASS59A	Num	8	1058	Ego Net Denominator	axss59a
134	NASS59B	Num	8	1066	Ego Net Denominator	axss59b
135	NASS59C	Num	8	1074	Ego Net Denominator	axss59c
136	NASS59D	Num	8	1082	Ego Net Denominator	axss59d
137	NASS59E	Num	8	1090	Ego Net Denominator	axss59e
138	NASS59F	Num	8	1098	Ego Net Denominator	axss59f
139	NASS59G	Num	8	1106	Ego Net Denominator	axss59g
140	NASS60A	Num	8	1114	Ego Net Denominator	axss60a
141	NASS60B	Num	8	1122	Ego Net Denominator	axss60b
142	NASS60C	Num	8	1130	Ego Net Denominator	axss60c
143	NASS60D	Num	8	1138	Ego Net Denominator	axss60d
144	NASS60E	Num	8	1146	Ego Net Denominator	axss60e
145	NASS60F	Num	8	1154	Ego Net Denominator	axss60f
146	NASS60G	Num	8	1162	Ego Net Denominator	axss60g
147	NASS60H	Num	8	1170	Ego Net Denominator	axss60h
148	NASS60I	Num	8	1178	Ego Net Denominator	axss60i
149	NASS60J	Num	8	1186	Ego Net Denominator	axss60j
150	NASS60K	Num	8	1194	Ego Net Denominator	axss60k
151	NASS60L	Num	8	1202	Ego Net Denominator	axss60l
152	NASS60M	Num	8	1210	Ego Net Denominator	axss60m
153	NASS60N	Num	8	1218	Ego Net Denominator	axss60n
154	NASS60O	Num	8	1226	Ego Net Denominator	axss60o
155	NASS62A	Num	8	1234	Ego Net Denominator	axss62a
156	NASS62B	Num	8	1242	Ego Net Denominator	axss62b
157	NASS62C	Num	8	1250	Ego Net Denominator	axss62c
158	NASS62D	Num	8	1258	Ego Net Denominator	axss62d
159	NASS62E	Num	8	1266	Ego Net Denominator	axss62e
160	NASS62F	Num	8	1274	Ego Net Denominator	axss62f
161	NASS62G	Num	8	1282	Ego Net Denominator	axss62g
162	NASS62H	Num	8	1290	Ego Net Denominator	axss62h
163	NASS62I	Num	8	1298	Ego Net Denominator	axss62i
164	NASS62J	Num	8	1306	Ego Net Denominator	axss62j
165	NASS62K	Num	8	1314	Ego Net Denominator	axss62k
166	NASS62L	Num	8	1322	Ego Net Denominator	axss62l
167	NASS62M	Num	8	1330	Ego Net Denominator	axss62m
168	NASS62N	Num	8	1338	Ego Net Denominator	axss62n
169	NASS62O	Num	8	1346	Ego Net Denominator	axss62o
170	NASS62P	Num	8	1354	Ego Net Denominator	axss62p
171	NASS62Q	Num	8	1362	Ego Net Denominator	axss62q
172	NASS62R	Num	8	1370	Ego Net Denominator	axss62r
173	NASS63	Num	8	1378	Ego Net Denominator	axss63
174	NASS64	Num	8	1386	Ego Net Denominator	axss64
175	AXRGPA	Num	8	1394	Recieve alter mean:	gpa
176	AXRNACT	Num	8	1402	Recieve alter mean:	numact
177	AXRS1	Num	8	1410	Recieve alter mean:	s1
178	AXRS2	Num	8	1418	Recieve alter mean:	s2
179	AXRS3	Num	8	1426	Recieve alter mean:	s3
180	AXRS45A	Num	8	1434	Recieve alter mean:	s45a
181	AXRS45B	Num	8	1442	Recieve alter mean:	s45b
182	AXRS45C	Num	8	1450	Recieve alter mean:	s45c
183	AXRS45D	Num	8	1458	Recieve alter mean:	s45d

