



## Tackling smoking among out of school youth in South Africa: An analysis of friendship ties

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### ABSTRACT

**Background:** Friendships during adolescence play a significant role in the initiation and maintenance of tobacco use. Smoking behaviour among adolescent friends has not been explored among out of school youth (OSY) in South Africa. Out of school youth (OSY), described as those between 13 and 20 years old, have not completed their schooling and are not currently enrolled in school, are at greater risk for tobacco use.

**Aim:** The main aim of this study is to examine whether the smoking behaviour of OSY is associated with that of their OSY friends.

**Methods:** Respondent driven sampling was used to recruit OSY and their OSY friends. A mixed effects logistic regression with a random intercept across school-province combinations was used to analyse survey data. Race and gender were also incorporated into the analyses as effect moderators ( $n = 391$ ).

**Results:** Results of this study confirm that cigarette smoking was common among OSY and their OSY friends, with 53.5% of the respondents smoking in the past month ( $SD = 0.44$ ). When OSY friends were either all non-smokers or half their friends were non-smokers, Coloured (mixed race) OSY were less likely to smoke compared to Black African and Other (mostly Asian descent) OSY.

**Conclusion:** Cultural norms and values associated with the different race groups may play a role in the smoking behaviour of out of school youth friends. Understanding this relationship is useful for identifying those OSY that are vulnerable to the behaviours that place them at risk of tobacco related morbidity and mortality.

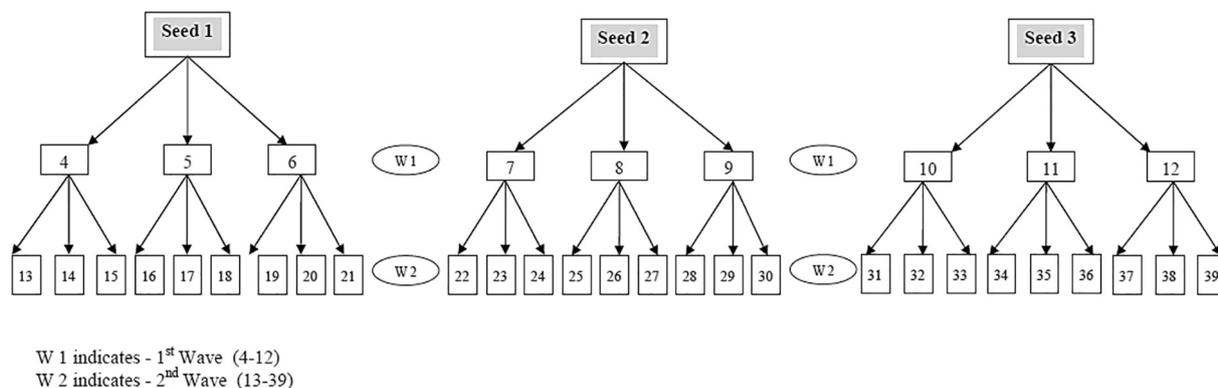
### 1. Introduction

Adolescence is a critical development period marked by the exploration of various identities and experimental behaviour within the personal and social environment. These behaviours could have a negative impact on their health and once established in adolescence, often persist into adulthood (Reddy et al., 2013b). An important challenge for South Africa, like in many other countries, is the high prevalence of tobacco use among adolescents leading to dependence, school dropout, poor educational outcomes, diminished work capacity, disability, and premature death (Balsa, Giuliano, & French, 2011; Kelly et al., 2015; Staff, Patrick, Loken, & Maggs, 2008; Townsend, Flisher, & King, 2007; Weybright, Caldwell, Xie, Wegner, & Smith, 2017). Adolescents in South Africa are likely to initiate cigarette use between the ages of 12–14 years (Reddy et al., 2013b; Townsend, Flisher, Gilreath, & King, 2006). According to the recent South African National Youth Risk

Behaviour Survey, 17.6% of school going learners (13 to 20 years) reported smoking cigarettes in the past month (Reddy et al., 2013b).

