Sociodemographic Differences in Time Trends of Suicidal Thoughts and Suicide Attempts Among Adolescents Living in Amsterdam, The Netherlands

Time Trends of Suicidal Behaviors Among Adolescents

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Abstract. *Background:* Suicidal thoughts and suicide attempts among adolescents are major public health problems. More insight into secular changes in suicidal thoughts and suicide attempts among adolescents from various sociodemographic groups is crucial for adequate and targeted policy-making and prevention. We therefore examined 5-year time trends in suicidal thoughts and suicide attempts among adolescents and potential differences in time trends between sociodemographic groups. *Methods:* Logistic regression analyses were based on annually repeated cross-sectional data including 26,273 multi-ethnic students (13–14 years old) in the second year of various levels of secondary education in Amsterdam, The Netherlands. *Results:* Overall, the prevalence of adolescents in Amsterdam with suicidal thoughts decreased from 17.6% during 2010–2011 to 13.2% during 2014–2015. The prevalence of adolescents reporting suicide attempts decreased from 2.9% to 1.9% over the observed 5-year period. We found differences in these time trends between subgroups based on ethnicity and educational level. *Limitations:* The use of confidential and self-reported data could have biased the results. *Conclusion:* In order for prevention policy to be effective it is important to pay attention to changes in risk groups for suicidal thoughts and suicide attempts over time.

Keywords: time trends, adolescence, suicidal thoughts, suicide attempt, sociodemographic factors

Suicidal thoughts and suicide attempts among adolescents are major public health problems. A previous review of studies mostly conducted in high-income countries demonstrated that the mean proportion of adolescents reporting that they had attempted suicide in the previous year was approximately 6%, while 19% of adolescents had suicidal thoughts (Evans et al., 2005). A study among high school students aged 15–16 years from 17 European countries found that the median prevalence of any lifetime self-reported suicide attempt was 10.5% across the participating countries (range 4.1–23.5%). The median of frequent self-harm thoughts (at least five times) was 7.4% (range 2.1–15.3%; Kokkevi et al., 2012). A recent population-based study among adolescents in low-and middle-income countries found that the overall prevalence of suicidal thoughts as well of suicide attempts was 17% in the previous year (Uddin et al., 2019). This and other evidence suggests that the risk of first onset for suicidal behavior increases significantly at the start of adolescence (12 years), peaks at around age 16, and remains elevated into the early 20s (Beesdo-Baum et al., 2015; Evans et al., 2005; Kessler et al., 2007; Nock et al., 2008).

Several studies suggest that suicide among adolescents worldwide has decreased in the past two decades

(McLoughlin et al., 2015), with slight increases in recent years (Belsher et al., 2019; OECD Family Database, 2017; Statistics Netherlands, 2019). However, evidence from the last decade concerning time trends of suicidal thoughts and suicide attempts among adolescents in general population samples is limited and mainly based on the high school Youth Risk Behavior Survey of the Centers of Disease Control and Prevention of the United States (Kann et al., 2018; Lindsey et al., 2019; Liu et al., 2020; Nock et al., 2008). The national results of this study among 14–17-year-olds showed that the prevalence of suicidal thoughts in the past 12 months decreased between 1991 and 2007 (29.0% and 14.5%, respectively), and then increased between 2007 and 2017 (14.5% and 17.2%, respectively), but did not change significantly between 2015 (17.7%) and 2017 (17.2%). The overall prevalence of having attempted suicide in the past 12 months in 2017 (7.4%) was almost the same as in 1991 (7.3%), with a small significant decrease during this period (Kann et al., 2018).

To enable identification of high-risk groups, information on sociodemographic differences in time trends of suicidal behavior is needed(Evans et al., 2005). Time trends show how health inequalities develop and provide insight into the most important future challenges for public health and care: How many adolescents, and especially which subgroups, will develop suicidal thoughts and potentially attempt suicide? How do we deal with shifts in risk groups? In the present study, we examined 5-year time trends in suicidal thoughts and suicide attempts among 13–14-year-old multi-ethnic Dutch adolescents in Amsterdam at 1-year time points. We pay particular attention to differences in these time trends between sociodemographic groups.

