The smoking chain: friendship networks, education, social background and adolescent smoking behavior in the Netherlands

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Setting the Stage

3.1 Introduction

To set the stage for the explanatory questions examined in the next four chapters, this chapter addresses four descriptive questions. These questions examine how secondary school friendship networks and school organization relate to adolescent smoking behavior using the cross-sectional data of the DNSSSU 2003 and 2007 and the LNDA collected in 2008 and 2009. A core aspect of the questions addressed in this book concerns the relation between school types and smoking behavior. To obtain a clear picture of what the data analyzed in the next four chapters, the first question addressed in this chapter is the following: To what extent does smoking prevalence among secondary school students differ across school types? The trends in the general Dutch adolescent population are examined and then compared to the longitudinal network data to determine whether and how the sample collected for this book differs from the general population. This study addresses questions concerning changes in smoking behavior during the second grade of secondary school. Again, it is relevant to determine whether and how these changes differ between the general population sample and the data collected for this study. Hence, the second question of this chapter is as follows: Does smoking prevalence among secondary school students change during the second grade? An important issue addressed in this study is how friendship networks and school type composition affect smoking behavior. Thus, it is relevant to examine the following question: How do school organization characteristics, such as school type and class, relate to secondary school students’ friendship networks? Furthermore, How do secondary school friendship networks relate to smoking behavior?
3.2 Dutch Secondary School Students’ Smoking Prevalence: Variation in Time and Across School Types

**DNSSSU 2007**

The DNSSSU 2007 (Monshouwer, et al., 2008) shows that the percentage of students who smoke on a daily basis is five times higher among preparatory vocational (VMBO-p) students than among academic preparatory (VWO) students (11 percent vs. 2 percent) (Monshouwer, et al., 2004). This reflects an odds ratio of 6.05. Statistics on lifetime, previous year, and previous month prevalence show a similar tendency.

As in 2003, the largest increase in smoking prevalence in 2007 is between the age of thirteen and fourteen. In this period, the increase in lifetime prevalence is from 26.9 to 39.0 percent, previous month prevalence increases from 9.8 to 18.6 percent, and daily use prevalence increases from 1.8 to 6.8 percent (Monshouwer, et al., 2008). Furthermore, the DNSSSU 2007 shows a significant decrease in lifetime smoking prevalence among Dutch adolescents, from 27 percent in 1999 to 19 percent in 2007. However, the significant differences between school types remain apparent. In 2007, the lifetime prevalence is 45.5 percent for preparatory vocational students and 28.2 percent for academic preparatory students, equaling an odds ratio of 2.1. For previous month and daily prevalence, the percentages for preparatory vocational students and academic preparatory students are 23.4 and 11.3, and 11.1 and 1.7, respectively (see Table 3.1). This study focuses on second-graders. According to the DNSSSU 2007, for this category, the lifetime smoking prevalence is 31.1 percent, previous month prevalence is 13.3 percent, and daily smoking prevalence is 3.9 percent.

**Table 3.1 Smoking prevalence among Dutch secondary school students, age 12-16**

*Source: DNSSSU 2007*

<table>
<thead>
<tr>
<th></th>
<th>Lifetime</th>
<th>Last month</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparatory vocational education (VMBO-b)</td>
<td>45.5</td>
<td>23.4</td>
<td>11.1</td>
</tr>
<tr>
<td>Preparatory vocational education (VMBO-t)</td>
<td>38.8</td>
<td>18.1</td>
<td>7.4</td>
</tr>
<tr>
<td>Intermediate general education (HAVO)</td>
<td>34.2</td>
<td>15.1</td>
<td>5.1</td>
</tr>
<tr>
<td>University preparatory secondary education (VWO)</td>
<td>28.2</td>
<td>11.3</td>
<td>1.7</td>
</tr>
</tbody>
</table>
In Wave One, the lifetime prevalence of smoking is 32 percent, and in Wave Two, it is 42.7 percent (see Figure 3.1). This approximates the increase found in the DNSSSU 2007. The daily smoking prevalence doubles, from 4.1 percent in Wave One to 8.3 percent in Wave Two. This doubling confirms the choice to investigate the second grade.

Figure 3.1 Percentage of lifetime smoking prevalence among Dutch second-graders according to the DNSSSU 2007 compared to Wave One and Wave Two of the LNDA
**Figure 3.2** Lifetime smoking prevalence in schools One to Five for Wave One and Two

![Chart showing lifetime smoking prevalence](image)

**Figure 3.3** Lifetime smoking prevalence by school type in Wave One and Wave Two

![Chart showing lifetime smoking prevalence by school type](image)
Setting the Stage

Figure 3.2 shows the lifetime prevalence for each school in both waves. All five schools show an increase between the two waves that varies from 7.4 percent for School One to 13.3 percent for School Five. Figure 3.3 shows an increase in lifetime smoking prevalence for all school types between Waves One and Two that varies from 2.7 to 19.4 percent.