Most of the research in South African on tobacco use has been concentrated on school-going learners (Reddy et al., 2013a; Reddy, James, Sewpaul, & Koopman, 2010), with minimal focus on out of school youth (OSY). The UNESCO Institute for Statistics (UIS) considers OSY as those between 13 and 20 years old, have not completed their schooling and are not currently enrolled in school (UNESCO UIS, 2019). Globally, approximately 120 million children are out of school, with almost half (45%) residing in sub Saharan Africa. From grade nine onwards (from age 16 years old), an estimated 12% drop out of school and only 52% of the age appropriate population remain enrolled by grade twelve (Department of Basic Education, 2011; FHI360., 2014). In South Africa, 51% of OSY reported smoking in the past month (Desai, Mercken, Ruiter, Schepers, & Reddy, 2019), which is 33.4% higher than the prevalence rates reported by in-school learners (Reddy et al.,

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\*Multiple Stage Cluster Sampling (MSCS) was utilized at school level using schools

Fig. 1. Respondent driven sampling for out of school youth – a schematic illustration of two sampling phases (Reddy et al., 2011a).

2013b). Compared to their school going counterparts, OSY are at higher risk for developing tobacco related morbidity and mortality, as they do not have the protective factor of school, such as school based interventions and the supervision and positive mentoring of teachers and peers (Fleisch, Shindler, & Perry, 2012).

Adolescent friendships play a significant role in the initiation and maintenance of smoking behaviour. It is well known that friends exhibit similar smoking behaviour to each other (Eiser, Morgan, Gammage, Brooks, & Kirby, 1991; Engels, Knibbe, Drop, & Ytd, 1997). Research suggests that tobacco use is associated with having a greater number of friends who smoke in a social network (Alexander, Piazza, Mekos, & Valente, 2001; Ali & Dwyer, 2009; Ennett, 1994; Ennett et al., 2006; Ennett & Bauman, 1993; Kobus, 2003; Pollard, Tucker, Green, Kennedy, & Go, 2010). The friendship ties as a determinant of tobacco use has been extensively explored among in-school learners (Hall & Valente, 2007; Jeon & Goodson, 2015; Kobus, 2003; Mercken, Snijders, Steglich, & de Vries, 2009; Mercken, Steglich, Sinclair, Holliday, & Moore, 2012; Seo & Huang, 2012; Urberg, Değirmenciöglü, & Pilgrim, 1997; Valente, Gallaher, & Mouttapa, 2004), however, the focus on the hard to reach youth populations is considerably less (Kiesner, Poulin, & Nicotra, 2003; Wenzel, Tucker, Golinelli, Green Jr, & Zhou, 2010). To our knowledge, no studies have explored associations between smoking behaviour of OSY and their OSY friends.

Most studies on adolescent friend smoking rely on the respondents' reports of friend smoking, rather than direct reports of smoking from friends themselves (De Vries, Candel, Engels, & Mercken, 2006; Engels et al., 1997; West, Sweeting, & Ecob, 1999). This can result in adolescents projecting their own smoking behaviour onto their friends, resulting in smoking behaviour among friends seeming more similar than it actually is (Bauman & Ennett, 1996; Bauman & Fisher, 1986; Kobus, 2003). In the present study, we use smoking behaviour as reported by OSY friends themselves, thereby overcoming possible projection bias (McPherson, Smith-Lovin, & Cook, 2001; Mercken, Snijders, Steglich, Vertiainen, & de Vries, 2010; Unger et al., 2001).

The main goal of this study is to examine whether and how the smoking behaviour of OSY is associated with the smoking behaviour of their OSY friends, taking into account that this association may depend on gender and, in the South African context, race. Understanding this relationship may be useful for identifying those that are vulnerable to the smoking behaviours that place them at risk of morbidity and mortality.

## 2. Method

### 2.1. Participants and sampling

Four of the nine provinces (KwaZulu Natal, Western Cape,

Mpumalanga and Gauteng) representing the various language and racial groups (Black African, White, Indian, Coloured (mixed race), Other) of South Africa were selected using non-probability sampling. The provinces selected represented all racial and language groups of South Africa. Participants had to meet the predetermined criteria of being between the ages of 13–20 years, not having completed their senior high school certificate and have not been enrolled in secondary or high school for the current academic year. The researchers were unable to identify an existing register or database consisting of OSY, and therefore decided that respondent driven sampling (RDS) was an appropriate method to recruit OSY (Heckathorn, 2002; Ramirez-Valles, Heckathorn, Vázquez, Diaz, & Campbell, 2005).

