

Perceived peer norms, health risk behaviors, and clustering of risk behaviors among Palestinian youth

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1 **Abstract**

2 Relatively little is known about patterns of health risk behaviors among Middle Eastern
3 youth, including how these behaviors are related to perceived peer norms. In a sample of
4 approximately 2,500 15-24 year old Palestinian youth, perceived engagement of general
5 peers in alcohol consumption, drug use and sexual activity was substantially greater than
6 youths' own (self-reported) engagement in these activities, suggesting a tendency to
7 overestimate the prevalence of risk-taking behavior among peers. Individual participation in
8 a risk behavior strongly covaries with the perceived levels of both friends' and peers'
9 engagement in that behavior ($p=0.00$ in each case). In addition, significant clustering of risk
10 behaviors is found: youth who participate in one risk behavior are more likely to participate
11 in others. These findings for a rare representative sample of Middle Eastern youth are
12 strikingly similar to those in the US and Europe. The clustering of behaviors suggests that
13 prevention programs should be structured to deal with a range of connected risk behaviors
14 for which certain youth may be at risk. The findings also suggest that adjusting expectations
15 about peers' behavior may reduce young Palestinians' engagement in risk taking.

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20 **Introduction**

21 Health risk behaviors among adolescents and youth are a global concern. Smoking, drug and
22 alcohol use during adolescence have long been recognized as having direct health
23 implications and may increase the risks of developing chronic dependence and illness in
24 adulthood [1,2]. Research in the U.S. and other contexts has revealed several recurrent
25 patterns in youth health risk behaviors. First, youth tend to perceive high (and may possibly
26 overestimate) engagement of peers in risk behaviors relative to their own levels of
27 engagement [3,4,5]. Second, their likelihood to engage in such behaviors themselves is
28 positively related to these descriptive peer norms [6,7,8]. Third, youth who engage in one
29 risk behavior tend to engage in others, that is, behaviors are clustered [9]. This pattern is
30 often explained by problem behavior theory, introduced by Jessor [10,11], whereby an
31 underlying behavioral syndrome causes a youth to adopt multiple risk behaviors.

32 These patterns have important policy implications. The correlation of an individual's
33 behavior with perceived peer behavior suggests that influencing what youth think about
34 peers—or possibly, influencing peers' actual behavior--may reduce their likelihood of
35 engaging in risk activities. Clustering of risk behaviors would suggest that to be effective,
36 prevention education programs need to deal with a range of connected behaviors for which
37 certain youth may be at risk, not just single behaviors such as drug use.

38 Very little is known about these patterns of behavior among youth in the Middle East.
39 Surveys in the region mostly use school-based convenience samples of adolescents rather
40 than representative, random samples of youth that include out of school as well as older

41 youth, who may be at greatest risk. They do not ask about many risk behaviors (in particular
42 sensitive ones such as sexual activity) or do so only in terms of perceptions regarding peers,
43 not the youth's own engagement in an activity; surveys gathering data both on own behavior
44 as well as perceptions of peers are especially rare. Yet youth risk behavior, including alcohol
45 and drug use and earlier initiation of sexual activity, is a rising concern in the region with
46 implications for health and for HIV risk specifically [12,13,14].

47 Further, few studies, either in the Middle East or elsewhere, distinguish perceptions of the
48 behaviors of close friends (proximate peers, or individuals in one's social network), and of
49 more general peers, that is, the broader cohort of individuals of the same sex and age in the
50 community. Both may be important for determining an individual's behavior. While it might
51 be expected that the behavior of friends plays a particularly important role, perceptions of
52 general peers are also likely to be influential. Further, youth are more likely to be uncertain
53 about—and hence potentially overestimate—risk behaviors of general peers, so that there
54 may be more opportunity for interventions that correct these perceptions of norms.