184	AXRS45E	Num	8	1466	Recieve alter mean: s45e
185	AXRS45F	Num	8	1474	Recieve alter mean: s45f
186	AXRS46A	Num	8	1482	Recieve alter mean: s46a
187	AXRS46B	Num	8	1490	Recieve alter mean: s46b
188	AXRS46C	Num	8	1498	Recieve alter mean: s46c
189	AXRS46D	Num	8	1506	Recieve alter mean: s46d
190	AXRS47	Num	8	1514	Recieve alter mean: s47
191	AXRS48	Num	8	1522	Recieve alter mean: s48
192	AXRS49	Num	8	1530	Recieve alter mean: s49
193	AXRS50	Num	8	1538	Recieve alter mean: s50
194	AXRS59A	Num	8	1546	Recieve alter mean: s59a
195	AXRS59B	Num	8	1554	Recieve alter mean: s59b
196	AXRS59C	Num	8	1562	Recieve alter mean: s59c
197	AXRS59D	Num	8	1570	Recieve alter mean: s59d
198	AXRS59E	Num	8	1578	Recieve alter mean: s59e
199	AXRS59F	Num	8	1586	Recieve alter mean: s59f
200	AXRS59G	Num	8	1594	Recieve alter mean: s59g
201	AXRS60A	Num	8	1602	Recieve alter mean: s60a
202	AXRS60B	Num	8	1610	Recieve alter mean: s60b
203	AXRS60C	Num	8	1618	Recieve alter mean: s60c
204	AXRS60D	Num	8	1626	Recieve alter mean: s60d
205	AXRS60E	Num	8	1634	Recieve alter mean: s60e
206	AXRS60F	Num	8	1642	Recieve alter mean: s60f
207	AXRS60G	Num	8	1650	Recieve alter mean: s60g
208	AXRS60H	Num	8	1658	Recieve alter mean: s60h
209	AXRS60I	Num	8	1666	Recieve alter mean: s60i
210	AXRS60J	Num	8	1674	Recieve alter mean: s60j
211	AXRS60K	Num	8	1682	Recieve alter mean: s60k
212	AXRS60L	Num	8	1690	Recieve alter mean: s60l
213	AXRS60M	Num	8	1698	Recieve alter mean: s60m
214	AXRS60N	Num	8	1706	Recieve alter mean: s60n
215	AXRS60O	Num	8	1714	Recieve alter mean: s60o
216	AXRS62A	Num	8	1722	Recieve alter mean: s62a
217	AXRS62B	Num	8	1730	Recieve alter mean: s62b
218	AXRS62C	Num	8	1738	Recieve alter mean: s62c
219	AXRS62D	Num	8	1746	Recieve alter mean: s62d
220	AXRS62E	Num	8	1754	Recieve alter mean: s62e
221	AXRS62F	Num	8	1762	Recieve alter mean: s62f
222	AXRS62G	Num	8	1770	Recieve alter mean: s62g
223	AXRS62H	Num	8	1778	Recieve alter mean: s62h
224	AXRS62I	Num	8	1786	Recieve alter mean: s62i
225	AXRS62J	Num	8	1794	Recieve alter mean: s62j
226	AXRS62K	Num	8	1802	Recieve alter mean: s62k
227	AXRS62L	Num	8	1810	Recieve alter mean: s62l
228	AXRS62M	Num	8	1818	Recieve alter mean: s62m
229	AXRS62N	Num	8	1826	Recieve alter mean: s62n
230	AXRS62O	Num	8	1834	Recieve alter mean: s62o
231	AXRS62P	Num	8	1842	Recieve alter mean: s62p
232	AXRS62Q	Num	8	1850	Recieve alter mean: s62q
233	AXRS62R	Num	8	1858	Recieve alter mean: s62r
234	AXRS63	Num	8	1866	Recieve alter mean: s63
235	AXRS64	Num	8	1874	Recieve alter mean: s64
236	NARGPA	Num	8	1882	Ego Net Denominator axrgpa
237	NARNACT	Num	8	1890	Ego Net Denominator axrnact
238	NARS1	Num	8	1898	Ego Net Denominator axrs1
239	NARS2	Num	8	1906	Ego Net Denominator axrs2
240	NARS3	Num	8	1914	Ego Net Denominator axrs3
241	NARS45A	Num	8	1922	Ego Net Denominator axrs45a
242	NARS45B	Num	8	1930	Ego Net Denominator axrs45b
243	NARS45C	Num	8	1938	Ego Net Denominator axrs45c
244	NARS45D	Num	8	1946	Ego Net Denominator axrs45d
245	NARS45E	Num	8	1954	Ego Net Denominator axrs45e
246	NARS45F	Num	8	1962	Ego Net Denominator axrs45f

