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# **BONDS (The Behavior Outlook Norwegian Developmental Study): A Prospective Longitudinal Study of Early Development of Social Competence and Behavior Problems**

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## ABSTRACT

This report describes the rationale, goals, methods and sample of an ongoing prospective, longitudinal Norwegian study of early social development; BONDS (The Behavior Outlook Norwegian Developmental Study). The study aims at generating knowledge about the development of social competence and behavior problems from 6 months and onward. The design enables the study of influences on development from fathers and mothers as well as of children's childcare and school experiences. Frequent multi-method, multi-informant measures of children's behavior and development as well as family, child care centers, and school factors are included. Starting in 2006, the recruitment of the 1159 children was completed in 2008. The overall retention rate is high: 96.5% of the children and families continued to consent to participate in data collections up to age 4, and at that particular age 93.4% still participated. The study's unique contribution is its focus on early development in a large sample, using multi-informant data including videotaped structured parent-child interactions as well as extensive interviews and questionnaires with fathers and mothers and with child care centers and school personnel.

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## 1. BACKGROUND

Knowledge about development of social competence and behavior problems is imperative for optimizing the possibility for healthy and successful developmental outcomes. An understanding of risk and protective factors and of the processes leading to positive or negative developmental pathways will aid in the design of preventive interventions and the promotion of well being.

Longitudinal developmental research has provided major breakthroughs in the understanding of children's key social-developmental tasks. This comprises the acquisition of social skills necessary for getting along with other people, to perform adequately in school, and to comply with norms and rules [1]. Findings imply longitudinal impacts of social competence on later adjustment [2], and children who show deficits in the social arena are at risk for maladjustment, including academic failure, externalizing and internalizing problems, and delinquency [3,4]. Nonetheless, longitudinal studies examining the development of competence are still outnumbered by those mainly focusing on problem behavior.

The development of social competence is best considered within a socio-ecological framework comprising child, family, and peer group/school factors [5]. Child factors predictive of social competence include joint attention [6], social-cognitive skills including theory of mind [7], and language skills [8]. Family factors include quality of interactions and family composition [9,10].

Externalizing behavior problems like aggression, defiance, and noncompliance are commonly observed during the preschool years [11]. A recent review [12] of developmental trajectories of behavior problems (i.e. physical aggression and opposition-defiance), suggests that such behavior is universal during early childhood, and that most, albeit not all, children learn acceptable behaviors with age. Levels of childhood behavior problems are strongly predictive of difficulties in adolescence and early adulthood [13-17]. Some children have stable trajectories of high levels of behavior problems [18,19]. Several risk factors related to the child, family, and child care or school contribute [20], including difficult child temperament [21], negative family processes [22], and long hours in low-quality child care [23].

Models for the development of behavior problems have mainly been validated for boys [24] and knowledge is thus lacking concerning the role of gender. Partly because behavior problems are thought to be less prevalent among girls and consequently less researched, and partly because girls' behaviors may be less visible, we have fairly limited empirical evidence concerning girls [25]. Also, systematic gender differences seem difficult to detect before the age of four or five [19]. Further studies are needed to determine if developmental mechanisms are gender-specific, and whether there are main or moderating effects of gender on developmental processes or outcomes.

Gender differences in social competence have been found as early as 24 months of age [26]. Girls in preschool seem to engage in more pro-social behaviors than boys [27] and generally exhibit more mature forms of social behavior at a young age [28]. Several studies support the notion that girls are perceived as being more prosocial than boys [29,30].

Early onset behavior problems have been found to be accompanied by lack of social competence [31], although results do indicate a complex relationship between these domains across development [32]. Social competence and behavior problems are generally considered as opposite ends of a single dimension. However, given the moderate empirical association between these constructs, it has been suggested that they rather be conceptualized as two separate, but related dimensions under the overarching domain of social functioning [33].

The understanding of fathers' role in children's development is limited. Despite a general agreement that fathers have a significant function in children's lives, a striking characteristic of the developmental literature is the almost complete lack of paternal reports on young children's behavior. This may have caused a large portion of unexplained variance in the outcomes of developmental studies, or even led to incorrect interpretation of data, including attributing too much importance to mothers' influence [34].

Fathers' involvement in the care of their children is an important objective of Norwegian family policy [35], and fathers in Norway do seem to spend an increasing amount of time with their infants. This is

particularly so after the introduction in 1998 of a more flexible parental leave program [36], including a "father's quota" exclusive for the father. Consequently, a vast majority of Norwegian fathers with children born after 1998 have taken up to 6 weeks leave of absence in connection with the child's birth [37]. The Norwegian setting thus provides a particularly good starting point for studying the importance of fathers for children's social development.

Childcare centers are considered to be a potential arena for providing language and social stimulation, and for promoting children's social and cognitive competence. Accordingly, high-quality center care is related to more advanced development and academic achievement in a short time perspective [38] as well as into school age and adolescence [39-41]. Positive experiences with peers in childcare furthermore seem to predict better social and communicative skills with peers in third grade [42]. Yet, findings indicate that group experiences in childcare settings may sometimes be detrimental to the subsequent development of social competence; however interpretations concerning possible mechanisms diverge [42].

One review of US based research summarized that for some children, childcare center attendance is associated with elevated levels of behavior problems [43], an effect which may last up to 12 years of age [39]. The adverse effect of hours spent in childcare may be limited to children in low-quality care or large child groups [23]. Recent results [41] suggested high-quality early childcare to predict youth reports at age 15 of lower levels of externalizing problems. Notably, studies from cultural contexts outside of the U.S. have not found center care attendance to predict behavior problems (e.g. [44,45]).

A universal outreach of subsidized and generally high-quality center care has long been a priority for the Norwegian governments [46]. Accordingly, altogether 88.5% of children in Norway attended center care in 2009 [47]. Still, there is a remarkable lack of Nordic research on effects of universal childcare, and thus a call for longitudinal studies within such a setting [48].

Starting school is an important developmental milestone and may be challenging for some children [49,50]. This transition, which most likely is influenced both by childcare attendance and child and family factors, can have a lasting impact on children's views of themselves, their well being, and their ability to learn [51]. Some types of skills and behaviors at the time of school entry are found to be associated with later performance [52], and recent results suggest that certain prosocial and antisocial behavior show stability across the transition to school [53]. There is however a lack of knowledge about the factors that moderate stability and change, and how they interact.