55 The present paper uses an unusual representative sample of Palestinian youth to investigate
56 the relationship of individual behavior to the perceived behavior of peers, distinguishing
57 close friends (proximate peers) and general peers. We provide a partial assessment of the
58 overall validity of general peer perceptions by considering the extent to which they are
59 similar for youth within the same community. We also examine the covariance of individual
60 risk behaviors, measured as the odds ratio of engaging in one health risk behavior
61 conditional on engaging in another. In addition to assessing for the first time whether
62 patterns observed in other contexts are also found in a sample of Middle Eastern youth, the

63 findings will also be of use for developing appropriate prevention programs, which remain
64 limited in the Palestinian Territories as elsewhere in the region in spite of growing concerns
65 over youth health risk activities.

66 This study builds on prior analysis of the data from the survey, known as Palestinian Youth
67 Health Risk Study [15,16], that shows generally low but not insignificant prevalence of most
68 health risk behaviors among young people, including alcohol use, drug use, and sexual
69 activity before marriage. For example, 22.4% of male youth aged 20-24 and 11.6% of
70 females reported having tried alcohol (8.1% and 3.6% for male and female youth 15-19).
71 9.3% of unmarried male youth and 6.7% of unmarried female youth age 20-24 report having
72 had sexual intercourse, although almost one quarter of both report any sexual experience.
73 Smoking, on the other hand, is strikingly high, even among younger youth (45.4% of males
74 and 21.2% of females 15-19 smoke). Rates of interpersonal violence (fighting) are also
75 significant, and appear higher than among similar age youth in the US but comparable to
76 rates in South Africa, another setting with a history of political and social conflict.

77 **Methods**

78 **Participants and Procedures**

79 The survey targeted a representative sample of 2,500 youth 15-24 in the West Bank and East
80 Jerusalem. A stratified two-stage random sample was drawn from the 2007 population
81 census, with strata formed by crossing the 12 governorates with urban, rural, and refugee
82 camp location. Within strata, 208 survey clusters (census enumeration areas) were randomly
83 sampled with probability proportional to size. Within each cluster, 14 households with youth

84 in the appropriate age range were selected using a modified random walk [16]. Youths' oral
85 consent/assent and (for minors) parental consent for interviews was obtained for the
86 interview after interviewers explained the purpose and content of the survey. The study
87 adhered to the guidelines of the Declaration of Helsinki. Ethical approval was granted by
88 RAND Corporation Human Subjects Protection Committee. Substantial efforts were made
89 to develop procedures to ensure that youth were comfortable discussing sensitive topics.
90 Interviewers were strictly instructed to ensure that the youth interview was conducted in a
91 private room or other private area (e.g., the roof of the house). Youth could choose to be
92 interviewed at a local youth center or other outside location, though few did so. Interviewers
93 were matched to respondents by gender. To accommodate sensitivities, questions on sexual
94 activity were not asked of minors (those under 18).

95 In the interview, after answering questions on a range of relatively non-sensitive topics,
96 youth were asked their perceptions of risk behaviors (smoking, alcohol use, drug use, and
97 violence or fighting) among general peers and proximate peers, and then asked about their
98 own activities. This order was selected to avoid respondents shaping answers about peers to
99 be consistent with what they had reported (and possibly, under-reported) about their own
100 risk activity.

101 For the *general* peers' questions, respondents were asked to think about youth in the
102 community of their own age and sex, beginning with questions about the share of peers who
103 are working and using tobacco before asking about the share engaging in more sensitive
104 behaviors. The survey responses suggest that respondents were able to give meaningful
105 answers in this format [16]. For example, there was little clumping of responses at 50%,

106 indicating that youth report actual perceptions of shares instead of resorting to the modal
107 response. For *proximate* peers, youth were asked about three individuals their own age and
108 sex who were closest to them (individuals “who you spend your time with, such as your
109 good friends”) and who we will refer to below as ‘friends’.

110 **Measures**

111 Smoking: youth were asked first if they had ever tried smoking tobacco (including both
112 cigarettes and *narghila* or water pipe), and if so, if they currently smoked. (Unless otherwise
113 noted, shares or percentages presented in this paper for current behavior are based on all
114 youth in an age/gender group, not conditional on ever having engaged in the activity.)

115 Alcohol use: Youth were asked first if they had ever tried alcohol, and if so, if they currently
116 drank on occasion.

