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COHORT PROFILE: Monitoring Young Lifestyles (MyLife), a prospective longitudinal quantitative and qualitative study of youth development and substance use in Norway.

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ABSTRACT

Purpose: The Monitoring Young Lifestyles (MyLife) study was initiated as a large-scale mixed-methods prospective longitudinal investigation of correlates, causes, and consequences of adolescent substance use and other addictive behaviors in Norway.

Participants: The MyLife cohort comprises 3,512 8th, 9th, and 10th graders (55% girls) who were recruited in 2017 from 33 Norwegian middle schools selected from low, medium, and high standard of living areas in both rural and urban regions. All 3,512 adolescents were enrolled in the quantitative study arm (QT), while 120 were enrolled in the qualitative study arm (QL).

Findings to date: Baseline QT assessment was conducted during the 2017 Fall semester, when 2,975 adolescents completed an online questionnaire during regular class time. A total of 2,857 adolescents participated in the first QT follow-up during the 2018 Fall semester. Baseline QL assessment was conducted during the fall of 2014 and the 2015 Fall semester, when 118 8th graders completed face-to-face interviews. QL group- and individual follow-ups were conducted in the spring of 2015 and fall of 2017 (n = 98) and the spring of 2017 and 2018 (n = 95).

Future plans: Both QT and QL arms have planned follow-ups through 2021. Consents were obtained for individual-level linkages of adolescent responses to a range of national registries and databases, as well as to the parental responses also obtained at QT baseline. These supplemental data sources will provide key information on additional putative exposures as well as on long-term health, educational, and social outcomes in the MyLife cohort.

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Strengths and limitations of this study

- To the best of our knowledge, the MyLife study is the very first multidisciplinary longitudinal study of youth in Norway to employ a quantitative developmental epidemiology perspective and quantitative survey assessments in combination with qualitative individual and group interviews.
- The study will extend and possibly augment the knowledge of adolescent behavioral health in general, and of substance use in particular, gained by previous studies in Norway.
- Comparative strengths of MyLife rest in its integration of wider age ranges (3 grades/cohorts, 13-16 years old at baseline), sizeable samples (1,000 per grade/cohort), balanced follow-ups (annual, for five years), and mixed longitudinal methods
- The consent and recruitment were limited by privacy and confidentiality concerns, possibly resulting in less-than-ideal study enrollment
- Non-random sampling may have implications for generalizability and related inferences

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INTRODUCTION

Adolescent substance use remains a significant public health concern, notwithstanding recent reports on the declines in underage drinking and smoking (1-4). Negative consequences of such early behaviors are considerable, as early substance use is associated with a range of adverse psychological, social, and health outcomes (5-9). In addition, the Global Burden of Disease project ranks the use of alcohol, tobacco, and other drugs (ATOD) among the most important risk factors for disability adjusted life years in high income countries, including Norway (8). Understanding the use of alcohol, tobacco, and other drugs early in life is therefore of key public health importance, both in Norway and internationally. The current report describes the Monitoring Young Lifestyles (MyLife) study, which was designed as a large-scale longitudinal investigation of youth in Norway specifically aiming to advance our understanding of early substance use and other addictive behaviors, as well as the associated risk factors, consequences and social processes.

Risk and protective factors for early substance use can stem from multiple ecological levels that either alone or in combination can contribute to varied patterns and developmental trajectories of substance use (10-14). Indeed, understanding the developmental course of substance use has become central to understanding the causes, onset, timing, duration, and consequences of these behaviors (15-26). More importantly, detecting and examining different developmental patterns through which substance use problems develop and progress over time can greatly inform not only our understanding of risk and protective factors associated with these behaviors, but of potential prevention and treatment strategies as well (11, 27).

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Yet, there is a dearth of studies utilizing developmental epidemiology and developmental psychopathology frameworks (28-30) to address these issues in Norway. While numerous cross-sectional reports examined various issues associated with early substance use, ranging from correlates, exposures, risk-perceptions, and diverse cultural and behavioral patterns (31-39), they cannot fully address the questions of causal pathways and individual developments and progressions over time. Current knowledge concerning early substance use in Norway is thus largely based on the results from cross-sectional studies. In addition, a handful of notable longitudinal reports also remain somewhat limited: even though they are based on large, well-established prospective studies (e.g., the Young in Norway Longitudinal Study (40, 41) or the Tracking Opportunities and Problems study (42, 43)) these projects were not established with the specific and primary purpose of investigating early substance use and related issues.

Given the above-identified gaps in both current knowledge and methodological approaches, the MyLife study was designed as a large-scale longitudinal investigation of youth in Norway specifically aiming to advance our understanding of early substance use and other addictive behaviors, as well as of the associated individual and social processes. In general, we are interested in finding out how substance use and other addictive behaviors begin, how they develop over time, and why some continue and/or progresses further into problem behaviors. These key questions will be investigated both quantitatively and qualitatively over time within general developmental epidemiology and human ecology theoretical frameworks (10, 11, 44-47). The results will provide updated insights into a range of putative causes and consequences of early substance use among contemporary adolescents, of the associated risk and protective factors, and of developments and transitions over time. Also, a wide range of research questions can be addressed in secondary data analysis and through planned linkages

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with other data sources (e.g., national health registries) (48-50). The ultimate aim is to inform public health policies, and to improve prevention and intervention strategies.

COHORT DESCRIPTION

Study design

The MyLife study aims to investigate a wide range of research questions from diverse fields (psychology, epidemiology, sociology, etc.), to integrate both quantitative and qualitative methodologies, and to facilitate in-depth study of developmental issues, transitions, and risk and protective factors relevant to underage substance use over the shortest possible investigation period. With this in mind, a prospective longitudinal design with participants of appropriate ages was selected as the most scientifically and logistically feasible one. Middle school students were identified as the most appropriate target population, given that they were of ages immediately preceding the onset of the studied behaviors, and cognitively capable of informed assent and independent survey and interview participation. The key aspects of the MyLife core study were informed by the results and experiences from the 2014 pilot study (38, 51-54).

Quantitative Arm (QT): The quantitative arm was designed as a multi-cohort study with five annual prospective assessments (a.k.a., 'accelerated longitudinal design', ALD), where middle-school students from grades 8 through 10 were recruited. The accelerated longitudinal design (ALD) was selected as the most efficient prospective design, given the budgetary, time, and staff constrains (55-57). Comparative advantages of this design rest in its integration of relatively large sample sizes (approximately 1,000 students from each grade), wider youth participant age range (3 school cohorts; grades 8, 9, and 10 at baseline) and relatively frequent

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and balanced follow-ups (annual, for five years) capturing key developmental transitions during adolescence.

Qualitative Arm (QL): A few qualitative studies of youth transitions (58, 59) have utilized longitudinal designs, but to the best of our knowledge, this is the first study to investigate the social and cultural processes surrounding youth substance use with a longitudinal qualitative design. The qualitative approach can provide insight into the social relations in which individual trajectories develop, as well as into the social and cultural processes that surround adolescents' use of alcohol, tobacco and drugs. As they grow older, adolescents' understanding of these substances will be challenged and their social identities as well as their substance use practices can be altered accordingly; repeated interviews can both map and explore in the ways these changes take place.

In sum, the MyLife study will achieve its scientific objectives through two separate, yet connected, study arms: a) Quantitative (QT); where the core quantitative cohort is to be followed-up annually for a total of five assessments spanning middle- and high-school years) and b) Qualitative (QL); where the core qualitative cohort is to be followed-up via group and individual interviews spanning middle- and high-school years). Inclusion of parental reports provides much needed additional information/validation beyond youth self-reports, whereas administrative data from schools and communities enable examination of non-individual factors potentially shaping developmental trajectories and outcomes. We also aim to link the quantitative data and parental responses to a range of objective indicators of health, adjustment, and well-being available through the national registries encompassing data on all residents in Norway. Study design, cohorts, data sources, and timelines for all planned assessments are shown in Figure 1.

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Setting

The setting for the study is Norway, a high income country in Northern Europe with a relatively small population, characterized by a generous welfare state with public education and universal health care systems. Norway is ranked number one on the Inequality-adjusted Human Development Index (60). The main behavioral risk factors for disability adjusted life years are tobacco use, poor diet, alcohol use, and drug use (8).

Sampling

The first step in sampling procedures was completed in 2015, and involved selection of geographical areas within Norway. To ensure geographic and sample diversity, five of the nineteen Norwegian counties were chosen for study inclusion: one each from the north (Troms), from the middle (Sør-Trøndelag), from the west (Møre og Romsdal), from the south (Rogaland), and from the east (Buskerud) of the country, see Figure 2.

The second step in sampling procedures involved ensuring representation of adolescents from both urban and rural areas; that is, from both urban and rural schools. Within each county, we first selected the schools from the largest city in the county, and then schools from rural municipalities – but for practical reasons, still within 2 hours drive from the largest city. Middle schools with fewer than 50 students were excluded because of a poor cost-benefit ratio.

The third step in sampling procedures involved ensuring representation of low, middle, and high standard of living communities. The standard of living index (SLI) is a standardized indicator available from Statistics Norway for all Norwegian municipalities up to 2008 and it reflects community-level characteristics ranging from social security, single parent, and disability payments, mortality and unemployment rates, to individuals in vocational

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rehabilitation (61). The municipalities within counties, and the districts within cities, were sorted into low, middle and high SLI categories using tertile splits. Municipalities/districts were drawn at random from the sorted list using a random number generator so that 30%, 40% and 30% of adolescents were from low, medium and high SLI schools/communities, respectively

In almost all cases, there was only one eligible school within each geographical area. In the few cases were there was more than one school, the target school was selected through a random number generator. The school selection procedure resulted in 42 schools with upwards of 9,500 middle school students (see Figure 2 for details). The school enrollments varied from 54 to 529 middle school students in 2017. All 42 selected schools were contacted and invited to take part in the MyLife study. Nine schools declined, leaving 33 schools with about 7,000 middle school students. All currently enrolled students were eligible for study inclusion; the aim was to obtain full 8th, 9th, and 10th grade cohorts from each school if possible.