## 2. DESIGN

### 2.1. STUDY RATIONALE AND GOAL

The BONDS (Behavior Outlook Norwegian Developmental Study) conducted by the Norwegian Center for Child Behavioral Development, focuses on children's social development from 6 months onwards, with respect to social competence and behavior problems. Social developmental processes evolve in close interplay with those in other areas, in particular cognitive development and development of symptoms which co-occur with behavior problems (including impulsivity, hyperactivity, depression, and anxiety). Social development furthermore takes place in continual interactions with others, in which reciprocal influences are exerted over time. At the earliest ages, these transactional processes primarily engage the child's parents/caregivers. With age, siblings and peers become increasingly important. Social-ecological, relational, temperamental, biological, and health-related factors, in turn, influence children's social development, directly or indirectly through the interpersonal processes involved. The conceptual framework of the BONDS is shown in Figure 1.

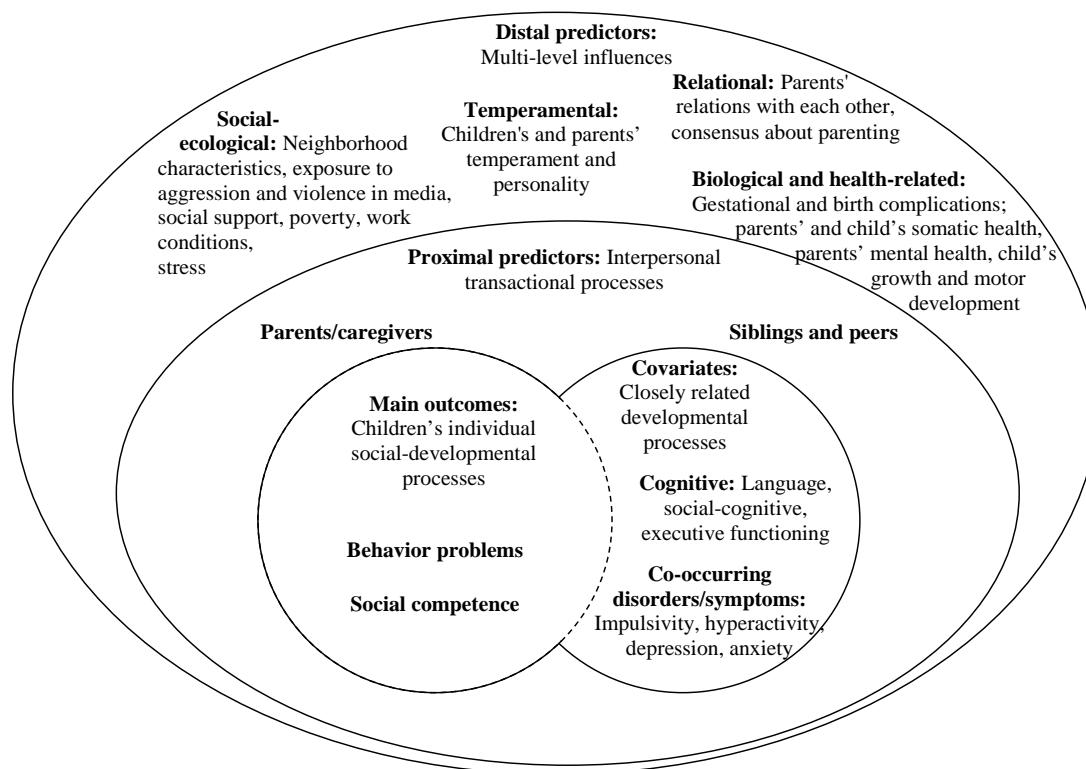


Figure 1. Conceptual framework for the BONDS.

The study is guided by Bronfenbrenner's social-ecological framework [5] and that of the social interaction-learning model (SIL; [54, 22]). The social-ecological framework addresses the interaction between individual, family, community, and institutional factors related to children's upbringing and take into account the complex interactions between multiple individual and environmental circumstances. Likewise, the SIL model draws on ecological and transactional principles holding that children's behavior is directly affected by parenting and by transactional patterns within the family and with peers.

A specific aim of the BONDS is to identify individual developmental pathways leading to competence and problems. Another objective is to provide an empirical basis for the early identification of children at risk. The study is designed to contribute new knowledge about the role of fathers and that of child care experiences for children's subsequent development. The project further aims at elucidating how behavior problems and social competence influence social and academic exclusion and inclusion throughout childcare and in the early school years. Altogether, this study provides a unique opportunity to test several competing hypothesis about children's early experiences and their later development, and results may suggest possible points for prevention and intervention.

## 2.2. DATA COLLECTION AND MEASURES

The BONDS is designed to include comprehensive and frequent multi-method, multi-informant measures of the main focal variables (children's behavior problems and social competence), extensive measures of related developmental processes and interpersonal interactions with parents and peers, and appropriate measures of a wide range of direct or indirect influences. Standardized psychometric scales previously used in quantitative national and international research are employed when possible and feasible. At the current time, data collection up to 5 years is completed, while data collection after school entry and in the second school year is ongoing. Figure 2 graphs the various waves of data collection. The data collection modes of the study are described in the following sections.

Activity	Child age	Year of data collection 2006-2016													
		06	07	08	09	10	11	12	13	14	15	16			
Parent interviews (including self-report questionnaire, videotaped interaction, and child assessment)	0.5		██████████												
	1 <sup>a</sup>		██████████												
	2 <sup>a</sup>			██████████											
	3 <sup>a</sup>				██████████										
	4 <sup>bc</sup>					██████████									
	5 <sup>d</sup>						██████████								
	SE <sup>be</sup>									██████	██████	██████			
School teacher questionnaire	SY2 <sup>df</sup>										██████	██████	██████		
	SE <sup>e</sup>										██████	██████	██████		
	SY2 <sup>f</sup>											██████	██████		
C.c.c. child questionnaire	2			██████████											
	3				██████████										
	4					██████████									
C.c.c. environment questionnaire	-- <sup>g</sup>				██████	██████	██████								
C.c.c. environment interview	-- <sup>g</sup>				██████████										
C.c.c. school-preparatory activities interview	5 <sup>h</sup>									██████████					

Note. <sup>a</sup>Including videotaped interaction with one parent. <sup>b</sup>Including child language development assessment. <sup>c</sup>Including child motor development and Effortful Control assessment. <sup>d</sup>Extended telephone interview. <sup>e</sup>After school entry, which normally takes place in August of the year of the child's 6th birthday. <sup>f</sup>In second school year. <sup>g</sup>Data collection concerning child care centers independent of the child's age. <sup>h</sup>School preparatory activities in child care centers.

Figure 2. Completed and ongoing data collection waves of the BONDS, January 2014. Child's age given in years. Lines represent data collection waves completed and ongoing as per January 2014. Brief parent telephone interviews in-between personal parent interviews from age 0.5 to 4 years are not shown. Abbreviation: C.c.c.=Childcare center.

