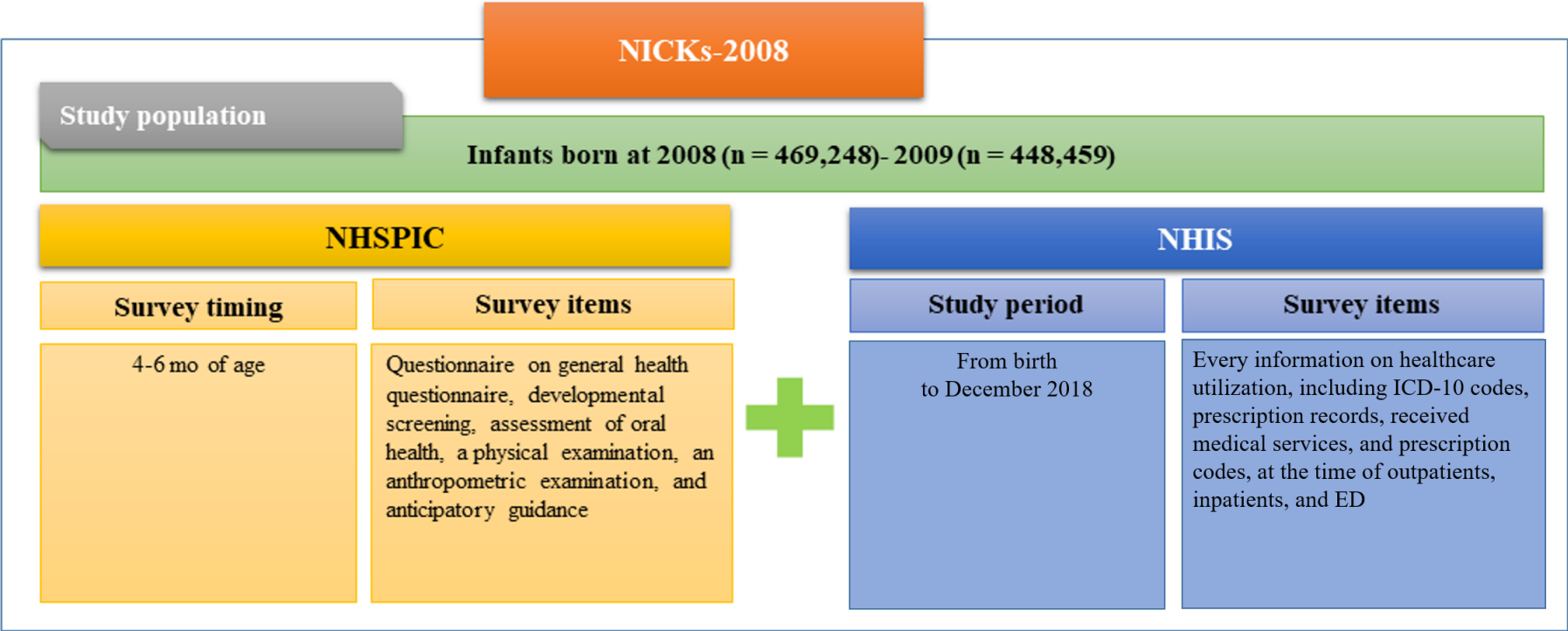


Figure S1. Present study design



ED, emergency department; ICD-10, International Classification of Disease, 10th Version; NHIS, National Health Insurance Service; NHSPIC, National Health Screening Program for Infants and Children; NICKs-2008, National Investigation of birth Cohort in Korea study 2008

Table S1. Checklist of Recommendations for Reporting of Observational Studies Using the Reporting of Studies Conducted Using Observational Routinely Collected Health Data (RECORD) Guidelines

	Item No	Recommendation	Reported
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Abstract
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Abstract
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Introduction
Objectives	3	State specific objectives, including any prespecified hypotheses	Introduction
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	Methods- Study Design and Setting
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Methods- Study Design and Setting
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	Methods- Study Design and Setting; Figure 1
		(b) For matched studies, give matching criteria and number of exposed and unexposed	Methods- eFigure 1, Table 1, and eTable 3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Methods- exposure and outcome; eTables 2 and 3
Data sources/measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Methods- Study Design and Setting, Data Source, and Statistical Analyses; eTable 2
Bias	9	Describe any efforts to address potential sources of bias	Methods: Statistical Analyses, Table 1 and eTable 3
Study size	10	Explain how the study size was arrived at	Methods- Study Design and Setting; Figure 1