Informed consent

Because of the respondents' young age, informed parental consent was required before the children could be invited to participate, or give assent for own participation in the MyLife study. The schools were provided with packages containing a booklet describing the study, consent form, and a secure return envelope; this information package was administered to all students during class time to take home to their parents. Students were asked to share this MyLife study information with their parents and to return sealed envelopes with completed consent forms to their teachers by a deadline; we asked that the forms be returned even if no consent for study participation was granted. Parents were asked to consent to their child(ren)'s participation in all of the planned five annual rounds of the quantitative arm of the study. This involved completing a 30-minute questionnaire during a

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school hour while they were in middle school, and in a private setting after they left middle school. The consent also involved permission for the individual-level linkage of questionnaire data to the data obtained from the national health (e.g., information on primary and specialized health utilization) and other registries (e.g., information on education, welfare, and unemployment) pending appropriate ethical and research approvals. In addition, parents were asked to consent to be invited to complete a brief electronic questionnaire of their own and, if so, to future registry linkages as well. In the beginning of the 2017 Fall semester, 4,195 valid consent forms were returned. Parental consent was obtained for 3,512 children. A total of 3,035 parents also consented to their own study participation. The individual consent rate varied widely across schools, ranging from 23.2% to 96.1% (Mean consent rate = 48.4%, Standard deviation = 15.33). The inclusion flow for QT is shown in Figure 2, including the baseline data collection.

A subgroup of 145 students from six schools (one class per school) were also asked to consent to the child's participation in the qualitative study, involving both individual and group interviews over time. Consent for the qualitative study was obtained for 120 students; see Figure 3 for QL flow.

Patient and public involvement

This study involved no patients. Focus groups consisting of adolescents and middle school teachers were involved in study design by providing feedback concerning the QT surveys content and administration modes. School principals and contact persons also provided feedback after baseline data collection/administration, which aided in fine-tuning of the follow-up procedures. Study progress and selected aggregate results are shared with

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those directly involved (schools, parents, adolescents) through semi-annual newsletters, and with general public via the project NIPH-based website.

THE MYLIFE COHORT

The MyLife core QT cohort comprises a total of 3,512 8th, 9th, and 10th grade middle-school students with valid parental consent, who are invited to each of the five annual assessments. A brief overview of the QT core cohort characteristics is presented in Table 1.

Table 1.
Brief overview of MyLife core QT cohort characteristics (*N* = 3,512)

Variables	*N*	%
Gender:		
Girls	1,923	54.8%
Boys	1,589	45.2%
Birthday year:		
2001	12	0.3%
2002	998	28.4%
2003	1,214	34.6%
2004	1,286	36.6%
2005	2	0.01%
County:		
Buskerud (East)	497	14.2%
Møre og Romsdal (West)	568	16.2%
Rogaland (South)	1,137	32.4%
Sør-Trøndelag (Middle)	949	27.0%
Troms (North)	361	10.3%
School location:		
Rural municipality	1,293	36.8%
Town/city	2,219	63.2%
Municipal/city district standard of living tertile:		
Low	956	27.2%
Medium	1,394	39.7%
High	1,162	33.1%

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The MyLife core QL cohort comprises a total of 120 middle-school students (boys *n* = 58 and girls *n* = 62) from six schools/classes with valid parental consent, who are invited to each of the five rounds of qualitative interviews. To ensure identification of potential regional and demographic differences, the schools were selected across Norway (two each from the South-East, Northern, and Western region), and both urban and suburban schools were recruited within each region (see Figure 2).

DATA COLLECTION

Pilot study

A small scale mixed-methods pilot study including four middle schools and one high school (*n* = 851) was conducted in 2014 to test recruitment strategies, modes of data collection, and questionnaires items. This has been described in detail elsewhere (51, 52). The QL arm of the pilot study included two 8th grade classes (*n* = 36), and also tested recruitment strategies, interview guides, and interviewing techniques (38, 53). The experiences from the pilot study also informed the main study decisions related to the adjustments of time intervals between interviews, the balance between individual and group interviews, and group size and composition. One of the classes (*n* = 13) continued participation after the pilot, and is included in the hereby described core qualitative MyLife sample (*n* = 120) even though its baseline was completed ahead of the main study schedule.

The first QT wave in the 2017 fall semester (MyLife baseline)

During the first wave of QT data collection the entire cohort of 3,512 students was invited to complete a 30-minute electronically-administered questionnaire during a regular school period. A contact person at each school received 1,000 Norwegian Kroner (about 100

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Euros) as compensation for assisting with data collection, while each participating class received the same amount into their class' saving account.

All but one of the 33 recruited schools managed to organize data collection. Due to this one withdrawn school ($n_{enrolled}$ = 65), a total of 3,447 instead of the eligible 3,512 students were invited to take part in the baseline assessment (see Figure 3 also). Teachers supervised data collection during class time, by reading aloud a standardized MyLife study guide describing the purpose of the study, assent, and confidentiality, providing practical information about accessing the on-line questionnaire, and reminding students that they are always free to decline participation or withdraw from the study altogether (including information collected about them deleted). Students were instructed to type in a Uniform Resource Locator (URL) in their web-browsers, which gave them access to the MyLife on-line questionnaire. Students without parental consent were instructed to do schoolwork for the duration of the class.

The questionnaire contained questions about a wide range of themes, with a particular focus on family background, leisure time activities, personal characteristics, and substance use. A summary of the baseline master questionnaire is presented in Table 2. The questionnaire contained enough contact details to allow identification in the Norwegian population registry. After removing questionnaires with insufficient contact information and duplicates, a total of 2,975 valid responses remained, yielding a response rate of 85%. For 8th, 9th, and 10th graders, the response rate was 88%, 81%, and 85% respectively.

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Table 2.
Brief overview of topics encompassed in the MyLife QT adolescent baseline questionnaire (2017)

Topic	Items
Socio-demographic characteristics	Gender; birthdate; school and county; grade; residence; household composition; immigrant status; parental SES (employment and educations); religious affiliation; perceived SES; income
Parent-child relationships	Parental knowledge of child's leisure time; discipline; frequency of breaking rules; consequences of breaking rules; feel safe at home
Risk and protective factors	Stress/Negative life events; leisure time activities; unsupervised leisure time; sports/music/hobbies involvement; social media and videogames; gambling; personality and temperamental traits; delinquency
School and peer experiences	Truancy; school connectedness; core GPA last semester; plans for further education; close friendships; popularity among peers; victimization and mobbing experiences; boyfriends/girlfriends history; boyfriend/girlfriend use of tobacco, alcohol and cannabis.
Health and diet	Pubertal timing; physical and learning disabilities; self-rated physical health; soft-drinks and energy drinks intake; use of painkillers; injury; violence; depression symptoms
Alcohol	Exposure to drinking opportunities; alcohol use, and alcohol intoxication, and episodic heavy drinking histories; initiation age; usual alcohol quantity; drinking with parents; received alcohol from parents; witnessing of parental intoxication; alcohol expectancies; perceived harmfulness; legalization attitudes.
Tobacco	Cigarettes, snus and e-cigarette use histories; initiation age; last time used; usual quantity/day; place of purchase; beliefs about cigarette smoking; witnessing of parental cigarette and snus use; perceived harmfulness; legalization attitudes.
Cannabis	Exposure to cannabis use opportunities; cannabis use history; initiation age; willingness to trying cannabis; perceived cannabis availability; cannabis use expectancies; perceived harmfulness; legalization opinions.
Other substances	Synthetic cannabinoids; MDMA; Amphetamines; Cocaine; Prescription medications.

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The second QT wave in the fall of 2018 (1st FUP)

By the 2018 Fall semester, students who were in 10th grade at study entry in 2017 had graduated middle school and most had entered high-school. For those who were still in middle school (2,515 students) the data collection procedure was the same as at baseline, with the exception that they were handed a secure note with a unique pre-assigned PIN-code to enter in the questionnaire, instead of typing in all their contact details.

Those who had left middle-school (*n* = 997) could no longer be assessed in structured school settings, and were approached in a different way. First, a news-letter with updated information about the MyLife study and information about the upcoming round of data collection was mailed to their home addresses. Shortly after, an e-mail invitation with a link to the questionnaire was sent to each student, including the information that each participant would receive a 200 Norwegian Kroner gift card (about 20 Euros). Three reminders were sent to non-responders via e-mail and SMS. The questionnaire was completed by 2,857 adolescents, i.e., 81% of the cohort. For the 9th and 10th graders who again completed questionnaires in school, the response rate was 85.4% and 84.4% respectively. For those who were 10th graders in 2017 and who were approached outside of school, the response rate was 72.3%.

Out of the entire QT cohort (3,512 adolescents), 5.5% had not participated in 2017 or in 2018 (*n* = 194); 13.1% (*n* = 461) had participated only in 2017; and 9.8% (*n* = 343) had participated only in 2018. A total of 71.6 % (*n* = 2,514) had participated both in 2017 and in 2018.

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The QT parental questionnaire in the 2017 Fall semester

A total of 3,035 parents had consented to their own participation in the study. Of these, 2,918 were invited to take part in the study, and 117 were not invited because of incomplete contact information (see Figure 3). In late 2017, all parents received an e-mail with a link to a questionnaire that took about 15 minutes to complete. The contents of the questionnaire are summarized in Table 3. The questionnaire contained questions about the parent who completed the questionnaire (the mother in 79% of cases) and, if relevant, the other parent in the household, and questions about their child or children who participated in the MyLife study. Parents were not reimbursed. Two reminder e-mails were sent to non-responders, and by the end of the data collection in December 2017, 1,899 parents had completed the questionnaire. A total of 276 parents had two children who participated in the study, and two parents had three children who participated in the study. Therefore, parents of a total of 2,041 children completed parental questionnaires.

The qualitative arm (QL)

The first wave of QL data collection was initiated in 2015, in addition to one class which completed baseline interviews as part of the pilot study in 2014 (see Figure 4). This translated into a total of six 8th grade classes from six schools (*n* = 118 students). All baseline interviews were conducted as group interviews of approximately 45 minutes duration; a total of 26 interview sessions were completed. All newly recruited classes were recruited from schools that also consented for participation in the QT arm. However, even though the selected schools/classes participated in both QT and QL MyLife study arms, it is currently not possible to identify and cross-link individual participants.

