

RESEARCH ARTICLE

# Association of School Characteristics and Implementation in the X:IT Study—A School-Randomized Smoking Prevention Program

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## ABSTRACT

**BACKGROUND:** Assessment of implementation is essential for the evaluation of school-based preventive activities. Interventions are more easily implemented in schools if detailed instructional manuals, lesson plans, and materials are provided; however, implementation may also be affected by other factors than the intervention itself—for example, school-level characteristics, such as principal support and organizational capacity. We examined school-level characteristics of schools in groups of high, medium, and low implementation of a smoking prevention intervention.

**METHODS:** The X:IT study is a school-randomized trial testing a multicomponent intervention to prevent smoking among adolescents. Our data came from electronic questionnaires completed by school coordinators at 96.1% of participating intervention schools (N = 49) at first follow-up.

**RESULTS:** Schools that implemented the X:IT intervention to a medium or high degree had higher levels of administrative leadership (77.3% and 83.3% vs 42.9%), school climate/organizational health (95.5% and 91.7% vs 66.7%), mission-policy alignment (90.9% and 100.0% vs 71.4%), personnel expertise (81.8% and 75.0% vs 46.7%), school culture (77.3% and 91.7% vs 53.3%), positive classroom climate (91.4% and 96.2% vs 82.9%) compared with low implementation schools.

**CONCLUSION:** Our findings highlight the importance of considering the school context in future health prevention initiatives.

**Keywords:** implementation evaluation; implementation fidelity; smoking prevention; school-randomized trial; school-based research.

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Schools are regarded as a suitable setting for preventive activities for children and adolescents.<sup>1,2</sup> How well an intervention is implemented can influence effect sizes,<sup>3,4</sup> and this could be part of the explanation for the mixed effects of school-based smoking prevention interventions, seen over the last decades.<sup>5,6</sup> To improve implementation of interventions we need to

know what characterizes schools which succeeded in implementing a complex intervention.

Implementation of school-based prevention often rely on teachers as implementers along with the tasks of teaching,<sup>7</sup> and implementation of health promoting activities therefore compete with many other responsibilities.<sup>8</sup> The demands on schools are increasing,<sup>9</sup> and implementation of a new program

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in an already challenged school setting may induce a higher stress load.<sup>10</sup> Furthermore, schools are complex settings,<sup>11</sup> and implementation in schools is complicated by the multiple levels where the implementation occurs and is assessed.<sup>7</sup> For example, assessing implementation can be whether the teacher training workshops were delivered adequately, or it can be whether teachers implemented the program to their pupils as intended by program developers. Failure to implement on any level may influence the effectiveness of the program.

Several factors have been found to ease implementation of school-based interventions: detailed instructional manuals, lesson plans, and provision of materials, such as handouts.<sup>4,12,13</sup> But, implementation may also be affected by other factors than the intervention itself.<sup>14</sup> A range of school-level characteristics have been shown to affect implementation fidelity: strong and supportive leadership can improve the implementation of an intervention.<sup>15,16</sup> It is important for the implementation process, that the school principal has a positive attitude and belief about the intervention; that he or she engages him/herself in the project; and provides support for the school staff who acts as implementers.<sup>17</sup> Interventions are better implemented in schools with greater organizational capacity, ie, good communication and willingness to cooperate.<sup>18,19</sup> Implementation is also facilitated by local planning and involvement in decisions about implementation<sup>13,20</sup> and integration into school routines.<sup>2,16</sup> Furthermore, school size can influence the implementation; some interventions may be easier implemented in small schools than in large ones,<sup>12</sup> while others showed the opposite picture.<sup>13,21</sup>

Domitrovich et al<sup>14</sup> presented a multilevel framework for contextual factors, which may affect implementation quality of school-based interventions. They argue, that implementation may be influenced both by characteristics of the intervention itself and by the intervention support system.<sup>14</sup> The implementation is further influenced by surrounding factors at multiple levels: the macro level, the school level, and the individual level.