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Methods- Study Design and Setting; Figure 1 and eFigure 1
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	Methods: Statistical Analyses
		(b) Describe any methods used to examine subgroups and interactions	Methods: Statistical Analyses
		(c) Explain how missing data were addressed	Methods: Statistical Analyses
		(d) If applicable, explain how loss to follow-up was addressed	Not applicable
		(e) Describe any sensitivity analyses	Methods: Statistical Analyses
<b>Results</b>			
Participants	13	(a) Report numbers of individuals at each stage of study--e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed	Figures 1 and eFigure 1
		(b) Give reasons for non-participation at each stage	Figure 1
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	Method, Results: Study Population; Table 1
		(b) Indicate number of participants with missing data for each variable of interest	Table 1
		(c) Summarize follow-up time (e.g. average and total amount)	Methods: Study Design and Setting; Figure 1
Outcome data	15	Report numbers of outcome events or summary measures over time	Table 5,6,8 and 9
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g. 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Methods: Statistical Analyses, Tables 5-9
		(b) Report category boundaries when continuous variables were categorized	Not applicable
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Results
Other analyses	17	Report other analyses done--e.g. analyses of subgroups and interactions, and sensitivity	Figures 2-5 and eTables

		analyses	5-9
<b>Discussion</b>			
Key result	18	Summarize key results with reference to study objectives	Discussion
Limitation	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Discussion
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Discussion
Generalizability	21	Discuss the generalizability (external validity) of the study results	Discussion
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Article information

Table S2. Definitions of childhood diseases shown in the present study

Variables	Definition	References
<b><i>Certainly defined childhood diseases</i></b>		
Neurologic diseases		
Febrile convulsion	ICD-10 code R56	1, 2
Epilepsy	ICD-10 codes G40 or G41.X and $\geq 2$ claims of antiepileptic medications within 6 months	2
ADHD	ICD-10 code F90.0 and $\geq 2$ claims within 6 months after 4 years old	3
Autism spectrum disorder	ICD-10 codes (F84.0, F84.1, or F84.9) with $\geq 2$ claims within 6 months after the age of 18 months	4
Infectious diseases		
Pneumonia	ICD-10 codes (J12.0-J18.0) at admission	5
Acute bronchiolitis	ICD-10 code (J21.x) at admission	6
Tonsillar and/or adenoid hypertrophy	Tonsillar and/or adenoid hypertrophy requiring tonsillectomy and/or adenoidectomy	
Gastrointestinal diseases		
Hypertrophic pyloric stenosis	ICD-10 code (Q40.0) with pyloromyotomy	7
Intussusception	ICD-10 code (K56.1) with air reduction or manual reduction	8
Heart diseases		
Kawasaki disease	ICD-10 code (M30.3) with the use of intravenous immunoglobulin and aspirin ( $\geq 25$ days)	9
Allergic diseases		
Asthma	ICD-10 codes (J45.X, J46.X) at admission	10
Atopic dermatitis	ICD-10 codes (J30.1-J30.4) with $\geq 5$ claims and the use of topical corticosteroids $\geq 2$ times	11
Chronic urticaria	ICD-10 codes (L50.1, L50.8, L50.9) with $\geq 2$ claims of antihistamines within 6 weeks	12
Other disease		
Alopecia areata	ICD-10 code (L63.X) with $\geq 3$ claims by dermatologists	13
<b><i>ICD-10 code-based definition of childhood diseases</i></b>		
Gastrointestinal diseases		
Irritable bowel syndrome	ICD-10 code (K58.X)	14
Acute pancreatitis	ICD-10 code (K85) at admission	15, 16
Chronic viral (B, C) hepatitis	ICD-10 codes (B18.1, 18.2)	17, 18

Heart diseases		
Arrhythmia	ICD-10 codes (I47.x-I49.x) at admission	19
Acute myocarditis	ICD-10 codes (I40.x-I41.x) at admission	20
Hemato-oncologic diseases		
Idiopathic thrombocytopenic purpura	ICD-10 code (D693.x)	21, 22
Iron deficiency anemia	ICD-10 code (D50.9)	
Hemolytic anemia	ICD10 code (D59)	23
Kidney diseases		
Nephrotic syndrome	ICD-10 codes (N05.x)	24
Chronic kidney diseases	ICD-10 codes (N18.x)	25
Henoch-Schönlein purpura	ICD-10 code (M36)	26
Endocrine diseases		
Congenital hypothyroidism	ICD-10 codes (E03.0, E03.1)	27
Goiter	ICD-10 code (E04.9X)	28
Hashimoto's disease	ICD-10 codes (E06.3, E06.9)	29
Myasthenia gravis	ICD-10 code (G70.0)	30
Central precocious puberty	ICD-10 code (E30.1)	31
Allergic diseases		
Anaphylaxis	ICD-10 codes (T78.0, T78.2) at admission or ED visit	32
Food allergy	ICD-10 code (T78.10)	33
Rheumatic diseases		
Juvenile rheumatoid arthritis	ICD10 code (M08.X)	34

ADHD, attention deficit hyperactivity disorder; ED, emergency department; ICD, International Classification of Diseases 10<sup>th</sup> revision.