**2.2.1. Parental interviews and questionnaires.** The assessments comprise a parent-completed computer-administered questionnaire section in addition to the interview. Interviews are carried out at 0.5 (both parents), 1 (father), 2 (mother), 3 (father), and 4 years (mother, and also a questionnaire to father), as well as after school entry (in the autumn of the year of the child's 6th birthday). The interviews are conducted by trained locally employed project staff, and take place in offices at the project's disposal, or in the participants' home if preferred.

**2.2.2. Videotaped structured interactions.** The child and parent completed a set of interaction tasks (12-15 minutes) for videotaped structured observation in connection with the interviews at 1, 2, and 3 years. The set up was standardized and manual-driven and included free-play, cleaning-up, teaching, waiting, and/or inhibition tasks. The tasks were adapted from other studies [55, 56], and designed to capture behavior variation meaningful for the development of behavior problems and social competence.

**2.2.3. Brief assessment – language and motor development and effortful control skills.** This assessment of the child by means of standardized brief testing of language and motor development as well as effortful control was carried out in connection with the interview at age 4 by trained project staff.

**2.2.4. Telephone interviews.** Brief telephone interviews (ca. 5-7 minutes) were conducted at about 8, 10, 15, 18, 21, 28, 32, and 42 months, and in addition 2 and 1 months before as well as 1, 2, and 3 months



after entry to center-based child care (if known to project staff). These telephone interviews included a subset of questions posed in the personal interviews. Extended telephone interviews (ca. 20 minutes), containing additional content analogous to the full personal interviews, are conducted with one of the parents at 5 years, as well as in the second school year (i.e., the year of the child's 7<sup>th</sup> birthday).

**2.2.5. Childcare center reports - children.** Questionnaire reports completed by child care center staff at 2, 3 and 4 years, which include a comprehensive item pool of children's problem behavior and social competence, mainly corresponding with those in the parental and telephone interviews.

**2.2.6. Childcare center reports - structure and process.** A comprehensive questionnaire addressing quality, structure, process, and educational content administered annually for three years (2009-2011) to the leaders as well as the teachers of child care centers in the study's catchment area (~ 135 centers). Additionally, centers that enrolled 5-years-olds in the project reported on the centers' school preparatory activities, including what specific school preparatory measures they implemented and how they were organized, the aims of the activities in terms of formal and informal learning processes and settings as well as the weighting of subject areas and social competencies.

**2.2.7. Personal interview with child care center leaders.** An interview (2009) with each childcare leader with in-depth questions on themes such as how centers address social competence and behavior problem development and children's participation in everyday life.

**2.2.8. Teacher reports - children.** Questionnaire reports comprising measures of social competence and behavior problems, school readiness, and short-term adjustment to school (social and academic), teacher-pupil relationships, and classroom environment.

## 2.3. PILOT STUDIES

To ascertain feasibility, time use, and acceptability to participants, the personal interviews, structured interactions, and telephone interviews for ages 0.5 to 3 years were piloted in small groups of parents ( $n \sim 30$  per group) sampled to resemble the future participants. The piloting of the structured interactions was a necessary prerequisite to the main study as these constituted a Norwegian adaptation and standardization of the procedures and measures.

## 2.4. STATISTICAL POWER AND SAMPLE CONSIDERATIONS

We set out to gather a representative sample from the general population of adequate size to investigate the main research objectives. Thus, sites in five municipalities in Southeast Norway were chosen that, despite a relatively limited geographical spread, represent a fair variation in key demographic variables, approximating those at the national level. Extensive power analyses were conducted according to a proposed design on growth and growth mixture modeling, which included several series of simulations in M-plus [57]. An original sampling plan based on this first set of analyses was designed to extend the recruitment period for girls after all boys would have been recruited, in order to gather a larger sample of girls (750) than boys (550) with better power for gender-specific studies of behavior problems (assuming lower levels in girls as previously found). However, the recruitment progressed slower than expected, and the plan of an extended recruitment period was abandoned. After having accordingly adjusted sampling plan to projected equal numbers (550) of boys and girls, a second set of power analyses was performed. In

these analyses, for standard growth modeling, the minimum detectable latent correlation to the slope proved to be .30 in gender-specific groups, corresponding to an observed  $R^2$  of 3.6%, a small effect by social science standards. For growth mixture modeling, the results suggested minimum detectable effects ranging from .28 to .47 in gender-specific groups - that is, small to medium effect sizes by social science standards.

### 3. ETHICS

The study, including recruitment of participants, data collection up to age 4, a project period to 2026, and limited use of official registry data, was originally approved by The Regional Committee for Medical and Health Research Ethics and the Norwegian Social Science Data Services. The continuation after age 4, including data collection in school, extension of the project period to 2036, and extended use of official registry data has furthermore been approved by the Regional Committee. The project is based on informed consent of parents, who may withdraw participation and ask for deletion of collected data. Childcare centers and schools participate optionally in the data collection.

## 4. SAMPLE

### 4.1. COMPOSITION

Families were informed about the project in 2006-2008 at the 5-month visit at child health clinics in the following five municipalities in the counties of Telemark and Buskerud: Bamble, Drammen, Porsgrunn, Skien and Tinn. In Norway, child health clinics are public and free and attended almost universally. The inclusion criterion was the child being the appropriate age and at least one parent being able to participate without a translator. Families were informed by the nurse, and provided contact information if agreeing to be contacted. The families of 1,931 eligible children received information, of which 1,465 (76%) accepted to be contacted, and 1,159 (79%, or 60% of those originally informed) eventually agreed to participate. The number of participating children by sex and sibling status is shown in Table 1.

*Table 1. Recruited children by gender and sibling status in the BONDS*

Siblings in project	Gender	
	Boys	Girls
Singletons with no siblings in project	565	523
Singletons with a sibling in project (13 pairs)	14	12
Twins (21 pairs)	18	24
Triplets (1 set)	3	0
Total	600	559

## 4.2. REPRESENTATIVENESS

Table 2 compares key demographic variables reported by parents compared to anonymous records of the 1,931 eligible families kept by the clinics, and population statistics for Norway for 2006-2008.