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Table 3.
Brief overview of areas encompassed in the MyLife QT parental baseline questionnaire (2017)

Topic	Items
Information reported about self	
Socio-demographic characteristics	Gender; date of birth; household composition; own and partner's education; own and partner's employment status; household income; home ownership; perceived SES
Risk and protective factors	Self-rated physical and mental health; relationship satisfaction; agreement re: important decisions; agreement re: childrearing; negative life events; personality
Substance use	Tobacco, snus, alcohol, and cannabis use histories; drinking with child(ren) present; house rules about smoking; legalization opinions; knowledge of and attitudes towards child(ren)'s possible substance use
Information reported about the child	
Socio-demographic characteristics	Gender; date of birth; twin status; nature of relationship with child
Child characteristics	Learning and physical disabilities; temperament; conduct problems
Parent-child relationships	Parental knowledge of child's leisure time; discipline; frequency of breaking rules; consequences of breaking rules
School and peer experiences	Interacting with other parents at school; knowing other children at school

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The first follow-up (Time 2; 2017 Fall semester) was conducted when students were in the 10th grade as group interviews similar to the baseline. Interviews were conducted in smaller groups of 4-6 students each; a total of 24 group interviews were conducted with 85 students. The first follow up with the pilot class was conducted in the 2015 Spring semester (8th graders, *n* = 13) hence it is not comparable to other Time 2 interviews. The second follow-up was conducted during the second semester of 10th grade (Time 3; 2018 Spring; 2017 for the pilot class). These were individual interviews; a total of 95 interviews of approximately 40 minutes duration were conducted during regular school hours.

FINDINGS TO DATE

QT

Descriptive statistics for selected demographic and substance use variables for adolescent QT baseline are presented in Table 4. The majority of responders were born in Norway, and had parents who lived together. Only a handful of parents (7.2% of mothers and 4.1% of fathers) were reported as unemployed. In terms of subjective social status, most ranked their family highly compared to others in their neighborhood. The gender differences in demographic variables were quite small, but boys had a higher mean score on subjective social status compared to girls.

About one in six had consumed alcohol in their lifetimes, but only one in sixteen had consumed alcohol in the last 30 days. A little over a third of the nine percent who had ever tried snus had also used snus in the last 30 days. This was also the case for cigarette smoking – most of those who had ever tried smoking had not smoked a cigarette in the last 30 days. Only about one percent had tried cannabis, and less than one percent had tried other illicit drugs. There were some gender differences in substance use. Significantly more boys than

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girls had tried snus, cigarettes and cannabis, but there were no gender differences in alcohol consumption, snus use, and cigarette smoking in the last 30 days.

Table 4.
MyLife core QT cohort demographic and key behavioral characteristics at baseline (*N* = 2,975)

	Total (*N*= 2,975)	Girls (*n* = 1,668)	Boys (*n* = 1,307)
Demographic variables			
Age	13.9 (0.82)	13.9 (0.81)	13.9 (0.83)
Born in Norway	93.4%	93.5%	93.3%
Parents live together	72.1%	71.1%	73.4%
Mother employed:			
Yes	90.1%	90.6%	89.4%
No	7.2%	6.8%	7.6%
Unknown	2.8%	2.6%	3.0%
Father employed:			
Yes	92.5%	92.4%	92.5%
No	4.1%	4.4%	3.8%
Unknown	3.4%	3.2%	3.7%
Subjective social status (1 = worst off, 10 = best off)*	7.29 (1.72)	7.19 (1.68)	7.41 (1.76)
Substance use			
Ever consumed alcohol	15.7%	15.3%	16.3%
Consumed alcohol in the last 30 days	6.1%	6.5%	5.6%
Ever tried snus*	8.9%	7.4%	10.8%
Used snus in the last 30 days	3.6%	3.0%	4.3%
Ever tried a cigarette*	8.6%	7.11%	10.5%
Smoked a cigarette in the last 30 days	3.0%	2.7%	3.4%
Tried cannabis*	1.3%	0.7%	2.0%
Tried other illicit drug	0.9%	0.7%	1.1%

Note:
t-tests performed for continuous variables and X^2-tests for categorical variables to assess gender differences.
* denotes statistically significant gender difference at the $p < 0.05$ level.

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Table 5 shows substance use in 2017 and 2018 for respondents at both time points to assess stability in use as well as the rate of starters and quitters. By 2018 a large majority had still never consumed alcohol, used snus, smoked cigarettes, or used cannabis. However, more than one fifth of the respondents started to drink alcohol during this time period. Substantially fewer initiated use of snus (7.2%), cigarettes (4.8%), and cannabis (2.8%). In the same time period, less than two percent stopped drinking alcohol, about four percent stopped using snus, one percent stopped smoking cigarettes, and less than half a percent stopped using cannabis.

Table 5.
Current substance use in 2017 and 2018 for those who participated in both QT waves, *N* = 2,514

Current use of:	Never	Only in 2017	Only in 2018	In 2017 and 2018
Alcohol	66.7%	1.6%	23.2%	8.5%
Snus	86.7%	2.6%	7.2%	3.5%
Cigarette	92.7%	1.4%	4.8%	1.2%
Cannabis	96.1%	0.4%	2.8%	0.7%

Note:
Current use = used at least once in the last 12 months

QL

Pilot study interviews indicated that the, at that time, 12-13 year old participants were highly skeptical of drinking. They believed that young people drink because they want to be cool, because they are miserable, or because of group pressure. The results were interpreted as reflecting a deep-rooted cultural ambivalence towards alcohol use in Norway (62), also suggesting that boundaries between 'adolescents' and 'adults' are fundamental when understanding emerging adolescent social identities, especially when it comes to drinking and drinking culture (53).

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Preliminary analysis of the main study interviews suggest a normalization of non-drinking among 15-16 year olds, and continued ambivalence in their perceptions of alcohol use. While cigarette smoking was very uncommon, snus use was more common and socially accepted, and e-cigarettes seem to have some novelty value. Overall, substance use appeared not to be at the core of many adolescents' self-image, which often centered on school performance, sports/exercise, and ambitions for the future. However, some individual trajectories highlight vulnerability that may point towards future problem use of alcohol and/or illegal substances.

Future plans

Both QT and QL MyLife study arms have planned individual adolescent follow-ups through 2021 (see Figure 1). Specifically, three more QT annual rounds are scheduled for 2019, 2020, and 2021. The planned procedures and data collection strategies are identical as for the 2018, but after 2019 the entire cohort – having graduated middle school – will have to be contacted individually. QL follow-ups will be conducted as individual interviews, specifically during the spring of 2019, when the students will be in the first year of high school, and spring 2021, when the students will in the last year in high school. All interviews will be conducted by the trained research staff and MyLife team members at the Norwegian Institute of Public Health as before.

Norway has rich information about each of its municipalities, particularly indicators of socio-economic status such as the unemployment rate, income disparity, and educational level. Such municipal level variables can be linked to the quantitative data and be included in multilevel analysis to explore more complex person-environment interaction hypotheses.

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Finally, parental consent was obtained for individual-level linkages of questionnaire data to the national-level administrative sources of data, such as health, education, and labor and social registries (48-50). These registries can provide additional information on putative risk exposures, as well as on the range of long-term outcomes for MyLife adolescents through continually and prospectively updated registry records. Registry linkages will be made for all cohort members, including parents, following appropriate permissions from the Norwegian Regional Committee for Medical and Health Research Ethics.

STRENGTHS AND LIMITATIONS

To the best of our knowledge, the MyLife study is the very first longitudinal study of youth in Norway to employ a quantitative developmental epidemiology perspective in combination with qualitative individual and group interviewing, and to encompass a high number (5) of meaningfully spaced (annual) assessments focusing specifically on behavioral development and substance use trajectories over the critical adolescent years. The MyLife study aims to integrate multiple sources of data, multiple informants, and multiple methodologies. In that respect, the study will significantly a) extend and augment the knowledge of adolescent behavioral health in general, and of substance use in particular gained by previous studies, b) substantively contribute to both national and international research, and c) inform public health policy.

As with all studies, there are important limitations that should be noted. Because of the reasonable privacy and confidentiality issues, the participating schools were not able to share parental contact info, thus precluding the MyLife team from directly contacting the parents with study information and consent forms. For this reason, distribution of the project information booklets and consent letters was outsourced to schools and students themselves,

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where the students were asked to share the MyLife study information with their parents and to return sealed envelopes with completed consent forms to their teachers. While close to 7,000 information packages were distributed to the participating schools to match their official enrollment, a total, 4,195 valid consent forms were returned, and 2,756 were not returned. It is not known, however, how many of the MyLife booklets actually reached the parents, given the reliance on students themselves as liaisons. This suggests that the consent strategy, albeit the only one legally and ethically feasible, might have been less than optimal.

The related limitation concerns non-random sampling and implications for inferences and generalizability. First and foremost, it should be noted that the aim of the MyLife study is not to estimate national prevalence rates or to draw related inferences. Large-scale national monitoring efforts, such as the ESPAD (63), are far more appropriate when population-level estimates and population-level generalizability are of primary interest. Rather, MyLife aims to draw inferences about the prospective associations between the risk and protective factors, especially over time. When such estimates are of interest, population-representative samples are not required, given appropriate control for confounding and avoidance of other biases (64). Further, an unanticipated benefit of the moderate consent rate may be that the study is not as prone to attrition over time as longitudinal studies that start off with representative samples but lose a substantial proportion of participants over time. Indeed, we have reasons to expect low attrition in the next three rounds of QT data collection because of the high response rate in the second round, which may be indicative of the high commitment to and identification with the study. Similarly, QL retention rates remained strong throughout the follow-ups so far, despite the relatively demanding individual interviews. A major criticism of longitudinal studies with non-representative samples is that they lack heterogeneity (65). In our case, ensuring representation of adolescents from different geographical areas and

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different socio-economic areas supports greater cohort heterogeneity than would have been obtained through the simple random sampling.

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Ethics approval: The MyLife study received approval by the Norwegian Data Inspectorate (reference no.: 15/01495) after ethical evaluation by The National Committee for Research Ethics in the Social Sciences and the Humanities (reference no.: 2016/137). All participants were fully informed about the study, and provided paper-and-pencil informed parental consent and electronic assent following parental consent. Participation is entirely voluntary and participants are free to withdraw at any time.

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Data sharing statement: Researchers interested in collaboration are both welcomed and invited to propose research projects by contacting the MyLife team. The MyLife dataset is administrated by the NIPH.

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FIGURE CAPTIONS

Figure 1.
MyLife study design, data sources, and planned assessments.

Figure 2.
MyLife cohort geographic representation.

Figure 3.
Flow chart for the recruitment of the quantitative arm of the MyLife study.