At the macro level, policies and financing can facilitate or hinder the implementation of an intervention, as can community or district level support for preventive activities. At the school level, factors that relate to the organizational functioning of the school are important: interventions that align with the existing school policy are more easily implemented (mission-policy alignment); an including decision structure, where teachers are involved in decision making and free to choose methods of teaching, and the amount and type of resources provided also facilitate better implementation, as does the level of prevention expertise in the building and a strong and supportive administrative leader to back implementation; school culture is how

things are routinely done in the organization, and composes norms, values, and shared beliefs. School culture also has an impact on implementation processes; the school climate and organizational health is the school personality. This is relatively stable over time, and a positive school climate buffers the staff willingness to implement an intervention.<sup>14</sup> Moreover, characteristics such as the school size, area urbanization, and composition of pupils are included. The pupil composition is an expression of the pupils attending a school aggregated to the school level. Schools with large numbers of at-risk pupils may experience difficulties with implementing prevention initiatives. Classroom climate may also impact the implementation process; classes that are characterized by mutual respect and a good pupil-teacher relationship are anticipated to achieve better implementation, compared with classes characterized by high levels of conflicts.<sup>14</sup>

At the individual level, teacher characteristics may influence implementation. Among those supposed to hinder the implementation is lack of experience with implementing preventive interventions, insecurity with teaching methods (ie, interactive teaching) and psychosocial functioning (stress, depression, or professional burnout), whereas the individual acceptance, perception of, and attitude to the intervention is supposed to facilitate greater implementation.<sup>14</sup> Based on the model by Domitrovich et al,<sup>14</sup> the aim of this study was to evaluate the association between school-level characteristics and implementation fidelity in groups of schools with high, medium, and low implementation.

## METHODS

The X:IT intervention was a school-based multicomponent program to prevent smoking among adolescents. The evaluation was designed as a cluster-randomized controlled trial with schools from all over Denmark. The program consisted of 3 main intervention components: smoke-free school grounds; smoke-free curriculum; and parental involvement comprising smoke-free contracts and dialogues.<sup>22</sup>

Intention to treat analyses showed an overall effect of the X:IT study after 1 year of intervention: odds ratio for smoking among pupils in intervention schools compared with control schools was 0.61 (95% CI: 0.45-0.81).<sup>23</sup> The implementation of the program was assessed through a quantitative evaluation of implementation fidelity based on adherence, dose, quality of delivery, and participant responsiveness as recommended by Dusenbury et al.<sup>4</sup> Measures of implementation fidelity were combined into an overall school-wise implementation index, and showed that the implementation of the intervention components in the X:IT study varied across components and over time, and that the program was implemented with high fidelity at one fourth of the schools.

## Participants

Detailed information on study design and population has previously been published.<sup>22</sup> In the evaluation of the X:IT study, there were 51 intervention and 43 control schools. All year, 7 pupils (mean age: 12.5 years) at participating schools were invited. Data were collected by means of electronic questionnaires among pupils, coordinators at schools, and coordinators in municipalities. This study is primarily based on implementation data from the school coordinator questionnaire which was collected from 1 person (preferably the school X:IT coordinator) at each intervention school (N = 49 responses, response rate = 96%) after 1 year of intervention. Two items were derived from the municipality questionnaire (N = 17 responses, response rate = 100%), and 2 items on classroom climate were aggregated from the pupil's questionnaire (N = 116 classes, response rate = 95.9%). All included items are described in Table 1.

