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Siblings, friends, course-mates, club-mates: How adolescent health behavior homophily varies by race, class, gender, and health status

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ABSTRACT

Many unhealthy behaviors develop during adolescence, and these behaviors can have fundamental consequences for health and mortality in adulthood. Social network structure and the degree of homophily in a network affect how health behaviors and innovations are spread. However, the degree of health behavior homophily across different social ties and within subpopulations is unknown. This paper addresses this gap in the literature by using a novel regression model to document the degree of homophily across various relationship types and subpopulations for behaviors of interest that are related to health outcomes. These patterns in health behavior homophily have implications for which behaviors and ties should be the subjects of future research and for predicting how homophily may shape health programs focused on specific subpopulations (gender, race, class, health status) or a specific social context (families, peer groups, classrooms, or school activities).

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1. Background

Many unhealthy behaviors develop during adolescence, which can have fundamental consequences for health and mortality in adulthood. Health campaigns are increasingly being based on “network interventions” (Valente, 2012). Peers and social networks have long been thought to be important influences on behavior during adolescence (Ennett and Bauman, 1993), an argument that aligns with the assertion that social networks have important effects on health behaviors and health innovations across the life-course (Christakis and Fowler, 2007; McPherson et al., 2001; Smith and Christakis, 2008). Much debate has centered on whether these “network effects” reflect peer influence or selection (Cohen-Cole and Fletcher, 2008; Fowler and Christakis, 2008). Recent theoretical research in statistics and elsewhere has noted the difficulty – if not impossibility – of distinguishing between these two mechanisms, even with experimental data (Aral et al., 2009; Aral and Walker, 2011; Shalizi and Thomas, 2011). However, a simpler set of questions remains unanswered: how much

homophily do we see on health behaviors in adolescence, and how does this differ by network type?

We define homophily as “the principle that contact between similar people occurs at a higher rate than among dissimilar people” (McPherson et al., 2001). This definition thus encompasses both the process of assortative mixing – that individuals seek to associate with those who are similar to themselves – and other social processes that could generate homophilous outcomes such as triadic closure (Feld, 1982; Goodreau et al., 2009). While it is well known that individuals tend to associate with demographically-similar alters (McPherson et al., 2001; James Moody, 1999), the question of how much homophily exists for health behaviors among adolescents has received less attention. Although some research has documented homophily among friends (de la Haye et al., 2011; Gaughan, 2006; Kandel, 1978), little is known about how it compares to health behavior homophily in networks forged from other relationships.

In this paper, we make two contributions. First, we document the degree of homophily across various relationship types and behaviors that are strongly linked to health outcomes. We advance research on social networks and health by documenting which behaviors and ties should be the subjects of future research. The degree of homophily for various network types is important

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because health promotion programs are often targeted towards a specific social context (e.g. family, classroom, after-school) and the degree of homophily in these networks will affect the way a behavior spreads (Valente, 2012). Second, we examine whether there are subgroup differences in health behavior homophily across different networks and health behaviors. This is important for understanding how health inequalities are produced and maintained (Smith and Christakis, 2008) and for how a behavior may spread through a subpopulation's network.

1.1. The importance of health behavior homophily

Homophily is useful for describing patterns of similarity within social networks (Lazarsfeld and Merton, 1954; McPherson et al., 2001; James Moody, 1999), but there are additional reasons it merits attention with respect to health behaviors. Demographic homophily is associated with the spread of information and behaviors (McPherson et al., 2001; Rogers, 1995). This happens because people that are similar are likely to share many interests, talk more often, and more willing to trust information which is shared (Aral and Van Alstyne, 2011).

Health behavior homophily, like demographic homophily, is also an important determinant of the success of health interventions. A recent online experiment (Centola, 2011) compares respondents with identically structured networks with and without homophily on individual obesity, and finds that greater homophily leads to significantly more adoption of a weight loss plan. This effect was quite large, as the rate of adoption was more than three times higher in the homophilous experimental group. The paper concludes “not only that exposure and adoption levels were greatest in homophilous networks, but that the most effective social environment for increasing the ‘willingness’ of obese individuals to adopt the behavior was the one in which they interacted with others with similar health characteristics” (Centola, 2011: 1271). Therefore, to better understand how a health promotion campaign or behavior will spread through a network, one needs to know the degree of health behavior homophily within the network. Network interventions to promote healthier behaviors will likely be more successful within the more homophilous network types and subpopulations, while less homophilous networks or groups may require more complex network data or intervention designs (e.g. those suggested by Valente, 2012) to achieve the same result.