Figure 4.
Flow chart for the recruitment of the quantitative arm of the MyLife study.

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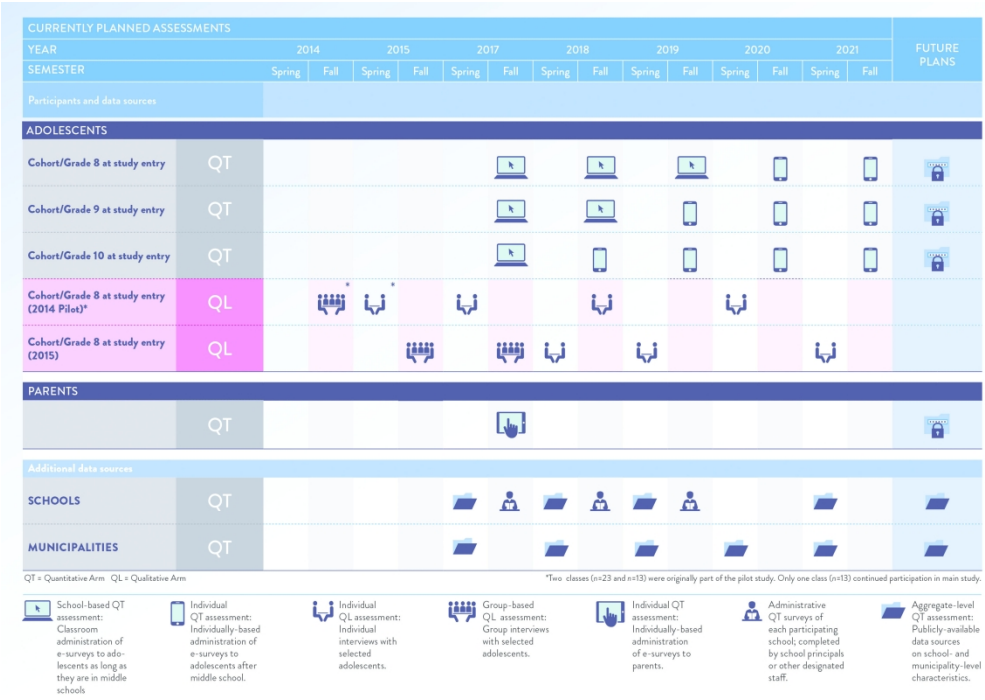

Figure 1.MyLife study design, data sources, and planned assessments.

279x194mm (300 x 300 DPI)

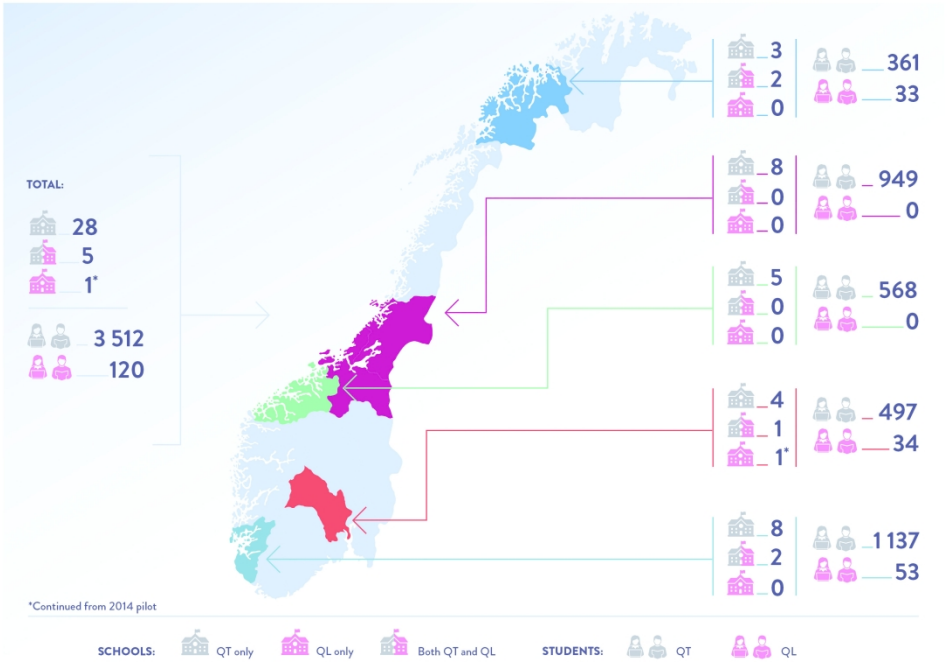

Figure 2.
MyLife cohort geographic representation.

297x209mm (300 x 300 DPI)

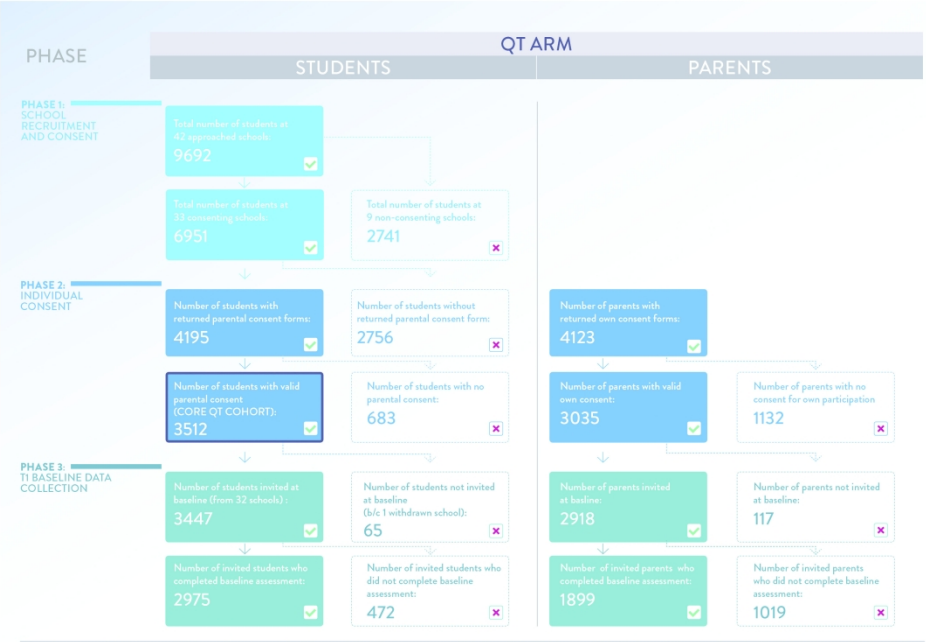

Figure 3. MyLife QT arm recruitment.

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Figure 4.
Flow chart for the recruitment of the quantitative arm of the MyLife study.

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Cohort profile: Monitoring Young Lifestyles (MyLife), a prospective longitudinal quantitative and qualitative study of youth development and substance use in Norway

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COHORT PROFILE: Monitoring Young Lifestyles (MyLife), a prospective longitudinal quantitative and qualitative study of youth development and substance use in Norway.

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ABSTRACT

Purpose: The Monitoring Young Lifestyles (MyLife) project was initiated as a multidisciplinary prospective investigation of correlates, causes, and consequences of adolescent substance use and other addictive behaviors in Norway.

Participants: The MyLife cohort was recruited from middle schools in Norway, which were selected from low, medium, and high standard of living areas in both rural and urban regions of the country. A total of 3,512 8th, 9th, and 10th graders (55% girls) from 33 schools were enrolled in the quantitative project arm (QT), while a total of 120 8th graders (52% girls) from 6 schools were enrolled in the qualitative project arm (QL).

Findings to date: QT baseline was conducted in the fall of 2017, when 2,975 adolescents completed an on-line questionnaire during a regular class time. A total of 2,857 adolescents participated in the first QT follow-up one year later. QL baseline was conducted across the Fall semesters of 2014 (1 class) and 2015 (5 classes), when a total of 118 8th graders completed face-to-face interviews. QL follow-ups were conducted in the spring of 2015 and fall of 2017 (*n* = 98) for group interviews, and in the spring of 2017 and 2018 (*n* = 95) for individual interviews. In terms of additional data sources, a total of 3,035 parents consented to own participation, of which 1,899 completed a brief on-line questionnaire at QT baseline in late 2017. School principals completed brief surveys at the same time.

Future plans: Both QT and QL arms have planned follow-ups through 2021. Consents were obtained for individual-level linkages of adolescent and parental quantitative surveys to each other, as well as to the data available in multiple national registries and databases. These supplemental data sources will provide key information on additional putative exposures as well as on long-term health, educational, and social outcomes in the MyLife cohort.

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Strengths and limitations of this study

- To the best of our knowledge, Monitoring Young Lifestyles (MyLife) is the first integrated quantitative and qualitative prospective study of youth in Norway that specifically focuses on substance use and related behaviors.
- MyLife quantitative arm encompasses adolescent participants of wider age ranges (3 grades/cohorts, 13-16 years old at baseline), sizeable samples (approximately 1,000 per grade/cohort), and multiple and balanced follow-ups (annual, for 5 years).
- MyLife qualitative arm encompasses sizeable samples (approximately 120 8th graders from 6 schools/classes) and multiple follow-ups (a total of 5 group- and individual interviews over the period of 6 years).
- The consent and recruitment procedures were limited by privacy and confidentiality concerns, with possible implications for representativeness and related inferences.
- Future plans involve individual-level linkages of adolescent and parental quantitative surveys to each other, as well as to the individual-level health and social registries data to ultimately extend the current knowledge on adolescent development in general, and on substance use and addictive behaviors in particular.

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INTRODUCTION

Adolescent substance use remains a significant public health concern, as early substance use is associated with a range of adverse psychological, social, and health outcomes[1-3]. In addition, the Global Burden of Disease project ranks substance use and the related disorders among the most important risk factors for mortality and disability in high income countries such as Norway[4 5]. This burden is especially salient among the youngest, as mental health and substance use disorders are the primary contributors to disability in youth from high-income countries[6]. For example, among those between 5 and 14 years of age in Norway, alcohol use remains the number one behavioral risk for mortality and number three risk for disability[5].