## Instrumentation

The outcome, implementation fidelity, was defined as the degree to which the program was implemented as intended, and assessed by adherence to the intervention, dose, quality of delivery, and participant responsiveness. Adherence is the extent to which core intervention components were delivered as intended by program developers. Dose is how much of the intervention the participants received. Quality of delivery refers to how the program components were delivered, and participant responsiveness reflects the extent to which participants were engaged by and involved in the activities of the program.<sup>4</sup>

Analysis of the implementation fidelity measure differentiated the intervention schools into categories of high, medium, or low implementation. Schools in the high implementation group had implemented each of the 3 components per the demands of the X:IT study, schools in the medium implementation group had implemented 2 of 3 components, and schools with low implementation status had implemented only 1 or none of the components as required. The implementation index was constructed on basis of questionnaire data from 2202 pupils and 50 school coordinators, and included measures across all 4 implementation concepts (adherence, dose, quality of delivery, and participant responsiveness).

In the development of implementation index, we combined items on implementation fidelity within each of the 3 main components. For each main component, there were 2 indices; 1 based on school coordinator responses and 1 based on pupils' responses. The applicability of this approach was tested through confirmatory factor analyses. The definition of whether a component was implemented or not,

was based on conceptual discussions, and cut points for implementation were decided before analyses. A component was regarded as implemented only if pupils as well as school coordinators had responded positively on the implementation of that particular component.

## Data Analysis

School was the unit of analysis. Items from the municipality questionnaire were linked to all schools in the municipality to fit the school level, and items derived from the pupils' questionnaire were aggregated to fit the class level. We used Fisher's exact test to test for differences in implementation by decision structure, mission-policy alignment, school climate, organizational health, personnel expertise, administrative leadership, positive classroom climate, school culture, school size, pupil composition, and area affluence. The Cochran-Armitage test was used to test for trend in the resource variable. The significance level to detect associations between school-level characteristics and implementation fidelity was set at  $p \leq .10$  based on the small sample size.<sup>24</sup> All analyses were performed with SAS 9.3 software.

Patterns of school characteristics were constructed from all factors at the school level as Domitrovich et al<sup>14</sup> recommend. School-level characteristics: mission-policy alignment, decision structure, resources, personnel expertise, administrative leadership, school culture, school climate/organizational health, classroom climate and characteristics of the school: size, affluence of the area, and pupil composition. In Table 1, we have shown detailed descriptions of all included items: how each school-level factor was defined in the model; how we measured the factor in the X:IT study; dichotomizations and data sources.

Results are presented in a radar plot; a graphical method well-suited for presenting multivariate comparative health data. Radar plots are ideal for presenting similarities or differences between groups in multiple variables.<sup>25</sup> The plot is shaped as a circle: from the center of the circle come a number of rays, each representing a variable. In this study, the rays represent the school-level characteristics that may influence implementation quality. Each group of schools (high, medium, and low implementation) has its own marking/gray scaling in the plot. Results are shown as proportion of schools in each group with the relevant school-level characteristic. Details about included variables and dichotomizations are shown in Table 1. Sensitivity analyses of dichotomizations showed results in the same direction.

## RESULTS

In Figure 1, we show school-level characteristics in schools of high, medium, and low implementation of

Table 1. Conceptualizations of School-Level Characteristics That Can Affect Implementation Quality