Methods

Sample and Materials

Every year all secondary schools within the working area of the Public Health Service (GGD) of Amsterdam require routine health assessments of their students. Only students attending conservative religious, private, international, and special-needs schools were excluded ($n < 250$ per school year). These assessments conducted throughout the school year include a self-reported electronic health questionnaire and a subsequent clinical interview. Data from the questionnaire administered to second-year students (13–14 years old) living in Amsterdam from the 2010–2011 school year until the 2014–2015 school year were used. Data from earlier or later years were not available as different methods were used. The questionnaires were completed by the students during school hours in an exam room under supervision of a teacher and a school nurse of the GGD. To avoid socially desirable answers, the school nurse explained that students' answers were confidential and were known only to the school nurse or possibly a physician. Before data collection, information letters were sent to parents and students. A passive informed consent procedure was used, so students and their parents could decide to not to complete the questionnaire. The response rates from the period 2010–2011 to 2014–2015 were: 90.1%, 90.2%, 88.3%, 89.9%, and 88.5%, respectively. The most common reason for non-response was absence of the student on the day the questionnaire was administered. We did not find any substantial differences between present and absent students with regard to sociodemographic characteristics. Given the high annual response rates and similarity between present and absent students, we considered the data to be representative of all 13–14-years-old living in Amsterdam.

Measures

The measures of suicidal thoughts and suicide attempts used in this study were in line with the widely accepted definition of suicidal thoughts and suicide attempts (Silverman et al., 2007).

Suicidal Thoughts

Suicidal thoughts were assessed with the following question: "During the past 12 months, have you ever seriously thought about ending your life?" The response categories were "never," "rarely," "sometimes," "often," "very often," and, similar to other studies on the topic, dichotomized into "no" (*never*) or "yes" (*rarely or more*; Brener et al., 2002; Dupere et al., 2009). Substantial test–retest reliability (κ = .61–.80) of this measure was previously demonstrated (κ = .74; Brener et al., 2002).

Suicide Attempts

Suicide attempts were assessed with the following question: "During the past 12 months, have you made an attempt to end your life?" The response categories were "no" or "yes." Substantial test–retest reliability of this measure was demonstrated previously (κ = .73; Brener et al., 2002).

Sociodemographic Characteristics

The sociodemographic characteristics gathered in the questionnaire were age, sex, ethnicity, family composition, and educational level.

In accordance with the definition used by Statistics Netherlands, we defined a student to be of non-Dutch ethnic background when at least one parent was foreign-born

(Keij, 2000). We categorized ethnicity into the five largest ethnic groups in The Netherlands: Dutch, Surinamese, Turkish, Moroccan, and other. The birth country of the mother was determinant.

Family composition was assessed by asking with whom the student lived most days of the week: living together with father and mother, living together with father/mother and partner, co-parenting, single-parent family, or other living arrangement.

Education was divided into four categories according to the Dutch secondary school system: the practical track of preparatory vocational secondary education (PT VMBO), in which students prepare for manual jobs; the theoretical track of preparatory vocational secondary education (TT VMBO), in which students prepare for administrative jobs; senior general secondary education (HAVO), in which students prepare for higher professional education; and pre-university education (VWO), in which students prepare for university. Many secondary schools offer introductory mixed classes, giving students 2 years to find out which educational level suits them best. In the present study, adolescents who attended second-year mixed-level education were categorized as "mixed-level education" (Nuffic, 2020).

