Missing Out on More than Health: Global Health and Social Integration in Adolescence

Jeanne L. Long
Hubert Department of Global Health
Emory University
Rollins School of Public Health
1518 Clifton Road NE
Atlanta, GA 30322
jeanne.louise.long@emory.edu

Elizabeth Vaquera
Department of Sociology
University of South Florida
4202 East Fowler Avenue, CPR107
Tampa, Florida 33620 USA
evaquera@usf.edu

Solveig Argeseanu Cunningham
Hubert Department of Global Health and Department of Sociology
Emory University
Rollins School of Public Health
1518 Clifton Road NE, Room 738
Atlanta, GA 30322
sargese@emory.edu

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ABSTRACT

Health and social integration are widely recognized as two leading sources of happiness and general well-being. While researchers have demonstrated that friendships--a measure of social integration-- and health are related, the mechanisms behind the association are not understood. Using data from the National Longitudinal Survey of Adolescent Health, we explore three pathways that may explain the relationships between health, including obesity, and social integration in terms of reduced peer acceptance and social withdrawal: physical appearance, social engagement, and psychological well-being. Results indicate that physical appearance and social engagement are the most salient factors in the relationship between health and peer acceptance. Social withdrawal associated with poor health is not explained by any of the pathways. Physical appearance was particularly important in explaining reduced peer acceptance of obese youth, with opportunities for social engagement asserting a greater role among those with lower self-rated health.

Introduction

Health and social integration are widely recognized as two leading sources of happiness and well-being, both in lay discourse and in scientific literature (Helliwell and Putnam 2004, Koopmans et al. 2008, Siahpush et al. 2008, Steptoe et al. 2009). Researchers have demonstrated both the potential harms and benefits of social integration for health, for example, that friendships influence physical and mental health, including body weight, (Renna et al. 2008), depression (Falci and McNeely 2009), suicidal behavior (Bearman and Moody 2004), self-worth and loneliness (Reiter-Purtill et al. 2010). Friends may also affect health behaviors such as smoking (Costello et al. 2008, Paavola et al. 2001) fast food consumption, sports participation, and regular exercise (Ali et al. 2011). On the other hand, health is a predictor of social well-being, including perceptions of one's own social status (Wolff et al. 2010), position within social networks, and social isolation (Haas et al. 2010, Strauss and Pollack 2003). Poor health, including obesity (Crosnoe et al. 2008, Cunningham et al. 2012, Puhl and Latner 2007, Strauss and Pollack 2003, Tang-Peronard and Heitmann 2008b), ADHD, depression (Coleman et al. 2009, Martin et al. 2007), type I diabetes (Storch et al. 2004) and other chronic conditions such as eczema and epilepsy (Sentenac et al. 2011) affect social integration among adolescents. That both directions of influence have been identified suggests that a cyclical progression may exist, with poor health leading to poorer social integration, leading to poorer health.

The next step in understanding the relationship between poor health and social integration is to explain how these relationships operate. This study takes this approach using the National Longitudinal Study of Adolescent Health. We measure health in terms of three indicators of global health: self-rated health, number of reported health problems, and obesity. We use obesity as a measure of global health for adolescents because childhood obesity presents early manifestations of adult health (l'Allemand-Jander 2010) and is associated with poor quality of life (Swallen et al. 2005). Measures of social integration were number of friendship nominations received from schoolmates, indicating peer acceptance or rejection, and number of self-reported friendships, indicating social withdrawal or engagement. This study contributes to the literature by presenting an assessment of the relationships between global health and social integration and proposing a framework for understanding these relationships. We propose that health can impact social integration

because it alters physical appearance, impedes social engagement, and reduces psychological well-being. We build on Scambler's (2004) distinction between 'enacted stigma', refering to acts of discrimination based on the social and cultural bias against a condition, and 'felt stigma,' the shame one feels for having the condition and the fear of confronting enacted stigma. We also build on Goffman's (1984) theory of stigma and the management of stigma.

Conceptual Framework

Poor global health can be expected to lead to poorer social integration because it negatively affects physical appearance, social engagement, and psychological well-being. Because poor global health, and especially obesity, modifies physical appearance, it may reduce peer's acceptance of a child and may lead the child to withdraw from social interactions to avoid discrimination. Poor health may also limit opportunities to engage with peers, as a result of low acceptance by peers and the child's own social withdrawal. Finally, poor health may damage psychological well-being leading to lower peer acceptance and social withdrawal.