117 Drug use: Separate ‘ever used’ questions were asked for marijuana or hashish, pills,
118 inhalants, and cocaine or heroin. Youth who said they had ever tried any of these drugs were
119 asked if they currently used any drugs.

120 Sexual activity: Youth were asked if they had ever had experience of sexual activity with a
121 member of the opposite sex, defined as “romantic kissing, touching private body parts, or
122 sexual intercourse”. The question was asked only of unmarried, non-minor (over 17 years)
123 youth. Those reporting affirmatively were then asked specifically if they had ever had sexual
124 intercourse (SI), defining the term explicitly to avoid ambiguity.

125 Violence: Respondents were asked if they had been involved in a physical fight with
126 someone in the last year, and how many times.

127 Behavior of general peers: Youth were asked to estimate the share (percentage) of young
128 people their age and sex in their community who engage in the following behaviors:
129 smoking, (current) drinking, current drug use, and sexual intercourse.

130 Behaviors of proximate peers: For the three individuals of their own age and sex closest to
131 them, youth were asked how many of the three engaged in smoking, (current) drinking,
132 current drug use, and sexual intercourse if not married. For comparisons with own and
133 general peers' rates of engagement in the behavior, friends responses are expressed below as
134 shares—that is, 0,1,2, or 3 out of 3 total.

135 **Data analysis**

136 Analysis of differences in behavior by subgroups was done primarily using Pearson chi-
137 square tests. To examine the covariance of individual risk behaviors, we used logistic
138 models to estimate odds ratios of a youth engaging in one behavior conditional on engaging
139 in another, with controls for age and location. Separate analyses were performed by gender.
140 The analysis used STATA version 13, incorporating the two-stage survey design, in
141 particular to allow correlations of standard errors within sample clusters.

142 **Results**

143 **Peers' and friends' behaviors**

144 Table 1 presents means for self-reported engagement in different behaviors as well as means
145 of perceived engagement of proximate peers (close friends) and general peers. Patterns in
146 own behaviors are discussed in detail elsewhere [15]. Perceived engagement among friends
147 follow the same patterns by gender, age and location as own behaviors: higher among older
148 youth, among males, and in urban areas and refugee camps relative to rural areas. However,
149 point estimates for mean friends' engagement are usually moderately higher than means of
150 own self-reported engagement. For example, for male youth 20-24, the mean own smoking
151 prevalence is 71.5%, while it is 76% for friends ($p= 0.030$ for the difference); for young
152 women in this age group the shares are 31% and 29% respectively ($p=0.018$). For current
153 alcohol use in this age group, 9% of males say they currently drink, compared with 13% for
154 friends ($p=0.000$); the corresponding figures for females are 4% and 6%. ($p=0.001$).

155 In contrast, for general peers (youth of same age and gender in their community),
156 respondents perceive prevalences of behaviors that are substantially higher than their own
157 reported engagement in these behaviors. For example, whereas 9.1% of older male youth
158 say they currently drink alcohol and the mean proportion of close friends reported to drink is
159 13%, the mean perceived rate of drinking among general age-sex peers is 22%; for females
160 in this age group the rates are 4.1% and 6.7% for own drinking and friends and 9% for peers.
161 A similar pattern prevails for drinking among younger youth of both genders. For drug use,
162 the difference between own and friends' reported use (both of which are very low) on the
163 one hand, and peers on the other, is even larger in proportional terms.

164 It may be noted that if youth were fairly well aware of how their peers behave, responses
165 within a community about these peers should be relatively consistent, as the questions in

166 effect ask all respondents in an age/sex category to estimate the same datum--the share of
 167 youth like themselves in the community who engage in a behavior. Therefore these
 168 responses, if they are capturing the local prevalence of a behavior, should be relatively

Table 1 - Own risk behaviors and perceptions of friends' and peers' behaviors (% engaging in activities)