Data Analysis

Suicidal thoughts and suicide attempts were compared across the 5 years of the data. We used predicted probabilities on the basis of the unadjusted regression analyses to estimate the percentages of students with suicidal thoughts and suicide attempts adjusted for chance fluctuation. As the purpose of the paper was to test if in general the trend went up- or downward, logistic regression analyses with time as an independent variable were used, adjusted for the aforementioned sociodemographic characteristics. Finally, we examined interactions between time and the sociodemographic characteristics to determine whether time trends of suicidal thoughts and suicide attempts varied between sociodemographic groups. As suggested by Sterne and Smith (2001), we presented 95% confidence intervals – indicating the precision and potential range of our estimates – as well as precise p values, without reference to an arbitrary threshold: The lower the p value, the stronger the evidence. Data analysis was performed using IBM SPSS Statistics 21.

Results

Population Characteristics

In total, 26,273 respondents (89%) were included in the analyses. The number of respondents included per year varied between 4,888 and 5,420 (respectively, 2012–2013 and 2011–2012). The mean age of the participants was 13.6 years. The distributions of sociodemographic variables across years were comparable and are shown in Table E1 in Electronic Supplementary Material 1 (ESM1).

Suicidal Thoughts and Suicide Attempts

Across the 5 years, more than 15% of the students reported having suicidal thoughts during the past 12 months, and 2.4% of the students had made an attempt to end their life during the past 12 months. Suicidal thoughts and suicide attempts differed according to gender, ethnicities, family composition, and educational level ($p < .001$). Girls reported suicidal thoughts twice as often as boys did (20.6% vs. 10.0%) and attempted suicide three times as often as boys (3.6% vs. 1.1%). Adolescents of Surinamese origin reported the highest percentage of suicidal thoughts (19.1%) and suicide attempts (3.4%), and adolescents from Moroccan origin the lowest (8.6% and 1.5%, respectively). Students living with both parents reported the lowest percentages of suicidal thoughts (13.2%) and suicide attempts (1.8%). Students living with one parent and a partner reported the highest percentages: 24.3% had suicidal thoughts in the past 12 months and 4.5% attempted suicide in that period. Students attending the practical track of pre-vocational secondary education reported the highest rates of suicidal thoughts (17.1%) and attempted suicides (3.8%) in the past 12 months. Students attending pre-university education reported the lowest percentages (12.7% and 1.0%, respectively). Please see Table E2 in ESM 1.

Time Trends in Suicidal Thoughts and Suicide Attempts

The prevalence of suicidal thoughts decreased (crude odds ratio [OR] = 0.92; 95% CI [0.90, 0.94]; $p < .001$) during our 5-year period of observation from 17.6% during 2010–2011 to 13.2% during 2014–2015. After controlling for the sociodemographic factors as previously mentioned, the observed decrease in suicidal thoughts remained identical (adjusted OR = 0.92; 95% CI [0.90, 0.94]; $p < .001$).

The prevalence of reported suicide attempts during the past 12 months decreased from 2.9% during 2010–2011

to 1.9% during 2014–2015 (crude *OR* = 0.90; 95% CI [0.85, 0.95]; $p < .001$; adjusted *OR* = 0.90; 95% CI [0.85, 0.96]; $p < .001$). Please see Table E3 in ESM 1.

Time Trends According to Ethnicity

We found different time trends between the ethnicities regarding suicidal thoughts ($\chi^2 = 21{,}6$; $df = 4$; $p < .001$) and suicide attempts ($\chi^2 = 8.6$; $df = 4$; $p = .07$). Please see Table E3 in ESM 1.

We found decreasing time trends for suicidal thoughts during the past 12 months for adolescents of Surinamese origin (adjusted *OR* = 0.87; 95% CI [0.81, 0.93]; $p < .001$), Turkish origin (adjusted *OR* = 0.83; 95% CI [0.76, 0.90]; $p < .001$), and Moroccan origin (adjusted *OR* = 0.84; 95% CI [0.78, 0.90]; $p < .001$). By contrast, the time trend for students of Dutch origin remained relatively stable (adjusted *OR* = 0.98; 95% CI [0.94, 1.02]; $p = .22$) (Figure 1).

