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Identifying well-connected opinion leaders for informal health promotion: The example of the ASSIST smoking prevention program

Jo Holliday [a], Suzanne Audrey [b], Rona Campbell [c] and Laurence Moore [d]

[a]Centre for the Development and Evaluation of Complex Interventions for Public Health Improvement, School of Social Sciences, Cardiff University; [b]Centre for the Development and Evaluation of Complex Interventions for Public Health Improvement, University of Bristol; [c]Centre for the Development and Evaluation of Complex Interventions for Public Health, University of Bristol; [d]MRC/CSO Social and Public Health Sciences Unit, University of Glasgow

ABSTRACT

Methods used to select opinion leaders for informal behavior change interventions vary, affecting the role they adopt and the outcomes of interventions. The development of successful identification methods requires evidence that these methods achieve their aims. This study explored whether the "whole community" nomination process used in the ASSIST smoking prevention program successfully identified "peer supporters" who were well placed within their school social networks to diffuse an antismoking message to their peers. Data were collected in the United Kingdom during A Stop Smoking in Schools Trial. Behavioral data were provided at baseline and post intervention by all students. Social network data were provided post intervention by students in four control and six intervention schools. Centrality measures calculated using UCINET demonstrate that the ASSIST nomination process successfully identified peer supporters who were more socially connected than others in their year and who had social connections across the entire year group including the program's target group. The results indicate that three simple questions can identify individuals who are held in high esteem by their year group and who also have the interpersonal networks required of opinion leaders to successfully disseminate smoke-free messages through their social networks. This approach could be used in other informal health promotion initiatives.

Adolescent smoking remains an issue of global public health concern. The 2009/2010 Health Behaviour in School-Aged Children (HBSC) survey (Currie et al., 2012) noted that 6% of 13-year-olds were weekly smokers. In Wales, UK, 22% of girls and 18% of boys aged 15 years reported having first used a cigarette at age 13 or younger, and 6% girls and 3% boys aged 13 smoke at least once a week. In the United States these figures are lower: 11% of girls and 14% of boys aged 15 years have smoked by age 13, and 3% of girls and 4% of boys aged 13 smoke at least once a week. A number of risk factors, including peers, family factors, school factors, socioeconomic status, ethnicity, depression, and stress, have been identified as instrumental in adolescent smoking (Conrad, Flay, & Hill, 1992; Schepis & Rao, 2005; Tyas & Pederson, 1998), although these may operate differently in different social, cultural, and legislative contexts. For example, educational systems differ across the world, exposing young people to different social and environmental influences within this setting. Furthermore, the introduction of tobacco-related legislation and the implementation of education and prevention interventions has not been uniform worldwide.

The promise of adolescent smoking prevention

Despite concerted efforts, there is little consensus regarding the most successful approach to adolescent smoking prevention. School-based interventions have shown promise, although their long-term effectiveness and the quality of existing evidence has been questioned (Thomas, McLellan, & Perera, 2013). The demands placed on teachers and concerns regarding the suitability of authority figures for providing health related information have directed attention toward initiatives that rely on young people taking the lead role in addressing their own health. However, there is variable evidence of effectiveness (Harden, Oakley, & Oliver, 2001; Kim & Free, 2008; Tobler & Stratton, 1997) and the need for further research in this area has been recommended (Backett-Milburn & Wilson, 2000; Harden et al., 2001; Kim & Free, 2008).

Several studies have found peer educators to be effective implementers of smoking prevention initiatives (e.g., Armstrong, De Klerk, Shean, Dunn, & Dolin, 1990; Campbell et al., 2008; Telch, Miller, Killen, Cooke, & Maccoby, 1990). School-based peer-led health promotion

CONTACT Dr Jo Holliday jo.holliday@ndph.ox.ac.uk Nuffield Department of Population Health, University of Oxford, Richard Doll Building, Old Road Campus, Roosevelt Drive, Oxford, OX3 7LF, UK.

often comprises structured didactic educational programs that require peer educators to become "mini-teachers," taking responsibility for the content of sessions and controlling any interaction that occurs. Since one of the rationales for peer education is that it harnesses naturally occurring interaction and information sharing (Finn, 1981; Frankham, 1998), this approach is without doubt contradictory. This can be overcome by adopting informal approaches that emphasize everyday social interaction (Backett-Milburn & Wilson, 2000) and capitalize on the notion that informal contacts between peer educators and their peers may be as effective as the formal work that they undertake (Orme & Starkey, 1999).