Age		Males				Females			
		all	urban	rural	camps	all	urban	rural	camps
Current smoking									
15-19	Self	45.44	46.53	41.92	48.28	21.55	26.79	9.95	20.41
	Friends	54.07	53.40	52.19	66.09	16.87	18.71	11.52	21.53
	Peers	63.99	63.72	60.28	79.18	20.08	23.19	10.60	28.52
20-24	Self	71.52	77.57	56.62	73.68	31.22	36.60	16.08	34.04
	Friends	76.38	76.98	72.06	86.84	27.61	32.71	13.05	31.21
	Peers	80.36	80.45	78.76	85.26	28.78	34.13	11.66	39.11
Current alcohol use									
15-19	Self	3.35	4.49	0.51	3.45	1.19	1.85	0.00	0.00
	Friends	6.41	7.28	3.72	8.19	1.93	2.62	0.70	0.68
	Peers	13.00	13.37	10.86	17.27	5.54	7.36	1.11	7.12
20-24	Self	9.09	11.21	3.68	10.53	4.06	5.04	1.40	4.26
	Friends	13.02	15.26	7.16	14.91	6.71	8.22	2.33	7.97
	Peers	22.47	25.11	15.24	25.53	10.86	13.26	3.11	15.16
Current drug use									
15-19	Self	1.21	1.43	1.01	0.00	0.15	0.23	0.00	0.00
	Friends	1.03	1.23	0.00	2.87	0.25	0.31	0.18	0.00
	Peers	7.60	8.53	3.78	12.71	4.19	5.65	0.55	6.32
20-24	Self	3.64	4.98	0.74	2.63	1.23	1.86	0.00	0.00
	Friends	3.98	5.10	1.23	4.39	2.12	2.57	0.70	2.90
	Peers	13.17	15.24	8.51	12.15	8.10	10.14	0.96	14.05
Sexual activity, unmarried (intercourse)									
15-19	Self	5.49	6.92	1.72	5.00	4.06	4.48	1.96	8.33
	Friends	4.20	3.99	4.73	4.17	9.79	8.94	10.67	14.07
	Peers	7.68	7.74	7.03	9.31	10.64	12.38	5.32	17.30
20-24	Self	9.33	12.16	2.29	11.76	6.85	8.84	2.56	3.57
	Friends	11.80	13.58	7.45	13.06	20.81	22.18	16.11	25.98
	Peers	14.15	15.37	11.74	11.82	15.21	18.41	5.10	20.00

Notes: 'Friends' refer to three closest friends of the respondent. % for each respondent is calculated as the number reported to engage in the behavior divided by 3. 'Peers' refer to general peers in the community of the same age and sex as the respondent.

169 highly correlated within sample clusters (of which there are 208 in the survey), and should
170 also be more highly correlated than the intra-cluster responses for own engagement in the
171 behavior, as these do truly vary across individuals within a community. The association of
172 responses within a cluster can be measured with the intraclass correlation coefficient
173 (ICC), the ratio of between-cluster variation over the sum of the total (within-cluster and
174 between-cluster) variation; a higher ICC indicates stronger consistency or relatedness of an
175 outcome within clusters.

176 As shown in Table 2, for males, ICCs for (own) smoking and drinking are low (.031 and
177 .056); these are similar to school-based ICCs in studies of US students [17]. Consistency
178 within clusters of responses regarding both oneself and one's peers is stronger for female
179 than male youth. However, a uniform finding for both genders is that ICCs for responses
180 about local peer engagement in a behavior are substantially larger than for responses about
181 the individual's own behavior; that is, responses within a cluster about average peer
182 behavior in the community vary less than responses about the individual's own engagement.
183 Although it is not possible to state unambiguously what a 'high' value would be for ICCs
184 (they cannot be interpreted as simple Pearson correlation coefficients), the relative
185 consistency in responses about local peer behavior suggests that the peer prevalence
186 responses are meaningful.