247	NARS46A	Num	8	1970	Ego Net Denominator	axrs46a
248	NARS46B	Num	8	1978	Ego Net Denominator	axrs46b
249	NARS46C	Num	8	1986	Ego Net Denominator	axrs46c
250	NARS46D	Num	8	1994	Ego Net Denominator	axrs46d
251	NARS47	Num	8	2002	Ego Net Denominator	axrs47
252	NARS48	Num	8	2010	Ego Net Denominator	axrs48
253	NARS49	Num	8	2018	Ego Net Denominator	axrs49
254	NARS50	Num	8	2026	Ego Net Denominator	axrs50
255	NARS59A	Num	8	2034	Ego Net Denominator	axrs59a
256	NARS59B	Num	8	2042	Ego Net Denominator	axrs59b
257	NARS59C	Num	8	2050	Ego Net Denominator	axrs59c
258	NARS59D	Num	8	2058	Ego Net Denominator	axrs59d
259	NARS59E	Num	8	2066	Ego Net Denominator	axrs59e
260	NARS59F	Num	8	2074	Ego Net Denominator	axrs59f
261	NARS59G	Num	8	2082	Ego Net Denominator	axrs59g
262	NARS60A	Num	8	2090	Ego Net Denominator	axrs60a
263	NARS60B	Num	8	2098	Ego Net Denominator	axrs60b
264	NARS60C	Num	8	2106	Ego Net Denominator	axrs60c
265	NARS60D	Num	8	2114	Ego Net Denominator	axrs60d
266	NARS60E	Num	8	2122	Ego Net Denominator	axrs60e
267	NARS60F	Num	8	2130	Ego Net Denominator	axrs60f
268	NARS60G	Num	8	2138	Ego Net Denominator	axrs60g
269	NARS60H	Num	8	2146	Ego Net Denominator	axrs60h
270	NARS60I	Num	8	2154	Ego Net Denominator	axrs60i
271	NARS60J	Num	8	2162	Ego Net Denominator	axrs60j
272	NARS60K	Num	8	2170	Ego Net Denominator	axrs60k
273	NARS60L	Num	8	2178	Ego Net Denominator	axrs60l
274	NARS60M	Num	8	2186	Ego Net Denominator	axrs60m
275	NARS60N	Num	8	2194	Ego Net Denominator	axrs60n
276	NARS60O	Num	8	2202	Ego Net Denominator	axrs60o
277	NARS62A	Num	8	2210	Ego Net Denominator	axrs62a
278	NARS62B	Num	8	2218	Ego Net Denominator	axrs62b
279	NARS62C	Num	8	2226	Ego Net Denominator	axrs62c
280	NARS62D	Num	8	2234	Ego Net Denominator	axrs62d
281	NARS62E	Num	8	2242	Ego Net Denominator	axrs62e
282	NARS62F	Num	8	2250	Ego Net Denominator	axrs62f
283	NARS62G	Num	8	2258	Ego Net Denominator	axrs62g
284	NARS62H	Num	8	2266	Ego Net Denominator	axrs62h
285	NARS62I	Num	8	2274	Ego Net Denominator	axrs62i
286	NARS62J	Num	8	2282	Ego Net Denominator	axrs62j
287	NARS62K	Num	8	2290	Ego Net Denominator	axrs62k
288	NARS62L	Num	8	2298	Ego Net Denominator	axrs62l
289	NARS62M	Num	8	2306	Ego Net Denominator	axrs62m
290	NARS62N	Num	8	2314	Ego Net Denominator	axrs62n
291	NARS62O	Num	8	2322	Ego Net Denominator	axrs62o
292	NARS62P	Num	8	2330	Ego Net Denominator	axrs62p
293	NARS62Q	Num	8	2338	Ego Net Denominator	axrs62q
294	NARS62R	Num	8	2346	Ego Net Denominator	axrs62r
295	NARS63	Num	8	2354	Ego Net Denominator	axrs63
296	NARS64	Num	8	2362	Ego Net Denominator	axrs64
297	AXGPA	Num	8	2370	S&R alter mean:	gpa
298	AXNUMACT	Num	8	2378	S&R alter mean:	numact
299	AXS1	Num	8	2386	S&R alter mean:	s1
300	AXS2	Num	8	2394	S&R alter mean:	s2
301	AXS3	Num	8	2402	S&R alter mean:	s3
302	AXS45A	Num	8	2410	S&R alter mean:	s45a
303	AXS45B	Num	8	2418	S&R alter mean:	s45b
304	AXS45C	Num	8	2426	S&R alter mean:	s45c
305	AXS45D	Num	8	2434	S&R alter mean:	s45d
306	AXS45E	Num	8	2442	S&R alter mean:	s45e
307	AXS45F	Num	8	2450	S&R alter mean:	s45f
308	AXS46A	Num	8	2458	S&R alter mean:	s46a
309	AXS46B	Num	8	2466	S&R alter mean:	s46b