INSERT FIGURE 1 HERE

We propose the following hypotheses:

H1. Adolescents in poor health will experience lower peer-acceptance.

H2. Adolescents in poor health will withdraw from social interactions.

H3. The relationships between global health and social integration will be explained by: a. lower physical attractiveness; b. lower levels of social engagement and c. poorer psychological well-being.

Health and social acceptance

In *Stigma: Notes on the Management of a Spoiled Identity*, Erving Goffman argued that individuals who have an attribute that is different from others' must work hard to maintain or establish their identity as human beings (Goffman 1986). According to Goffman, when someone possesses an "undesired differentness" others see him as "not quite human" and, without realizing it, they discriminate against him or her in ways that effectively "reduce his life chances". This treatment is often motivated or justified through a

portrayal of the person as inferior, both as a response to the stigmatized attribute and by extrapolating from it other undesirable characteristics.

Discrimination has been reported with respect to several health conditions. For example, sexually transmitted infections and lung cancer have been portrayed as illnesses resulting from immoral behavior or undesirable habits (Sontag 2001). Thus, those suffering from these conditions are held responsible for their illness (Ablon 2002, McKenna Guylyn and Youssef 2010), being described as dirty or depraved (Sontag 2001). Conditions that affect one's behavior can also 'disqualify'--epilepsy (Jacoby et al. 2005), ADHD (Walker et al. 2008) and mental illness (Feldman and Crandall 2007) have been stigmatized as a result of unpredictable symptomology, a perceived lack of self-control, or for fear of intergenerational transmission (Ablon 1981). The term "mental illness" evokes rejection even among children and adolescents (Martin et al. 2007), with conditions such as ADHD and depression often attributed to low efforts on the part of the child, poor parenting, and substance abuse (Coleman et al. 2009). Health-related discrimination has been documented towards children, from both adults and peers, even for conditions attributed to chemical imbalances or genetic endowments (Martin et al. 2007).

The most extensively documented health discrimination has been towards obesity. Educators have reported believing that poor self-control contributes to obesity, that obese persons are untidy, emotional, have family problems (Puhl and Latner 2007), and are "socially withdrawn" (Zeller et al. 2008). Parents may partake in the stereotyping and teasing of their obese children, while also confronting negative judgment for having heavy children (Saguy and Gruys 2010). Children have held negative attitudes toward obese peers (Goldfield and Chrisler 1995), describing them as mean, stupid, sloppy, ugly, loud, and friendless (Musher-Eizenman et al. 2004), as well as less attractive, less athletic and more sick or absent from school (Zeller et al. 2008). Consequently, obese children have been less likely to be selected as friends than normal-weight children (Bell and Morgan 2000, Musher-Eizenman et al. 2004, Sigelman 1991, Young and Avdzej 1979), were more likely to be rejected by their classmates (Mahoney et al. 2005), and spent less time with friends (Falkner et al. 2001). Obese youth have also conveyed stigmatizing attitudes towards obesity (Puhl and Latner

2007). Similarly, overweight and obese girls reported believing that being thinner would improve their friendships (Gerner and Wilson 2005).

Health-related discrimination may be magnified by class, race, gender, and sexuality stereotypes, as well as differences in prevalence among sub-populations (Ablon 2002, Parker and Aggleton 2003). This discrimination is often internalized, resulting in feelings of self-blame for the diagnoses (Chapple et al. 2004). Thus, "perceiving oneself to be the target of discrimination is likely to affect individuals' identity formation, peer relations, academic achievement, occupational goals, and mental and physical well-being" (Brown and Bigler 2005) and, as discussed below, can lead to social withdrawal.

Health and social withdrawal

Scambler (2004) proposed that 'felt stigma' may lead an individual to conceal an illnesses in order to avoid negative reactions and judgment. The concept of felt stigma aligns with Goffman's (1986) argument that those who possess or believe that they possess attributes subject to discrimination must work to maintain their social identity (Goffman 1986). Those with an attribute that is easily visible to others can be thought of as "discredited." Aware that their "differentness" is evident to observers, their focus in social interactions is to mitigate the damage inflicted on their social identity. However, individuals whose differentness is not immediately evident lead the life of a discreditable individual, who at any moment could be found out to be different. They engage in identity management, attempting to "pass" as normal, often requiring them to maintain a safe social distance so that their differentness is not divulged (Goffman 1986). Thus, persons in poorer health can be expected to alter their behavior to confront the discrimination they expect to encounter.