Table 2 - Intracluster Correlation Coefficients (ICCs) for own and peers' engagement in risk behaviors

Behavior/Respondent engagement	Males		Females	
	Own engagement	Peer engagement	Own engagement	Peer engagement
Smoking	0.031	0.179	0.343	0.447
Alcohol use	0.056	0.269	0.127	0.575
Drug use	0.106	0.358	0.018	0.592
Ever Sexual intercourse (unmarried)	0.156	0.263	0.201	0.544

Notes: ICC is the ratio of between-cluster variation divided by the total variation, the sum of the within-cluster and between-cluster variation. For smoking, alcohol use, and sexual intercourse, 'own engagement' refers to current self-reported participation of the respondent and 'peer engagement' refers to the perceived share of local age/sex peers participating. For drug use, own engagement refers to the respondent reporting ever trying drugs and peer engagement refers to the perceived share of peers currently engaged in drug use. For own engagement in behaviors, which are binary outcomes, we use the approach of Rodriguez and Elo [18] to derive ICCs and confidence intervals. All peer and own behavior ICCs are significant at the 1% level.

187

188 **Correlation of self-reported own behaviors and that of friends**
 189 **and peers**

190 Table 3 examines the relationship of the respondent's own behavior to the perceived
 191 behaviors of friends and general peers. The table compares the mean of friends' and peers'
 192 prevalences for respondents who report engaging in a behavior with those who report not
 193 engaging in the behavior. In general, the differences are very large and statistically
 194 significant, with youth who report engaging in a behavior also reporting higher friends' as
 195 well as peers' engagement in the behavior (p=0.00 in each case). In proportional terms, the
 196 differences are largest for drug use. Among male youth who say they have never tried drugs,
 197 mean reported friends' (current) usage is just 1% compared with 17% for those who say they
 198 have tried drugs (p=0.000). Mean reported general peers' drug use for male youth who have

199 tried drugs is 8% compared with 26% for those who have not ($p=0.000$). Patterns for
 200 females are very similar. Although in both cases the associations are strongly significant, the
 201 correlations appear larger between own and friends' behaviors than between own and peers'
 202 behavior.

Table 3 - Mean of Friends' and peers' engagement in risk behaviors by respondent's own engagement in the behavior (%)

Behavior/Respondent engagement		Males				Females			
		Friends	<i>p</i>	Peers	<i>p</i>	Friends	<i>p</i>	Peers	<i>p</i>
Current smoking	No	0.43	0.000	61.95	0.000	0.09	0.000	15.60	0.000
	Yes	0.79		77.37		0.57		47.54	
Current alcohol use	No	0.06	0.000	15.49	0.000	0.03	0.000	6.93	0.000
	Yes	0.59		38.67		0.45		46.55	
Ever tried drugs	No	0.01	0.000	8.36	0.000	0.01	0.001	5.30	0.000
	Yes	0.17		25.87		0.14		28.94	
Ever Sexual intercourse (unmarried)	No	0.06	0.000	10.93	0.000	0.19	0.000	11.68	0.000
	Yes	0.46		32.31		0.72		45.67	

Notes: For drugs and sexual intercourse, questions regarding friends and peers ask about their current engagement behavior, not whether they ever engaged in it. Reported *p*-values are from regressions of perceived friends or peers shares on the respondent's own self-reported engagement in the behavior, with controls for age and location (urban, rural, refugee camp).

203

204 Covariance of individual risk behaviors

205 Table 4 presents odds ratios of engaging in one health risk behavior conditional on engaging
 206 in another, based on logistic models for males and females with controls for age and location
 207 (urban, rural, refugee camp). For young men, the associations of individual risk behaviors
 208 are very large. For example, the odds that a male youth who is a tobacco smoker also
 209 currently consumes alcohol are about 9 times higher than for a male youth who does not
 210 smoke ($p= 0.000$); the odds of having ever used drugs are 3.8 times higher ($p= 0.000$); of

211 having had sexual intercourse, about 11 times higher ($p= 0.001$). There is also an association
212 of smoking and violent behavior but this is somewhat lower: male youth who smoke are
213 about 1.6 times more likely to have been in a physical fight in the last year ($p=0.001$) and
214 the associations of fighting with other risk behaviors are also generally smaller than between
215 the other risk behaviors. However, all odds differences in the table for male youth are
216 significant at $p<0.05$.