Informal peer education

Informal peer education approaches are generally grounded in diffusion theory (Rogers, 1995), which posits that community norms are shaped by influential individuals ("opinion leaders"). Opinion leaders control the message they deliver and the method of dissemination and may therefore retain credibility with their peers (Turner & Shepherd, 1999; Valente & Pumpuang, 2007). It is therefore surprising that these approaches have rarely been adopted in the public health arena (e.g., Audrey, Cordall, Moore, Cohen, & Campbell, 2004; Grossberg, Tillotson, Roberts, Roach, & Brault, 1993; Kelly et al., 1991; Wiist & Snider, 1991).

Opinion leadership

Opinion leaders' characteristics distinguish them from other members of their community and facilitate their ability to carry out their role. Opinion leadership comprises (a) the leader's values and traits, (b) the leader's competence or expertise, and (c) the leader's social position (Katz, 1957; Valente & Pumpuang, 2007). This article focuses on social position.

Social networks are crucial in determining the spread of ideas and the adoption of new practices. Successful opinion leadership relies on who opinion leaders know, who knows them, and how accessible they are (Valente & Pumpuang, 2007). Location within social networks, such as degree of connectivity, and whether they are in central and strategic positions, such as having extensive interpersonal networks, are therefore crucial (Katz, 1957; Rogers & Cartano, 1962; Rogers, 1995). Indeed, many "viral marketing" or diffusion-style campaigns aim to recruit well-connected people to spread ideas through their social networks.

Identifying opinion leaders for informal peer education

The methods used to select opinion leaders vary, and differ in the degree to which they can identify individuals with certain characteristics and who may therefore be appropriate for different roles (Goldenberg, Lehmann, Shidlovski, & Barak, 2006; Locock, Dopson, Chambers, & Gabbay, 2001). For example, sociometric methods, whereby all (or most) respondents are interviewed regarding who they would go to for advice, may provide a good measure of a leader's social position, whereas self-identification methods may identify credible leaders more readily (Valente & Pumpuang, 2007). The choice of method is therefore instrumental to the success of peer education initiatives. While there is support for using multiple identification methods (Valente & Pumpuang, 2007), "whole community" methods are likely to be the most valid and reliable, minimizing the potential for bias and resulting in the nomination of more credible and trustworthy peer educators from across the whole community compared to other approaches (Valente & Davis, 1999; Valente & Pumpuang, 2007). However, they are also likely to be expensive, restrictive (Valente & Pumpuang, 2007), time-consuming, and sophisticated. It is therefore unsurprising that many peer education projects opt for simpler, less costly methods such as staff selection (Phelps, Mellanby, Crichton, & Tripp, 1994), self-selection (Stephenson et al., 2004), or a combination of these (Harrin, 1997). While some methods identify opinion leaders based on program theory, or characteristics needed in the role (Valente & Pumpuang, 2007), some do not; selection may depend on resources or constraints imposed by the setting in which peer educators are identified and/or will operate.

In order to uncover why some informal peer education interventions succeed and some fail, and to facilitate the development of successful interventions, it is crucial to understand the contribution of various elements of the intervention and the degree to which these achieve their aims. Given the importance of opinion leader position in diffusion interventions, exploring the degree to which opinion leaders are able to fulfill their role is particularly important where nomination methods have selected opinion leaders based on some, but not all, characteristics of opinion leadership, such as measures of esteem but not social position. Several studies have assessed the validity of different measures used to identify opinion leaders in the fields of marketing and sociology (e.g., Iyengar, Van Den Bulte, & Valente, 2011; Jacoby, 1974; Katz & Lazarsfeld, 1955; Rogers & Cartano, 1962; Weimann, 1991). They report variable agreement between methods, demonstrating that some opinion leaders identified using one method would also be identified using another. However, we could not locate studies that have explored this issue within the public health arena, nor that have assessed the degree to which different methods are able to identify opinion leaders who have strategic social positions.

