Effect of gestational age on special education: a population-based matched cohort analysis

Tessa de Baat ,[1] Anita C J Ravelli,[2,3] Cornelieke S H Aarnoudse-Moens,[1] Ameen Abu-Hanna,[3] Aleid G Leemhuis[1]

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[1]Department of Neonatology, Emma Children's Hospital, Amsterdam UMC, location University of Amsterdam, Meibergdreef 9, Amsterdam, The Netherlands
[2]Department of Obstetrics and Gynaecology, Reproductive and Development, Amsterdam UMC Location AMC, Amsterdam, The Netherlands
[3]Department of Medical Informatics, Amsterdam UMC Location AMC, Amsterdam, The Netherlands

Correspondence to
Tessa de Baat;
t.debaat@amsterdamumc.nl

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ABSTRACT

Objective To investigate the effect of gestational age on special education use at primary school age, and to examine specific groups with elevated risk.

Design, setting and patients Population-based matched cohort study linking data from the Dutch national perinatal registry (PERINED) of all singleton surviving children without major congenital abnormalities, born between 25^{+0} and 42^{+6} weeks of gestation between 1999 and 2009, with data of the mandatory special education registry of Statistics Netherlands.

Main outcome measures Use of special education at primary school age.

Results 1 814 540 children were included. Overall prevalence of special education was 6.6%, with highest rates in children born at 25 weeks (34.7%) and lowest at 40 weeks (5.7%). Elevated adjusted ORs for special education compared with the reference of 40 weeks were found in all gestational age groups (25–29 weeks, 30–31 weeks, 32–36 weeks, 37–39 weeks and 41–42 weeks), with the highest adjusted OR (3.50 (95% CI, 3.26 to 3.77)) in children born at 25–29 weeks. Comparable ORs were obtained after 1 to 1 exact matching with controls born at 40 weeks. Low maternal education, male sex, small for gestational age and 5-min Apgar score<7 increased special education use at week 25 and above.

Conclusion There is a strong inverse effect of gestational age on special education use in this complete nationwide, decennium birth cohort. Increased risk of special education use is still present in late preterms and those born at early-term or post-term.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Use of special education is more common among children born preterm, especially in those born at the lowest end of prematurity.

⇒ Unbiased and complete data on special education use over the full range gestation is of importance to midwives, gynaecologists, paediatricians, but also to parents, other caregivers, teachers, policymakers and society.

WHAT THIS STUDY ADDS

⇒ This large study with robust data shows a strong effect of gestational age on special education use over the full range of gestation, with highest risk among very preterm born but still increased risk in children born at early term (37–39 weeks) or post-term (41–42 weeks) compared with those born at 40 weeks.

⇒ Besides gestational age, low maternal education, male sex, being born small for gestational age and 5-min Apgar score<7 are independent risk factors that contribute to the risk of special education use, particularly in children born above 32–34 weeks.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Special education is valuable as an endpoint in research on long-term effects of interventions studied in randomised trials in perinatal and neonatal medicine.

INTRODUCTION

Based on estimates from 2020, global prevalence of preterm birth was 9.9%, which amounts to 13.4 million live births before a gestational age (GA) of 37 weeks.[1] Preterm birth is associated with cognitive, sensory, neuromotor and behavioural disabilities,[2] which may lead to special educational needs (SEN). SEN is more common among children born preterm, especially in those born at the lowest end of prematurity.[3] A study by van Beek *et al* demonstrated both lower academic attainment test scores and higher special education (SE) participation in a population-based cohort of preterm children born at $25^{0/7}$ to $29^{6/7}$ weeks of gestation, compared with term controls.[4] SEN, however, is not restricted to the very preterm population and occurs also in elevated rates in those born in late prematurity compared with those born at term.[5–8] Given that the late preterm population makes up the largest part of the total preterm population, disabilities at both ends of prematurity are of relevance.[9] Apart from low GA, risk factors for SEN are birth weight below the 10th percentile (small for gestational age; SGA), low socioeconomic status (SES), low maternal education and male sex.[3 10–12]

Care for children with SEN ranges, according to national policies, from support in mainstream classrooms to special school placement. In the Netherlands, SE schools are available for children with more severe special needs[13] and registration of placement in mainstream and SE schools is obligatory.