*Table 2. Key demographic variables in the BONDS sample, in the group of eligible families informed about the project at child health clinic visits, and for births in Norway in the years of the recruitment period*

Variable	Participants <sup>a</sup>	Child health clinic visits <sup>b</sup>	Births in Norway 2006–2008
	N=1,159	N=1,931	N=177,501
Baby's gender (Male)	51.8%	51.0%	51.3% <sup>c</sup>
Birth order (Firstborn)	47.1%	46.3%	42.6% <sup>c</sup>
Mother's birth country (Foreign - Europe)	7.0%	5.3% <sup>d</sup>	10.4% <sup>e</sup>
Mother's birth country (Outside Europe)	6.2%	7.7% <sup>d</sup>	12.0% <sup>e</sup>
Mother's age at birth (Average)	30.2 years	-- <sup>f</sup>	30.3 years <sup>c</sup>
Mother's age at birth (Standard deviation)	4.9 years	-- <sup>f</sup>	5.2 years <sup>c</sup>
Mother's civil status (Single)	4.7%	4.7%	11.4% <sup>c</sup>
Mother's civil status (Married)	47.2%	-- <sup>g</sup>	45.2% <sup>c</sup>
Mother's education (Only primary)	3.6%	5.9% <sup>d</sup>	17.5% <sup>h</sup>
Mother's education (College/University)	58.1%	57.1% <sup>d</sup>	50.3% <sup>h</sup>
Father's birth country (Foreign - Europe)	4.6%	-- <sup>f</sup>	-- <sup>i</sup>
Father's birth country (Outside Europe)	5.0%	-- <sup>f</sup>	-- <sup>i</sup>
Father's age at birth (Average)	32.8 years	-- <sup>f</sup>	33.4 years <sup>c</sup>
Father's age at birth (Standard deviation)	5.4 years	-- <sup>f</sup>	-- <sup>i</sup>
Father's education (Only primary)	4.2%	-- <sup>f</sup>	-- <sup>i</sup>
Father's education (College/University)	46.6%	-- <sup>f</sup>	-- <sup>i</sup>

*Note.* <sup>a</sup>Parent-interview data calculated by children. Families with more than one child in study are represented several times. Number of missing data points for baby and mother variables ranged from 0 (for sex) to 16 (1.4%, for mother's birth country). Number of missing data points for father variables ranged from 23 (2.0%, for age) to 261 (22.5%, for birth country). Missing data occurred due to technical failure, incomplete interviews, non-participating fathers, and the wish to withdraw collected data of two families who had terminated participation at the time of publication of this article. <sup>b</sup>Anonymous records kept by child health clinics. Number of missing data points ranged from 8 (0.4% for sex) to 168 (8.7%, for education level). Missing data occurred due to facts not known or not noted by child health clinic nurses. <sup>c</sup>Official statistics provided by Statistics Norway (available online on [www.ssb.no](http://www.ssb.no)). <sup>d</sup>Out of parents who came to the visit (in 80% of visits the mother alone, in 18% mother and father together, and in 2% the father or a grandparent without the mother) <sup>e</sup>Out of 161,308 mothers who gave birth in 2006-2008 in Norway; statistic provided by Statistics Norway on request from project, 2009. <sup>f</sup>Not available. <sup>g</sup>Not available (civil status was recorded as either single or married/cohabitating). <sup>h</sup>Highest attained educational level in 2009 for 145,989 mothers who had contributed official registry data on education out of the 161,308 mothers who gave birth in 2006-2008 in Norway; statistic provided by Statistics Norway on request from project, 2009. <sup>i</sup>Data not readily available and not obtained.

The sample fairly well resembles the eligible families, with differences of no more than 1.7 percentage units for all comparisons except for that concerning mother's education, suggesting that the sample seems biased towards fewer mothers with primary education only. In comparison with official statistics, the sample resembles the general population closely as regards child's gender and mother's age at birth. Both the sample and the eligible group consist of more firstborns than the general population; we do not know the reason why. A similar pattern is seen with respect to mother's civil status: The sample and the eligible families have an equal proportion of single mothers, in contrast to a more than double proportion in the population. This difference may partly be due to some parents' living together in practice while being officially registered at different addresses. The sample furthermore contains a larger proportion of European-born mothers and a smaller proportion of those born outside Europe than the group of eligible

families, and a substantially smaller proportion of foreign-born mothers than in the Norwegian population. Given the inclusion criterion of mastery of the Norwegian language, this was expected. While the sample and the eligible group both seem to differ importantly from population statistics with respect to education, it is difficult to evaluate the extent to which this is caused by a bias or by method differences. The population statistics tally completed degrees only; whereas parents' self-reports probably include a wider range of educative experiences. Other Norwegian population-based studies using self-reports of educational level on the same response format as BONDS report more comparable levels. For example, in a sample of 46,549 mothers from the Norwegian Mother and Child Cohort Study, Lygre, Björkman, Haug, Skjerven, and Helland [58] reported 2.5% of mothers with primary education only and 63.3% of mothers with College/University education. Furthermore, fathers are on average 2.6 years older than mothers, but fathers and mothers seem largely similar with respect to education. The sample contains somewhat fewer foreign-born fathers than mothers.

All in all, the current sample seems somewhat biased towards mothers with higher education, fewer immigrant parents, more firstborns, and possibly fewer single mothers. A bias towards higher education is a common finding in most research based on voluntary participation. A bias towards more firstborns has likewise been found in previous studies (e.g., [59]). As mentioned, the inclusion criteria partly caused the bias towards fewer immigrated mothers. It is important to emphasize that the probable bias present does not seem to grossly distort the sample. While non-firstborns, parents with lower education, and immigrant parents are underrepresented, they are far from non-existent and incorporating appropriate weighting procedures in analyses may partially compensate for the bias.

### 4.3. RETENTION RATES

Several strategies have been applied to increase the likelihood of keeping the respondents over time. Participants were assigned to one interviewer for continuity of contact. A small monetary compensation is given to participants for their time spent at interviews (e.g., NOK 200, about USD 35 in 2011 currency, for participating parents at personal interviews up to age 4). Telephone interviews are kept short. Newsletters are distributed twice a year, and up to age 4 an annual lottery took place, in which NOK 10 000 (~ USD 1700 in 2011 currency) was disbursed to a randomly chosen participating family. The overall retention rate is very high: Families of 96.5% ( $n=1118$  out of 1159) of the children continued to consent to participate in data collections up to age 4, and at that particular age 93.4% ( $n=1082$ ) participated in a personal interview.

## 5. CONCLUSION

BONDS is an ongoing study of development of behavior problems and social competence. It will provide a vast, high-quality dataset, and its unique features comprise: (a) a large population based sample followed longitudinally; (b) multi-method and multi-informant data collection; (c) a sample large enough to permit to detect reasonably small effects; (d) high retention rate; and (e) possibilities for future linkages of developmental data with outcomes from official registries. In order to be able to modify factors that foster healthy development, there is a need to examine the early developmental periods and identify turning points in children's trajectories [60]. BONDS will provide some of the missing pieces to make this happen.