Assessing structural elements of opinion leadership

The most direct way of examining structural elements of opinion leadership is using social network analysis, a collection of tools used to study social networks and social structures (Wasserman & Faust, 1994). Measures of individual cohesion can assess the degree to which individuals occupy strategic positions/are well socially connected. Further statistical tests may then be utilized to assess whether opinion leaders assume more strategic positions than others in their network. Centrality (Freeman, 1978/79) reflects importance based on one's position within one's network relative to others and may be used to assess opinion leadership. The *degree* of an actor is the number of actors to which s/he is adjacent. *Degree centrality* can be considered a measure of popularity and the actor's immediate influence. In networks

where ties have direction, the degree of an actor comprises two measures: The number of ties an actor makes to others is the *outdegree* (a measure of how influential the actor can be), and the number of ties made to an actor is the *indegree* (a measure of whether the actor can receive information from others). *Betweenness centrality* is defined as the proportion of times actor *i* needs actor *k* to get to actor *j* via the shortest path. Thus, the more actors that depend on actor *i* to connect with others, the more influential actor *i* is. *Closeness centrality* focuses on how close to all other actors in the network an actor is. It is the inverse of the farness, where the farness of an actor is defined as the sum of its distances to all others. Actors with high closeness centrality are good at communicating information to others in the network as they have very short communication paths to them.

The current study adds to the limited literature by exploring these issues in the context of the ASSIST smoking prevention program (Audrey et al., 2004). It aims to ascertain whether the nomination process used achieved its aims and provide evidence about the potential value of the nomination process to the ASSIST program and similar interventions.

Methods

The ASSIST program

The A Stop Smoking in Schools Trial (ASSIST) program is an informal school-based-peer led intervention aimed at reducing the uptake of weekly (regular) smoking among 12- to 13-year-olds. The program, which is based on diffusion theory, relies on peer socialization and the diffusion of smoke-free messages by "peer supporters" to other students in their school year.

The program utilizes a whole-community approach to nominating peer supporters, which underwent extensive development and piloting (Starkey, Audrey, Holliday, Moore, & Campbell, 2009). All students in Year 8 are asked to name up to five other students in their year that they "respect," "look up to," and consider "good leaders in sports and other group activities." The number of times each student is named at least once on a questionnaire completed by another student is recorded. To achieve a 15% critical mass of the year group participating as peer supporters (Kelly & Stevenson, 1995), lists are complied by gender and 18%[1] of students who receive the most nominations in each list are invited to a recruitment meeting at which they are provided with information about the program, and are invited to a 2-day out-of-school training course. The training, which is conducted by ASSIST trainers, not school staff, aims to provide the information, skills, and confidence to intervene in everyday situations and talk informally with peers about being smoke free. Peer supporters record brief details of interactions in a simple diary for the following 10 weeks. Four in-school follow-up sessions conducted by the trainers provide support and encouragement to the peer supporters. At the end of the program, all participating schools and peer supporters receive a certificate of achievement.[2]

While the ASSIST nomination process relied on measures of esteem to identify peer supporters, it was also the intention that they should be well connected across the year group so as to facilitate the diffusion of the smoke-free message through peer-to-peer conversations. This article therefore assesses adolescents' awareness of peer supporters, and the degree to which the peer nomination process successfully identified peer supporters who were more socially connected (in terms of both immediate connections and their connections across the entire year group, including to those most risk of smoking) than other students in their year.