Unbiased data on SE use over the full range gestation is of importance to gynaecologists, paediatricians, but also to caregivers, teachers, policymakers and society. Therefore, the aim of this study is to investigate the effect of GA at birth on SE use at primary school age in a nation-wide

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decennium birth cohort. We linked mandatory SE data to the perinatal registry, and we used matching strategies to control for confounding. We also aimed to get more insight into risk or protective factors contributing to or mitigating the GA risk for SE use in primary education.

METHODS

Design and data sources

We performed a population-based matched cohort study by data linkage. Data sources included the national perinatal registry (PERINED; www.perined.nl), data of the SE registry and the mortality registry before age 15 years (Statistics Netherlands). The perinatal registry is population based, and the completeness of the perinatal registry is 96–97%. Completing entries in the national special education registries (INSCHRWECTAB and INSCHRWPOTAB) of Statistics Netherlands is mandatory.

Study population

All live born, surviving singletons over a decade (1999–2009) with a GA at birth of 25^{+0} to 42^{+6} weeks and in whom linkage between the perinatal registry and the Personal Records Database was possible, were included in the study. Children with major congenital anomalies and children deceased before the age of 15 were excluded.

Outcome measurement

Primary education in the Netherlands is mandatory and both mainstream education and schools for SE are financed by the Dutch government.

SE in the Netherlands has two distinct forms. The first form has mainstream educational goals (special primary education; SPE) and is intended for children with mild cognitive and behavioural problems, (www.government.nl/topics/primary-education/types-of-primary-school). These schools have smaller classes, with more educational support. The second form has no mainstream educational goals (formal SE) and is intended for children with severe visual impairment, severe hearing impairment, problems with speech or communication, physical or mental retardation and/or learning difficulties, or severe behavioural and/or psychiatric problems. The approval of SE and the choice of schooling system is made by educational indication committees.

All SE schools have an obligation to register that a particular child attends their school in the national registry in a specific year. For the main purpose of this paper both SPE and formal SE were taken together and reported as SE use. If a child visited both systems in the course of their primary school age this was identified, but for the primary outcome this was counted only once.

Special support in mainstream education was not counted as SE

Gestational age

GA was measured in completed weeks of gestation. For instance, 40 weeks indicate 40.0–40.6 weeks. GA was also used in combinations of weeks (25–29, 30–31, 32–36, 37–39, 40 and 41–42 weeks). 40 weeks was used as the reference.

Covariates

The following characteristics were examined as covariates and potential confounders: sex (female, male); maternal education (classified as high (university or applied science), intermediate (secondary vocational education or senior general education), low (primary school or lower vocational education) or unknown maternal education; maternal age (measured in year, entered as continuous and categorised into four groups; <24 years, 24–30 years, 31–35 years and ≥36 years); parity (divided into P0 (nulliparous), P1 and P2+); maternal ethnicity (Western and non-Western); SES (this is area based and defined by the Netherlands Institute of Social Research into quintiles with Q1 being least affluent (very low SES) and Q5 being most affluent (very high SES); birth weight centile according to the Hoftiezer reference charts[14] (whereby SGAp10 was a birth weight below the 10th percentile and large for gestational age (LGA)p95 was a birth weight equal to or above the 95th percentile for sex and GA); and 5-min Apgar score (AS) (risk scores categorised into <7 and <4). In addition, the year of birth was used.

In 55% of the women, maternal education level was missing in the Statistics Netherlands registry of highest achieved education. Therefore, a dummy variable indicating an unknown maternal education was used as a separate variable in the adjustment analysis. The proportion of missing values for the other covariates maternal age and SES was<1.0%. These variables were imputed with the chained equations approach.

Statistical analysis

Individual record linkage of the PERINED registry was done by a personal identification code (Random Identification Number, of the mother and the child) from the Personal Records Database (Basisregistratie Personen) within the secure environment of Statistics Netherlands (www.microdata.nl). Deterministic linkage is based on three variables: date of birth of mother, date of birth of child and four-digit zip code.