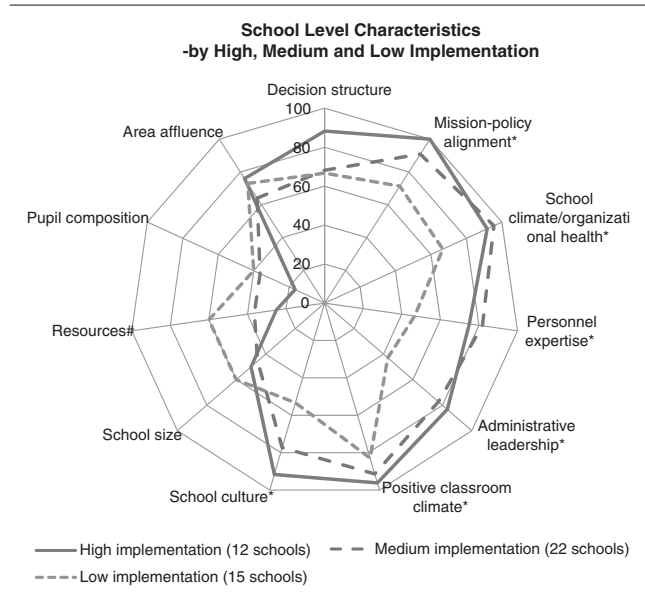
Characteristics That Can Affect Implementation	Explanation Per Domitrovich et al <sup>14</sup>	Measure in the Xi:IT Study	Dichotomizations	Data Source
Mission-policy alignment	Interventions that align directly with the school policy are more likely to be prioritized, implemented, and sustained over time	"The Xi:IT intervention is in accordance with our school values on smoking"	Totally agree + agree vs neither + disagree + totally disagree	School coordinator
Decision structure	Involvement of teachers in decision making decreases resistance to change and increases members' perceptions of successful program adoption	"In your municipality, was it voluntary for the schools to participate in the Xi:IT intervention?"	Yes vs no	Municipal coordinator
Resources	For example, stipends for training, dedicated staff time for prevention activities, space, equipment, and other necessary program resources are a part of a school's capacity to implement an intervention	"Did your municipality buy out the school coordinator at the Xi:IT intervention schools?"	Yes vs no	Municipal coordinator
Personnel expertise	The level of prevention expertise in the building, involvement of school personnel, availability of qualified staff, such as master teachers or coaches within the school or throughout the district	"Besides the Xi:IT intervention, within the last couple of years did your school:"  <ul style="list-style-type: none"> <li>• discuss smoking prevention at teacher meetings?</li> <li>• discuss smoking prevention at parents' meetings?</li> <li>• discuss smoking prevention with pupils?</li> </ul>	Yes vs no + don't know (sum score 0-3) 0 vs 1-3  If yes to 1 or more items, the school has some prevention expertise	School coordinator
Administrative leadership	A strong and supportive leader can have significant influence on program implementation	"Your leader supported:"  <ul style="list-style-type: none"> <li>• the Xi:IT intervention</li> <li>• you as Xi:IT coordinator</li> </ul>	Totally agree + agree vs neither + disagree + totally disagree (sum score 0-2) 0 vs 1-2 Yes to 1 or more means that the school has leader support	School coordinator
School culture	Culture influences the way things are routinely done in an organization, and reflects norms, values and shared beliefs or assumptions of membership	"At your school, most teachers agree on:"  <ul style="list-style-type: none"> <li>• it is a school responsibility to do smoking prevention?</li> <li>• the school should involve parents in the smoking prevention?</li> <li>• it is important to include teachers smoking habits in the smoking prevention?</li> </ul>	Totally agree + agree vs neither + disagree + totally disagree + have not been discussed (sum score 0-3) 0-1 vs 2-3 Most schools agreed on the school being responsible to do smoking prevention. To have a positive school culture, coordinators should be positive on 2 or 3 items	School coordinator

Table 1. Continued

Characteristics That Can Affect Implementation	Explanation Per Domitrovich et al <sup>14</sup>	Measure in the XiIT Study	Dichotomizations	Data Source
School climate/organizational health	School climate is the organizational personality of a school. Relatively stable over time, and influences the behavior of individuals in a building. Schools that are organizationally healthy and provide a positive and supportive environment for the staff may contribute to the staff willingness to implement	<i>"We have problems with conflicts between teachers"</i>	Totally agree + agree vs neither + disagree + totally disagree (sum score 0-3) 0 vs 1-3	School coordinator
Classroom climate	In example, sense of belonging, level of cooperation, and mutual respect among classroom members, and relationship between teacher and students	<i>"We have problems with sickness absence among teachers"</i> <i>"We have problems with long term sickness absence among teachers"</i> <i>"In your school class:"</i>	Yes to 1 or more means that the school climate is not optimal, and therefore categorized as  Totally agree + agree vs neither + disagree + totally disagree 0 vs 1	Pupils (belonging to a class with positive classroom climate)
Characteristics of the school	Characteristics of the school building or the student body aggregated at building level School size, urbanity, disorganized, or large number of at-risk students	<ul style="list-style-type: none"> <li><i>most pupils are kind and willing to help each other</i></li> <li><i>other pupils accept me as I am</i></li> </ul>	Aggregated from pupils to class level. Class mean > 0.70 on both items	School coordinator
School size		<i>"Number of pupils at the school"</i>	Above the median school size > 455	School coordinator
Area affluence		<i>"How affluent is the area where the school is located?"</i>	(Well) below the average vs average + (well) above the average	School coordinator
Pupil composition/at-risk pupils		<i>"It is a popular school"</i>	Totally agree + agree vs neither + disagree + totally disagree (sum score 0-4) 0-1 vs 2-4	School coordinator
		<i>"We have problems with pupil truancy"</i>	With agreement in 0 or 1 single item the schools are categorized as not having at-risk students	
		<i>"We have problems with vandalism and graffiti on school property"</i>		