Table S3. Perinatal clinical conditions of participants <sup>a</sup>

Variables, N (%)	All data (N = 374,074)			PS-matched data (N = 188,052) <sup>b</sup>		
	Breastfeeding <sup>c</sup> (N = 205,807)	Formula Feeding <sup>d</sup> (N = 168,267)	Standardized Difference % <sup>f</sup>	Breastfeeding <sup>c</sup> (N = 94,026)	Formula Feeding <sup>d</sup> (N = 94,026)	Standardized Difference % <sup>f</sup>
Fetus and newborn affected by maternal factors and by complications of pregnancy, labour and delivery	4,551 (2.21)	5,047 (3.00)	3.9	2,245 (2.40)	2,260 (2.40)	0.1
Disorders related to length of gestation and fetal growth	4,781 (2.32)	8,268 (4.91)	12.4	2,307 (2.50)	2,280 (2.40)	0.2
Birth trauma	1,981 (0.96)	1,656 (0.98)	0.7	894 (1.00)	911 (1.00)	0.2
Respiratory and cardiovascular disorders specific to the perinatal period	11,011 (5.35)	11,742 (6.98)	6.0	5,188 (5.50)	5,287 (5.60)	0.4
Infections specific to the perinatal period	30,551 (14.84)	27,205 (16.17)	3.4	14,147 (15.10)	14,283 (15.20)	0.4
Hemorrhagic and hematological disorders of fetus and newborn	73,480 (35.70)	53,178 (31.60)	8.6	30,905 (32.90)	29,742 (31.60)	2.6
Transitory endocrine and metabolic disorders specific to fetus and newborn	7,866 (3.82)	9,173 (5.45)	6.6	3,761 (4.00)	3,801 (4.00)	0.2
Digestive system disorders of fetus and newborn	6,164 (3.00)	5,432 (3.23)	0.8	2,816 (3.00)	2,792 (3.00)	0.1
Conditions involving the integument and temperature regulation of fetus and newborn	7,642 (3.71)	6,373 (3.79)	0.3	3,515 (3.70)	3,535 (3.80)	0.1
Congenital malformations, deformations, and other disorders originating in the perinatal period	12,587 (6.12)	11,498 (6.83)	2.8	5,825 (6.20)	5,884 (6.30)	0.3
Chromosomal abnormality	20,748 (10.08)	19,355 (11.50)	4.5	9,610 (10.20)	9,738 (10.40)	0.4

Abbreviations, N, number.

<sup>a</sup> Unless otherwise specified, all of perinatal clinical condition was assessed at birth.<sup>b</sup> Propensity score matching (1:1) was performed to reduce bias for the selection of the comparison group. Matching was performed by Mahalanobis algorithm with a caliper of 0.01 using multivariable logistic regression with 23 previously chosen covariates.<sup>c</sup> The breastfeeding group comprises children who have been breastfed until the first 4 to 6 months of age.<sup>d</sup> As the reference group, the formula feeding group comprised children who have been fed formula milk until the 4 to 6 months of age.

<sup>f</sup> Differences > 10% were interpreted as a meaningful difference. All standardized differences of cohort values were < 0.05.



Table S4. Comparisons of the prevalence of childhood diseases reported in other studies and that in the present study