Maternal and child characteristics were analysed by groups of GA. Categorical variables were expressed as N and % and tested with the χ^2 test. Mean and SD were reported for continuous variables and tested with a t-test.

Percentage rates for SE use were calculated both for whole weeks of GA separately from 25 to 42 weeks and for the six groups of GA.

These analyses were done for SE total and separately for SPE and formal SE

Logistic regression was used to calculate unadjusted ORs for SE use, for the grouped GA, using the group born at 40 weeks as a reference.

Then, adjusted ORs (aOR) for SE use by GA groups were calculated. We first adjusted for sex of the child, parity, maternal age, ethnicity, SES, maternal education and year of birth. In addition, we adjusted for SGAp10, LGAp95 and 5-min AS<7.

All adjustment factors were tested for interaction with GA. If an interaction factor was significant then a stratified analysis of SE use by week of gestation was performed. Ratios for SE use in high risk compared with non-high risk groups were calculated by week of gestation.

Matching minimises bias. Every mother–preterm child pair was matched to a combination of mother and child born at 40 weeks. 1 to 1 exact matching was performed separately for the three groups of preterm birth (25–29 weeks; 30–31 weeks; 32–36 weeks) and the reference group of 40 weeks. Matching variables included maternal age groups, parity, maternal education, SES in quintiles, maternal ethnicity, sex of the child and year of birth.

Statistical analyses were conducted using SPSS (25.0) and R and RStudio (4.2.3) within the secure environment of Statistics Netherlands. Results are based on calculations using non-public microdata from Statistics Netherlands.

Table 1 Maternal and neonatal characteristics per gestational age group

	Gestational age group in weeks (N)														
	25–29 (4918)	%	30–31 (5712)	%	32–36 (89 638)	%	37–39 (787 415)	%	40 (505 938)	%	41–42 (420 919)	%	Total (1 814 540)	%	P value
Maternal age (years)															<0.0001
13–23	659	13.4	685	12.0	8807	9.8	66 159	8.4	42 219	8.3	35 108	8.3	153 637	8.5	
24–30	1635	33.2	1958	34.3	30 979	34.6	253 136	32.1	165 148	32.6	136 642	32.5	589 498	32.5	
31–35	1894	38.5	2264	39.6	37 511	41.8	351 891	44.7	229 550	45.4	190 726	45.3	813 836	44.9	
≥35	730	14.8	805	14.1	12 341	13.8	116 229	14.8	69 021	13.6	58 443	13.9	257 569	14.2	
Parity															<0.0001
Nulliparous	3092	62.9	3710	65.0	55 377	61.8	351 567	44.6	223 822	44.2	208 551	49.5	846 119	46.6	
Primiparous	1107	22.5	1224	21.4	22 493	25.1	288 968	36.7	191 882	37.9	142 511	33.9	648 185	35.7	
Multiparous (≥2)	719	14.6	778	13.6	11 768	13.1	146 880	18.7	90 234	17.8	69 857	16.6	320 236	17.6	
Maternal education															<0.0001
Low	659	13.4	712	12.5	10 104	11.3	76 332	9.7	42 685	8.4	34 678	8.2	165 170	9.1	
Intermediate	1068	21.7	1170	20.5	17 215	19.2	139 168	17.7	85 165	16.8	69 980	16.6	313 766	17.3	
High	861	17.5	960	16.8	15 368	17.1	139 748	17.7	97 580	19.3	83 345	19.8	337 862	18.6	
Unknown	2330	47.4	2870	50.2	46 951	52.4	432 167	54.9	280 508	55.4	232 916	55.3	997 742	55.0	
SES (quintiles)															<0.0001
Q1 (very low)	1215	24.7	1314	23.0	18 382	20.5	153 427	19.5	92 680	18.3	76 932	18.3	343 950	19.0	
Q2	996	20.3	1194	20.9	18 299	20.4	156 595	19.9	98 583	19.5	81 806	19.4	357 473	19.7	
Q3	993	20.2	1204	21.1	19 219	21.4	170 907	21.7	112 126	22.2	93 451	22.2	397 900	21.9	
Q4	964	19.6	1059	18.5	17 854	19.9	158 775	20.2	103 471	20.5	86 225	20.5	368 348	20.3	
Q5 (very high)	750	15.3	941	16.5	15 884	17.7	147 711	18.8	99 078	19.6	82 505	19.6	346 869	19.1	
Maternal ethnicity															<0.0001
Western	3742	76.1	4672	81.8	75 020	83.7	654 847	83.2	429 119	84.8	359 908	85.5	1 527 308	84.2	
Non-Western	1176	23.9	1040	18.2	14 618	16.3	132 568	16.8	76 819	15.2	61 011	14.5	287 232	15.8	
Sex															<0.0001
Female	2191	44.6	2485	43.5	39 644	44.2	377 037	47.9	253 640	50.1	207 535	49.3	882 532	48.6	
Male	2727	55.4	3227	56.5	49 994	55.8	410 378	52.1	252 298	49.9	213 384	50.7	932 008	51.4	
Birth weight percentile															<0.0001
SGAp10	1802	36.6	2149	37.6	16 229	18.1	84 313	10.7	51 407	10.2	38 409	9.1	194 309	10.7	
p10-p94	2911	59.2	3304	57.8	67 339	75.1	642 925	81.7	421 467	83.3	359 342	85.4	1 497 288	82.5	
LGAp95	205	4.2	259	4.5	6070	6.8	60 177	7.6	33 064	6.5	23 168	5.5	122 943	6.8	
5-min Apgar score															
<7	896	18.2	536	9.4	2181	2.4	5610	0.71	3678	0.73	4231	1.0	17 132	0.9	<0.0001
<4	167	3.4	76	1.3	267	0.30	651	0.08	443	0.09	452	0.11	2056	0.11	<0.0001