**Figure 1. School-Level Characteristics—By High, Medium, and Low Implementation of the X:IT Intervention After 1 Year.**  
 \* Statistical significant difference tested by Fisher's exact test.  
 # Statistical significant tested by Cochran-Armitage test for trend



the X:IT intervention after 1 year of study. Generally, schools in the high and medium implementation groups seem to share more of the same characteristics, compared with low implementation schools: at all high and most of the medium implementation schools (100% and 90.9%) the X:IT intervention aligned with existing school policies (mission-policy alignment), which was the case at 71.4% of the low implementation schools ( $p = .027$ ). The school climate or organizational health were positive on most schools of high and medium implementation (91.7% and 95.5%), compared with 66.7% of low implementation ( $p = .045$ ).

Also, personnel expertise was markedly higher in groups of medium and high implementation schools compared with low implementation: 81.8% of medium and 75.0% of high implementation schools had prior expertise with prevention activities (personnel expertise), where half of the schools in the low group had so (46.7%,  $p = .077$ ). Strong and supportive leadership to back the intervention was present at 77.3% of medium and 83.3% of high implementation schools, whereas this was the case for only 42.9% of low implementation schools ( $p = .019$ ).

Positive classroom climate—based on pupils' responses on acceptance and willingness to help each other—was present in almost all school classes at high implementation schools (96.2%), at 91.4% of classes in medium implementation and in 82.9% of classes in low implementation schools ( $p = .022$ ). The school

culture—expressed by shared values and beliefs—was also markedly higher at high implementation schools (91.7%), 77.3% at medium and 53.3% at low implementation schools ( $p = .080$ ).

We found no difference by school size, ie, schools bigger or smaller than the median school size (high: 50.0%, medium: 45.5%, low: 60.0%,  $p = 1.000$ ). Resources were the only characteristic where low implementation schools scored higher than high and medium implementation groups (60.0% vs 25.0% and 36.4%,  $p = .061$ ).

We examined whether there was a difference in implementation by presence of at-risk students (the student body) and area affluence, and found no differences, although high implementation schools tended to have smaller proportions of at-risk students (high 16.7%, medium 36.4%, and low 40.0%,  $p = .465$ ). There was no difference by affluence in the area where the school was situated either: schools located in average, above and well above average areas compared with below or well below (high: 75.0%, medium: 63.8%, and low: 72.9%,  $p = .785$ ).

We were unable to detect a significant difference in decision structure, measured by whether it was voluntary for the schools to participate in the X:IT study, although this was the case at 88.3% of high implementation schools, compared with 66.7% and 68.2% at low and medium implementation schools ( $p = .662$ ).

## DISCUSSION

We examined school-level characteristics for schools with high, medium, and low implementation of the smoking prevention intervention: X:IT and found that high and medium implementation schools differed significantly from low implementation schools on multiple characteristics as proposed in the model by Domitrovich et al.<sup>14</sup> These schools had higher levels of administrative leadership, mission-policy alignment, school climate/organizational health, personnel expertise, school culture, and a positive classroom climate. We found no differences by school size, area affluence, or composition of pupils.