Understanding the use of alcohol, tobacco, and other drugs, as well as the causes and consequences of these behaviors as they occur early in life is therefore of key public health importance, both in Norway and internationally. The relevant research no longer seeks to simply identify the most important risk and protective factors[7-9]; instead, it increasingly aims to understand their complex contribution to varied patterns and developmental trajectories of early drinking, smoking, and drug use[10-17]. Indeed, understanding the developmental course of substance use has become central to understanding the causes, onset, timing, duration, and consequences of these behaviors. More importantly, understanding how different substance use patterns develop and progress over time and across various sub-populations ultimately informs not only our understanding of the associated risk and protective factors, but also of the potential prevention and treatment strategies[7 8 18].

Such questions are best explored within the developmental psychopathology and epidemiology frameworks and social-ecological theories of human development[19-27]. These

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approaches study developing individuals within their social contexts (i.e., families, schools, cultures, etc.) and focus on causal mechanisms underlying developmental shifts towards or away from pathological outcomes and problem behaviors such as substance use[20-22 27-30]. And while these fields have been traditionally dominated by quantitative approaches and statistical analyses, integration of qualitative methods into core developmental psychopathology frameworks can offer unique advantages[31 32]. Specifically, qualitative methods address the "why" questions and provide insights into the larger socio-cultural contexts in which individuals develop[33 34]; the results from the integrated studies therefore offer both depth and breadth in understanding of youth development and cultures. For example, repeated interviews with adolescents can help us map and describe the complex social and cultural processes underlying their use of alcohol, tobacco, or drugs. Yet, multidisciplinary and mixed methods studies of early substance use remain few and far between, constrained by the high-risk samples, cross-sectional designs, and general non-reliance on developmental framework[35 36].

These research challenges and the resulting knowledge gaps are especially evident in Norway, where substance use remains a significant public health issue and policy priority[37]. While numerous Norwegian cross-sectional reports examined various aspects of early substance use[38-46], such studies could not fully address the key questions of causal pathways and intra-individual developments over time. A handful of notable longitudinal reports also remain somewhat limited: even though they are based on large, well-established prospective cohorts (e.g., the Young in Norway Longitudinal Study[47] or the Tracking Opportunities and Problems Study[48]), these projects were not established with the specific purpose of investigating early substance use. Finally, a comprehensive qualitative longitudinal

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investigation of substance use among youth, the surrounding cultures and underlying processes has not been undertaken in Norway so far.

Given the above-identified gaps, the MyLife project was initiated as a large-scale multidisciplinary and mixed-methods prospective investigation of early substance use and other addictive behaviors, their normative and non-normative developmental courses, their varied causes and consequences, putative comorbidities, and underlying psychological and social processes and mechanisms. Our primary research questions will therefore focus on identification and examination of risk and protective factors associated with substance use patterns across adolescence. Closer examination of sensitive developmental periods and larger contextual factors in relation to changes both across and within individuals will also be prioritized. These questions will be examined both quantitatively (i.e., examination of adolescents' repeated surveys, parental surveys, and various administrative data sources) and qualitatively (i.e., examination of adolescents' repeated individual and group-based interviews using thematic content and narrative analyses). Further, we aim to both quantitatively and qualitatively explore numerous under-studied and emerging questions, including the problematic use of social media and video games[49-52], the role of alcohol and drug use opportunities[39 42 53], putative gender, ethnic, and socio-economic variations and differences[15 54 55], resilient outcomes in face of multiple risk factors[41], and shifting cultural norms and behaviors surrounding early substance use[45 56-59]. Finally, a wider range of research questions and outcomes extending beyond adolescence can eventually be addressed through various secondary projects and data analyses and the planned individual-level linkages of quantitative data with other administrative and health data sources readily available in Norway[60]. The study ultimately aims to narrow the existing research gap, to inform relevant public health policies, and to improve prevention and intervention strategies concerning early

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substance use and other addictive behaviors. This report describes the MyLife project, its design and sampling, recruitment and data collection for quantitative and qualitative project arms, core cohorts, and selected preliminary results.

COHORT DESCRIPTION

MyLife core project design and procedures

A prospective longitudinal design was selected as the most scientifically and logistically feasible one, and was fully integrated into the MyLife quantitative and qualitative project arms (described below). Middle school students were identified as the most appropriate target population, given that they were a) of ages immediately preceding the largely normative onset of studied behaviors, and b) cognitively capable of informed assent and independent survey and interview participation. Consequently, middle schools were identified as the most appropriate recruitment and initial assessment platforms. The project consists of three main components, described below and in Figure 1:

1. Quantitative Arm (QT): This arm was designed as a multi-cohort study with five annual prospective assessments (a.k.a., 'accelerated longitudinal design', ALD). ALD was selected as the most efficient design, given the budgetary, time, and staff constraints [61-63]. Additional features include integration of multiple cohorts (3 school cohorts; middle school grades 8, 9, and 10 at QT baseline), sizeable samples (approximately 1,000 students from each cohort/grade), and relatively frequent and balanced follow-ups (annual, for five years). Data collection windows for all 5 annual assessments were set during the Fall semester, with closing at the last day of that calendar year (i.e., September through December 31). The chosen QT design fully reflects our key theoretical models and scientific aims while optimizing data

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collection time and robustness to dropout[61 64]. It also facilitates modeling of complex trajectories, patterns, and groups; of conjoint and comorbid outcomes over time; and of critical developmental events, periods, and shifts [63-67].

2. Qualitative Arm (QL): This arm was designed as a semi-structured longitudinal study encompassing five semi-structured group- and individual interview assessments over the period of six years. Enrollment and interviews schedule (i.e., timeline and balancing between the individual and group interviews) were based on methodological and structural considerations ranging from availability of research funds and staff, to availability of participating schools and students. This arm featured a single-cohort design, where only 8th graders were included. The developmental approach was chosen in order to understand a broad range of adolescents' experiences over time, including alcohol, tobacco and drug use[68].

3. *Parental QT reports and additional data sources*: Parental reports completed at QT baseline provide additional information beyond the youth self-reports, whereas the school principals' reports completed at QT baseline provide information on school characteristics thereby facilitating both quantitative and qualitative contextual analyses. Further, publically accessible administrative data on schools and communities will also enable quantitative and qualitative examination of larger structural factors potentially shaping developmental trajectories and health outcomes of interest. Finally, MyLife also aims to link adolescent and parental QT responses to a range of objective indicators of health, adjustment, and well-being available through various national registries[60]. Study design, all participants, data sources, and planned timelines are shown in Figure 1.

It should be noted that the original MyLife design proposed overlapping QL and QT samples, as well as the common baseline for the Fall semester of 2015. The separation of data

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collection schedules for the two arms resulted from a lengthy evaluation process by the Norwegian Data Protection Authority (DPA). Nevertheless, the MyLife project still facilitates mixed methods analyses, albeit not at the individual student level[34 59].

Setting

The setting for the study is Norway, a high income country in Northern Europe with a relatively small population, characterized by a generous welfare state with public education and universal health care systems. Norway is ranked number one on the Inequality-adjusted Human Development Index[69]. The main behavioral risk factors for both years of life lost and years lived with disability in the population between 15 and 49 years of age are tobacco, alcohol, and drug use[5].

Sampling and recruitment

The first step in sampling procedures involved selection of geographical areas. To ensure geographic and sample diversity, 5 out of 19 counties in Norway were chosen for study inclusion: one each from the north (Troms), from the middle (Sør-Trøndelag), from the west (Møre og Romsdal), from the south (Rogaland), and from the east (Buskerud) of the country, see Figure 2. The second step involved ensuring representation of both urban and rural areas. Within each county, we first selected the schools from the largest city in the county, and then schools from rural municipalities – but for practical reasons, still within a 2-hrs drive from the largest city. Schools with fewer than 50 students were excluded because of a poor cost-benefit ratio. The third step involved ensuring representation of low, middle, and high standard of living communities. To this end, we used the Standard of Living Index (SLI) -- a standardized indicator available from Statistics Norway for all Norwegian municipalities up to 2008 and reflecting community-level characteristics ranging from social security, single parent, and

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disability payments, to mortality and unemployment rates[70]. The municipalities within counties, and the districts within cities were sorted into low, middle and high SLI categories using tertile splits. Municipalities/districts were drawn from the sorted list using a random number generator so that 30%, 40% and 30% of the target sample would be from low, medium and high SLI communities, respectively.

In almost all cases, there was only one eligible school within each geographical area. In cases with more than one school, the target school was selected through a random number generator. This procedure resulted in 42 schools with upwards of 9,500 middle school students (see Figure 2 for details) suitable for both QT and QL arm participation. Two additional schools previously identified in the pilot project were eligible for QL.

The enrollments in the identified schools ranged from 54 to 529 middle school students. All 42 schools were contacted and invited to participate in the QT arm. Nine schools declined, leaving 33 schools with about 7,000 middle school students potentially available for study inclusion. A total of 7 schools were invited to participate in the QL arm; 5 schools identified through the procedure above were eligible for new participation, while 2 schools identified during the pilot study were eligible for continued participation. One school declined, leaving a total of 6 QL eligible schools. The ultimate aim was to enroll full 8th, 9th, and 10th grade cohorts from each school if possible (for QT) and one 8th grade class/cohort per school (for QL). These school recruitment procedures were completed in 2015 and are shown in Figure 3 (for QT) and Figure 4 (for QL).

Informed consent

General procedures: Because of the respondents' young age, informed parental consent was required before the children could be invited to participate, or give assent for

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own participation in the MyLife study. The schools were provided with information packages containing a printed booklet describing the project in plain language, explicit consent form, and a secure return envelope; this package was administered to all students during regular class time. Students were asked to take the package home, share it with their parents, and to return sealed envelopes with completed consent forms to their teachers by a deadline. In order to estimate as accurate as possible response and consent rates, we asked that the forms be returned even if no consent for study participation was granted. Those with parental consent were asked to assent for own participation immediately preceding the QT and QL baseline assessments.

QT consent: Parents were asked to consent to their child(ren)'s participation in all of the planned five annual rounds of the QT arm. This involved completing a 30-minute questionnaire during a school hour while they were in middle school, and in a private setting after they graduated middle school. The consent also involved permission for the individual-level linkages of the obtained QT data to the data available in the national health (e.g., information on primary and specialized health utilization) and other registries (e.g., information on education, welfare, and unemployment) pending necessary ethical and research approvals. In addition, parents were asked to consent to be invited to complete a brief electronic questionnaire of their own and, if so, to future registry linkages as well.