LGAp95, large for gestational age ≥95th percentile; SES, socioeconomic status; SGAp10, small for gestational age <10th percentile.

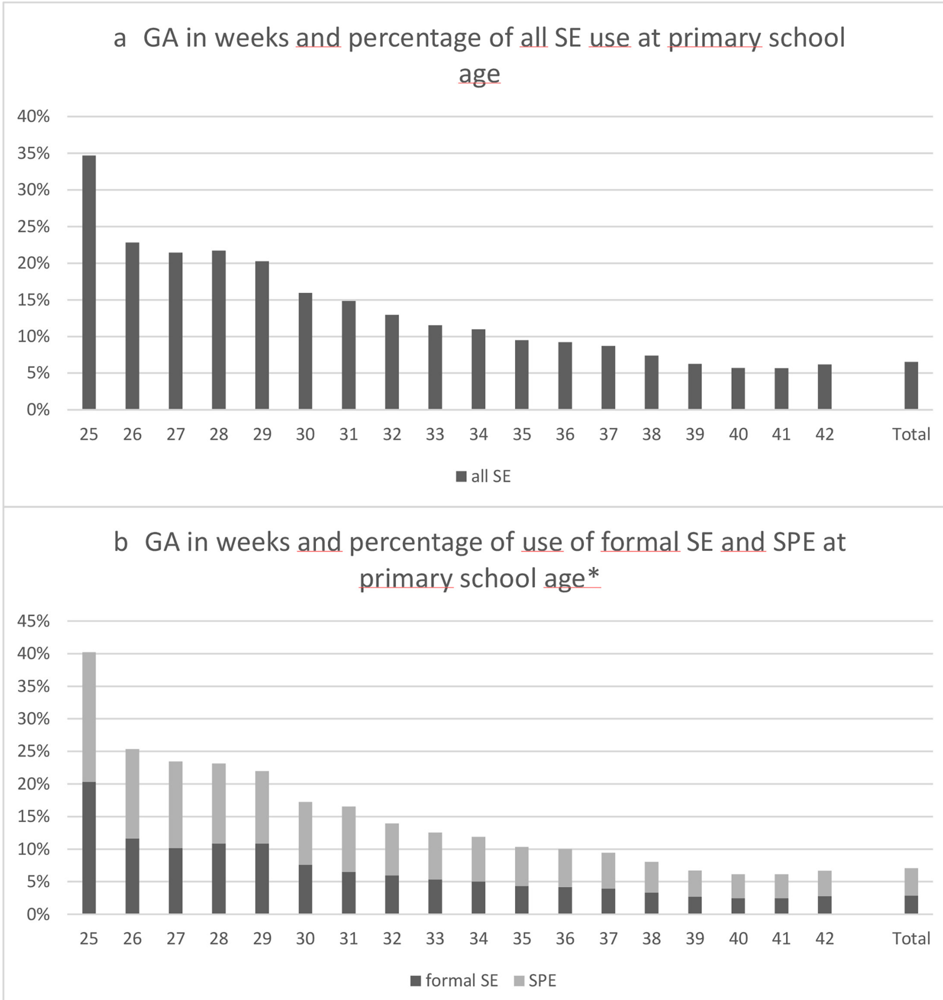

Figure 1 (a) Gestational age (GA) in weeks and percentage of all special education (SE) use at primary school age, (b) gestational age (GA) in weeks and percentage use of formal special education (SE) and special primary education (SPE) at primary school age separately. *Possible overlap between formal SE and SPE.

RESULTS

A total of 1988 261 children were born in the Netherlands between 1999 and 2009. After excluding multiple births, 96.1% of the singletons in the perinatal registry could be linked to Statistics Netherlands. 1814 540 infants were included in the analysis (online supplemental figure 1).

Within this cohort, 100 268 (5.5%) were born preterm (<37 weeks). Compared with mothers that delivered at 40 weeks, mothers that delivered at 25–29 weeks were more often younger (13.4% vs 8.3%), nulliparous (62.9% vs 44.2%), of low education (13.4% vs 8.4%), of very low SES (24.7% vs 18.3%) and of non-Western ethnicity (23.9% vs 15.2%). Children born at

Table 2 Unadjusted and adjusted ORs for special education use of gestational age groups over the full range of gestation within the birth cohort 1999–2009

Gestational age (weeks)	N	Special education use n	%	OR (95% CI) Unadjusted	OR (95% CI) Adjustment*	OR (95% CI) Adjustment†
25–29	4918	1083	22.0	4.66 (4.35 to 4.99)	4.36 (4.06 to 4.69)	3.50 (3.26 to 3.77)