310	AXS46C	Num	8	2474	S&R alter mean: s46c
311	AXS46D	Num	8	2482	S&R alter mean: s46d
312	AXS47	Num	8	2490	S&R alter mean: s47
313	AXS48	Num	8	2498	S&R alter mean: s48
314	AXS49	Num	8	2506	S&R alter mean: s49
315	AXS50	Num	8	2514	S&R alter mean: s50
316	AXS59A	Num	8	2522	S&R alter mean: s59a
317	AXS59B	Num	8	2530	S&R alter mean: s59b
318	AXS59C	Num	8	2538	S&R alter mean: s59c
319	AXS59D	Num	8	2546	S&R alter mean: s59d
320	AXS59E	Num	8	2554	S&R alter mean: s59e
321	AXS59F	Num	8	2562	S&R alter mean: s59f
322	AXS59G	Num	8	2570	S&R alter mean: s59g
323	AXS60A	Num	8	2578	S&R alter mean: s60a
324	AXS60B	Num	8	2586	S&R alter mean: s60b
325	AXS60C	Num	8	2594	S&R alter mean: s60c
326	AXS60D	Num	8	2602	S&R alter mean: s60d
327	AXS60E	Num	8	2610	S&R alter mean: s60e
328	AXS60F	Num	8	2618	S&R alter mean: s60f
329	AXS60G	Num	8	2626	S&R alter mean: s60g
330	AXS60H	Num	8	2634	S&R alter mean: s60h
331	AXS60I	Num	8	2642	S&R alter mean: s60i
332	AXS60J	Num	8	2650	S&R alter mean: s60j
333	AXS60K	Num	8	2658	S&R alter mean: s60k
334	AXS60L	Num	8	2666	S&R alter mean: s60l
335	AXS60M	Num	8	2674	S&R alter mean: s60m
336	AXS60N	Num	8	2682	S&R alter mean: s60n
337	AXS60O	Num	8	2690	S&R alter mean: s60o
338	AXS62A	Num	8	2698	S&R alter mean: s62a
339	AXS62B	Num	8	2706	S&R alter mean: s62b
340	AXS62C	Num	8	2714	S&R alter mean: s62c
341	AXS62D	Num	8	2722	S&R alter mean: s62d
342	AXS62E	Num	8	2730	S&R alter mean: s62e
343	AXS62F	Num	8	2738	S&R alter mean: s62f
344	AXS62G	Num	8	2746	S&R alter mean: s62g
345	AXS62H	Num	8	2754	S&R alter mean: s62h
346	AXS62I	Num	8	2762	S&R alter mean: s62i
347	AXS62J	Num	8	2770	S&R alter mean: s62j
348	AXS62K	Num	8	2778	S&R alter mean: s62k
349	AXS62L	Num	8	2786	S&R alter mean: s62l
350	AXS62M	Num	8	2794	S&R alter mean: s62m
351	AXS62N	Num	8	2802	S&R alter mean: s62n
352	AXS62O	Num	8	2810	S&R alter mean: s62o
353	AXS62P	Num	8	2818	S&R alter mean: s62p
354	AXS62Q	Num	8	2826	S&R alter mean: s62q
355	AXS62R	Num	8	2834	S&R alter mean: s62r
356	AXS63	Num	8	2842	S&R alter mean: s63
357	AXS64	Num	8	2850	S&R alter mean: s64
358	NAGPA	Num	8	2858	Ego Net Denominator axgpa
359	NANUMACT	Num	8	2866	Ego Net Denominator axnumact
360	NAS1	Num	8	2874	Ego Net Denominator axs1
361	NAS2	Num	8	2882	Ego Net Denominator axs2
362	NAS3	Num	8	2890	Ego Net Denominator axs3
363	NAS45A	Num	8	2898	Ego Net Denominator axs45a
364	NAS45B	Num	8	2906	Ego Net Denominator axs45b
365	NAS45C	Num	8	2914	Ego Net Denominator axs45c
366	NAS45D	Num	8	2922	Ego Net Denominator axs45d
367	NAS45E	Num	8	2930	Ego Net Denominator axs45e
368	NAS45F	Num	8	2938	Ego Net Denominator axs45f
369	NAS46A	Num	8	2946	Ego Net Denominator axs46a
370	NAS46B	Num	8	2954	Ego Net Denominator axs46b
371	NAS46C	Num	8	2962	Ego Net Denominator axs46c
372	NAS46D	Num	8	2970	Ego Net Denominator axs46d