Figure 3.3 shows a strong difference in smoking prevalence between students who attend the HAVO/VWO and VWO school type, the four VMBO school types and the HAVO school type. As discussed in Chapter One, these six school types can be categorized into three main types: VMBO, HAVO and VWO. The analyses in this study also use this categorization. This means that the four VMBO school types are merged, and the HAVO/VWO school type is combined with the VWO school type. The reason for merging the four VMBO school types is that, as Figure 3.3 shows, these school types show similar smoking behavior prevalence, and all of these school types aim at follow-up educational programs for the lower segment of the labor market. The HAVO/VWO school type and the VWO school type are merged because they both have significantly lower smoking prevalence scores than the other school types, and HAVO/VWO students have the potential to become VWO students. Taken together, for the analyses in Chapters Five, Six, and Seven, three school types are used: preparatory vocational education (VMBO), intermediate general education (HAVO), and academic preparatory education (VWO).

Figure 3.4  Lifetime smoking prevalence by school type
At Wave One, the lifetime smoking prevalence of preparatory vocational students is 36.6 percent. With a lifetime prevalence of 39.7 percent, the intermediate general students, on average, score slightly higher. However, with a percentage of 15.8, students in the academic preparatory school type have a lifetime smoking prevalence that is almost half of that of the preparatory vocational and intermediate general students. The lifetime prevalence at Wave Two shows a similar pattern. The average score for lifetime smoking prevalence for the preparatory vocational students is 48.2 percent. At 55 percent, the intermediate general students smoking prevalence score is higher. Again, at 21.2 percent, the average lifetime smoking prevalence of academic preparatory students is less than half of the prevalence of the four preparatory vocational and intermediate general school types. Furthermore, the increase in smoking prevalence between Waves One and Two is larger for preparatory vocational and intermediate general students than for students in academic preparatory school. This means that the relationship between school type and smoking behavior is non-linear, which, as we will see, has consequences for the statistical models used in this study.

### 3.3 Smoking Behavior and Friendship

Table 3.2 shows the correlations between individual lifetime smoking prevalence and reciprocal friends who smoke for Waves One and Two. Table 3.3 shows the correlations between individual lifetime smoking prevalence and that of friends1. These findings indicate that similarity in smoking behavior is common among friends in this sample.

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1 The values are 0 = never smoked and 1 = from once or twice to daily smoking. To calculate the percentage lifetime smoking prevalence of smoking friends, the total number of friends that scored 1 for lifetime smoking prevalence was divided by the total number of friends.
Table 3.2  Correlations between individual lifetime smoking prevalence and the percentage of friends who smoked once or more in their life at Wave One and Wave Two

<table>
<thead>
<tr>
<th>Wave</th>
<th>Spearman Correlation</th>
<th>Value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave One</td>
<td>Number of Valid Cases</td>
<td>0.310</td>
<td>0.000</td>
</tr>
<tr>
<td>Wave Two</td>
<td>Number of Valid Cases</td>
<td>0.41</td>
<td>0.000</td>
</tr>
</tbody>
</table>

P < 0.05 in bold. p < 0.10 in italics

Table 3.3  Correlations between individual lifetime smoking prevalence and the percentage of friends who smoked once or more in their life at Wave One and Wave Two for each school separately

<table>
<thead>
<tr>
<th>School One</th>
<th>Wave One</th>
<th>Wave Two</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td>0.193</td>
<td>0.020</td>
</tr>
<tr>
<td>Valid N</td>
<td>145</td>
<td>144</td>
</tr>
<tr>
<td>School Two</td>
<td>Spearman Correlation</td>
<td>0.175</td>
</tr>
<tr>
<td>Valid N</td>
<td>265</td>
<td>255</td>
</tr>
<tr>
<td>School Three</td>
<td>Spearman Correlation</td>
<td>0.274</td>
</tr>
<tr>
<td>Valid N</td>
<td>66</td>
<td>80</td>
</tr>
<tr>
<td>School Four</td>
<td>Spearman Correlation</td>
<td>0.233</td>
</tr>
<tr>
<td>Valid N</td>
<td>235</td>
<td>233</td>
</tr>
<tr>
<td>School Five</td>
<td>Spearman Correlation</td>
<td>0.403</td>
</tr>
<tr>
<td>Valid N</td>
<td>116</td>
<td>119</td>
</tr>
</tbody>
</table>