30–31	5712	876	15.3	2.99 (2.78 to 3.22	2.71 (2.51 to 2.92)	2.24 (2.08 to 2.42)
32–36	89 638	8922	10.0	1.82 (1.78 to 1.87)	1.69 (1.64 to 1.73)	1.61 (1.57 to 1.65)
37–39	787 415	54 717	6.9	1.23 (1.21 to 1.25)	1.18 (1.17 to 1.20)	1.18 (1.17 to 1.20)
40	505 938	28 908	5.7	1.00 (reference)	1.00 (reference)	1.00 (reference)
41–42	420 919	24 358	5.8	1.01 (1.00 to 1.03)	1.02 (1.00 to 1.04)	1.03 (1.01 to 1.05)
Total	1 814 540	118 864	6.6			

*Adjusted for sex of the child, parity, maternal age, ethnicity, socioeconomic status, maternal education and year of birth.
†Adjusted for * and small for gestational age <p10, large for gestational age ≥p95 and 5-min Apgar score<7.

Table 3 ORs for special education use of preterm gestational age groups after matching all mother–preterm child pairs with a mother and child born at 40 weeks

Gestational age (weeks)	N	Matching group 40 weeks of gestation N	Special education use OR (95% CI) Unadjusted	OR (95% CI) Adjustment*	OR (95% CI) Adjustment†
25–29	4918	4918	3.81 (3.35 to 4.34)	4.07 (3.56 to 4.65)	3.50 (3.05 to 4.03)
30–31	5712	5712	2.53 (2.23 to 2.87)	2.64 (2.32 to 3.00)	2.24 (1.95 to 2.56)
32–36	89 638	89 638	1.62 (1.57 to 16.7)	1.65 (1.60 to 1.71)	1.57 (1.51 to 1.62)

*Adjusted for sex of the child, parity, maternal age, ethnicity, socioeconomic status, maternal education and year of birth
†Adjusted for * and small for gestational age <p10, large for gestational age ≥p95 and 5-min Apgar score<7.