373	NAS47	Num	8	2978	Ego Net Denominator	axs47
374	NAS48	Num	8	2986	Ego Net Denominator	axs48
375	NAS49	Num	8	2994	Ego Net Denominator	axs49
376	NAS50	Num	8	3002	Ego Net Denominator	axs50
377	NAS59A	Num	8	3010	Ego Net Denominator	axs59a
378	NAS59B	Num	8	3018	Ego Net Denominator	axs59b
379	NAS59C	Num	8	3026	Ego Net Denominator	axs59c
380	NAS59D	Num	8	3034	Ego Net Denominator	axs59d
381	NAS59E	Num	8	3042	Ego Net Denominator	axs59e
382	NAS59F	Num	8	3050	Ego Net Denominator	axs59f
383	NAS59G	Num	8	3058	Ego Net Denominator	axs59g
384	NAS60A	Num	8	3066	Ego Net Denominator	axs60a
385	NAS60B	Num	8	3074	Ego Net Denominator	axs60b
386	NAS60C	Num	8	3082	Ego Net Denominator	axs60c
387	NAS60D	Num	8	3090	Ego Net Denominator	axs60d
388	NAS60E	Num	8	3098	Ego Net Denominator	axs60e
389	NAS60F	Num	8	3106	Ego Net Denominator	axs60f
390	NAS60G	Num	8	3114	Ego Net Denominator	axs60g
391	NAS60H	Num	8	3122	Ego Net Denominator	axs60h
392	NAS60I	Num	8	3130	Ego Net Denominator	axs60i
393	NAS60J	Num	8	3138	Ego Net Denominator	axs60j
394	NAS60K	Num	8	3146	Ego Net Denominator	axs60k
395	NAS60L	Num	8	3154	Ego Net Denominator	axs60l
396	NAS60M	Num	8	3162	Ego Net Denominator	axs60m
397	NAS60N	Num	8	3170	Ego Net Denominator	axs60n
398	NAS60O	Num	8	3178	Ego Net Denominator	axs60o
399	NAS62A	Num	8	3186	Ego Net Denominator	axs62a
400	NAS62B	Num	8	3194	Ego Net Denominator	axs62b
401	NAS62C	Num	8	3202	Ego Net Denominator	axs62c
402	NAS62D	Num	8	3210	Ego Net Denominator	axs62d
403	NAS62E	Num	8	3218	Ego Net Denominator	axs62e
404	NAS62F	Num	8	3226	Ego Net Denominator	axs62f
405	NAS62G	Num	8	3234	Ego Net Denominator	axs62g
406	NAS62H	Num	8	3242	Ego Net Denominator	axs62h
407	NAS62I	Num	8	3250	Ego Net Denominator	axs62i
408	NAS62J	Num	8	3258	Ego Net Denominator	axs62j
409	NAS62K	Num	8	3266	Ego Net Denominator	axs62k
410	NAS62L	Num	8	3274	Ego Net Denominator	axs62l
411	NAS62M	Num	8	3282	Ego Net Denominator	axs62m
412	NAS62N	Num	8	3290	Ego Net Denominator	axs62n
413	NAS62O	Num	8	3298	Ego Net Denominator	axs62o
414	NAS62P	Num	8	3306	Ego Net Denominator	axs62p
415	NAS62Q	Num	8	3314	Ego Net Denominator	axs62q
416	NAS62R	Num	8	3322	Ego Net Denominator	axs62r
417	NAS63	Num	8	3330	Ego Net Denominator	axs63
418	NAS64	Num	8	3338	Ego Net Denominator	axs64
419	DENX2	Num	8	3346	Total Network Density: TFN	
420	RCHDEN	Num	8	3354	Density at maximum Reach	
421	RELDEN	Num	8	3362	Density/Max Pos. Den	
422	PCTMUT	Num	8	3370	PCT dyads mutual	
423	PCTASY	Num	8	3378	Pct dyads Asymmetric	
424	RHO2	Num	8	3386	Katz and Powells Mutuality index	
425	SEG1S3	Num	8	3394	Freeman Seg Index: Grade	
426	SS37	Num	8	3402	Saliency Index: Grade=7	
427	SS38	Num	8	3410	Saliency Index: Grade=8	
428	SS39	Num	8	3418	Saliency Index: Grade=9	
429	SS310	Num	8	3426	Saliency Index: Grade=10	
430	SS311	Num	8	3434	Saliency Index: Grade=11	
431	SS312	Num	8	3442	Saliency Index: Grade=12	
432	SEG1RCE5	Num	8	3450	Freeman Seg Index: Race/Ethnic(5)	
433	SRCE51	Num	8	3458	Saliency Index: Race(5)=White	
434	SRCE52	Num	8	3466	Saliency Index: Race(5)=Black	
435	SRCE53	Num	8	3474	Saliency Index: Race(5)=Hispanic	