Similar differences were found in time trends for the various ethnicities for suicide attempts. The steepest decreases were for adolescents of Turkish origin (adjusted *OR* = 0.77; 95% CI [0.64, 0.93]; $p = .01$) and Moroccan origin (adjusted *OR* = 0.79; 95% CI [0.67, 0.94]; $p = .01$). For the adolescents of Dutch origin (adjusted *OR* = 0.97; 95% CI [0.87, 1.08]; $p = .59$) the time trend for suicide attempt remained fairly stable during the observation period (Figure 2).

Time Trends According to Educational Level

We found differences in time trends between educational levels in suicidal thoughts ($\chi^2 = 17.2$; df 4; $p = .002$) and

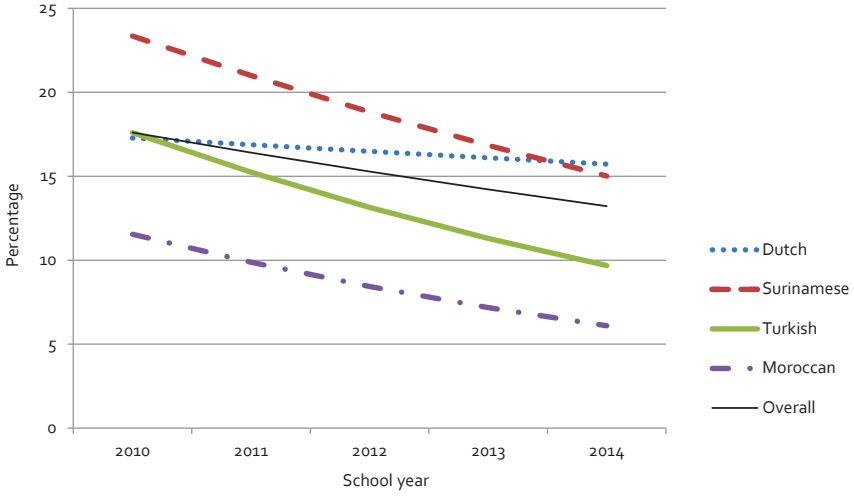

Figure 1. Estimated percentage of 13–14-year-olds reporting suicidal thoughts during the past 12 months, stratified by ethnicity, for school years 2010–2011 to 2014–2015.

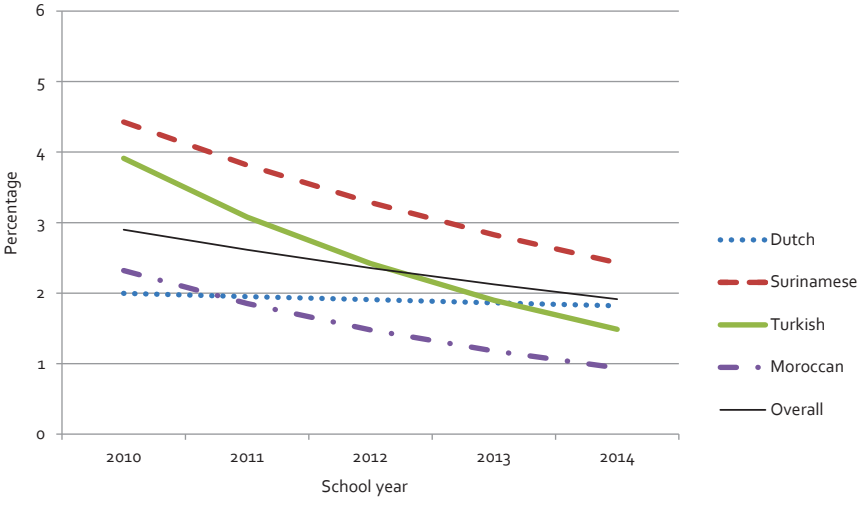

Figure 2. Estimated percentage of 13–14-year-olds reporting suicide attempts during the past 12 months, stratified by ethnicity, for school years 2010–2011 to 2014–2015.