Study design and participants

The ASSIST program was evaluated during a randomized controlled trial conducted between 2001 and 2004 in England and Wales (Starkey, Moore, Campbell, Sidaway, Bloor, & ASSIST, 2005). The trial involved 10,730 Year 8 (12–13 years old) students in 59 schools (30 intervention schools) at baseline. The evaluation included an evaluation of the school social networks (Steglich, Sinclair, Holliday, & Moore, 2012).

At each of four data sweeps (baseline [Year 8] and three post-intervention data sweeps [Years 8, 9, and 10]), students provided data regarding their own smoking behavior, the behavior of others, and various other demographic and behavioral measures. At baseline, students provided nomination data that were used to identify peer supporters, and at each subsequent data sweep, they provided social network data using a fixed-choice, free-recall questionnaire that asked them to name up to six friends.

The current study uses data from baseline (Year 8) behavioral questionnaires, and social network data and data concerning the awareness of peer supporters collected immediately post intervention (Year 8). Data from students in 10 schools are used except in the case of student awareness of those undertaking the peer supporter role, where data from 30 intervention schools are used. The 10 schools were purposively selected to ensure that a range of schools were included. They included two in the upper south Wales valleys, two in the lower south Wales valleys, and six from urban/suburban locations across southwest England and south Wales. Four schools were control schools. The number of students in Year 8 ranged from 115 to 270, and the percentage of students entitled to free school meals (used as a school-level measure of social deprivation) ranged from 4.8 to 26.1.

Variables

Respondent smoking behavior was assessed via the five-level question used in the Office for National Statistics surveys for young people in England (see, e.g., Fuller, 2013). One of the

[1]In the trial, the 17.5% of students with the most nominations were invited to a recruitment meeting. The program is now licensed and delivered outside of the trial context, and this has been increased to 18% to ensure that sufficient peer supporters are trained.

[2]In the trial, all students who handed in a diary received a gift voucher. Outside the trial, licensees provide various incentives to motivate and reward students.

primary outcomes of the trial was a reduction in the prevalence of smoking in the past week among students who were occasional, experimental, or ex-smokers (those at "high risk" of smoking uptake). These "high-risk" students were identified as those who at baseline responded "I have only ever tried smoking once"; "I used to smoke sometimes but I never smoke a cigarette now"; and "I sometimes smoke cigarettes now but I don't smoke as many as one a week."

While outdegree is generally regarded a measure of how influential actors are, the fixed-choice format of questionnaires used in this study limits the potential to accurately measure outdegree. Therefore, *degree centrality*, which combines outdegree and indegree, was used as a measure of the ability of the peer supporters to exert immediate influence on other actors in the network through interpersonal communication. *Betweenness centrality* represented an indicator of a peer supporters' ability to control the flow of information in the network. *Closeness centrality* was used as a measure of a peer supporters' potential to influence others to whom they were not directly tied. Reciprocated distances were taken prior to summing them. In this case, closeness is the sum of reciprocated distances and infinite distances contribute a value of zero. The *mean distance* of peer supporters from students in the "high-risk" group was calculated to ascertain whether the peer supporters were more able than other students to spread the smoke-free message to these individuals. All measures were normalized to enable comparison across networks of different sizes. While reciprocal friendship nominations (friendships reciprocated by friends named by a respondent) are generally considered the most reliable indication of presence, reciprocation, and quality of friendship (Bukowski & Hoza, 1989), critiques argue that concentrating on reciprocal nominations ignores other important aspects of young people's social networks (Carley & Krackhardt, 1996; Gest, Farmer, Cairns, & Xie, 2003). Since the current analyses intended to explore the transmission of information, it was reasonable to include unreciprocated ties as information exchange need not be between close friends. Ties to actors outside of Year 8 at the respondents' school were excluded, as the intervention was focused within Year 8.

Analysis

Given that control school data were used in this study, in all analyses, "peer supporters" were classed as those nominated as potential peer supporters in intervention schools and those who would have been nominated in control schools following tallying of the peer questionnaires. In order to obtain a general sense of how aware young people were that peer supporters were working within their school, descriptive statistics were compiled from questionnaire data. Ninety-five percent confidence intervals were calculated in STATA 9.2 using design weighted survey estimators that took account of clustering of responses within schools.