The starting point for recruiting the initial school dropouts or “seeds” began by selecting a set of nationally representative schools ( $n = 85$ ) using a stratified cluster sample design. Up to twenty “seeds” per school site were gathered. If schools were unable to provide the contact details of school dropouts, survey administrators recruited seeds in the community, by approaching young people who appeared to meet the predetermined criteria. Each seed was required to recruit up to three other OSY to participate in the survey. These participants formed the “first wave” of sampling, and in turn were required to recruit a further three OSY, and so on. Up to four waves of recruitment were conducted (Fig. 1) (Reddy et al., 2011b). Each respondent received compensation for completing the survey. A coupon system was used to track the recruitment process to determine who recruited whom. The coupons were designed to tear off so the recruiter could keep the one-half of the coupon, and the potential recruit the other half. The potential recruit was required to arrive at the survey site (community hall or public library) with their half of the coupon. If the potential OSY recruit met the predetermined criteria, they were asked about their social relationship with their recruiter and then proceeded to complete a self-administered survey. As proof of recruitment, the recruiter also returned to the survey site with their half of the coupon to be compensated (monetary) for each successful recruit who was enrolled into the study (Heckathorn, 2002). Each participant completed a self-administered questionnaire in one of the five languages (English, Afrikaans, isiZulu, Xhosa, and Sesotho). The questionnaire was initially designed in English and translated into four languages, namely Afrikaans, isiZulu, Xhosa, and Sesotho. To check for consistency and correct translation, the survey was back-translated from these languages to English. The self-administered survey measured a range of socio-demographic characteristics and risk behaviour. Only relationship ties with OSY friends were used in this study as 74% of the respondents described their relationship with their recruits as a friend. Furthermore, only those seeds who recruited at least one friend were included in the study. All measures used in the current study are stated below.

## 2.2. Measures

### 2.2.1. Cigarette smoking

Participants were asked to describe their cigarette smoking pattern over the last 30 days by selecting one of the following statements: never smoked, smoked either 1 to 2 days, 3 to 5 days, 6 to 9 days, 10 to 19 days, 20 to 29 days, or smoked on all 30 days. Those who never smoked were coded as “0 = non-smoker”. All those who smoked at least once in the past month, even if they had a few puffs (experimenters) were coded as “1 = smoker”. Participants with missing tobacco use were excluded. This classification was used because evidence suggests that non-daily/experimenters as well as daily smokers are substantially more vulnerable to the negative health effects of cigarette smoking compared to non-smokers (Hassmiller, Warner, Mendez, Levy, & Romano, 2003).

### 2.2.2. Smoking of OSY friends

OSY friendship ties were based on the relationships identified during the recruitment process explained earlier. In the present study, only recruited OSY friends participating in the study themselves were included as they also completed the questionnaire. Since the smoking behaviour of the OSY friends was known, the proportion of smoking friends was calculated in UCINET 6 (Borgatti, Everett, & Freeman, 2002). Participants who did not recruit at least one OSY friend were excluded from the study.

### 2.2.3. Parent tobacco use

Participants were asked to indicate if their parents or guardians smoke (0 = no parents/guardians smoke, 1 = “both parents/guardians smoke”, 2 = “only my father/male guardian smokes”, 3 = “only my mother/female guardian smokes”, and 4 = “I don't know”). This variable was recoded as 0 = “no parents/guardians smoke” and “I don't know”, 1 = “one parent/guardian smokes”, 2 = “two parent/guardians smoke”.