217 For female youth, the correlations are similarly positive but more variable and less precisely
218 estimated. All of the (small number of) female youth reporting alcohol use also smoke, so no
219 odds ratios are estimated for alcohol use conditional on smoking. The relationship of other
220 behaviors to smoking is very strong for females, with ORs of 8.01 for ever tried drugs
221 ($p=0.000$), 3.98 for any sexual activity ($p=0.000$) and 4.23 for fighting ($p=0.000$). Alcohol
222 use appears to be significantly associated with a higher likelihood of sexual activity and
223 internet/phone sex.

224 To test whether covariances of behaviors changes as youth get older, the same models were
225 run adding interactions of age with the given behavior indicator. With the exception of a
226 smoking and sexual intercourse for females, for which the age interaction was positive,
227 interaction results were not statistically significant.

228

Table 4 - Associations of individual risk behaviors (odds ratios)

Males 15-24					
	Current smoking	Current alcohol use	Ever used drugs	Ever had sexual intercourse	Ever had sexual activity
Current smoking	--	9.486	3.843	10.988	3.916
<i>P</i>	--	0.000	0.000	0.001	0.000
Current alcohol use	9.486	--	9.453	19.974	9.145
<i>P</i>	0.000	--	0.000	0.000	0.000
Ever used drugs	3.843	9.453	--	11.031	8.249
<i>P</i>	0.000	0.000	--	0.000	0.000
Ever had sexual intercourse	10.988	19.974	11.031	--	--
<i>P</i>	0.001	0.000	0.000		
Ever had sexual activity	3.916	9.145	8.249	--	--
<i>P</i>	0.000	0.000	0.000		
Females 15-24					
	Current smoking	Current alcohol use	Ever used drugs	Ever had sexual intercourse	Ever had sexual activity
Current smoking	--	--	8.017	22.499	3.984
<i>P</i>			0.000	0.000	0.000
Current alcohol use	--	--	3.646	3.394	2.670
<i>P</i>	--	--	0.062	0.075	0.041
Ever used drugs	8.017	3.646	--	6.839	2.115
<i>P</i>	0.000	0.062	--	0.001	0.081
Ever had sexual intercourse	22.499	3.394	6.839	--	--
<i>P</i>	0.000	0.075	0.001		
Ever had sexual activity	3.984	2.670	2.115	--	--
<i>P</i>	0.000	0.041	0.081		

Notes: Based on logit regressions. Shows the increase in the likelihood of engaging in an activity (shown in first column) if the individual engages in another activity (along top row). Model also includes controls for age and location (urban, rural, camp). Among females, all who reported current drinking also reported currently smoking so this relationship is not estimated.

230 **Discussion**

231 This study is among the first in the Middle East region to collect representative information
232 on health risk behaviors of youth, and is further distinguished by the fact that information
233 was collected on perceived behaviors of both close friends and general peers. With respect
234 to a number of key patterns, the findings from this sample of Palestinian youth display a
235 striking similarity to youth or adolescent surveys carried out in other regions, even if overall
236 levels of engagement in risk behaviors appear lower than elsewhere other than for smoking.
237 These patterns include (1) perceived peer norms for risk behaviors that are substantially
238 higher than self-reported engagement in these behaviors; (2) a correlation of a youth's own
239 behavior with these perceived peer norms; and (3) a strong likelihood that youth who engage
240 in one risk behavior also engage in others.

241 Regarding (1), it should first be noted that the disparities in own and perceived peers' risk
242 behaviors are small for close friends but large for general age-sex peers in the community.
243 This suggests that youth overestimate engagement in risks among individuals whose
244 behavior they do not closely observe. This is not surprising to find in our sample given that
245 large disparities between descriptive peer norms and self-reported alcohol and drug use
246 behavior have been noted for years in the literature in the US and elsewhere [5,8,19]—
247 though confirmation of this pattern in a Middle East context is rare.

248 However, youth may also be underreporting their own--and close friends'--risk behavior in
249 this conservative environment. Therefore the extent to which the discrepancy in own and
250 peer rates of risk behavior reflects overestimation of the latter or understating of the former

251 remains unclear, though as discussed elsewhere [15] it is likely that actual prevalences of
252 behaviors in this population fall between the means for individual self-reports and peers.
253 Finally, it should be emphasized that even if youth overestimate prevalence among general
254 peers, these perceptions are not random guesses. The high intracluster correlations of these
255 responses reported above indicate consistency among youth in the same cluster with respect
256 to perceptions of general peer behavior.