Social network measures provided by 1,855 students eligible to provide data at both baseline and the first post-intervention data collection were calculated using UCINET 6.0 for Windows (Borgatti, Everett, & Freeman, 2002). This comprised 355 peer supporters and 1,500 non-peer supporters. Median values obtained for peer supporters and those who were not peer supporters were compared using Wilcoxon rank sum (Mann–Whitney) tests. A p value of less than .05 has been considered statistically significant.

Results

Smoking prevalence

The trial of the program found a 22% reduction in the odds of being a regular smoker in intervention schools compared with control schools (odds ratio 0.78, confidence interval [CI]: 064–0.96) using follow-up data collected at three time points over a 2-year period (Campbell et al., 2008).

Response to social network questionnaire

Completion rates were 95.6% for the social network questionnaire and 96.0% for the behavioral questionnaires. Of the 79 students who did not provide data, 67 were absent from the data collection, 2 named only themselves on the questionnaire, 8 declined to complete the questionnaire, and 2 provided data as an absentee under the supervision of school staff and did not complete the network questionnaire. The reason for this is unknown.

The number of friends named varied. However, 86.1% named 6 friends, the maximum allowed. Respondents were asked to categorize each friend in relation to the school attended and year group, for example, "is in Year 8 at my school." One thousand and eighty-eight of the 3,064 friends named (58%) were in Year 8 at the same school. While this appears low, respondents were most likely to name students in their year at their school, and of the 9,872 ties made to friends, 8,442 (86%) were to students in Year 8 at the same school.

Awareness of peer supporters

Of the 5,066 students in intervention schools (811 peer supporters), 4,991 provided data on their awareness of peer supporters. Of these, 4,387 (88%) indicated that they knew at least one peer supporter, 1,654 (33%) that they knew 1–4 peer supporters, 1,255 (25%) that they knew 5–10, and 1,487 that they knew more than 10 (30%). Unsurprisingly, a higher proportion of peer supporters (99.9%) reported knowing peer supporters (95% CI: 99.01, 99.98) compared to non-peer supporters (95% CI: 0.02, 0.99). However, it is encouraging that 85.6% (95% CI: 82.61, 88.15) of non-peer supporters indicated that they knew at least one peer supporter compared to 14.4% of those who did not (95% CI: 11.85, 17.39).

Centrality measures

The results of the social network analysis are presented in Table 1. In all 10 schools, statistically significant higher median normalized degree centrality measures were observed for peer supporters compared to individuals who were not peer supporters, demonstrating that peer supporters had more ties to other actors than other students. Normalized betweenness

Table 1. Centrality measures for individuals identified as peer supporters and those who were not.