1.2. Health behavior homophily across network types

Health promotion programs may be targeted toward a specific context of social interaction, for example the family (Kumpfer and Alvarado, 2003) classroom (Lynagh et al., 1997), or after-school program (Beets et al., 2009). Understanding how behaviors will spread through a context depends in part on the degree of homophily among participants with that relationship type. However, few studies have compared health behavior homophily across network types. Those that have compared homophily across different networks have focused on non-American contexts like the Netherlands (Poelen et al., 2007) or a subpopulation like Latina girls (Kaplan et al., 2001), but not a large representative sample of U.S. adolescents.

In our analysis, we examine how homophily varies among four relationship types (siblings, friends, course-mates and club-mates) for four health behaviors (smoking cigarettes, drinking alcohol, watching television, and exercising), and discern whether some network types are more homophilous for some health behaviors than others. On the one hand, some relationships could be more homophilous for certain behaviors than others, meaning that

homophily may be greater within networks *where that behavior occurs*. Behaviors that are more social (drinking and smoking), may be more similar among friends, while behaviors that occur at home (TV watching) may be more similar for siblings, and exercise may be more similar among club-mates, since exercise often occurs in club settings. These tendencies may, however, be moderated by the strength of the tie – both its emotional salience and the frequency of interaction. If we assume that siblings ties have greater strength than friendship ties which in turn have greater strength than course- or club-mate ties, then we would expect this to be the ordering of health behavior similarity, regardless of the health behavior. Additionally, there may be interesting complementarities or multipliers across tie types. For instance, it may be that homophily levels are higher when two individuals are both club-mates and course-mates than one would expect from the linearity of the separate terms. These forms of interaction effects, known as multiplexity in the networks literature, have a long history of study and special theoretical importance (Verbrugge, 1979).

1.3. Subgroup differences in health behavior homophily

Documenting sociodemographic subgroup differences in health behavior homophily patterns is important because the demographic composition of a population can affect how health inequalities are produced and maintained (Blau and Schwartz, 1997; McPherson and Smith-Lovin, 1987). There are numerous examples of health promotion programs having differential effects on different subpopulations, for example by race/ethnicity (Kirby et al., 2004), socioeconomic status (Durkin et al., 2009), or gender (Kling et al., 2007). There are also clear race/ethnic differences in adolescent health behaviors. For example, blacks have lower rates of smoking than whites or Hispanics (Ellickson et al., 2004; Faulkner and Merritt, 1998) and lower levels of drinking than whites (Blum et al., 2000; Seffrin, 2012). Despite blacks' healthier smoking and drinking habits than white adolescents, black girls have significantly lower physical activity than whites and also steeper declines in activity throughout adolescence (Kimm et al., 2002). Similarly, adolescents of low socioeconomic status transition into unhealthy behavior groups for smoking and weight gain at elevated rates, which may be due in part to differences in peer influence (Felton et al., 1999), but social class differences in health behavior homophily or peer influence have not been explicitly examined.

Although subgroup differences in health behaviors are well documented, subgroup variation in health behavior homophily has not been well studied. One expectation for patterns of subgroup differences in health behavior homophily is that race, class and gender groups with lower levels of a behavior in the subgroup will show lower levels of baseline homophily and higher inbreeding homophily for that behavior. Baseline homophily is “homophily created by the demography of the potential tie pool” and inbreeding homophily is that “explicitly over and above the opportunity set” (McPherson et al., 2001, p.419). If a behavior is not widely shared, we expect that those who partake will be a more select group and the behavior will be more heavily niched, resulting in higher levels of inbreeding homophily. If, on the other hand, a behavior is widely shared and expected, then it will be more evenly distributed within the network, resulting in higher baseline homophily and lower inbreeding homophily (Blau, 1977). Finally, adolescents in poor health are typically more socially isolated than their healthy peers (Haas et al., 2010). Accordingly, we expect that these individuals will show higher levels of sibling homophily than their healthy peers (due to their greater relative level of sibling interaction), and lower levels of homophily in other networks (due to their greater social isolation).

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