### 2.2.4. Background characteristics

Geographical characteristics of the participants were provided by stating the province (1 = Gauteng, 2 = KwaZulu natal, 3 = Mpumalanga, and 4 = Western Cape), and the area that they reside in (1 = rural, 2 = urban, 3 = peri-urban, 4 = I don't know). School area was measured as the area in which the participant may have previously attended school, which was also the recruitment site. Those who did not know the area in which they resided in were coded as missing. Gender (1 = boy, 2 = girl), age and race of participants defined by the Department of Labour (1 = Black African, 2 = Coloured, 3 = Indian, 4 = White, 5 = Other) were obtained. Due to the low number of Indian, White and Other participants, race was recoded as 1 = Black African, 2 = Coloured and 3 = Other. Racial categories allow investigation of ongoing health disparities that have endured post-Apartheid and were not used with the intention of reifying social constructions developed during the Apartheid era (Statistics South Africa, 2010).

## 2.3. Ethics

Ethics approval for the study was granted by the South African Medical Association Ethics Committee. Permission was additionally obtained from the relevant Provincial Departments of Education and school principals to use the schools as initial points of contact. Participants as well as the parent/guardians of participants younger than 18 years gave written consent and assent to participate in the study.

## 2.4. Statistical analyses

All statistical analyses were performed using SPSS version 25. Due

to missing values for some variables, we performed Little's Missing Completely at Random (MCAR) test to verify that these values were missing completely at random. To examine the association between OSY smoking and proportion of smoking of OSY friends, a mixed effects logistic regression was used with a random intercept across school-province combinations to take into account the hierarchical structure of the data: OSY nested in school area nested in a province. If the variances of the random intercepts at the province and school level were zero, these random effects were removed. Additional predictor variables were gender, race, age, area and parent smoking. Furthermore, the moderating effect of gender and race on the effect of proportion of OSY smoking friends was tested. Step-by-step, the model was reduced by eliminating higher order non-significant interaction terms based on omnibus tests. In the case of significant interactions, simple effects analyses were conducted to further probe the nature of the interaction (Aiken, West, & Reno, 1991). Main effects were considered significant if  $p \leq 0.05$  and interaction effects were considered significant if  $p \leq 0.1$ .

## 3. Results

### 3.1. Socio-demographic profile of the participants

Of the total 4432 respondents who completed the survey, 2683 respondents had their coupon numbers correctly recorded. Only those respondents who had a friendship tie with at least one of their OSY recruits were included in the study, leading to a final sample size of 391 OSY. Table 1 shows that 53.5% of participants reported smoking at least once in the past month. More than half the participants (55%) were males, the majority (61.4%) described themselves as Black African, and the mean age was 17.83 years (SD = 1.6). Less than half (39.9%) of participants resided in rural areas, whilst 40.2% resided in the Western Cape province. The average proportion of OSY smoking friends was 54% (SD = 0.44).

#### 3.1.1. OSY and their OSY friends' tobacco use

We investigated whether the smoking behaviour of OSY is associated with the smoking behaviour of their OSY friends. Little's Missing Completely at Random (MCAR) test showed that missing values on covariates were missing completely at random (chi-square = 2.45,  $p = 0.87$ ). The random effect of province was removed as the variance was zero. The final model had two levels with OSY nested in school area

**Table 1**  
Socio-demographic characteristics of participants.

Characteristics	Mean (SD)/%	n
Past month cigarette smoking		
Smoker <sup>a</sup>	53.5	209
Non-smoker	46.5	182
Gender		
Male	55	213
Female	45	174
Province		
Gauteng	15.9	62
KwaZulu Natal	37.6	147
Mpumalanga	6.4	25
Western Cape	40.2	157
Race		
Black African	61.4	239
Coloured	33.4	130
Other	5.1	20
Area		
Rural	39.9	131
Urban	31.1	102
Peri-urban	29	95
Age	17.83 (1.6)	382
Parent smoking	0.51 (0.73)	382
Proportion of smoking friends	0.54 (0.44)	387

<sup>a</sup> Smokers include experimenters.