In the beginning of the 2017 Fall semester, 4,195 valid QT consent forms were returned wherein the explicit parental consent was obtained for 3,512 children. A total of 3,035 parents also gave consent for their own study participation. The individual consent rate varied widely across schools, ranging from 23.2% to 96.1%. The inclusion flow for the QT arm is shown in Figure 3, including the baseline assessment.

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QL consent: A subgroup of 143 students from 6 schools (one 8th grade class/cohort per school) were approached in 2015 following the main school recruitment procedures. Similar to the QT procedures above, parents were asked to consent to their child's participation in the QL arm involving both individual and group interviews over time. Parental consent for the QL arm participation was obtained for 120 students (see Figure 4).

Patient and public involvement

This study involves no patients. School principals and contact persons also provided feedback after the baseline data collection, which aided the fine-tuning of follow-up procedures. Study progress and selected aggregate results are shared with those directly involved (schools, parents, adolescents) through semi-annual newsletters, and with general public via the project NIPH-based website.

Data Collection

***Pilot study*:** A small scale mixed-methods pilot study including 4 middle schools and 1 high school (*N* = 851) was conducted in 2014 to test recruitment strategies, modes of data collection, and questionnaire/interview content for both study arms. The QT pilot involved 5 cohorts: 8th, 9th, and 10th grade middle school students, and first and second year high-school students. The results informed several key aspects of the main study. For example, high-school cohorts were eliminated from baseline inclusion as scientifically and logistically non-efficient; questionnaires were simplified to be appropriate for younger adolescents and several sensitive items were removed (e.g., suicidality module); reimbursement strategies were fine-tuned to include gift cards of meaningful value for individual participation in combination with random lottery drawings of highly prized items such as iPhones; and

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National Identity Numbers were selected as the primary means of participant identification and data linkages.

The QL pilot included two 8th grade classes (n = 36), and it also tested recruitment strategies, interview topics, and assessment techniques. The pilot informed the main study decisions concerning the timing and balance of individual and group interviews, group sizes and composition, etc. Importantly, one of the pilot classes (n = 13) continued participation, and is included in the core QL sample even though its baseline was completed one year ahead of the main study schedule. Specifically, interviews with these participants continue to inform the decisions on how to proceed with the rest of the core sample, including the selection of emerging topics for both QT surveys and QL interviews.

The pilot characteristics and selected results are described elsewhere[45 49 55 58].

1. QT data collection

QT baseline: During the first wave of QT data collection, the entire cohort of 3,512 students was invited to complete a 30-minute electronically-administered questionnaire during a regular school hour. All but one of the 33 invited schools managed to organize data collection. Due to this one withdrawn school ($n_{enrolled}$ = 65), a total of 3,447 instead of the eligible 3,512 students were invited (see Figure 3 also). Teachers supervised data collection during class time, by reading aloud a standardized MyLife study guide which described again the purpose of the study, assent, and confidentiality; provided practical information about accessing the on-line questionnaire; and reminded the students that they are free to decline participation or withdraw from the study altogether (including the right to have information collected about them deleted). Students were instructed to type in a Uniform Resource Locator (URL) in their web-browsers, which gave them access to the questionnaire. Those

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without parental consent were instructed to do schoolwork for the duration of the class. A contact person at each school received 1,000 Norwegian Kroner (about 100 Euros) as compensation for assisting with data collection, while each participating class received the same amount into their class' savings account regardless of the individual response rates.

The questionnaire assessed a wide range of topics and characteristics, with a particular focus on family background, leisure time activities, personal characteristics, and substance use. An overview of the baseline master questionnaire is presented in Table 1. The questionnaire contained sufficient contact details to allow student identification in the Norwegian Population Registry and facilitate linkages to the unique National Identity Numbers. After removing the cases with insufficient contact information and duplicates, a total of 2,975 valid responses remained, yielding a response rate of 85%. For 8th, 9th, and 10th graders, the response rate was 88%, 81%, and 85% respectively.

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Table 1.
Brief overview of topics encompassed in the MyLife QT adolescent baseline questionnaire (2017)

Topic	Items
Socio-demographic characteristics	Gender; birthdate; school and county; grade; residence; household composition; immigrant status; parental SES (employment and educations); religious affiliation; perceived SES; income
Parent-child relationships	Parental knowledge of child's leisure time; discipline; frequency of breaking rules; consequences of breaking rules; feel safe at home
Risk and protective factors	Stress/Negative life events; leisure time activities; unsupervised leisure time; sports/music/hobbies involvement; social media and videogames; gambling; personality and temperamental traits; delinquency
School and peer experiences	Truancy; school connectedness; core GPA last semester; plans for further education; close friendships; popularity among peers; victimization and mobbing experiences; boyfriends/girlfriends history; boyfriend/girlfriend use of tobacco, alcohol and cannabis.
Health and diet	Pubertal timing; physical and learning disabilities; self-rated physical health; soft-drinks and energy drinks intake; use of painkillers; injury; violence; depression symptoms
Alcohol	Exposure to drinking opportunities; alcohol use, and alcohol intoxication, and episodic heavy drinking histories; initiation age; usual alcohol quantity; drinking with parents; received alcohol from parents; witnessing of parental intoxication; alcohol expectancies; perceived harmfulness; legalization attitudes.
Tobacco	Cigarettes, snus and e-cigarette use histories; initiation age; last time used; usual quantity/day; place of purchase; beliefs about cigarette smoking; witnessing of parental cigarette and snus use; perceived harmfulness; legalization attitudes.
Cannabis	Exposure to cannabis use opportunities; cannabis use history; initiation age; willingness to trying cannabis; perceived cannabis availability; cannabis use expectancies; perceived harmfulness; legalization opinions.
Other substances	Synthetic cannabinoids; MDMA; Amphetamines; Cocaine; Prescription medications.

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QT first annual follow-up: By the 2018 Fall semester, students who were in 10th grade at study entry in 2017 had graduated middle school and most had entered high-school. For those who were still in middle school (*n* = 2,515), the data collection procedure remained the same as at baseline, with the exception that the teachers handed them a secure note with a unique pre-assigned PIN-code to enter in the questionnaire.

Those who had graduated middle-school (*n* = 997) could no longer be assessed in structured school settings, and were approached individually. First, a newsletter with updated information about the MyLife study and about the upcoming round of data collection was mailed to their home addresses. Shortly after, an e-mail invitation with a link to the questionnaire was sent to each student, including the information that their time and effort would be reimbursed with a 200 Norwegian Kroner gift card (about 20 Euros). Three reminders were sent to non-responders via e-mail and SMS during the fall of 2018.

The first QT follow-up was completed by 2,857 adolescents (i.e., 81% of the cohort). For the 9th and 10th graders who again responded in school setting, the response rate was 85.4% and 84.4% respectively. For those who were approached individually, the response rate was 72.3%. Out of the entire QT cohort (*N* = 3,512), 5.5% had not participated in 2017 or in 2018 (*n* = 194); 13.1% (*n* = 461) had participated only in 2017; and 9.8% (*n* = 343) had participated only in 2018. A total of 71.6 % (*n* = 2,514) had participated both in the 2017 baseline and in the 2018 follow-up.

2. QL data collection

***QL baseline*:** The first wave of QL data collection was initiated in 2015 with 5 newly-enrolled classes of 8th graders. In addition, one class completed baseline interviews in 2014, as part of the pilot study (see Figure 4). This translated into a total of 6 8th grade classes from

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6 schools (*n* = 118). All baseline interviews were group interviews of approximately 45 minutes duration; a total of 26 interview sessions were completed. QL baseline reimbursements for both the student participants and teacher assistants were identical to the QT procedures.

***QL follow-ups*:** The first QL follow-up (Time 2; 2017 Fall semester) of the 5 core classes was conducted when students were in the 10th grade (i.e., 2017 Fall semester). These were group interviews similar to the baseline. Interviews were conducted in smaller groups of 4-6 students each; a total of 24 group interviews were conducted with 85 students. The first follow up with the one pilot class was conducted during the 2015 Spring semester, when those students were in the second semester of the 8th grade (*n* = 13).

The second follow-up for all 6 participating classes was conducted during the second semester of their respective 10th grade (Time 3; 2018 Spring semester for the 5 core classes; 2017 Spring semester for one pilot class). These were individual interviews; a total of 95 interviews of approximately 40 minutes duration were conducted during regular school hours. Participants were reimbursed with a 300 Norwegian Kroner (approximately 30 Euros) gift card for their time and effort invested into individual interviews.

3. Additional data collection and data sources

QT parental baseline: A total of 3,035 parents had consented to their own participation in the study. Of these, 2,918 provided sufficient contact information and were thus invited in late 2017 to take part in the MyLife study with an e-mail containing a questionnaire link. Two reminder e-mails were sent to non-responders, and by the end of the data collection in December 2017, 1,899 parents had completed the questionnaire. A total of 276 parents had two children, and two parents had three children who participated in the

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MyLife QT arm. Therefore, parents of a total of 2,041 QT children completed parental questionnaires. Parents were not reimbursed.

The content of the parental questionnaire is summarized in Table 2. This 15-min questionnaire included items concerning the demographic, health, and well-being of the responding parent (the mother in 79% of cases) and the other parent in the household (if any), as well as the items concerning the MyLife participating child(ren).

QT school administrative survey: At QT baseline, school administrators from all recruited schools were invited to complete a brief on-line survey. Out of the 34 schools, 21 responded, providing both the feedback regarding their MyLife participation experiences and additional information about their school characteristics; e.g., the type of prevention programs implemented (if any), school rules and disciplinary measures, distance to alcohol outlets, etc.

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Table 2.
Brief overview of areas encompassed in the MyLife QT parental baseline questionnaire (2017)

Topic	Items
Information reported about self	
Socio-demographic characteristics	Gender; date of birth; household composition; own and partner's education; own and partner's employment status; household income; home ownership; perceived SES
Risk and protective factors	Self-rated physical and mental health; relationship satisfaction; agreement re: important decisions; agreement re: childrearing; negative life events; personality
Substance use	Tobacco, snus, alcohol, and cannabis use histories; drinking with child(ren) present; house rules about smoking; legalization opinions; knowledge of and attitudes towards child(ren)'s possible substance use
Information reported about the child	
Socio-demographic characteristics	Gender; date of birth; twin status; nature of relationship with child
Child characteristics	Learning and physical disabilities; temperament; conduct problems
Parent-child relationships	Parental knowledge of child's leisure time; discipline; frequency of breaking rules; consequences of breaking rules
School and peer experiences	Interacting with other parents at school; knowing other children at school

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FINDINGS TO DATE

Core cohort characteristics

A brief overview of the core cohort characteristics is shown in Table 3a (for the QT cohort; *N* = 3,512) and in Table 3b (for the QL cohort, *N* = 120).