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**BONDS (THE BEHAVIOR OUTLOOK NORWEGIAN DEVELOPMENTAL STUDY):**  
A prospective longitudinal study of early development of social competence and behavior problems

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## ABSTRACT

This report describes the rationale, goals, methods and sample of an ongoing prospective, longitudinal Norwegian study of early social development; BONDS (The Behavior Outlook Norwegian Developmental Study). The study aims at generating knowledge about the development of social competence and behavior problems from 6 months and onward. The design enables the study of influences on development from fathers and mothers as well as of children's childcare and school experiences. Frequent multi-method, multi-informant measures of children's behavior and development as well as family, child care centers, and school factors are included. Starting in 2006, the recruitment of the 1159 children was completed in 2008. The overall retention rate is high: 96.5% of the children and families continued to consent to participate in data collections up to age 4, and at that particular age 93.4% still participated. The study's unique contribution is its focus on early development in a large sample, using multi-informant data including videotaped structured parent-child interactions as well as extensive interviews and questionnaires with fathers and mothers and with child care centers and school personnel.

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## 1. BACKGROUND

Knowledge about development of social competence and behavior problems is imperative for optimizing the possibility for healthy and successful developmental outcomes. An understanding of risk and protective factors and of the processes leading to positive or negative developmental pathways will aid in the design of preventive interventions and the promotion of well being.

Longitudinal developmental research has provided major breakthroughs in the understanding of children's key social-developmental tasks. This comprises the acquisition of social skills necessary for getting along with other people, to perform adequately in school, and to comply with norms and rules [1]. Findings imply longitudinal impacts of social competence on later adjustment [2], and children who show deficits in the social arena are at risk for maladjustment, including academic failure, externalizing and internalizing problems, and delinquency [3,4]. Nonetheless, longitudinal studies examining the development of competence are still outnumbered by those mainly focusing on problem behavior.

The development of social competence is best considered within a socio-ecological framework comprising child, family, and peer group/school factors [5]. Child factors predictive of social competence include joint attention [6], social-cognitive skills including theory of mind [7], and language skills [8]. Family factors include quality of interactions and family composition [9,10].

Externalizing behavior problems like aggression, defiance, and noncompliance are commonly observed during the preschool years [11]. A recent review [12] of developmental trajectories of behavior problems (i.e. physical aggression and opposition-defiance), suggests that such behavior is universal during early childhood, and that most, albeit not all, children learn acceptable behaviors with age. Levels of childhood behavior problems are strongly predictive of difficulties in adolescence and early adulthood [13-17]. Some children have stable trajectories of high levels of behavior problems [18,19]. Several risk factors related to the child, family, and child care or school contribute [20], including difficult child temperament [21], negative family processes [22], and long hours in low-quality child care [23].

Models for the development of behavior problems have mainly been validated for boys [24] and knowledge is thus lacking concerning the role of gender. Partly because behavior problems are thought to be less prevalent among girls and consequently less researched, and partly because girls' behaviors may be less visible, we have fairly limited empirical evidence concerning girls [25]. Also, systematic gender differences seem difficult to detect before the age of four or five [19]. Further studies are needed to determine if developmental mechanisms are gender-specific, and whether there are main or moderating effects of gender on developmental processes or outcomes.

Gender differences in social competence have been found as early as 24 months of age [26]. Girls in preschool seem to engage in more pro-social behaviors than boys [27] and generally exhibit more mature forms of social behavior at a young age [28]. Several studies support the notion that girls are perceived as being more prosocial than boys [29,30].

Early onset behavior problems have been found to be accompanied by lack of social competence [31], although results do indicate a complex relationship between these domains across development [32]. Social competence and behavior problems are generally considered as opposite ends of a single dimension. However, given the moderate empirical association between these constructs, it has been suggested that they rather be conceptualized as two separate, but related dimensions under the overarching domain of social functioning [33].

The understanding of fathers' role in children's development is limited. Despite a general agreement that fathers have a significant function in children's lives, a striking characteristic of the developmental literature is the almost complete lack of paternal reports on young children's behavior. This may have caused a large portion of unexplained variance in the outcomes of developmental studies, or even led to incorrect interpretation of data, including attributing too much importance to mothers' influence [34].

Fathers' involvement in the care of their children is an important objective of Norwegian family policy [35], and fathers in Norway do seem to spend an increasing amount of time with their infants. This is

particularly so after the introduction in 1998 of a more flexible parental leave program [36], including a "father's quota" exclusive for the father. Consequently, a vast majority of Norwegian fathers with children born after 1998 have taken up to 6 weeks leave of absence in connection with the child's birth [37]. The Norwegian setting thus provides a particularly good starting point for studying the importance of fathers for children's social development.

Childcare centers are considered to be a potential arena for providing language and social stimulation, and for promoting children's social and cognitive competence. Accordingly, high-quality center care is related to more advanced development and academic achievement in a short time perspective [38] as well as into school age and adolescence [39-41]. Positive experiences with peers in childcare furthermore seem to predict better social and communicative skills with peers in third grade [42]. Yet, findings indicate that group experiences in childcare settings may sometimes be detrimental to the subsequent development of social competence; however interpretations concerning possible mechanisms diverge [42].

One review of US based research summarized that for some children, childcare center attendance is associated with elevated levels of behavior problems [43], an effect which may last up to 12 years of age [39]. The adverse effect of hours spent in childcare may be limited to children in low-quality care or large child groups [23]. Recent results [41] suggested high-quality early childcare to predict youth reports at age 15 of lower levels of externalizing problems. Notably, studies from cultural contexts outside of the U.S. have not found center care attendance to predict behavior problems (e.g. [44,45]).

A universal outreach of subsidized and generally high-quality center care has long been a priority for the Norwegian governments [46]. Accordingly, altogether 88.5% of children in Norway attended center care in 2009 [47]. Still, there is a remarkable lack of Nordic research on effects of universal childcare, and thus a call for longitudinal studies within such a setting [48].

Starting school is an important developmental milestone and may be challenging for some children [49,50]. This transition, which most likely is influenced both by childcare attendance and child and family factors, can have a lasting impact on children's views of themselves, their well being, and their ability to learn [51]. Some types of skills and behaviors at the time of school entry are found to be associated with later performance [52], and recent results suggest that certain prosocial and antisocial behavior show stability across the transition to school [53]. There is however a lack of knowledge about the factors that moderate stability and change, and how they interact.