**Table 2**  
Logistic regression results for the model including interaction terms.

	β	S.E.	p-value	Odds ratio	95% CI	
					Lower	Upper
Boys (ref Girls)	-1.13 <sup>+</sup>	0.28	0.00	0.32	0.19	0.56
Black African (ref Coloured)	2.76 <sup>+</sup>	0.83	0.00	15.84	3.11	80.72
Other	3.15 <sup>+</sup>	1.35	0.02	23.35	1.65	330.45
Parent smoking	-0.78 <sup>+</sup>	0.21	0.00	0.46	0.30	0.69
Rural (ref peri-urban)	-0.26	0.33	0.45	0.78	0.40	1.50
Urban	-0.74 <sup>+</sup>	0.36	0.04	0.48	0.24	0.96
Age	-0.15	0.09	0.08	0.86	0.72	1.02
Proportion of smoking OSY friends	1.38	1.54	0.12	3.99	0.68	23.28
Proportion of smoking OSY friends x Black African (ref Coloured)	-1.95 <sup>+</sup>	0.97	0.05	0.14	0.02	0.96
Proportion of smoking OSY friends x Other (ref Coloured)	-3.05	1.78	0.09	0.05	0.00	1.58

<sup>+</sup> Significance at 1% level; β (beta); S.E (Standard error); CI (Confidence Interval).

(variance = 0.04). Moreover, the final model shown in Table 2, revealed a significant interaction between race (Black African vs Coloured) and the proportion of OSY friends who smoke (OR = 0.14,  $p = 0.05$ , [95% CI: 0.02–0.96]).

As shown in the upper part of Table 3, none of the simple effects of proportion of smoking friends per level of race were significant. Further simple effects analysis of race per level of proportion of smoking friends did reveal significant results, as shown in the bottom part of Table 3. When all OSY friends were non-smokers, participants who classified themselves as Coloured OSY were significantly less likely to smoke compared to Black African (OR = 15.84,  $p < 0.01$  [95% CI: 3.11–80.72]) and Other OSY (OR = 23.36,  $p = 0.02$ , [95% CI: 1.65–330.45]). When half of OSY friends were non-smokers, Coloured OSY were still significantly less likely to smoke compared to Black African OSY (OR = 5.96,  $p < 0.01$  [95% CI: 2.52–14.18]) and Other OSY (OR = 1.63,  $p = 0.03$ , [95% CI: 1.14–22.72]). When all OSY friends were smoking, racial differences were no longer significant. We also found that the odds of OSY being a smoker is lower (OR = 0.46,  $p < 0.05$  [95% CI: 0.30–0.69]) when their parents were smokers. Boys (OR = 0.32,  $p < 0.05$ ) were less likely to smoke cigarettes in the past month compared to girls. Those residing in urban areas (OR = 0.48,  $p = 0.04$ ) were also less likely to smoke compared to those residing in

**Table 3**  
Simple effects analysis for significant interaction effects in the model.

Proportion of OSY smoking friends x race	β	S.E	t	p-value	Odds ratio	95% CI
Simple effects of proportion of smoking friends, per race						
Black African	-0.57	0.38	-1.50	0.14	0.57	0.27–1.20
Coloured	1.38	0.90	1.54	0.12	3.99	0.68–23.28
Other	-1.66	1.54	-1.08	0.28	0.19	0.01–3.92
Simple effects of race at different proportions of friend smoking						
No smoking friends						
Black African (ref Coloured)	2.76	0.83	3.34	0.00 <sup>+</sup>	15.84	3.11–80.72
Other (ref Coloured)	3.15	1.35	2.34	0.02 <sup>+</sup>	23.35	1.65–330.45
Other (ref Black African)	0.39	1.12	0.35	0.73	1.48	0.16–13.40
50% smoking friends						
Black African (ref Coloured)	1.77	0.44	4.06	0.00 <sup>+</sup>	5.97	2.51–14.18
Other (ref Coloured)	1.63	0.76	2.14	0.03 <sup>+</sup>	5.10	1.14–22.73
Other (ref Black African)	-0.16	0.67	-0.23	0.82	0.86	0.23–3.71
All smoking friends						
Black African (ref Coloured)	0.81	0.42	1.95	0.52	2.25	0.10–5.09
Other (ref Coloured)	0.11	0.96	0.11	0.91	1.11	0.17–7.39
Other (ref Black African)	-0.70	0.95	-0.74	0.46	0.50	0.08–3.20

<sup>+</sup> significant at the 5% level; OSY (Out of school youth), β (beta); S.E (Standard error); CI (Confidence Interval).

peri-urban areas, respectively.