Table 3a.
Brief overview of the MyLife core QT cohort characteristics (*N* = 3,512)

Characteristics	*N*	%
Gender:		
Girls	1,923	54.8%
Boys	1,589	45.2%
Cohort (middle school grade at baseline inclusion):		
8th	1,295	36.9%
9th	1,220	34.7%
10th	997	28.4%
County:		
Buskerud (East)	497	14.2%
Møre og Romsdal (West)	568	16.2%
Rogaland (South)	1,137	32.4%
Sør-Trøndelag (Middle)	949	27.0%
Troms (North)	361	10.3%
School location:		
Rural municipality	1,293	36.8%
Town/city	2,219	63.2%
Municipal/city district standard of living tertile:		
Low	956	27.2%
Medium	1,394	39.7%
High	1,162	33.1%

Table 3b.
Brief overview of the MyLife core QL cohort characteristics (*N* = 120)

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Characteristics	*N*	%
Gender:		
Girls	62	51.7%
Boys	58	48.3%
Cohort (middle school grade at baseline inclusion):		
8th	120	100%
(Fall semester 2014)	13	11%
(Fall semester 2015)	107	89%
Province:		
East	34	25.8%
West	53	40.0%
North	33	34.1%
School location:		
Rural municipality	30	25.0%
Town/city	90	75.0%
Municipal/city district standard of living tertile:		
Low	43	35.8%
Medium	34	28.3%
High	43	35.8%

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QT preliminary results

Descriptive statistics for selected demographic and substance use variables for adolescent QT baseline are presented in Table 4, including basic distributions by gender and grade cohorts. The majority of responders were born in Norway, and had parents who lived together and were employed; many assigned high social status to their family when compared to other families in the neighborhood.

In terms of the observed key outcomes, about 1 in 6 had consumed alcohol in their lifetime, but only 1 in 16 had consumed alcohol in the last 30 days. While 9% reported having tried snus, only about 1/3 of those reported using it in the last 30 days. This was also the case

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for cigarette smoking – most of those who had ever tried smoking had not smoked a cigarette in the last 30 days. Reported experimentation with cannabis and other illicit drugs was minimal.

Significantly more boys than girls had tried snus, cigarettes and cannabis, but there were no gender differences in alcohol consumption, snus use, and cigarette smoking in the last 30 days. All substance use outcomes, save for trying illicit drugs, were more prevalent in older cohorts, as expected.

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Table 4.
MyLife core QT cohort demographic and key substance use outcomes at baseline (*N* = 2,975)

	Total (*N*= 2,975)	Girls (*n* = 1,668)	Boys (*n* = 1,307)	Grade 8 (*n* = 1,141)	Grade 9 (*n* = 989)	Grade 10 (*n* = 845)
Adolescent self-reported demographic variables						
Age	13.9 (0.82)	13.9 (0.81)	13.9 (0.83)	13.0 (0.09)	14.0 (0.09)	15.0 (0.09)
Born in Norway	93.4%	93.5%	93.3%	93.2%	93.7%	93.2%
Parents live together	72.1%	71.1%	73.4%	73.2%	70.5%	72.5%
Mother employed:						
Yes	90.1%	90.6%	89.4%	89.4%	90.3%	90.7%
No	7.2%	6.8%	7.6%	7.2%	6.8%	7.5%
Unknown	2.8%	2.6%	3.0%	3.4%	2.9%	1.8%
Father employed:						
Yes	92.5%	92.4%	92.5%	92.2%	92.4%	92.9%
No	4.1%	4.4%	3.8%	3.8%	4.2%	4.4%
Unknown	3.4%	3.2%	3.7%	4.0%	3.5%	2.6%
Subjective social status (1 = worst off, 10 = best off)	7.29 (1.72)	7.19 (1.68)	7.41 (1.76)	7.3 (1.7)	7.2 (1.7)	7.3 (1.7)
Adolescent self-reported substance use*						
Ever consumed alcohol [b]	15.7%	15.3%	16.3%	9.3%	14.2%	25.9%
Consumed alcohol in the last 30 days [b]	6.1%	6.5%	5.6%	2.3%	4.4%	13.2%
Ever tried snus [a b]	8.9%	7.4%	10.8%	3.6%	10.7%	13.9%
Used snus in the last 30 days [b]	3.6%	3.0%	4.3%	1.0%	4.4%	6.0%
Ever tried a cigarette [a b]	8.6%	7.11%	10.5%	4.0%	9.1%	14.1%
Smoked a cigarette in the last 30 days [b]	3.0%	2.7%	3.4%	1.6%	3.2%	4.7%
Tried cannabis [a b]	1.3%	0.7%	2.0%	0.2%	1.4%	2.5%
Tried other illicit drug	0.9%	0.7%	1.1%	0.6%	1.1%	0.8%

Note:
* Gender (X^2-tests) and cohort (logistic regressions) differences assessed for substance use outcomes only.
[a] denotes statistically significant gender differences at the $p < 0.05$ level; [b] denotes statistically significant cohort differences at the $p < 0.05$ level

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Table 5 shows substance use outcomes in 2017 and 2018 for respondents at both time points to assess stability in use as well as the rate of starters and quitters. By 2018, a large majority had still never consumed alcohol, or tried snus, cigarettes, or cannabis. However, almost ¼ of the respondents started to drink alcohol during this time period. Substantially fewer initiated the use of snus (7.2%), cigarettes (4.8%), and cannabis (2.8%). Proportions of those who ceased using alcohol, snus, cigarette, and cannabis between 2017 and 2018 were minimal (all < 3%).

Table 5.
Current substance use in 2017 and 2018 for those who participated in both QT waves, *N* = 2,514

Current use of:	Never	Only in 2017	Only in 2018	In 2017 and 2018
Alcohol	66.7%	1.6%	23.2%	8.5%
Snus	86.7%	2.6%	7.2%	3.5%
Cigarette	92.7%	1.4%	4.8%	1.2%
Cannabis	96.1%	0.4%	2.8%	0.7%

Note:
Current use = used at least once in the last 12 months

QL preliminary results

Pilot study interviews indicated that the participants -- 12-13 year old at that time -- were highly skeptical of drinking. They believed that young people drink because they want to be cool, because they are miserable, or because of group pressure. These narratives were interpreted as reflecting a deep-rooted cultural ambivalence towards alcohol use in Norway while also suggesting that boundaries between 'adolescents' and 'adults' are fundamental when understanding emerging adolescent social identities, especially when it comes to drinking and drinking culture[58].

Preliminary analysis of the main study interviews suggest a normalization of non-drinking among 15-16 year olds, and continued ambivalence in their perceptions of alcohol

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use. While cigarette smoking was very uncommon, snus use was more common and socially accepted; e-cigarettes seem to have some novelty value. Overall, substance use appeared not to be at the core of many adolescents' self-image, which often centered on school performance, sports and exercise, and ambitions and plans for the future. However, some individual trajectories highlight vulnerability that may point towards future problem use of alcohol and/or illegal substances.

STRENGTHS AND LIMITATIONS

To the best of our knowledge, MyLife is the first longitudinal study of youth in Norway to employ quantitative developmental assessments in combination with qualitative individual and group interviewing in order to specifically examine substance use over the early life span. The MyLife project aims to integrate multiple sources of data, multiple informants, and multiple methodologies. In that respect, the project will significantly a) extend and augment the knowledge gained by previous studies of adolescent health and adjustment in general, and of substance use in particular, and b) contribute to both national and international research and public health policy.

As with all studies, there are important limitations. First, the non-alignment of the QT and QL baselines resulted from administrative delays; nevertheless, the project largely retained its multidisciplinary and mixed-methods character. Next, because of the privacy and confidentiality concerns, the participating schools were not able to share parental contact info with the MyLife team. For this reason, distribution of the project information booklets and consent forms was outsourced to schools and ultimately to students themselves. Given this reliance on young adolescents as liaisons, it is not known how many parents were properly

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informed about the MyLife study. It is possible that the more vulnerable or high-risk adolescents were less likely to share this info with their parents, thus affecting the core sample characteristics. This also suggests that the utilized consent strategy, albeit the only ethically feasible one in our case, might have been less than optimal.

The related limitation concerns inferences and generalizability of our results. For example, given our inclusion criteria and sampling strategies, we may have missed the onset of substance use before grade 8th and among adolescents who may be particularly vulnerable for a range of negative outcomes. However, we can still identify those "early starters" in the core sample. Second, we do not aim to estimate national prevalence rates or to draw related inferences. Large-scale national monitoring efforts, such as the ESPAD[71], are far more appropriate when population-level estimates and population-level generalizability are of primary interest. Rather, MyLife aims to draw inferences about the associations between the putative risk and protective factors and various substance use outcomes and patterns over time. In such cases, population-representative samples are not required, given appropriate control for confounding and avoidance of other biases[72]. Relatedly, a major criticism of longitudinal studies with non-representative samples is the lack of heterogeneity[73]. In our case, over-sampling from different geographical and socio-economic areas supports greater cohort heterogeneity than would have been obtained through the basic random sampling. Finally, identification of the factors associated with attrition may improve future retention rates, especially for those participants followed-up individually.

Future plans

Both study arms have planned individual adolescent follow-ups through 2021 (see Figure 1). Specifically, three more QT annual rounds are scheduled for 2019, 2020, and 2021.

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The planned procedures and data collection strategies are identical as for the 2018, but after 2019 the entire cohort -- having graduated middle school -- will be contacted and assessed individually. QL follow-ups will be conducted as individual interviews, specifically during the spring of 2019 (i.e., the first year of high school), and spring 2021 (i.e., the final year of high school).

Norway has rich information about each of its municipalities, particularly indicators of socio-economic status such as the unemployment rate, income disparity, and educational level. Similar information is available for schools, in addition to the information provided by school administrators. These characteristics can be linked to both aggregate- and individual-level data and be included in the planned mixed-methods and multilevel analyses.