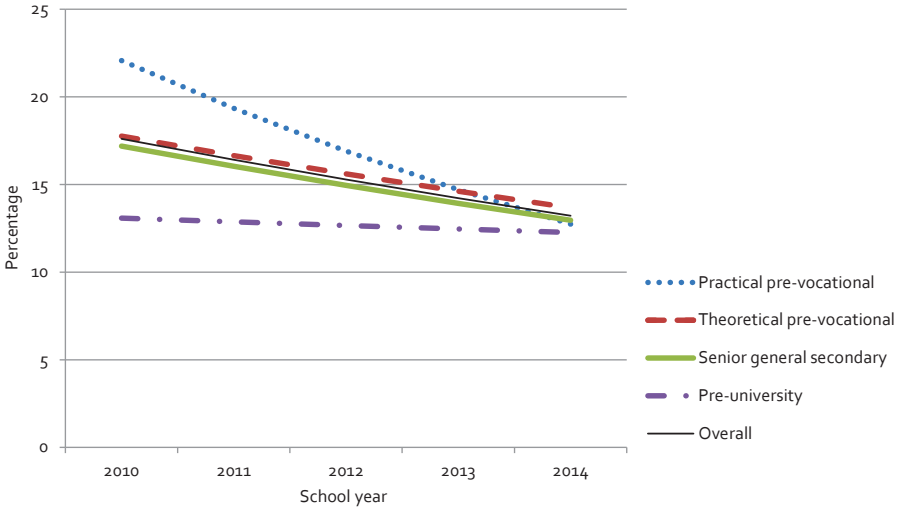

Figure 3. Estimated percentage of 13–14-year-olds reporting suicidal thoughts during the past 12 months, stratified by educational levels, for school years 2010–2011 to 2014–2015.

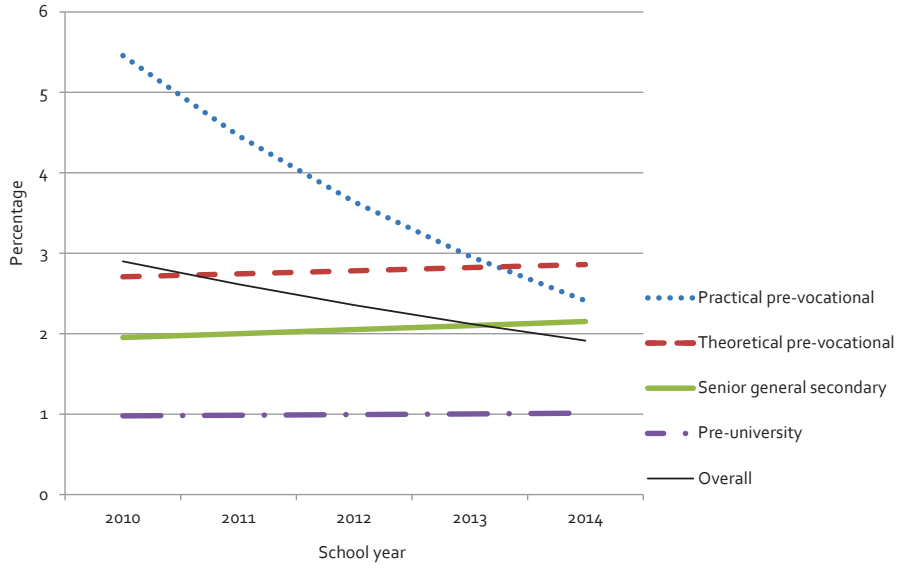

Figure 4. Estimated percentage of 13–14-year-olds reporting suicide attempts during the past 12 months, stratified by educational level, for school years 2010–2011 to 2014–2015.

suicide attempts (χ^2 = 15.9; *df* 4; *p* = .003). Please see Table E3 in ESM 1.