25–29 weeks were more frequently male (55.4% vs 49.9%), SGAp10 (36.6% vs 10.2%) and more often had a 5-min AS<7 (18.2% vs 0.7%) (table 1).

The overall prevalence of SE use was 6.6%. SE use was highest in children born at 25 weeks (34.7%) and lowest at 40 weeks (5.7%) (figure 1a, online supplemental table 1).

Figure 1b shows the effect of GA on formal SE and SPE separately. Use of formal SE was 2.9% and use of SPE was 4.2%. The risk for both types of schooling decreased with advancing GA. The SPE versus formal SE ratio was 1.0 at 25 weeks and increased to 1.5 at 40 weeks (online supplemental table 1).

SE use was 22% in children born at 25–29 weeks and 5.7% and in those born at 40 weeks (table 2).

ORs increased with decreasing GA, with the highest OR for children born between 25 and 29 weeks of 4.66 (95% CI, 4.35 to 4.99). But this did not account solely for preterm-born children. At 37–39 and at 41–42 weeks we found a slight but significantly elevated OR. When adjusted for maternal age, parity, maternal education, maternal ethnicity, SES, sex and the year of birth, the aOR for SE use decreased most in the group of 25–29 weeks which was 4.36 (95% CI, 4.06 to 4.69) and this was 3.50 (95% CI, 3.26 to 3.77) after subsequent adjustment for SGAp10, LGAp95 and 5-min AS<7. In the other gestational age groups, the differences were less pronounced (table 2).

Table 3 shows the ORs after matching, which was 100% in all three matched gestational groups. When children born between 25–29 weeks were matched to children born at 40 weeks the crude OR was 3.81 (95% CI, 3.35 to 4.34). AORs of the GA groups were significantly increased. Results after matching were comparable (aOR 3.50 (95% CI, 3.05 to 4.03)) to the adjusted aORs shown in table 2.

In online supplemental table 2 the multivariate effect of different risk factors on SE use is shown. The highest aORs for SE besides GA were in the women with low education aOR 5.61 (95% CI, 5.44 to 5.78) and male sex aOR 2.33 (95% CI, 2.30 to 2.36). Unknown education had a comparable aOR to the reference.

We found that there were significant interactions between GA and four risk factors (low maternal education, male sex, SGAp10