## 2. DESIGN

### 2.1. STUDY RATIONALE AND GOAL

The BONDS (Behavior Outlook Norwegian Developmental Study) conducted by the Norwegian Center for Child Behavioral Development, focuses on children's social development from 6 months onwards, with respect to social competence and behavior problems. Social developmental processes evolve in close interplay with those in other areas, in particular cognitive development and development of symptoms which co-occur with behavior problems (including impulsivity, hyperactivity, depression, and anxiety). Social development furthermore takes place in continual interactions with others, in which reciprocal influences are exerted over time. At the earliest ages, these transactional processes primarily engage the child's parents/caregivers. With age, siblings and peers become increasingly important. Social-ecological, relational, temperamental, biological, and health-related factors, in turn, influence children's social development, directly or indirectly through the interpersonal processes involved. The conceptual framework of the BONDS is shown in Figure 1.

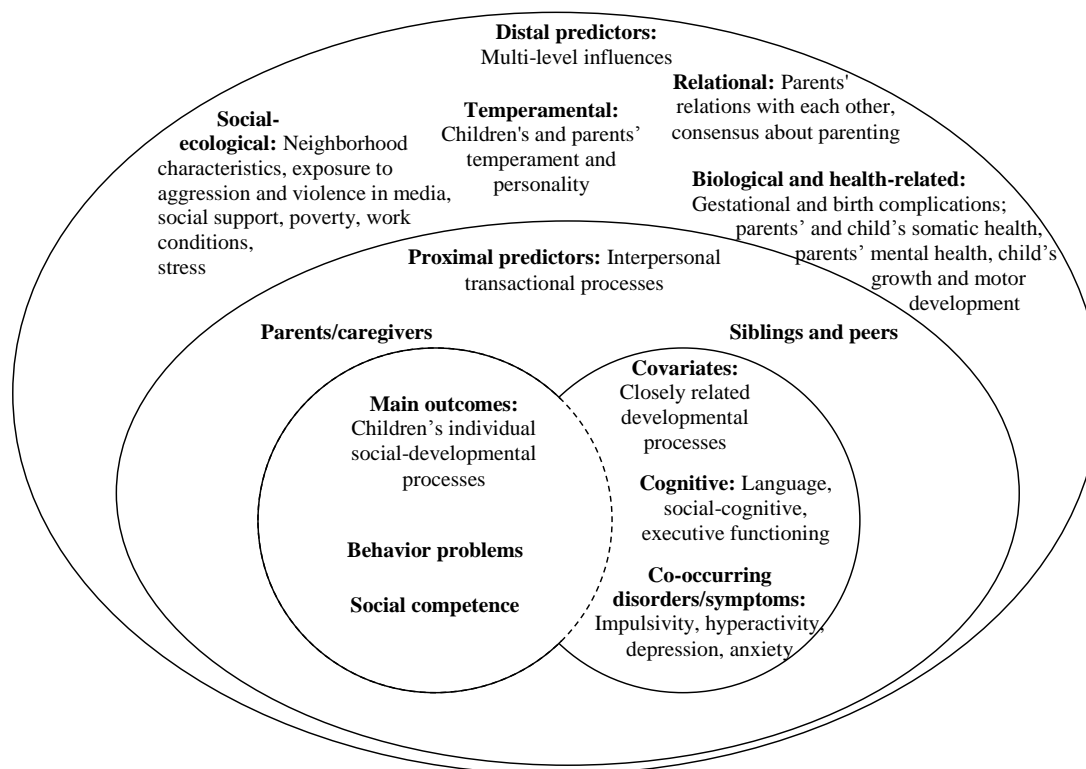


Figure 1. Conceptual framework for the BONDS.

The study is guided by Bronfenbrenner's social-ecological framework [5] and that of the social interaction-learning model (SIL; [54, 22]). The social-ecological framework addresses the interaction between individual, family, community, and institutional factors related to children's upbringing and take into account the complex interactions between multiple individual and environmental circumstances. Likewise, the SIL model draws on ecological and transactional principles holding that children's behavior is directly affected by parenting and by transactional patterns within the family and with peers.

A specific aim of the BONDS is to identify individual developmental pathways leading to competence and problems. Another objective is to provide an empirical basis for the early identification of children at risk. The study is designed to contribute new knowledge about the role of fathers and that of child care experiences for children's subsequent development. The project further aims at elucidating how behavior problems and social competence influence social and academic exclusion and inclusion throughout childcare and in the early school years. Altogether, this study provides a unique opportunity to test several competing hypothesis about children's early experiences and their later development, and results may suggest possible points for prevention and intervention.

## 2.2. DATA COLLECTION AND MEASURES

The BONDS is designed to include comprehensive and frequent multi-method, multi-informant measures of the main focal variables (children's behavior problems and social competence), extensive measures of related developmental processes and interpersonal interactions with parents and peers, and appropriate measures of a wide range of direct or indirect influences. Standardized psychometric scales previously used in quantitative national and international research are employed when possible and feasible. At the current time, data collection up to 5 years is completed, while data collection after school entry and in the second school year is ongoing. Figure 2 graphs the various waves of data collection. The data collection modes of the study are described in the following sections.

Activity	Child age	Year of data collection 2006-2016														
		06	07	08	09	10	11	12	13	14	15	16				
Parent interviews (including self-report questionnaire, videotaped interaction, and child assessment)	0.5		██████████													
	1 <sup>a</sup>		██████████													
	2 <sup>a</sup>			██████████												
	3 <sup>a</sup>				██████████											
	4 <sup>bc</sup>					██████████										
	5 <sup>d</sup>						██████████									
	SE <sup>be</sup>									██████	██████	██████				
School teacher questionnaire	SY2 <sup>df</sup>											██████	██████	██████		
	SE <sup>e</sup>											██████	██████	██████		
	SY2 <sup>f</sup>												██████	██████		
C.c.c. child questionnaire	2			██████████												
	3				██████████											
	4					██████████										
C.c.c. environment questionnaire	-- <sup>g</sup>				██████	██████	██████									
C.c.c. environment interview	-- <sup>g</sup>				██████████											
C.c.c. school-preparatory activities interview	5 <sup>h</sup>									██████████						

Note. <sup>a</sup>Including videotaped interaction with one parent. <sup>b</sup>Including child language development assessment. <sup>c</sup>Including child motor development and Effortful Control assessment. <sup>d</sup>Extended telephone interview. <sup>e</sup>After school entry, which normally takes place in August of the year of the child's 6th birthday. <sup>f</sup>In second school year. <sup>g</sup>Data collection concerning child care centers independent of the child's age. <sup>h</sup>School preparatory activities in child care centers.

Figure 2. Completed and ongoing data collection waves of the BONDS, January 2014. Child's age given in years. Lines represent data collection waves completed and ongoing as per January 2014. Brief parent telephone interviews in-between personal parent interviews from age 0.5 to 4 years are not shown. Abbreviation: C.c.c.=Childcare center.