Regarding suicidal thoughts, the largest decrease was for students attending the practical track of pre-vocational education (adjusted *OR* = 0.84; 95% CI [0.80, 0.89]; *p* < .001). Decreasing time trends were also found for adolescents attending the theoretical track of pre-vocational education (adjusted *OR* = 0.91; 95% CI [0.87, 0.97]; *p* = .001) and senior general secondary education (adjusted *OR* =0.92; 95% CI [0.86, 0.99]; *p* = .02), while the trend for pre-university students remained stable (adjusted *OR* = 0.99; 95% CI [0.94, 1.04]; *p* = .60; Figure 3).

We found a decreasing time trend in suicide attempts only for adolescents attending the practical track of pre-vocational education (adjusted *OR* = 0.81; 95% CI [0.73,0.89]; *p* < .001). For the other educational levels the trends showed slight increases (theoretical pre-vocational: adjusted *OR* = 1.02; 95% CI [0.90, 1.14]; *p* = .78; senior general secondary: adjusted *OR* = 1.03; 95% CI [0.87, 1.22]; *p* = .75; pre-university: adjusted *OR* = 1.03; 95% CI [0.87, 1.22]; *p* = .76; Figure 4).

Discussion

Overall, the prevalence of adolescents in Amsterdam reporting suicidal thoughts decreased from 17.6% to 13.2% over the observed 5-year period. The prevalence of adolescents reporting suicide attempts decreased from 2.9% to 1.9%. For both suicidal thoughts and suicide attempts, we found differences in time trends between subgroups based on ethnicity and educational level.

Changes in Suicidal Thoughts and Suicide Attempts

The observed decrease in suicidal thoughts and suicide attempts for adolescents is in line with previous studies during our study period (Kann et al., 2018), and the decreasing suicide rates between 2003 and 2014 (McLoughlin et al., 2015). In 2017 there was a dramatic increase in suicide among adolescents in The Netherlands. However, in 2018 the number of suicides returned to the level of 2016 and previous years (Statistics Netherlands, 2020). Our findings are in contrast to the increase in psychosocial problems between 2005 and 2014 among adolescents in Amsterdam (van Vuuren et al., 2018). One possible explanation for this disparity is the decrease in substance use in Amsterdam between 2005 and 2015 (GGD Amsterdam, 2020; Verhagen et al., 2015), as previous research demonstrated a consistently positive association between substance use and suicidal behavior (Breet et al., 2018). However, this explanation is fairly speculative and the observed decreases could also be caused by other factors. Our findings are in contrast to the suggested negative influence of social media and media contagion on suicidal behavior, for example, creating unrealistic self-image, decreasing self-esteem, online risk-taking behavior, or cyberbullying (Richards et al., 2015). The release of the Netflix series *13 Reasons Why* was associated with a temporal increase in suicidal behavior and suicide rates among US youth (Bridge et al., 2020; Cooper et al., 2018). However, recent Dutch research found no rise in suicide among Dutch youth after the release of *13 Reasons Why* in The Netherlands (Mérelle et al., 2020).

Ethnic and Educational Differences

Time trends differed between the various ethnicities and educational levels for both suicidal thoughts and suicide attempts. Despite previous efforts to reduce mental health problems among Amsterdam adolescents, the decrease has not been the same for all groups. We observed a decline in time trends for suicidal thoughts and suicide attempts for all non-Dutch ethnic groups, while the time trends for students of Dutch origin remained stable.