There is empirical evidence that people choose to "pass for healthy" in order to avoid prejudice (Joachim and Acorn 2000). Youth with epilepsy determined whether to disclose their illness in part based on their evaluation of the others' ability to be empathetic, handle the information, and maintain equality and reciprocity in the relationship (Admi and Shaham 2007). Young women with type I diabetes reported that disclosing their condition to colleagues hinged upon the likelihood of being revealed by an event of hypoglycemia (Rasmussen et al. 2007). Adolescents similarly devise strategies to secretly manage their illness

and avoid unwanted attention. Universtity students with type 1 diabetes recounted secretly managing their illness by retreating to bathrooms or dorm rooms to test their blood sugar (Balfe 2009), while those with negative self-perceptions were more likely to neglect checking their blood sugar altogether (Bennett Murphy et al. 1997). Obese youth and those with diabetes admitted to eating and drinking foods they knew would make them sick in order to fit in (Balfe 2009, Curtis 2008) and youth with Celiac disease described unease when they could not accept food that was offered to them (Olsson et al. 2009). Consequently, in an effort to conform, youth already in poor health may adopt detrimental behaviors to avoid expected negative social responses.

Even when they cannot "pass", individuals with health problems may preemptively exclude themselves from interactions and activities to limit attention (Rumsey et al. 2004). Overweight and obese youth have described self-consciousness as a barrier to engaging in physical activities (Zabinski et al. 2003), as well as eating in solitude and faking injuries to avoid participating in gym classes (Curtis 2008). Adolescents with skin conditions also expressed concerns regarding sports participation because uniforms exposed skin that they could not conceal with make-up (Golics et al. 2009).

Three Pathways Linking Health and Social Integration

Physical Appearance

In concordance with Goffman's proposition that physical appearance is a critical component in the value and expectations about competence assigned to others (Goffman 1986), attractiveness is expected to be an element of health stigma. Physically attractive people are perceived as more sociable, dominant, mentally healthy, and socially skilled (Feingold 1992). A meta-analysis examining the influence of beauty found that being attractive also proved a significant advantage for children: attractive children were evaluated by teachers more positively in terms of academic performance, interpersonal competence, development and adjustment, and were treated more favorably by peers, caregivers, and teachers than unattractive children (Langlois et al. 2000). Similarly, aggressive adolescents with lower rated facial attractiveness were considered less popular than equally aggressive but "attractive," adolescents (Rosen and Underwood 2010).

Physical appearance may be especially important for social well-being during adolescence (Rumsey et al. 2004), therefore, health conditions that affect physical appearance may be more likely to lead to stigmatization. Health problems such as obesity, sickle-cell anemia, Type I diabetes, psoriasis, eczema and acne can affect physical appearance, and youth with these conditions report being taunted and struggling to cope with the social consequences (Dyson et al. 2010, Fox et al. 2007, Golics et al. 2009, Jacobson et al. 1997). Among children and adolescents, the most documented discrimination has been associated with respect to obesity (Bell and Morgan 2000, Crosnoe et al. 2008, Strauss and Pollack 2003, Tang-Peronard and Heitmann 2008a).

Social Engagement

Poor health may limit involvement in activities that offer friendship opportunities (La Greca et al. 2002). Adolescents have reported that illness disrupts their relations with peers and family, predominantly by interfering with social and school activities (Suris et al. 2004, Zeltzer et al. 1980). In a review of qualitative studies examining adolescents living with chronic health conditions, youths' primary concern centered on their ability to develop and maintain friendships; an objective often sabotaged by their illness and time spent in the hospital (Taylor et al. 2008). They further complained that prolonged or repeated absences from school inhibited academic achievement. Indeed, poor health was associated with falling behind in classes, in large part due to absenteeism (Needham et al. 2004).

Poor health may also restrict participation in activities that promote social interaction such as physical education and sports. Children and adolescents with asthma tend to be less physically active than their peers, often not as a consequence of their health but of the family's illness beliefs and inaccurate symptom perception (Williams et al. 2008). The need to take medication may present an additional barrier to social interactions, jeopardizing opportunities to participate in sports and school trips (Newbould et al. 2007). Accordingly, illness may systematically reduce opportunities to spend time with classmates, make friends, and cultivate friendships.