Strong administrative leadership has been shown to influence the implementation in schools substantially.<sup>13,15,19</sup> Most schools in the X:IT study with medium and high implementation had a strong and supportive leader to back the implementation of the intervention, whereas less than half of the low implementation schools had the leader support. Leaders can support the intervention by participating in the implementation and having a positive attitude toward the intervention, but also by allocating teacher time for the actual prevention activities.<sup>14</sup> The smoke-free school grounds component in the X:IT intervention required the schools to make the school

grounds completely smoke-free for both pupils and teachers during school hours. Structural changes have a better chance of being implemented if the school leader supports them.

According to Domitrovich et al,<sup>14</sup> interventions that align directly with a school mission or school policy are easier to implement. We found that in each of the 12 high implementation schools and in 20 (90.9%) of the medium implementation schools, the principles in the X:IT intervention were in accordance with existing school values on smoking (mission-policy alignment).

School climate is the organizational personality of a school,<sup>26</sup> and organizational health is an indicator of school climate. Positive school climate has been associated with better implementation,<sup>27</sup> whereas poor staff morale and a history of failed interventions have been linked to implementation problems.<sup>19</sup> In the X:IT study, almost all high and medium implementation schools had a good school climate, whereas this was only the case for two thirds of the low implementation schools. We measured the school climate as the amount of conflicts between teachers, problems with sickness absence and long sickness absence among teachers, but other aspects of school climate, as for example, openness in communication and orientation to change, could also have been relevant.

Consistent with previous research<sup>16,28</sup> we found that the level of prevention expertise in the school (personnel expertise) was associated with implementation fidelity, as larger proportions of high and medium implementation schools had some degree of experience with smoking prevention compared with low implementation schools. The same picture was seen for the presence of school culture; in more high and medium implementation schools, teachers agreed that the school should be involved in smoking prevention and that including parents was desirable.

Most pupils in the X:IT study attended a school class with a positive classroom climate, although the proportions were higher when implementation fidelity was higher. The classroom climate here is an expression of mutual respect among classroom members (most pupils are kind and willing to help each other, and other pupils accept me as I am). We aggregated pupils' responses within the classes to illustrate to which degree positive classroom climate was present in each class. The association between classroom climate and implementation has been shown previously.<sup>29,30</sup>

Some of the characteristics in the model by Domitrovich et al<sup>14</sup> were not confirmed by our results. One not confirmed as resources; we hypothesized that allocation of resources would yield higher implementation. Instead, we found the opposite picture; a larger proportion of low implementation schools were allocated specific resources for the X:IT

intervention. An explanation for this discrepancy could be that in the model, resources are exemplified as stipends for training, dedicated staff time for prevention activities, space, equipment, and other necessary program resources. In the X:IT study most of this was included in the intervention package; all school leaders and school coordinators were offered training on X:IT workshops prior to the beginning of the project period, and all materials (books, posters, newsletters, smoke-free contracts, and more) were provided free of charge to the schools as part of the intervention. Consequently, our measure of resources covers only whether the municipalities bought out the school coordinators to dedicated staff time on the X:IT study. The results suggest that schools in the low implementation group were provided with more dedicated staff time than the other groups. It could be that schools in this group had a stronger need for specific resource allocation. Another perspective is that funding school coordinators for dedicated staff time on the X:IT study is not synonymous with actual time spent on the project.

In contrast with previous findings,<sup>31</sup> we found no significant effect of decision structure on implementation fidelity. Decision structure is an expression of the teachers' possibility to choose methods of teaching and involvement in decision making at the school. Our measure of decision structure unfortunately only covers this partly, whether it was voluntary for the schools to participate in the X:IT study or the decision was taken at the community level. We hypothesized, that schools able to choose to join would achieve better implementation, and anticipated that the choice of participating was based on a decision from both teachers and the school leader. The X:IT curricular materials were developed so that teachers could chose methods of teaching, but we were not able to collect information from the teachers on to which degree they modified their methods of teaching. Our results on this would benefit from in-depth examination of the decision structure at the schools, and the results should be interpreted with caution.