Furthermore, we found no decline in time trend for suicidal thoughts for students engaged in pre-university education. For suicide attempts, only the data from students attending the practical track of pre-vocational secondary education showed a clear declining trend. Essentially, the differences in suicidal behavior between the various socioeconomic groups have become smaller. Our findings differ from most previous studies, which have indicated a widening gap of sociodemographic inequalities (Kim et al., 2016; van Bergen et al., 2018). A possible explanation for these contradictory findings could be the existing mental health programs that focus on high-risk groups. Recent studies have suggested that societal changes such as the rise of social media and greater emphasis on examinations and academic performance can have a greater impact on specific sociodemographic groups (Inchley et al., 2016; van Vuuren et al., 2018). These developments can possibly explain the shift that we found in sociodemographic differences. In both cases, the definition of high-risk groups needs to be reconsidered.

Strengths and Limitations

Major strengths of our study are its large sample size and high response rate in each school year. Another strength is the repeated assessments by identical sampling and data-collection procedures. In addition, compared with a cohort study, a repeated cross-sectional study better reflects the changing community. A possible limitation is the use of self-reported data. However, the alternative would have been to use hospital or other medical records of suicide attempts, and these produce underestimates because the majority of those who attempt suicide do not have contact with medical services (Evans et al., 2005; Rutter, 1995). Second, we cannot rule out that seasonality has affected the results. As the questionnaire is administered throughout the school year, the influence of seasonality is probably negligible. Third, we also need to mention the relative short time span of 5 years. We cannot exclude the possibility that the downward trend observed is a fluctuation within a longer time trend. Fourth, another uncertainty is whether these trends reflect changes in actual prevalence of suicidal behavior, or whether adolescents are less open about reporting suicidal behavior than in the past. Our findings do not suggest a likelihood of disclosing fewer problems, considering that the decrease was not consistent across the various sociodemographic groups. Fifth, the occurrence of suicidal behavior was based on only two questions with a substantial test–retest reliability. Finally, data collection was confidential, but not anonymous. A previous Dutch study among adolescents in a similar setting has shown that there was no significant difference in suicidal behavior between confidentially and anonymously collected data (Van De Looij-Jansen et al., 2006).

Implications for Future Research and Public Health

Although our study shows declining trends, the observed percentages of suicidal thoughts and suicide attempts are

still high and therefore early screening and prevention remain important. School-based screening, as described in this study, can identify students with suicidal behavior who have not been recognized by school professionals, but screening is unlikely to identify all students who may need help. Screening should be one component of a school's mental health initiatives in identifying and helping at-risk students (Kaess et al., 2014; Scott et al., 2009). In particular, the added value of screening is dependent on the availability and quality of the subsequent referral programs and healthcare.

Our findings demonstrate the need for implementing prevention programs for high-risk groups, with special attention to the fact that risk groups may change over time. Future research needs to gain insight into the causes behind the trends in suicidal thoughts and suicide attempts (e.g., change in substance use, change in psychosocial problems, increase in social media use, change in school-related stress; Evans et al., 2005; Rutter, 1995). Finally, we view our study as exploratory in the context of developing knowledge on trends in adolescent suicidal behavior, and invite researchers to replicate our study in other populations and over a longer time span.

Conclusion

The overall declining time trends with differences in time trends between subgroups based on ethnicity and educational level show how health inequalities develop, identify future societal challenges, and enable policymakers to make evidence-based, long-term decisions about prevention and care.

Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at https://doi.org/10.1027/0227-5910/a000735

ESM 1. The tables show population characteristics (Table E1), suicidal thoughts and suicide attempts (Table E2), and five-year time trends in suicidal thoughts and suicide attempts (Table E3), reported by 13–14-year-olds participating in the Amsterdam youth health monitor between school years 2010–2011 and 2014–2015.

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Conflict of Interest
The authors have none to report.

Publication Ethics
This study is registered at the Dutch Data Protection Authority and meets national ethics and privacy requirements. Medical ethical approval was sought before analysis, but the ethics board ruled that observational studies using anonymized data are not subject to ethical approval.

Authorship
C. L. van Vuuren: conception and design of the work, data collection, analysis and interpretation, drafting the article, and final approval of the version to be published.
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