257 Pattern (2), the strongly positive correlation of individuals' self-reported risk behavior with
258 perceived descriptive peer norms—whether of friends or general peers—is consistent with
259 studies noted above from outside the region. Like those studies, our results suggest a
260 possible causal link from perceptions of peer engagement to an individual's own
261 participation in health risk activities. Here the emphasis is less on whether these perceptions
262 are accurate than whether they influence one's own behavior. However, as is well
263 recognized, correlations of self-reported behavior and perceived peer behavior may reflect
264 selection issues or confounders rather than a causal relation. Those participating in a
265 stigmatized activity may simply have better information about how common that activity is
266 in the community; they may tend to associate with, hence know more about, peers who are
267 most like themselves in terms of behavior (homophily); they may assume that other youth
268 are like themselves in terms of behavior (projection); or, youth who engage in a behavior
269 may tend to exaggerate the extent of that behavior among others as a means of self-
270 justification. Each of these factors can explain the correlation of own behavior and perceived
271 peer engagement, apart from any causal relationship. It is difficult to arrive at a conclusive
272 determination on causality, especially with cross-section data; this is even the case with
273 studies collection longitudinal data with direct information on friends' behavior [20].

274 Finally, as in studies in other settings [9], we find that youth who participated in one risk
275 behavior have an elevated chance of participating in other risk behaviors. This pattern is
276 often explained by problem behavior theory [10,11], whereby an underlying behavioral
277 syndrome causes a youth to participate in multiple risk behaviors. We find that ‘traditional’
278 health risk behaviors such as smoking and drinking are linked not only to each other but also
279 to engagement in interpersonal violence (fighting), which has been observed in surveys of
280 adolescents in Western countries [21]. Some research from industrialized countries that
281 examines changes in clustering of risk behaviors as young people transition to adulthood
282 find that the correlations decline with age, suggesting a weakening of an underlying problem
283 behavior syndrome, though other studies find no change [9]. In our sample we find few
284 differences in the correlations of behaviors between younger and older youth. Future
285 analysis of the data will examine whether youth who participate in multiple risk behaviors
286 share important characteristics, namely a lack of protective factors such as family support
287 and income or an excess of potential risk factors such as exposure to violence or depression.

288

289 **Limitations and conclusions**

290 An important limitation of this study, discussed in the preceding section, is the reliance on
291 respondents’ self-reports of risk behaviors, which may lead to underreporting. Still, the
292 strong relationships among measures reported here are expected to be robust in a qualitative
293 sense and are consistent with those found in more thoroughly researched environments.
294 They have potentially important implications for policies to prevent or reduce risk behaviors
295 among Palestinian and other Middle Eastern youth. Since the patterns are like those

296 observed in other regions, in principal, program design can take similar approaches as in the
297 U.S. and elsewhere, with appropriate testing and adaptation for local cultural context.

298

299 For example, the correlation of an individual's behavior with perceived peer behavior
300 suggests that influencing what youth think about peers may reduce their likelihood of
301 engaging in risk behaviors [22]. In particular, the possibility that youth overestimate the
302 extent of what peers are doing implies that provision of more accurate information on peers
303 would be useful. This assumes that the relationship of these perceptions and an individual's
304 own behavior is causal. Given the considerations noted above, this cannot be inferred from
305 our results. Nevertheless, interventions elsewhere appear to be successful in changing
306 perceptions of peer norms, and for some groups, reducing actual risk behavior as well
307 [22,23]. Further, in contexts where such 'feedback' interventions have been successful, both
308 an association of own and perceived peer risk taking and an apparent overestimation of peer
309 risk behavior engagement are observed, as in the present sample. These results suggests that
310 it would be worth testing this kind of intervention in the Palestinian context. With regard to
311 the covariance of individual risk behaviors, it is clear that, as in other contexts, prevention
312 education programs for Palestinian youth should be structured to deal with a range of
313 connected risk behaviors for which certain youth may be at risk, not just single behaviors
314 such as drug use [2].

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