Psychological Well-being

Poor health may lead to psychosocial distress, which may in turn affect social interactions (Rumsey and Harcourt 2007). Negative attention can heighten anxiety, leading to social avoidance and fewer social connections (Rumsey et al. 2004). Youth living with illnesses that limit physical functioning have exhibited an increased risk of psychological disorders and social adjustment problems (Cadman et al. 1987) and were more isolated from peers (Liptak et al. 2010). Even among youth with Type 1 diabetes, a less physically-limiting condition, depressive symptoms, social anxiety, and loneliness have partially explained the peer discrimination they report (Fekkes et al. 2006, Storch et al. 2004). Sentenac suggested that psychosocial adjustment may moderate the relationship between chronic conditions and peer victimization, as youth experiencing loneliness and fear of rejection may self-identify as victims (Sentenac et al. 2011). Poor mental health may also impair social integration, as previous research has reported that adolescents with depression were more likely to withdraw from friendships and occupy marginalized social network positions (Schaefer et al. 2011).

Data and Methods

Data

We used the National Longitudinal Study of Adolescent Health (Add Health), a school-based study of the health-related behaviors of adolescents. The data are representative of the U.S. population enrolled in secondary school in 1995. The first data collection was conducted in schools in 1994-95 (In-School questionnaire) and included all students in the selected schools. Interviews were conducted with over 90,000 students (Harris 2003). The In-School questionnaire was followed by an In-Home wave in 1995, in which about 200 students were recruited from each High School and Middle School pair, resulting in a self-weighting sample of 20,745 adolescents in grades 7 through 12 (Harris 2003). Separate interviews with parents, siblings and partners were also conducted for the respondents of the In-Home instrument.

Our final sample was drawn from the 11,514 respondents who participated in both the In-School and In-Home Wave I surveys and had full information on all the measures included in the study. We employed the

sample of students who participated in both questionnaires because information on friends was collected in school, while much of the information on health was collected in the In-Home survey.

Social integration: As the set of relationships that one has with one's peers, we quantified social integration with two measures: a count of self-reported same-sex friends and a count of the friendship nominations received from same-sex schoolmates. The first measure indicates social withdrawal and the second peer-acceptance. Similar measures have been used in previous Add Health studies (Crosnoe et al. 2008, Haas et al. 2010, Schaefer et al. 2011, Strauss and Pollack 2003). We limited analysis to same-sex friends to minimize combining friendship and romantic relationships.

Health: Add Health collected information on several self-reported components of health. One indicator was self-rated health, measured on a Likert scale from 1 to 5, representing poor to excellent health, respectively. Self-rated health has been used in previous studies to examine the relationship of health with academic success (Needham, Crosnoe and Muller, 2004), social integration (Haas, Schaefer and Kornienko, 2010), and overall quality of life of adolescents (Sawatzky et al., 2010). It is a strong marker of overall health and is associated with other health indicators such as physical activity, nutrition, health-risk behavior and physical disability (Sawatzky et al., 2010). For adults, self-rated health consistently predicts mortality and is considered an irreplaceable dimension of health status (Idler and Benyamini 1997). Among adolescents in Add Health, self-rated health was moderately stable across waves, suggesting that it is both a spontaneous assessment of health and an enduring concept (Boardman 2006).

Our second measure of global health was a health index, which is a count of the health problems reported by the respondent. While specific health problems may be difficult to interpret, we expected that respondents who report multiple health problems were in worse health (Boardman 2006). We selected the most commonly reported conditions and created dummy variables indicating whether the respondent reported experiencing each condition: obese (more than two standard deviation above the age and sex-specific z-score of the reference population); overweight (more than one standard deviation above the age and sex-specific z-score of the reference population); short stature (more than one standard deviation below the age and sex-specific z-score of the reference population); frequent sore throat, cough, feeling really sick,

skin problems such as itching or pimples; use of a wheelchair, walking with an assistive device, or other physical limitations; or experiencing, every day or almost every day: asthma, heart problems, cold sweats, chest pain, dizziness, feeling hot, headaches, painful urination, poor appetite, sore muscles, stomachaches, and feeling tired.

The third measure of global health was obesity, a prevalent health condition among adolescents (Ogden et al. 2012) known to create early symptomology of adult chronic health conditions (l'Allemand-Jander 2010) and is associated with lower quality of life (Swallen et al. 2005). We used the 2000 CDC Growth Reference to calculate each child's BMI z-score, standardized to the reference population for the child's age and sex (Vidmar et al. 2004). Cutoffs for normal weight, overweight, and obese were used according to the Child Obesity Working Group of the International Obesity Task Force (Cole et al. 2000). These cutoffs correspond to adult BMI cutoff points of BMI<25kg/m2 for normal weight, BMI 25–29.99 for overweight, and BMI≥30 for obese. Adolescents who were more than two standard deviation above the age and sex-specific z-score of the reference population were categorized as obese.