		Normalized degree centrality			Normalized betweenness centrality			Normalized closeness centrality#			Mean distance#		
School	N	Median (quartiles)	*Z* value	*p* Value	Median (quartiles)	*Z* value	*p* Value	Median (quartiles)	*Z* value	*p* Value	Median (quartiles)	*Z* value	*p* Value
C28	PS* (*n* = 23)	7.21 (5.41, 8.11)	2.88	.004	2.20 (1.10, 3.66)	2.41	.016	36.40 (34.02, 37.79)	3.20	.001	0.36 (0.32, 0.38)	2.13	.033
	Y8 (*n* = 89)	5.41 (3.60, 6.31)			1.19 (0.23, 2.30)			33.26 (27.99, 35.80)			0.33 (0.30, 0.37)		
I17	PS* (*n* = 27)	7.09 (5.51, 7.87)	4.09	.000	1.53 (0.66, 3.50)	2.11	.035	38.09 (35.20, 42.31)	3.00	.003	0.38 (0.34, 0.42)	1.07	.284
	Y8 (*n* = 101)	5.51 (4.72, 6.30)			1.18 (0.43, 1.95)			35.61 (33.09, 38.31)			0.37 (0.34, 0.40)		
I2	PS* (*n* = 27)	5.00 (4.38, 6.25)	4.97	.000	3.54 (1.28, 5.10)	4.59	.000	32.32 (30.03, 34.59)	4.80	.000	0.35 (0.31, 0.39)	4.55	.000
	Y8 (*n* = 128)	3.75 (3.13, 4.38)			0.82 (0.11, 1.99)			29.15 (26.74, 31.21)			0.29 (0.26, 0.32)		
C11	PS* (*n* = 31)	5.10 (4.46, 5.73)	4.49	.000	1.93 (0.83, 4.74)	2.02	.043	31.18 (28.11, 32.99)	3.67	.000	0.30 (0.28, 0.33)	2.11	.035
	Y8 (*n* = 127)	3.82 (3.19, 4.46)			1.18 (0.37, 2.31)			27.92 (25.84, 30.41)			0.29 (0.26, 0.31)		
I23	PS* (*n* = 35)	2.35 (1.77, 2.94)	4.18	.000	1.39 (0.62, 2.47)	2.22	.026	32.32 (30.62, 34.14)	3.83	.000	0.34 (0.32, 0.36)	4.33	.000
	Y8 (*n* = 135)	1.77 (1.47, 2.06)			0.83 (0.12, 2.03)			29.97 (27.16, 32.23)			0.31 (0.27, 0.33)		
C16	PS* (*n* = 39)	3.11 (2.59, 4.15)	3.84	.000	2.44 (0.89, 4.77)	3.86	.000	25.50 (23.77, 27.91)	4.42	.000	0.27 (0.24, 0.29)	4.34	.000
	Y8 (*n* = 155)	2.59 (2.07, 3.11)			0.78 (0.16, 1.97)			23.18 (21.41, 25.21)			0.24 (0.21, 0.26)		
I16	PS* (*n* = 39)	3.47 (2.97, 5.45)	5.26	.000	1.62 (0.45, 4.46)	3.24	.001	30.13 (26.61, 31.68)	4.75	.000	0.29 (0.26, 0.34)	3.78	.000
	Y8 (*n* = 164)	2.97 (1.98, 3.47)			0.62 (0.05, 2.00)			26.14 (24.20, 28.56)			0.26 (0.24, 0.29)		
I13	PS* (*n* = 40)	4.07 (2.72, 4.75)	5.28	.000	1.39 (0.60, 3.47)	3.16	.002	28.74 (26.32, 30.87)	5.21	.000	0.31 (0.28, 0.34)	5.48	.000
	Y8 (*n* = 182)	2.72 (2.26, 3.17)			0.59 (0.10, 1.86)			25.48 (22.69, 27.31)			0.26 (0.23, 0.29)		
C20	PS* (*n* = 47)	3.23 (2.82, 4.03)	5.35	.000	1.50 (0.49, 1.86)	2.52	.012	31.04 (28.02, 32.78)	3.81	.000	0.31 (0.28, 0.39)	3.42	.000
	Y8 (*n* = 202)	2.42 (2.02, 2.82)			0.82 (0.35, 1.49)			29.10 (27.31, 30.74)			0.29 (0.26, 0.32)		
I19	PS* (*n* = 47)	3.40 (2.26, 3.77)	5.01	.000	1.19 (0.61, 1.84)	3.57	.000	30.97 (29.09, 32.63)	3.99	.000	0.33 (0.29, 0.36)	4.30	.000
	Y8 (*n* = 217)	2.26 (1.89, 3.02)			0.71 (0.29, 1.37)			29.42 (27.54, 30.91)			0.30 (0.27, 0.32)		

Note. PS = peer supporter, Y8 = rest of Year 8.
*Peer supporters were classed as those nominated as potential peer supporters in intervention schools and those who would have been nominated in control schools following tallying of the peer questionnaires.
#Based on reciprocal distances, hence low value.

centrality measures were also statistically significantly higher for individuals identified as peer supporters than for those who were not in all 10 schools, confirming that peer supporters were more likely to be located on paths between two actors in the network than those not nominated as peer supporters. Median normalized closeness centrality measures were significantly greater for students identified as peer supporters in all schools. Peer supporters were therefore closer to other actors than non-peer supporters.