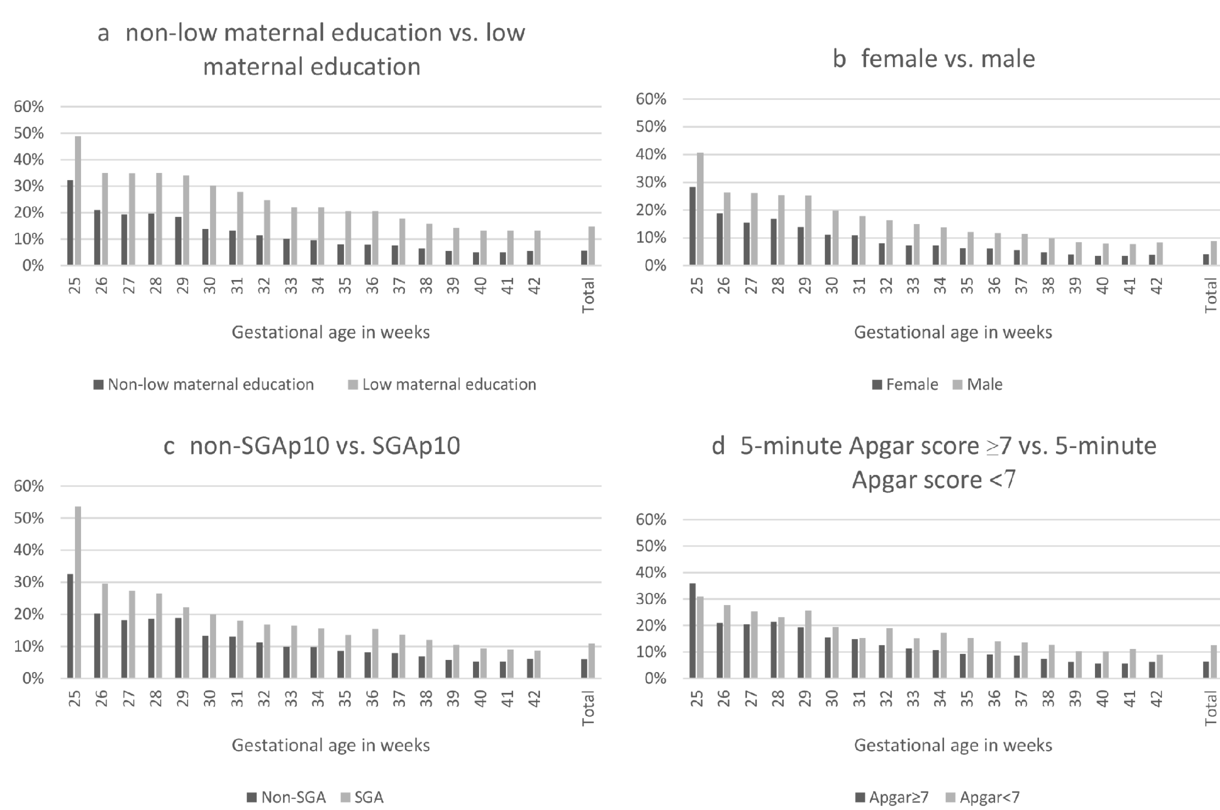

Figure 2 Percentage of special education use per gestational age in weeks stratified by (a) maternal education, (b) sex, (c) small for gestational age<10th percentile (SGAp10) and (d) 5-min Apgar score.

and 5-min AS<7). The four risk factors were relatively more prevalent in higher GA (figure 2).

For these groups, stratified analyses were performed and visualised in figure 2. Overall, children born to mothers with a low education had a 14.8% risk on SE, with a GA range from 49% to 13%. Boys had an 8.9% risk for SE with a GA range from 41% to 8%. In children with SGAp10, the overall risk was 10.9% with a GA range from 54% to 9%. Children with 5-min AS<7 had 12.5% risk for SE with a GA range from 31% to 9% (figure 2, online supplemental table 3).

DISCUSSION

This study shows the strong effect of GA on SE use, with the highest risk among the very preterm born children. Results were based on a complete nationwide registration of SE use in primary school age in an almost 2 million large decennium birth cohort linked to national perinatal data. To account for sociodemographic and perinatal risk factors, we both applied multivariate analysis and matching techniques.

We found 35% SE use in those born at 25 weeks which decreased gradually with increasing GA to 5.7% at 40 weeks. In all gestational age groups SE use was significantly increased compared with 40 weeks. The finding that even children born at early-term and post-term have a higher SE use is consistent with other national cohort studies.[15] ORs of different gestational age groups were comparable after matching. In multivariate analysis (online supplemental table 2), ORs were marginal and not different according to year of birth, consistent with stable neurodevelopmental outcomes in cohorts studied in different epochs.[16]

We showed that low maternal education, male sex, being born SGA and having 5-min AS<7 increase the rate of SE use at each week of gestation, but not equally so. Especially above 32–34 weeks, these risk factors contributed with a higher ratio to the risk of SE use. We hypothesise that in higher GA ranges, these risk factors are absorbed by GA itself to a lesser extent.

We had the opportunity to study both SPE and formal SE use. SPE use was 4.2% and formal SE use was 2.9%. Equal rates of formal SE compared with SPE use were found between 25 and 29 weeks, while later in gestation attendance in SPE was more prevalent than in formal SE, elucidating the biological vulnerability of children born at lower GA.

In our 40 weeks reference group the use of SE was still 5.7%, highlighting that SE is an important part of the Dutch educational system. Because educational systems differ per country, it is important to have knowledge of country-specific numbers of children with SEN. Population-based studies found rates of SEN from 3.5% to 11.2%.[9 12 15 17] These studies show that independent of whether SEN is studied in mainstream education or in special schools, as GA decreases, the risk of SEN increases.

Burger *et al* found a positive association between GA up until term and school performance in mainstream education in the Dutch population at 12 years.[18] Combined with our study this provides insight into the lower academic achievements in lower GA across the full educational spectrum of primary schooling.