Physical appearance, social engagement, and psychological well-being: Add Health asked interviewers to report how physically attractive, well-groomed, and physically mature respondents were, each on a scale of one to five. These indicators have been used in other Add Health studies to analyze associations between attractiveness and appearance and other outcomes such as weight preoccupation (Colabianchi et al. 2006, French et al. 2009) and academic performance (French et al. 2009).

Social engagement was measured as a series of dummy variables indicating whether the respondent participated in any school-related extra-curricular activity; missed school due to illness; or missed social events due to illness.

Psychological well-being was measured from composite averages for self-esteem and depression. Self-esteem was assessed by agreement with five questions: you have a lot of good personal qualities; you feel like you are doing just about everything right; you have a lot to be proud of; you like yourself just the way you are; and you feel loved and wanted. Depression was evaluated based on responses to 19 questions from the NIMH Center for Epidemiological Studies Depression Scale (CES-D) regarding the frequency of particular

feelings and moods (Radloff 1977). Other studies using Add Health data have utilized the CES-D scale (Merten et al. 2008, Nooney 2005); the scale was found to have an alpha of 0.87, with all items contributing strongly (Nooney 2005). Consistent with previous studies, we created a variable summing all the questions answered divided by the total responses given.

Control measures: The selection of control measures was guided by theoretical and empirical reports on the relationship between health and social relations: *adolescent characteristics* were gender, age (in years), and race/ethnicity from students' self-reports (non-Hispanic White, non-Hispanic Black, Asian, Other race[4] and Hispanic). We included the number of years the student attended the school, as recently arrived students have had fewer opportunities to make friends. We measured *socio-economic status* using parents' years of schooling and whether the family received food stamps, since socio-economic status is likely important for health and social standing at school. *School characteristics* included size (number of students), whether it was a public or private school, geographical region (West, Midwest, South, Northeast), and urban location (coded 1 if urban and 0 if rural or suburban). We also included school averages of each of our main explanatory variables – attractiveness, engagement, and psychological well-being - to account for school differences in student population and norms.

Analysis

The unequal probability cluster sample design of Add Health requires the use of robust standard errors at the school level. We also weighted the analytical models for differences in selection probabilities and response rates. Therefore, sample totals serve as estimates of population totals (Chantala 2002).
We used descriptive statistics and chi-squared tests to describe the variables of interest and the control variables. We then used linear regression to estimate the relationships between health and social integration, adding sequentially sets of explanatory variables following the general form:

$$y_i = \beta_0 + X_{ijs}\alpha + \theta_1 a + \theta_2 s_1 + \theta_3 m_1 + h_1\phi + D_s\Theta + e$$

where y_i is a count of the number of friends reported or the number of nominations received and X_{ijs} is a vector of demographic and socio-economic characteristics pertaining to the adolescent, the home, and the

school. We add consecutively to the models indicators of physical appearance, a_i, social engagement, s_i, mental health, m_i, and measures of adolescent health (self-reported health, count of health conditions, and obesity), h_i, and the average of all of these characteristics at the school level, $\bar{D}$. Linear regression is used to predict the number of friends reported and the number of nominations received.

Results

Descriptive characteristics of the sample are presented in Table 1. On average, adolescents reported almost 4 friends, and had approximately 5 schoolmates nominate them as friends. The majority of adolescents scored high on comprehensive measures of physical health and most reported that they were in good or excellent health, with only 9% reporting fair or poor health. Still, on average, adolescents reported more than one physical health problem (1.2). The most common health conditions cited among adolescents were waking up tired every day or almost every day, being overweight, having skin problems and obesity (22%, 19%, 14%, and 11%, respectively). About 7% of students also reported frequent headaches, being tired for no reason, and having aches, pain or soreness in muscles or joints. Most other conditions were reported by less than 5% of students. A small proportion of adolescents suffered from physical limitations due to a disability (2%) or used assistive devices (3%).

INSERT TABLE 1 HERE

Interviewer ratings of students' physical attractiveness and grooming averaged 3.60 and 3.59 respectively, out of a possible 5. The majority of all students were rated as having average (50%) or above average (30%) physical maturity, while 10% were considered very physically mature and 10% were either fairly or not physically mature.

Though most students reported that they frequently engaged in some form of physical activity, a noteworthy proportion reported never walking, running, or dancing (16%) and 60% never biking or skating. Almost half of the adolescents participated in team sports daily or often, with 26% of students reporting no participation in team sports and an additional 15% reporting no involvement in any type of extra-curricular

after-school activities. Only a small proportion of students frequently missed school or recreational activities for health (4%) or emotional reasons (2%).