#### 4. Discussion

The aim of this paper was to investigate the relationship between OSY smoking and the smoking of their OSY friends. Results of this study confirm that cigarette smoking was common among OSY and their OSY friends, with 53.5% of the respondents smoking on one or more days during the past month. In comparison, 17.6% of in-school learners reported smoking on one or more days during the past month, according to a South African national study that was simultaneously among in-school learners (Reddy et al., 2013a). These findings pose a serious health threat, as OSY are at higher risk for tobacco related morbidity and mortality (Townsend et al., 2007).

Among those participants who classified themselves as Coloured, those OSY friends that were either all non-smokers or half were non-smokers, were less likely to smoke compared to Black African and Other OSY. The differences found in the association between friends and OSY smoking may depend on cultural norms and values (Unger et al., 2001). South Africa is made up of people who are of African, Asian and Western descent. Those of Eastern and African descent are usually characterized as interdependent and collectivist, where individuals usually act, submit or conform to the choices of the social or reference group to maintain harmony or feel a sense of belonging (Panday, Reddy, Ruiter, Bergström, & De Vries, 2007; Triandis, 2001). In line with the South African study by Panday et al., the collectivist nature of Black African or Other (mostly characterized as being of Asian descent) participants may account for the smoking behaviour of these OSY being in accordance with that of their friends. Given the significant results of this study, more studies are needed to investigate the smoking behaviour of OSY and their friends, taking into consideration racial differences.

The negative association found between OSY smoking and parent smoking in this study may appear to be contradictory with the literature. However, applying a simple logistic regression with self-smoking as dependent variable and parent smoking as a predictor variable result in a positive zero-order association, confirming what has been found in previous studies (Alves et al., 2016; Engels, Vitaro, Bloklund, de Kemp, & Scholte, 2004; Hill, Hawkins, Catalano, Abbott, & Guo, 2005; Kodl & Mermelstein, 2004; Lieb, Schreier, Pfister, & Wittchen, 2003; McGee, Williams, & Reeder, 2006; Otten, Engels, van de Ven, & Bricker, 2007; Peterson Jr et al., 2006). What our results show is that, once this association is controlled for potential confounders such as OSY friend smoking, the association becomes negative. Hence, between two OSY who are completely equivalent on all confounders but one has parents

that smoke whereas the parents of the other do not, the first OSY is less likely to smoke than the second. An explanation could be that any child to some extent does not want to make the same mistakes as its parents. The positive zero-order association then implies that this disposition is not strong enough to compensate for the effects of the confounders in the model. More studies are needed to investigate this relationship further.

To our knowledge, this was the first study focusing on tobacco use among OSY and their OSY friends. More studies are needed on OSY and their friends, with a view to incorporating in-school as well as OSY friend social networks. A major strength of this study was having actual reports of smoking behaviour from OSY and their OSY friends themselves. Qualitative studies may further be useful in understanding friendship smoking behaviour and the composition of the wider social network of OSY.

The following limitations were present in this study. First, OSY are considered a hidden population and capturing all OSY friendships is difficult. In the present study, Respondent Driven Sampling allowed for the recruitment of hidden OSY using a chain-referral method (Heckathorn, 2002). Although this method led to successful recruiting of OSY friends, it is possible that participants have had more OSY friends other than those they recruited. Second, the present study focused only on friends who themselves had also dropped out of school. Future studies should examine OSY friendships together with any possible remaining in-school friends to obtain a more complete understanding of the peer friendship network surrounding an OSY. Third, the present study was cross-sectional, future studies should consider using longitudinal data to better elucidate causal relationships in the context of OSY tobacco use. These limitations notwithstanding, this study provides valuable insight into the associations between OSY smoking and smoking by their OSY friends.

#### Declaration of competing interest

R. Desai, R.A.C Ruiters, J. Schepers, S.P. Reddy and L.A.G Mercken all declare that they have no competing interests.

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