**2.2.1. Parental interviews and questionnaires.** The assessments comprise a parent-completed computer-administered questionnaire section in addition to the interview. Interviews are carried out at 0.5 (both parents), 1 (father), 2 (mother), 3 (father), and 4 years (mother, and also a questionnaire to father), as well as after school entry (in the autumn of the year of the child's 6th birthday). The interviews are conducted by trained locally employed project staff, and take place in offices at the project's disposal, or in the participants' home if preferred.

**2.2.2. Videotaped structured interactions.** The child and parent completed a set of interaction tasks (12-15 minutes) for videotaped structured observation in connection with the interviews at 1, 2, and 3 years. The set up was standardized and manual-driven and included free-play, cleaning-up, teaching, waiting, and/or inhibition tasks. The tasks were adapted from other studies [55, 56], and designed to capture behavior variation meaningful for the development of behavior problems and social competence.

**2.2.3. Brief assessment – language and motor development and effortful control skills.** This assessment of the child by means of standardized brief testing of language and motor development as well as effortful control was carried out in connection with the interview at age 4 by trained project staff.

**2.2.4. Telephone interviews.** Brief telephone interviews (ca. 5-7 minutes) were conducted at about 8, 10, 15, 18, 21, 28, 32, and 42 months, and in addition 2 and 1 months before as well as 1, 2, and 3 months

after entry to center-based child care (if known to project staff). These telephone interviews included a subset of questions posed in the personal interviews. Extended telephone interviews (ca. 20 minutes), containing additional content analogous to the full personal interviews, are conducted with one of the parents at 5 years, as well as in the second school year (i.e., the year of the child's 7<sup>th</sup> birthday).

**2.2.5. Childcare center reports - children.** Questionnaire reports completed by child care center staff at 2, 3 and 4 years, which include a comprehensive item pool of children's problem behavior and social competence, mainly corresponding with those in the parental and telephone interviews.

**2.2.6. Childcare center reports - structure and process.** A comprehensive questionnaire addressing quality, structure, process, and educational content administered annually for three years (2009-2011) to the leaders as well as the teachers of child care centers in the study's catchment area (~ 135 centers). Additionally, centers that enrolled 5-years-olds in the project reported on the centers' school preparatory activities, including what specific school preparatory measures they implemented and how they were organized, the aims of the activities in terms of formal and informal learning processes and settings as well as the weighting of subject areas and social competencies.

**2.2.7. Personal interview with child care center leaders.** An interview (2009) with each childcare leader with in-depth questions on themes such as how centers address social competence and behavior problem development and children's participation in everyday life.

**2.2.8. Teacher reports - children.** Questionnaire reports comprising measures of social competence and behavior problems, school readiness, and short-term adjustment to school (social and academic), teacher-pupil relationships, and classroom environment.

## 2.3. PILOT STUDIES

To ascertain feasibility, time use, and acceptability to participants, the personal interviews, structured interactions, and telephone interviews for ages 0.5 to 3 years were piloted in small groups of parents ( $n \sim 30$  per group) sampled to resemble the future participants. The piloting of the structured interactions was a necessary prerequisite to the main study as these constituted a Norwegian adaptation and standardization of the procedures and measures.

## 2.4. STATISTICAL POWER AND SAMPLE CONSIDERATIONS

We set out to gather a representative sample from the general population of adequate size to investigate the main research objectives. Thus, sites in five municipalities in Southeast Norway were chosen that, despite a relatively limited geographical spread, represent a fair variation in key demographic variables, approximating those at the national level. Extensive power analyses were conducted according to a proposed design on growth and growth mixture modeling, which included several series of simulations in M-plus [57]. An original sampling plan based on this first set of analyses was designed to extend the recruitment period for girls after all boys would have been recruited, in order to gather a larger sample of girls (750) than boys (550) with better power for gender-specific studies of behavior problems (assuming lower levels in girls as previously found). However, the recruitment progressed slower than expected, and the plan of an extended recruitment period was abandoned. After having accordingly adjusted sampling plan to projected equal numbers (550) of boys and girls, a second set of power analyses was performed. In



these analyses, for standard growth modeling, the minimum detectable latent correlation to the slope proved to be .30 in gender-specific groups, corresponding to an observed  $R^2$  of 3.6%, a small effect by social science standards. For growth mixture modeling, the results suggested minimum detectable effects ranging from .28 to .47 in gender-specific groups - that is, small to medium effect sizes by social science standards.

### 3. ETHICS

The study, including recruitment of participants, data collection up to age 4, a project period to 2026, and limited use of official registry data, was originally approved by The Regional Committee for Medical and Health Research Ethics and the Norwegian Social Science Data Services. The continuation after age 4, including data collection in school, extension of the project period to 2036, and extended use of official registry data has furthermore been approved by the Regional Committee. The project is based on informed consent of parents, who may withdraw participation and ask for deletion of collected data. Childcare centers and schools participate optionally in the data collection.

## 4. SAMPLE

### 4.1. COMPOSITION

Families were informed about the project in 2006-2008 at the 5-month visit at child health clinics in the following five municipalities in the counties of Telemark and Buskerud: Bamble, Drammen, Porsgrunn, Skien and Tinn. In Norway, child health clinics are public and free and attended almost universally. The inclusion criterion was the child being the appropriate age and at least one parent being able to participate without a translator. Families were informed by the nurse, and provided contact information if agreeing to be contacted. The families of 1,931 eligible children received information, of which 1,465 (76%) accepted to be contacted, and 1,159 (79%, or 60% of those originally informed) eventually agreed to participate. The number of participating children by sex and sibling status is shown in Table 1.

*Table 1. Recruited children by gender and sibling status in the BONDS*

Siblings in project	Gender	
	Boys	Girls
Singletons with no siblings in project	565	523
Singletons with a sibling in project (13 pairs)	14	12
Twins (21 pairs)	18	24
Triplets (1 set)	3	0
Total	600	559

## 4.2. REPRESENTATIVENESS

Table 2 compares key demographic variables reported by parents compared to anonymous records of the 1,931 eligible families kept by the clinics, and population statistics for Norway for 2006-2008.