Most adolescents were fairly social: 40% socialized with friends daily. However, 9% of adolescents reported never hanging out with friends and 37% stated they had trouble getting along with classmates. In terms of psychological well-being, adolescents had average or good (1.85 out of 5) self-esteem and scored a 0.56 on the CES-D scale.

Health and social integration

Panel A in Table 2 shows the relationship between global health and social withdrawal. The bivariate association (Model 1) between health and social withdrawal was small and non-significant, remaining non-significant across all models. The number of friends reported by the respondent was not associated with the respondent's health by any measure. There was no indication that adolescents in poorer health, whether measured as self-rated health, obesity, or number of health conditions, felt more withdrawn from others than those in better health.

INSERT TABLE 2 HERE

While there was no evidence for health being associated with social withdrawal, there were clear indications of health-related reductions in peer-acceptance. Using number of friendship nominations received as an indicator of peer-acceptance (Panel B), all health measures were strongly associated with lowered peer acceptance. Students received 0.13 fewer friendship nominations for each additional health problem reported. Demographic characteristics and physical appearance explained some of this disadvantage, while social engagement further explained a large component of the gap in friendship nominations. Psychological well-being suppressed inequalities in friendships associated with the number of health conditions.

Self-rated health behaved similarly to number of health conditions across the five models, though the associations were stronger and the decreases in coefficients after the inclusion of explanatory factors were more pronounced. In the bivariate model, for each level of poorer self-rated health, adolescents received 0.43 fewer friendship nominations. Demographic characteristics and physical appearance each explained about a

10% reduction of differences in peer-acceptance, while social engagement again accounted for the largest reduction in the coefficient (an additional 39%). For both the count of health problems and self-rated health, lower social engagement was the most salient explanation for fewer friend nominations.

Our third measure of global health, obesity, was associated with extensive reductions in peer-acceptance: in bivariate models, obese adolescent received 1.6 fewer friendship nominations compared to non-obese adolescents. Demographic characteristics explained some of this gap in friendship nominations. Physical appearance explained the largest portion of the gap in friendship nominations (12%), followed by social engagement, accounting for 7% of the friendship gap. As with the other global health measures, the addition of psychological well-being indicators did not further explain the gap in friendship nominations.

The associations between health and peer acceptance are only partially explained by the pathway variables we identified, with coefficients remaining large and significant. Thus, unmeasured factors further account for the lower peer acceptance that youth in poorer health encounter.

Discussion

If poorer health leads to lower social integration, either through reduced peer-acceptance through social withdrawal, then children in poorer health suffer an inequality that may have major lifelong implications. This study examined the associations between several aspects of health and social integration in adolescence and proposed mechanisms that may explain these associations. We proposed that poorer health would be associated with lower social integration, both in terms of social withdrawal and peer-acceptance. We found evidence of associations between peer-acceptance and health (Hypothesis 1): children with more health problems, lower self-rated health, and obesity are less accepted by peers, receiving significantly fewer friendship nominations than their healthy classmates. However, there was no evidence of withdrawal by adolescents in poorer health, as they reported having as many friends as other adolescents (Hypothesis 2).

Further, we investigated whether the relationships between social integration and health are explained by an adolescent's physical appearance, social engagement, and psychological well-being. Results indicated that lower engagement in social activities (Hypothesis 3b) explained some of the lowered peer-acceptance

associated with poorer health, as did physical appearance, the latter especially with respect to obesity as an indicator of health (Hypothesis 3a). Contrary to our expectations, psychological well-being did not explain differences in friendship nominations (Hypothesis 3c).

When comparing the three indicators of global health examined in this study, physical appearance explained a greater portion of the friendship nomination gap for obese adolescents, while social engagement was the stronger explanatory factor for self-rated health and number of health problems. This difference is likely related to how the health condition physically affects the adolescent. One plausible explanation for this is that although self-rated health may encompass any combination of visible or less visible symptoms of health, obesity is highly visible to others and is an important component of physical appearance. While we did not specifically differentiate health conditions on their visibility, our findings are consistent with studies indicating that the visibility of a health condition influences the manner in which discrimination occurs (Westbrook et al. 1993, Wirrell et al. 2006).