436	SRCE54	Num	8	3482	Saliency Index: race(5)=Asian
437	SRCE55	Num	8	3490	Saliency Index: Race(5)=Other
438	SEG1S2	Num	8	3498	Freeman Seg Index: Gender (1=Fem)
439	SS20	Num	8	3506	Saliency Index: Gender=Male
440	SS21	Num	8	3514	Saliency Index: Gender=Female

Additional Information about the Constructed Network Variables

Some of the in-school variables used in constructing the network measures were re-coded before the network measures were calculated. Because of this, the values for the in-school variables will not be comparable to the corresponding values of the calculated network measures.

The recoded in-school variables are:

In-school variable name	Codes from in-school questionnaire	Codes used to construct the network measures
S2 *	1 = male 2 = female	recoded to: 0 = male 1 = female
S48	1 = I try very hard to do my best. 2 = I try hard enough, but not as hard as I could. 3 = I don't try very hard. 4 = I never try at all.	reversed the codes to: 1 = I never try at all. 2 = I don't try very hard. 3 = I try hard enough, but not as hard as I could. 4 = I try very hard to do my best.
S49	0 = no 1 = yes	recoded to: 1 = yes 2 = no
S62a to S62r	1 = strongly agree 2 = agree 3 = neither agree or disagree 4 = disagree 5 = strongly disagree	reversed the codes to: 1 = strongly disagree 2 = disagree 3 = neither agree or disagree 4 = agree 5 = strongly agree

Algorithm for recoding the network variables so they match the in-school variables:

1. Subtract (1 + highest value of the Add Health variable) from the network measure to make the network measure correspond to the in-school value of the variable.

2. Example: mean of S48 before recoding = 1.7632006
mean of S48 after reverse coding = 3.237994

highest value of unrecoded S48 = 4
highest value of S48 + 1 = 5

$5 - 3.237994 = 1.7632006$ gives you the same value as before recoding.

* Does not need to be recoded but the user should be aware of the differences in codes.