*Table 2. Key demographic variables in the BONDS sample, in the group of eligible families informed about the project at child health clinic visits, and for births in Norway in the years of the recruitment period*

Variable	Participants <sup>a</sup>	Child health clinic visits <sup>b</sup>	Births in Norway 2006–2008
	N=1,159	N=1,931	N=177,501
Baby's gender (Male)	51.8%	51.0%	51.3% <sup>c</sup>
Birth order (Firstborn)	47.1%	46.3%	42.6% <sup>c</sup>
Mother's birth country (Foreign - Europe)	7.0%	5.3% <sup>d</sup>	10.4% <sup>e</sup>
Mother's birth country (Outside Europe)	6.2%	7.7% <sup>d</sup>	12.0% <sup>e</sup>
Mother's age at birth (Average)	30.2 years	-- <sup>f</sup>	30.3 years <sup>c</sup>
Mother's age at birth (Standard deviation)	4.9 years	-- <sup>f</sup>	5.2 years <sup>c</sup>
Mother's civil status (Single)	4.7%	4.7%	11.4% <sup>c</sup>
Mother's civil status (Married)	47.2%	-- <sup>g</sup>	45.2% <sup>c</sup>
Mother's education (Only primary)	3.6%	5.9% <sup>d</sup>	17.5% <sup>h</sup>
Mother's education (College/University)	58.1%	57.1% <sup>d</sup>	50.3% <sup>h</sup>
Father's birth country (Foreign - Europe)	4.6%	-- <sup>f</sup>	-- <sup>i</sup>
Father's birth country (Outside Europe)	5.0%	-- <sup>f</sup>	-- <sup>i</sup>
Father's age at birth (Average)	32.8 years	-- <sup>f</sup>	33.4 years <sup>c</sup>
Father's age at birth (Standard deviation)	5.4 years	-- <sup>f</sup>	-- <sup>i</sup>
Father's education (Only primary)	4.2%	-- <sup>f</sup>	-- <sup>i</sup>
Father's education (College/University)	46.6%	-- <sup>f</sup>	-- <sup>i</sup>

*Note.* <sup>a</sup>Parent-interview data calculated by children. Families with more than one child in study are represented several times. Number of missing data points for baby and mother variables ranged from 0 (for sex) to 16 (1.4%, for mother's birth country). Number of missing data points for father variables ranged from 23 (2.0%, for age) to 261 (22.5%, for birth country). Missing data occurred due to technical failure, incomplete interviews, non-participating fathers, and the wish to withdraw collected data of two families who had terminated participation at the time of publication of this article. <sup>b</sup>Anonymous records kept by child health clinics. Number of missing data points ranged from 8 (0.4% for sex) to 168 (8.7%, for education level). Missing data occurred due to facts not known or not noted by child health clinic nurses. <sup>c</sup>Official statistics provided by Statistics Norway (available online on [www.ssb.no](http://www.ssb.no)). <sup>d</sup>Out of parents who came to the visit (in 80% of visits the mother alone, in 18% mother and father together, and in 2% the father or a grandparent without the mother) <sup>e</sup>Out of 161,308 mothers who gave birth in 2006-2008 in Norway; statistic provided by Statistics Norway on request from project, 2009. <sup>f</sup>Not available. <sup>g</sup>Not available (civil status was recorded as either single or married/cohabitating). <sup>h</sup>Highest attained educational level in 2009 for 145,989 mothers who had contributed official registry data on education out of the 161,308 mothers who gave birth in 2006-2008 in Norway; statistic provided by Statistics Norway on request from project, 2009. <sup>i</sup>Data not readily available and not obtained.

The sample fairly well resembles the eligible families, with differences of no more than 1.7 percentage units for all comparisons except for that concerning mother's education, suggesting that the sample seems biased towards fewer mothers with primary education only. In comparison with official statistics, the sample resembles the general population closely as regards child's gender and mother's age at birth. Both the sample and the eligible group consist of more firstborns than the general population; we do not know the reason why. A similar pattern is seen with respect to mother's civil status: The sample and the eligible families have an equal proportion of single mothers, in contrast to a more than double proportion in the population. This difference may partly be due to some parents' living together in practice while being officially registered at different addresses. The sample furthermore contains a larger proportion of European-born mothers and a smaller proportion of those born outside Europe than the group of eligible

families, and a substantially smaller proportion of foreign-born mothers than in the Norwegian population. Given the inclusion criterion of mastery of the Norwegian language, this was expected. While the sample and the eligible group both seem to differ importantly from population statistics with respect to education, it is difficult to evaluate the extent to which this is caused by a bias or by method differences. The population statistics tally completed degrees only; whereas parents' self-reports probably include a wider range of educative experiences. Other Norwegian population-based studies using self-reports of educational level on the same response format as BONDS report more comparable levels. For example, in a sample of 46,549 mothers from the Norwegian Mother and Child Cohort Study, Lygre, Björkman, Haug, Skjerven, and Helland [58] reported 2.5% of mothers with primary education only and 63.3% of mothers with College/University education. Furthermore, fathers are on average 2.6 years older than mothers, but fathers and mothers seem largely similar with respect to education. The sample contains somewhat fewer foreign-born fathers than mothers.

All in all, the current sample seems somewhat biased towards mothers with higher education, fewer immigrant parents, more firstborns, and possibly fewer single mothers. A bias towards higher education is a common finding in most research based on voluntary participation. A bias towards more firstborns has likewise been found in previous studies (e.g., [59]). As mentioned, the inclusion criteria partly caused the bias towards fewer immigrated mothers. It is important to emphasize that the probable bias present does not seem to grossly distort the sample. While non-firstborns, parents with lower education, and immigrant parents are underrepresented, they are far from non-existent and incorporating appropriate weighting procedures in analyses may partially compensate for the bias.

### 4.3. RETENTION RATES

Several strategies have been applied to increase the likelihood of keeping the respondents over time. Participants were assigned to one interviewer for continuity of contact. A small monetary compensation is given to participants for their time spent at interviews (e.g., NOK 200, about USD 35 in 2011 currency, for participating parents at personal interviews up to age 4). Telephone interviews are kept short. Newsletters are distributed twice a year, and up to age 4 an annual lottery took place, in which NOK 10 000 (~ USD 1700 in 2011 currency) was disbursed to a randomly chosen participating family. The overall retention rate is very high: Families of 96.5% ( $n=1118$  out of 1159) of the children continued to consent to participate in data collections up to age 4, and at that particular age 93.4% ( $n=1082$ ) participated in a personal interview.

## 5. CONCLUSION

BONDS is an ongoing study of development of behavior problems and social competence. It will provide a vast, high-quality dataset, and its unique features comprise: (a) a large population based sample followed longitudinally; (b) multi-method and multi-informant data collection; (c) a sample large enough to permit to detect reasonably small effects; (d) high retention rate; and (e) possibilities for future linkages of developmental data with outcomes from official registries. In order to be able to modify factors that foster healthy development, there is a need to examine the early developmental periods and identify turning points in children's trajectories [60]. BONDS will provide some of the missing pieces to make this happen.

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