Though we did not find evidence of it, it is unlikely that social withdrawal does not occur. Rather, self-reported friendships may not capture the manner in which youth exclude themselves. It is possible that adolescents in poor health either do not realize or do not admit that they have fewer friends. Alternatively, youth with chronic conditions have documented maintaining close friendships primarily outside of school (Blum et al. 1991). Research is needed to delineate how adolescents perceive social integration. Feelings of social connectedness may matter more for adolescents' feelings of social integration than friendship nominations. Perceived social connectedness predicts feelings of life satisfaction, confidence, positive affect, and future aspirations among adolescents (Jose et al. 2012). Future research to capture whether children in poorer health are equally able to activate the social capital inherent in friendships would provide a clearer understanding of the social consequences of health.

Further, though poor psychological well-being is often cited as a potential source of self-exclusion or social withdrawal (Schaefer et al. 2011), our findings did not empirically demonstrate this relationship. However, psychological well-being may be captured in part by other characteristics, blurring the relationships between psychological well-being and social integration.

Some limitations of this study must be noted. We may be underestimating the importance of physical appearance, as average appearance ratings were relatively high, with a greater proportion of respondents being rated above average than below average. French and colleagues (2009) hypothesize that over the course of an interview the interviewer develops a positive impression of the respondent and consequently rates him or her higher than he or she otherwise would have (French et al. 2009). Thus, interviewers may show more compassion when evaluating adolescent appearance than would their peers.

Another limitation is the reliance on cross-sectional data. However, only the cross-section allows us to study social integration and health as concurrent processes among adolescents while attending high school. Because data on social integration was only recorded in the first wave of the Add Health study, longitudinal analyses cannot confirm whether friendships reported were maintained or changed over time. To the authors' knowledge, no other available dataset captures such a complete set of questions on health and social integration among adolescents.

Given the extensive evidence that friendships are central during this stage of the life course, understanding how relationships are affected by health is important for evaluating and promoting well-being. Our findings demonstrate the social consequences of poor health, with clear associations between measures of global health and social integration in the school context. Our results underscore how health-related social integration can manifest in multiple ways to impact adolescents. These findings suggest that the social outcomes of poor health for adolescents are nuanced. Consequently, as demonstrated through our comparison of obesity, self-rated health, and number of health conditions, adolescents may face more or less severe social repercussions depending on the characteristics of the health condition. For example, obese adolescents may be discredited due to their physical appearance, while youth with less visible health conditions may be less "discredited" and may withdraw from social interactions, thus having limited opportunities for friendship formation.

Physical appearance, social engagement, and psychological well-being accounted for some, but not all, of the differences in social integration associated with health in adolescents. Future studies are needed to delineate how youths conceive of their physical and mental health in the context of their social integration.

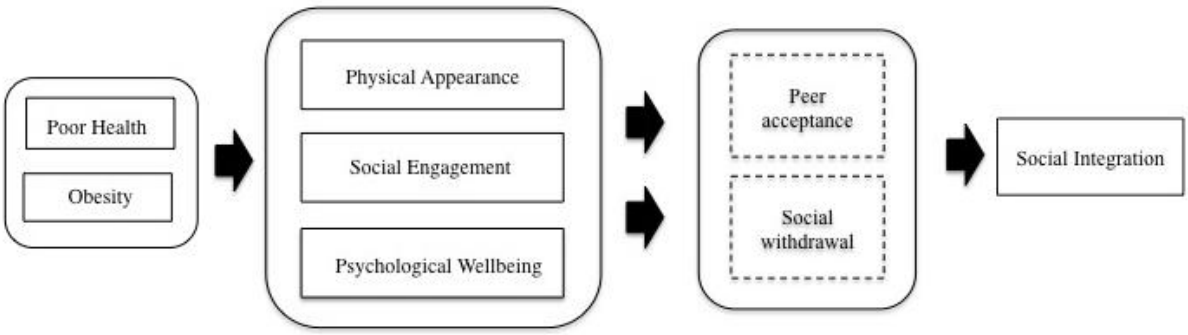

Figure 1: Conceptual framework

Table 1: Descriptive Statistics for Social Integration and Health for U.S. Adolescents (n=11,436)