Since the primary outcome of ASSIST was a reduction in smoking among the "high-risk" group, the mean distance of peer supporters from this group was examined. Individuals nominated as peer supporters were more likely to be closer to individuals in the "high-risk" group than other students in 9 of the 10 schools studied ($p < .05$).

Discussion

One of the key characteristics of successful opinion leaders is that they are strategically located within their diffusion network. However, little has been written about whether different methods used to identify "opinion leaders" in behavior change interventions successfully achieve this outcome. This article examined this in the context of the effective ASSIST smoking prevention program. While considerable efforts were made to identify questions that would best enable peer supporters who were influential for a variety of reasons to be nominated, the nomination process relied on measures of esteem to identify students who were advantageously located within their social networks. We have reported elsewhere that the nomination process successfully identified students who were representative of the social diversity of the year group (Audrey, Holliday, & Campbell, 2006), represented a diversity of social groups within the year group (Starkey et al., 2009), and in general were people that fellow students considered suitable to undertake the peer supporter role (Holliday, 2006). This study utilized data collected through ASSIST to examine whether the nomination process, which aimed to identify students with both the personal and network characteristics conducive to being successful peer supporters, was successful

in identifying peer supporters who were more strategically located in their social networks than other students in their year.

The majority of young people reported knowing at least one peer supporter, corroborating previous findings (Starkey et al., 2009). This suggests that the peer supporters had close social contact with a pool of students (and vice versa), with whom they could talk about smoking, and whose behaviors they had the potential to influence.

Degree centrality measures suggested that peer supporters had more potential to exert direct influence (through conversations) on the smoking behavior of others students compared to non-peer supporters. Given that young people generally associate with others who exhibit the same smoking behavior, training well-connected young people to promote a smoke-free culture is likely to be a positive intervention approach, as demonstrated by the ASSIST program. However, as reported elsewhere (Audrey et al., 2006), a significantly lower proportion of peer supporters were never smokers at baseline compared to non-peer supporters. Given the degree centrality findings presented here and previous reports of an association between popularity and smoking (e.g., Pearson et al., 2006; Valente, Fujimoto, Soto, Ritt-Olson, & Unger, 2013; Valente, Unger, & Johnson, 2005), the nomination of smokers is possibly an inevitable outcome of the peer nomination process. Discussion of the value of including these students as peer supporters is considered elsewhere (Holliday, 2006).

Measures of betweenness centrality indicated that peer supporters were more likely to be intermediaries between other actors than other students, suggesting that they had greater potential to control the flow of information in the network. This is consistent with earlier reports that high betweenness centrality measures are associated with innovativeness, and therefore the potential to undertake the opinion leader role (Valente, 1995).

Peer supporters were closer to other students in the year group compared to others, suggesting that they had greater ability to spread the smoke-free message and exert influence on others through indirect communication. More specifically, peer supporters were closer to those at high risk of smoking than other students, suggesting an increased potential to facilitate diffusion of the smoke-free message to the program's primary target group.

While the program was shown to have an effect on the smoking behavior of other Year 8 students, it should be acknowledged that the results reported here do not confirm the extent to which peer supporters spoke with their friends about smoking, the impact of conversations, or whether conversations between peer supporters and other Year 8 students led to the effect seen in ASSIST. Instead, it provides evidence of the peer supporters' potential to facilitate behavioral change through interpersonal communication. In reality, behavioral change may have been induced through indirect communication whereby information from peer supporters is subsequently communicated to others. It may also have been the result of young people modeling nonsmoking behavior, or antismoking values.