P < 0.05 in bold. p < 0.10 in italics
As an example, Figures 3.1 to 3.10 are visual representations of how lifetime smoking prevalence and directed friendship network ties change over time for the five schools in the sample. The nodes represent the individual students within the second-grade friendship network. For the sake of clarity, they are fixed on the same location in the pictures of both Wave One and Wave Two. The white nodes signify lifetime prevalence for nonsmokers, the gray nodes represent students who were absent during the measurement, and the black nodes are lifetime prevalence for smokers. The picture shows that the number of smokers increases, and the ties between the nodes differ between the First and Second Wave. Chapters Five, Six, and Seven will investigate how these changes in behavior and friendship network ties relate to each other.
Figure 3.2 School One at Wave Two

Figure 3.3 School Two at Wave One
Figure 3.4  School Two at Wave Two

Figure 3.5  School Three at Wave One
Figure 3.6  School Three at Wave Two

Figure 3.7  School Four at Wave One
Figure 3.8  School Four at Wave Two

Figure 3.9  School Five at Wave One
3.4 Network Structure and School Organization

Chapter Two discussed community detection, a technique for identifying clusters of nodes within a network. Clusters are parts of a network where the connections are denser than the average density of the whole network. Here, community detection and the association measure Cramer’s $\chi$ are combined to investigate the relation between network structures and school organization. More specifically, the associations between network friendship communities and school types and classes are examined. Community detection can identify which student belongs to a particular cluster within the network. Students are assigned a network partitioning score corresponding to the cluster. For example, if a student is part of cluster six, he/she is assigned the value six as a network partitioning score. Along with the cluster scores, community detection
yields modularity with a score between 0 and 1. Scores mostly fall between 0.3 and 0.7. The association measures between clusters and classes and clusters and school types provide a crude indicator of how school organization and social networks are related. Interpreting the associations between school types and clusters must be done cautiously because not all schools house all school types, as Table 2.1 shows.

Table 3.4 shows that the modularity for the five schools at both waves is higher than 0.40. In the case of School One, the results show that how schools are organized into classes relates to how befriended students cluster together in secondary school networks. Furthermore, friendship networks are stable across time, to some degree. In contrast, in School Two, school organization seems to have no relation to friendship clustering. Yet, as is the case in the first school, there is some consistency in friendship networks between Waves One and Two. In School Three, there is moderate community formation around school type and school class at Wave One. At Wave Two, the community formation around school type increases. In contrast, school class as a focus for community formation is less pronounced, but the results imply that there is some consistency in friendship network clustering over time. In School Four, school organization characteristics are important for the formation of secondary school friendship networks. In addition, there is some consistency in the clustering of friendship networks across time. In School Five, clear relation exists between communities and school organization, but no relationship exists between the clustering over time. Finally, caution is advised concerning the interpretation of the Cramer’s χ² and its p-values. Community detection is a heuristic device that yields different community partition scores with every estimation, implying that the estimation of the Cramer’s χ² and its p-value can vary.
3.5 Conclusion

This chapter began with four questions. First, does smoking prevalence vary across secondary school students in different school types? Although smoking among Dutch youth decreased significantly over the last decade, differences between school types remain. Both the DNSSSU 2003 and 2007 and the LNDA show significant differences across school tracks. In the case of the LNDA, the data indicate that preparatory vocational and intermediate general students smoke significantly more than academic preparatory students do. Second, does smoking prevalence change during the second grade? We find that it does. The steepest increase is between age 13 and 14 in the second grade. The third question...
was whether smoking relates to secondary school friendship networks. The data show consistently, and in line with the literature, that smoking behavior is similar among friends. The final question of this chapter, whether networks are related to school organization characteristics such as track and classroom, can be confirmed with some reservation due to the method used. Although this is a descriptive chapter (and by no means aims to make causal claims), we can say, with some caution, that school structure characteristics, such as track and school class, affect friendship network structures to some degree. Schools One to Four show significant associations between the community scores of Waves One and Two. This finding indicates that networks are partly stable and partly fluid over time.

In light of the main research question, the following chapters examine these findings in more detail to identify an explanation of the variations, associations, and correlations discussed above. Using the dNSSSU 2007, Chapter Four aims to explain the track variance in smoking behavior by considering how school organization, social background, and school composition (in terms of the social background of pupils in the school) affect adolescent smoking behavior. Using the Lnda, Chapters Five, Six and Seven investigate school networks and consider how these networks affect the interaction between adolescents’ smoking behavior and social background characteristics.