	Mean / Proportion	SE
Social Integration Measures		
Self-reported number of friends (Social withdrawal)	3.92	0.05
Friendship nominations (Peer acceptance)	4.72	0.13
Global Health Measures		
Self-rated health		
Excellent	0.29	0.01
Very good	0.41	0.01
Good	0.24	0.01
Fair	0.06	0.00
Poor	0.03	0.00
Health count	1.20	0.03
Obese	0.11	(0.01)
Health Conditions Reported		
Cold sweats	0.01	(0.00)
Sore throat or cough	0.02	(0.00)
Overweight	0.19	(0.01)
Skin issues	0.14	(0.00)
Really sick	0.01	(0.00)
Uses a wheelchair or walks with assistive device	0.03	(0.00)
Suffers from physical limitations due to a disability	0.02	(0.00)
Short	0.11	(0.01)
Asthma	0.02	(0.00)
Chest pain	0.01	(0.00)
Dizziness	0.02	(0.00)
Felt hot all over for no reason	0.02	(0.00)
Headache	0.07	(0.00)
Heart problems	0.01	(0.00)
Frequent or painful urination	0.01	(0.00)
Physically Weak	0.02	(0.00)
Poor Appetite	0.04	(0.00)
Aches, pains, or soreness in muscles or joints	0.07	(0.00)
Stomach ache or upset stomach	0.03	(0.00)
Tired for no reason	0.07	(0.00)
Wake up Tired	0.22	(0.01)
Pathways to Social Integration		
Physical Appearance Indicators		
Interviewer-rated attractiveness scale	3.60	0.02
Interviewer-assessed level of grooming	3.59	0.02
Interviewer-assessed physical maturity		
Not mature	0.02	0.00
Fairly	0.08	0.00
Average	0.50	0.01
Above average	0.30	0.01
Very mature	0.10	0.01

Social Engagement Indicators		
Frequency of biking or skating		
Not at all	0.60	0.01
Sometimes	0.23	0.01
Often	0.10	0.01
Daily	0.09	0.01
Frequency of walking, running, dancing		
Not at all	0.16	0.01
Sometimes	0.31	0.01
Often	0.25	0.01
Daily	0.28	0.01
Frequency of participating in team sports		
Not at all	0.26	0.01
Sometimes	0.27	0.01
Often	0.20	0.01
Daily	0.27	0.01
Is not involved in any after-school activities	0.15	0.01
Missed school for a health or emotional reason	0.04	0.00
Missed social or recreational activities for health or emotional reason	0.02	0.00
Work for pay	0.60	0.01
Drives a car	0.26	0.02
Has trouble getting along with classmates	0.37	0.01
Frequency of hanging out with friends		
Not at all	0.09	0.00
Sometimes	0.23	0.01
Often	0.28	0.01
Daily	0.40	0.01
Psychological Well-being Indicators		
Mental health	0.56	0.01
Self-esteem	1.85	0.12

Data source: National Longitudinal Study of Adolescent Health 1994-95.
Notes: Proportions represent weighted and adjusted estimates of population totals.

Table 2: Linear Regressions of Global Health measures and Pathways to Social Integration, (n=11,436)

	Model 1	Model 2	Model 3	Model 4	Model 5
	Bivariate	**Demographics**	**Physical appearance**	**Social engagement**	**Psychological well-being**
Panel A. Number of Friends Reported					
Health count	-0.02	-0.03	-0.02	-0.02	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Self-rated health	-0.02	-0.02	-0.01	0.01	0.03
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Obese	-0.02	0.07	0.09	0.10	0.10
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Panel B. Number of Friendship Nominations Received					
Health count	-0.13**	-0.11*	-0.10*	-0.07+	-0.12*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Self-rated health	-0.43**	-0.39**	-0.33**	-0.20**	-0.22**
	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
Obese	-1.60**	-1.55**	-1.36**	-1.26**	-1.25**
	(0.16)	(0.15)	(0.14)	(0.14)	(0.14)

Data source: National Longitudinal Study of Adolescent Health 1994-95.
Standard errors in parentheses.
** p<0.01, *p<0.05, + p<0.10.
Notes: Each model contains indicators for the pathway of interest and consecutively builds on the previous model, such that each model holds constant control variables from the prior model. Models are stratified by male and female gender. **Model 1** represents the unadjusted association of each health measure to social integration. **Model 2** controls for adolescent, family, and school characteristic variables including gender, age, race/ethnicity, the number of years attending the school, parent's years of education, whether the family receives food stamps, school size, public or private school, urban or rural school, geographic location, and school averages for the same physical appearance, social engagement, and psychological well-being variables measured in models 3, 4, and 5. **Model 3** controls for physical appearance based on interviewer ratings of the respondents' physical attractiveness, grooming, and physical maturity, in addition to whether the respondent used a wheelchair, brace, or assistive device. **Model 4** includes variables measuring respondents' participation in school-related extracurricular activities and self-reported absences from school or social events due to illness. **Model 5** adjusts for self-esteem and depression symptoms.

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