This article provides a useful addition to the evidence base. We believe it is the first study to use social network analysis to examine these issues in the context of a public health intervention. Questionnaire response rates were over 90% at each data sweep, reducing the likelihood of response bias and maximizing the accuracy of social network data. A major criticism of many smoking intervention studies is that smoking behavior outcomes are often based on self-report data, which may be biased (Sussman et al., 1988). Furthermore, many network studies in this field rely on adolescent reports of their friends' smoking behavior, which are often inflated due to projection effects (Ennett & Bauman, 1993). This was not the case in this study, as all young people in ASSIST were asked to provide saliva samples both to improve veracity of reporting and also for cotinine assay. We have reported elsewhere that the self-report data are accurate and reliable (Campbell et al., 2008).

A number of limitations of the current study should be acknowledged. First, while data from a range of schools were used, we acknowledge that the findings may not be generalizable outside of the UK context where adolescent social relations and educational systems differ. To avoid respondent burden, social network data were collected after program delivery, so it is possible that the school social networks may have changed during this time (approximately 3–4 months), and that the program itself may have influenced these networks. The free-recall approach and the fixed-format nature of the questionnaire may have resulted in fewer ties being made to Year 8 students than would have been made had responses been limited to Year 8 (14% of ties were made to friends outside of Year 8 at the same school), or limitless ties been allowed. However, other research supports this design, suggesting that additional ties may not be of equal significance (Kirke, 1996). Furthermore, the authors of the questionnaire from which the ASSIST questionnaire was adapted argued that allowing six friends was appropriate (Pearson & Michell, 2000). The possibility of fewer ties being made to Year 8 students was partly compensated for by including unreciprocated nominations in all analyses. However, this may have resulted in more loosely connected structures, and reduced the number of isolated actors. The limitation of using control school data is that peer supporters were identified as those nominated to undertake the peer supporter role when not every student nominated becomes a peer supporter; of the 978 students nominated as peer supporters, 835 carried out the role (85.4% of those nominated) (Campbell et al., 2008).

The results presented in this article demonstrate that the ASSIST nomination process was successful in achieving the goal of identifying peer supporters who were more socially connected than other students in their year, providing confidence that these students had the potential to effectively disseminate the smoke-free message across the year group. The demonstrable success of the ASSIST program has led to broader implementation in the United Kingdom. Since 2010, a total of just over 100,000 Year 8 students (nearly 19,000 peer supporters) in 650 schools have been exposed to DECIPHer-ASSIST, and over 300 trainers have been trained to deliver the program. Evidence from quality assurance monitoring implemented by DECIPHer Impact Ltd

demonstrates that implementation has been satisfactory in 28% of schools, "Good" in 43% of schools, and "Excellent" in 29% of schools (S. Good, personal communication, November 2015). These figures suggest that the methods employed within the intervention are acceptable to those delivering, and those in receipt of, the intervention. The use of the ASSIST peer nomination process, as opposed to other more sophisticated methods of opinion leader nomination such as sociometric methods, facilitates this. It is quick and easy to administer, easily comprehensible by young people, and "results" are straightforward to obtain. While the identification of opinion leaders using sociometric methods may also be readily understood by young people, such methods can be very time-consuming, costly to administer, and data analysis requires significant expertise. The likelihood of such methods being used on a large scale by practitioners is therefore questionable. The findings reported here, together with those reported elsewhere (Holliday, 2006; Starkey et al., 2009), provide evidence that three simple questions can identify those with the personal characteristics and interpersonal networks of opinion leaders.

The peer nomination process was not smoking related, suggesting that the same questions could be used to identify socially influential individuals for similar interventions. While it is probable that different cultures and interventions may require amendments to the questionnaire, in order to identify suitable individuals, it should be recognized that significantly amending them for use with other populations would not guarantee the results demonstrated here. Such changes should be considered carefully and piloted thoroughly. Nevertheless, we believe the standardized approach used in ASSIST could be replicated to nominate socially influential young people for other informal health promotion initiatives.

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ORCID

Jo Holliday http://orcid.org/0000-0003-4568-7320
Suzanne Audrey http://orcid.org/0000-0002-8310-2672
Rona Campbell http://orcid.org/0000-0002-1099-9319
Laurence Moore http://orcid.org/0000-0003-2182-823X

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