A recent study found preterm birth to be associated with lower economic and educational achievements at least until the late 20s.[19] Because academic achievements are associated with better life goals, decreasing need for SE could be viewed as a worthwhile goal of perinatal medicine.

However, we also found low maternal education, low SES, high parity, male sex, maternal age<30, presence of SGA and 5-min AS<7 to be additional independent risk factors for SE use. It would be valuable to investigate whether strategies decreasing inequities in perinatal care aimed to extend the duration of pregnancy in preterm premature rupture of membranes[20 21] could impact SEN. The reduction in GA due to the increased use of induction of labour is alarming in this aspect.[22]

Strengths and limitations

This is the largest population-based study to date, examining the effect of GA on SE use. The primary strength of this study lies in data linkage, with a 96% coverage, and the mandatory outcome measurement. Data linkage has the advantage of nationwide coverage, no referral bias or influences of geographical or one-centre selection differences. Another strength is the use of matching.

A limitation of our study is that 4% could not be linked, which could cause selection bias in either direction. Although we took many confounders into account, residual confounding by measures not registered in the perinatal registry or during childhood could be of influence on the association between GA and SE use. For example, smoking and body mass index of the mother are risk factors for preterm birth[23] but are not measured in the perinatal registry. It has been shown that there is an association between parental depression and school performance in children.[24 25] Also, Mannerkoski *et al* found that paternal age of 40 years or more was associated with a twofold risk of SE.[26] Neither paternal age nor paternal educational status was available in the registries used.

Another limitation is that we can only report on formal SE and SPE but not on subtypes of SE, since this was not available in the registry.

Information on maternal education was not available in 55% but SE use in this group was not elevated, it was slightly reduced. Moreover, SES quintiles were an alternative measure.

SE supply and use could potentially change over time by changes in national educational policy. By adjusting and matching for year of birth we have taken this into account. In 2014 an inclusive policy was implemented in the Dutch educational system, which promoted education of children with SEN in mainstream schools. This could have an impact on the current percentage of SE use. However, a recent study looking at school placement in autistic children showed no decrease in the proportion of special school placements.[13] We therefore recommend that in future studies on academic outcomes in new epochs, SEN should always be studied in both mainstream and special schools.

Finally, our study showed that GA has an important impact on SE use, and in the Dutch educational system SE use forms a large part of SEN. Our findings may therefore not be generalisable to other populations without further investigation on SEN in these populations. Further research could focus on longitudinal analysis with long-term academic outcomes and job perspectives at completion of education, for example, at the age of 25.[17]

Our linkage study shows that SE use is valuable as an endpoint in research on long-term effects of interventions studied in randomised trials in perinatal and neonatal medicine.

CONCLUSION

There is a strong inverse association between GA and SE use in this complete nationwide, decennium birth cohort. Increased risk of SE use is still present in late preterms and those born at early-term or post-term. Children born to low-educated women, boys, children born SGA or with 5-min AS<7 have an additional increased risk for SE use at each week of gestation.

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Contributors AGvW-L and ACJR designed the study with input from TdB and CSHA-M. TdB made the first draft of the paper. Statistical analysis was performed by ACJR. TdB, ACJR, CSHA-M, AA-H and AGvW-L were all involved with the interpretation of the findings. All authors contributed to the draft, the critical revision and the final version of the article. AGvW-L is responsible for the overall content as guarantor.

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Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval Based on the Dutch legislation, individual consent is not required in research based on pseudonymised records. The registry commission of the national registry, PERINED, approved the study question (registration nr. 19.43) as did Statistics Netherlands (project no. 8617). Output was checked for privacy regulations by Statistics Netherlands.

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Data availability statement Data may be obtained from a third party and are not publicly available. This research uses linked national registry data from PERINED and Statistics Netherlands. Results are based on calculations by the authors using non-public microdata from Statistics Netherlands. Under certain conditions these microdata are accessible for scientific research. Further information: microdatat@cbs.nl and www.perined.nl.

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ORCID iD
Tessa de Baat http://orcid.org/0000-0003-2932-8467

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