Previous research showed contrasting results on the influence of school size and area. Payne and Eckert<sup>21</sup> found that prevention programs were better implemented in larger schools, and schools located in urban communities; Gottfredson et al<sup>12</sup> showed the opposite direction for the school size. We were not able to confirm any influence of school size on implementation in our data, nor with respect to the affluence of the school area. Denmark is not a particularly diverse country on these parameters compared with other countries, which could be part of the explanation for the lack of association in our study. A large proportion of at-risk pupils may impede more difficulties in implementing an intervention with high fidelity.<sup>32</sup> Our data suggested that high

implementation schools had smaller proportion of at-risk pupils, but the difference was not statistically significant.

### Limitations

The X:IT study is a large randomized controlled trial involving more than 4500 pupils in 51 intervention and 43 control schools, with high response rates. Furthermore, studies examining school-level characteristics and implementation across multiple domains of implementation fidelity are sparse.

To achieve a broader picture of the actual implementation, we used information from both teachers (implementers) and pupils (participants) in our implementation index. School-level characteristics were based on teacher self-reports only, which could be a limitation, as they may be prone to social desirability bias. Due to the more objective character of observational data, this seems a preferable method. However, in large-scale interventions with many intervention sites, as in the X:IT study, it may be unrealistic to conduct observations; therefore, self-report constitutes a feasible and valuable source of information.<sup>33</sup>

All Danish municipalities were invited to join the X:IT study. Among the municipalities that agreed to participate, all schools were then invited. This could have resulted in selection bias both at the municipal and at the school level. Municipalities are large entities; nonattendance was mainly related to lack of administrative time at the municipal level. School dropout was also due to lack of time or resources. Within municipalities, participating schools were randomly allocated to either intervention or control group.

In an intervention study like the X:IT, the sample size of 49 intervention schools may be argued as a relatively large sample although in statistics, it is viewed as a small sample size. To detect any differences among schools of different levels of implementation, a significance level of  $p < .10$  was chosen. Use of this significance level in small sample sizes has been described.<sup>24</sup>

### Conclusion

This study adds to the literature on school-level characteristics and implementation fidelity in school-based smoking prevention. We found several school-level characteristics to be associated with implementation fidelity, as proposed in the model by Domitrovich et al.<sup>14</sup> Based on our findings, the school-level characteristics are extremely important to take into consideration when initiating future school-based smoking prevention activities.

## IMPLICATIONS FOR SCHOOL HEALTH

Our findings highlight the importance of considering the school context in future health prevention initiatives. Obtaining the desired effect in school-based smoking prevention is dependent on proper implementation, which is best achieved through well-developed interventions with specific implementation guidelines, and settings that are ready for implementing new initiatives. Many studies have been unable to show an effect of smoking prevention activities in schools, which may be partly due to lack of implementation.<sup>5</sup> A focus on school-level characteristics would make researchers/implementation facilitators able to support the schools in the areas where they are lacking. We recommend an overview of barriers and facilitators and a systematic assessment of strengths, weaknesses, opportunities, and threats<sup>34</sup> in the schools before the implementation phase, so that barriers for implementation can be addressed, and facilitators can be leveraged. This would optimize the conditions for new initiatives being implemented with fidelity.

### Human Subjects Approval Statement

The X:IT study is registered at the Danish Data Protection Agency, ref: 2010-54-0930. It adheres to Danish ethical standards; school principals received written information about the study and parents were informed that they could have their child withdrawn from the data base at any point in time. Pupils were informed that any information they provided would be anonymous and treated with confidence, and that completion of the questionnaires was optional.

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