Further, parental consent was obtained for individual-level linkages of questionnaire data to the national-level administrative sources of data, such as health, education, and labor and social registries[60]. These registries can provide additional information on putative risk exposures, as well as on the range of long-term outcomes for MyLife adolescents through continually and prospectively updated individual registry records. Registry linkages will be made for all cohort members, including parents, following the necessary administrative approvals; identifying National Identity Numbers have already been obtained from the Population Registry.

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Contributors: GSB and JBA drafted the manuscript, with substantive contributions from JS, RT, and KB. JBA, EK, and GSB designed and established the Quantitative arm of the MyLife project, while JS and RT designed and established the Qualitative arm. JBA, GSB, and JS remain responsible for the scientific direction and continued management of the project as a whole, with the assistance from EK, RT and KB. All authors reviewed, critically revised, and approved the manuscript.

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Competing interests: None.

Participants' consent for publication: Obtained. Paper-and-pencil informed parental consent and assent following parental consent were obtained for adolescents (electronic in the QT arm; oral in the QL arm); paper-and-pencil informed consent was obtained for parents. Participation is entirely voluntary and participants -- both adolescents and parents -- are free to withdraw at any time to request deletion of information collected on them so far.

Ethics approval: The MyLife project received approval by the Norwegian Data Protection Authority (DPA) (reference no.: 15/01495) after ethical evaluation by The National Committee for Research Ethics in the Social Sciences and the Humanities (reference no.: 2016/137). All participants were fully informed about the study.

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Additional approvals from relevant authorities will be sought on an as-needed basis for future individual-level data linkages (i.e., national social and health registries) and for potential study extensions.

Provenance and peer review: N/A.

Data sharing statement: Researchers interested in collaboration are both welcomed and invited to propose research projects by contacting the MyLife team. The MyLife dataset is administrated by the NIPH.

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FIGURE CAPTIONS

Figure 1.
MyLife study design, data sources, and planned assessments.

Figure 2.
MyLife cohort geographic representation.

Figure 3.
Flow chart for the recruitment of the quantitative arm (QT) of the MyLife study.

Figure 4.
Flow chart for the recruitment of the qualitative arm (QL) of the MyLife study.

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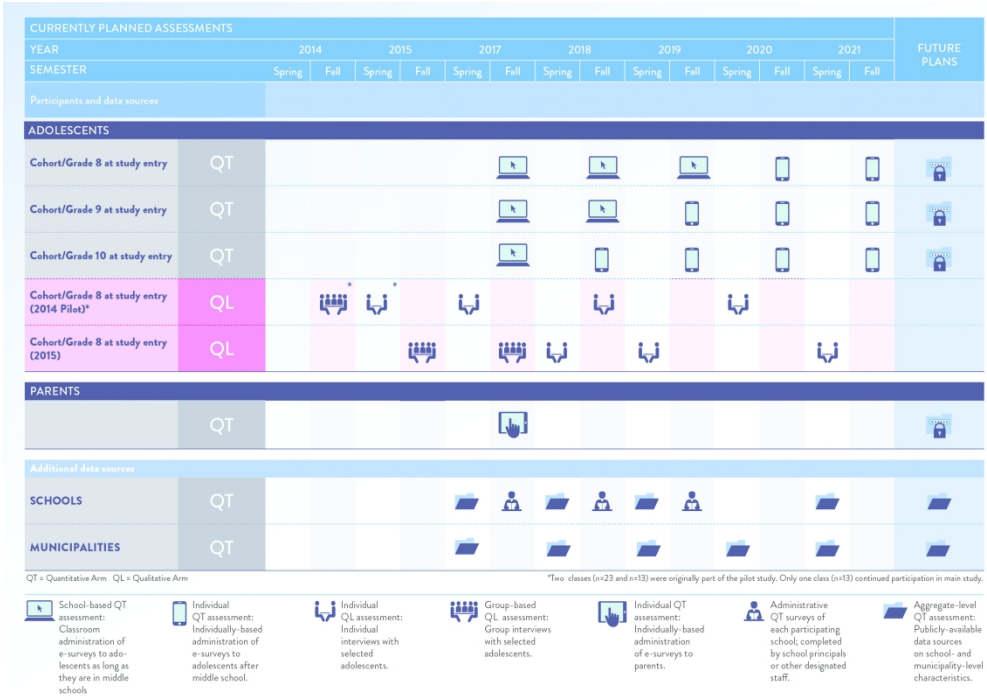

Figure 1.MyLife study design, data sources, and planned assessments.

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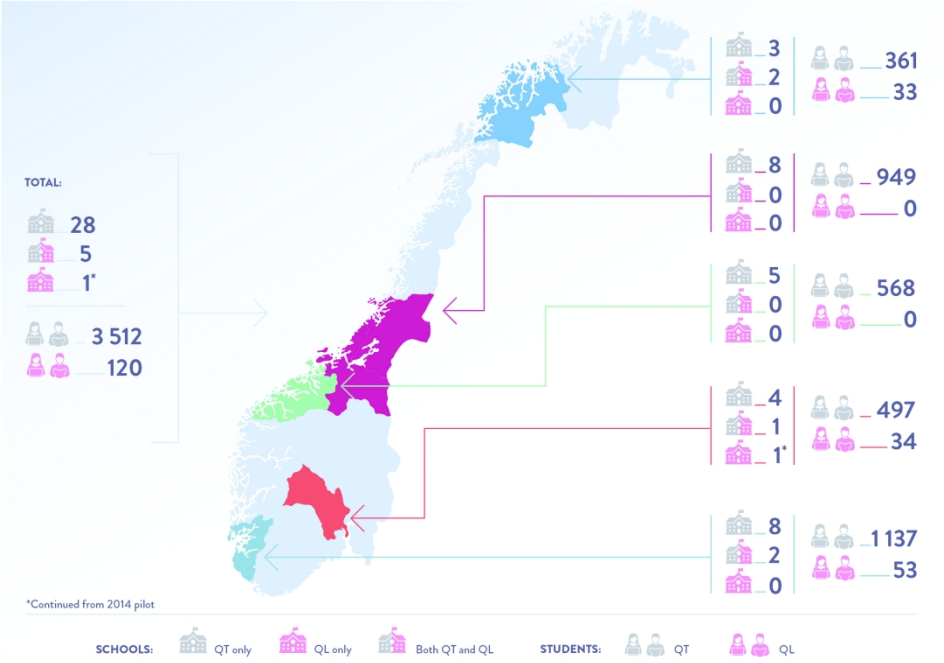

Figure 2.
MyLife cohort geographic representation.

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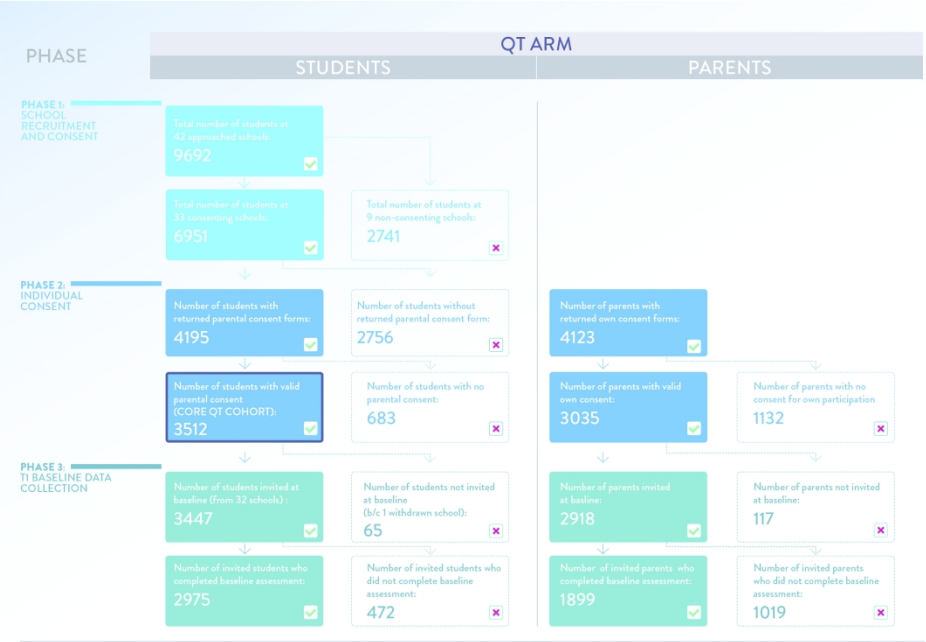

Figure 3. MyLife QT arm recruitment.

297x209mm (300 x 300 DPI)

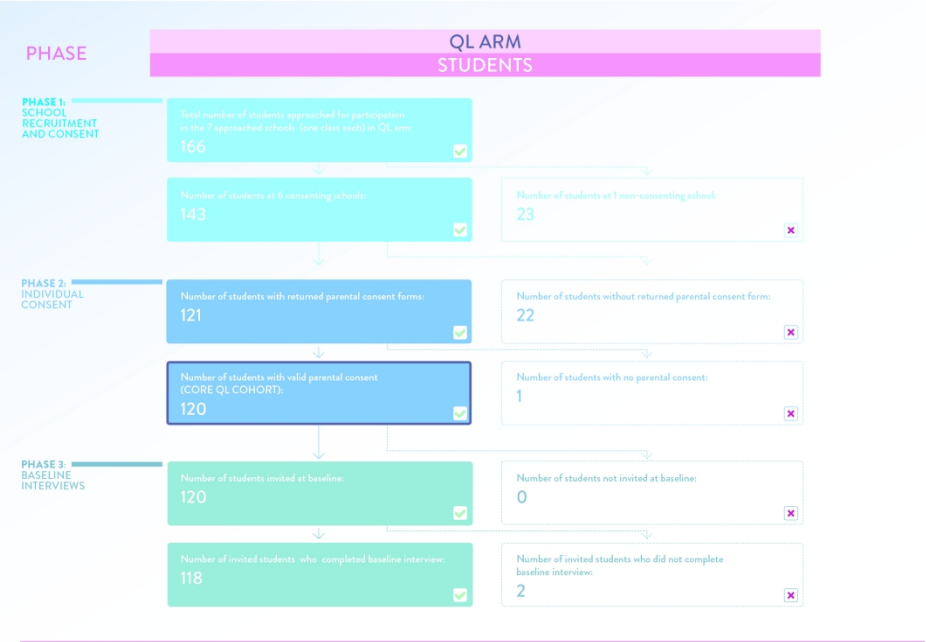

Figure 4. MyLife QL arm recruitment

297x209mm (300 x 300 DPI)