Childhood diseases	Prevalence in other studies	Prevalence in the present studies, n (%), total n = 374,074	References
<b><i>Certainly defined childhood diseases</i></b>			
Neurologic diseases			
Febrile convulsion	6.9% in South Korea	23,591 (6.3)	35
Epilepsy	0.66% in Norway	1,246 (0.3)	36
Attention deficit hyperactivity disorder	1.7% school-aged children in South Korea, 5% in meta-analysis	3,211 (0.9)	37, 38
Autism spectrum disorder	0.75-2.64% in South Korea	606 (0.2)	39
Infectious diseases			
Pneumonia	38.2-63.4% in children	97,343 (26.0)	40
Acute bronchiolitis	17.9-13.5/1000 person-years in children in the United States	25,160 (6.7)	41
Tonsillar or adenoid hypertrophy	77 (3.3%)/2,248 in 6-11-year-old children in South Korea	13,152 (3.5)	42
Gastrointestinal diseases			
Hypertrophic pyloric stenosis	0.39/1000 live births incidence	185 (0.0)	43
Intussusception	Incidence, 22.2 (95% CI, 13.9-33.7)/100,000 infants in Fiji	1,727 (0.5)	44
Heart diseases			
Kawasaki disease	17.5-20.8/100,000 children < 5 years in US	2,251 (0.6)	45
Hemato-oncologic diseases			
Malignancy	124.0-140.6/1,000,000/year in children aged 0-14 years (worldwide)	773 (0.2)	46
Allergic diseases			
Asthma	18.4-23.0/10,000/year	12,004 (3.2)	47
Atopic dermatitis	13.4-27.0% in children aged 6-7 years and those aged 12-13 years in South Korea	39,638 (10.6)	48
Chronic urticaria	2,256.5/100,000/year in South Korea	2,441 (0.7)	49
Other diseases			
Alopecia areata	0.57–2.1 from global incidence data	75 (0.0)	50

<i>ICD-10 code-based definition of childhood diseases</i>			
Gastrointestinal diseases			
Irritable bowel syndrome	22.0-35.5% in children in Canada	8,728 (2.3)	51, 52
Acute pancreatitis	1.9-2.2/100,000 person in children in the United States	47 (0.0)	53
Chronic viral (B, C) hepatitis	Global prevalence of chronic B hepatitis, 1.3%; chronic C hepatitis, 0.15%	48 (0.0)	54, 55
Heart diseases			
Arrhythmia	24.4/100,000 live births in infants	135 (0.0)	56
Acute myocarditis	1-2/100,000 children	20 (0.0)	57
Hemato-oncologic diseases			
Idiopathic thrombocytopenic purpura	1.9-6.4/100,000/year in children	885 (0.2)	58
Iron deficiency anemia	7.8% in infants aged 12 months	36,194 (9.7)	59
Hemolytic anemia	1/100,000 in children	195 (0.1)	60
Kidney diseases			
Nephrotic syndrome	2-7/100,000 in children	68 (0.0)	61
Chronic kidney diseases	18.5-59.3/1,000,000 in children	7 (0.0)	62
Henoch-Schönlein purpura	6-22/100,000/year in children	2,446 (0.7)	63
Endocrine diseases			
Congenital hypothyroidism	5.02/1000 births	336 (0.1)	64
Goiter	No information in the general population-based studies	610 (0.2)	
Hashimoto's disease	3.5-5/1000 in women and 0.6-1/1000 in men from adults studies	52 (0.0)	65, 66
Myasthenia gravis	1.5 per million children per year	27 (0.0)	67
Central precocious puberty	9.2 /10,000 in girls in Denmark, 0.9/10,000 in boys in Denmark	220 (0.1)	31
Allergic diseases			
Anaphylaxis	0.023% in South Korea	208 (0.1)	68
Food allergy	2-10% in South Korea	4,653 (1.2)	69
Rheumatic diseases			
Juvenile rheumatoid arthritis	11.9 (95% CI, 10.9-12.9) cases/100,000 in	225 (0.1)	70

	children in the United States		
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CI, confidence interval; ED, emergency department.

Table S5. Risk for various childhood diseases in breastfed children during the first 4 to 6 months of age compared with formula fed children.

	Unmatched data (n = 374,074)		PS-matched data (n =188,052)		Diseases after 6 months of age		Diseases after 24 months of age	
	N (%)							
	BMF (n=205,807)	FMF (n=168,267)	BMF (n=94,026)	FMF (n=94,026)	RR	95% CI	RR	95% CI
<b><i>Certainly defined childhood diseases</i></b>								
Neurologic diseases								
Febrile convulsion	12,011 (5.8)	11,580 (6.9)	5,515 (5.9)	6,264 (6.7)	<b>0.88</b>	<b>0.85 to 0.91</b>	<b>0.90</b>	<b>0.87 to 0.94</b>
Epilepsy	628 (0.3)	618 (0.4)	279 (0.3)	285 (0.3)	1.00	0.83 to 1.15	1.00	0.71 to 1.23
Attention deficit hyperactivity disorder	1,525 (0.7)	1,686 (1.0)	677 (0.7)	961 (1.0)	NA		<b>0.79</b>	<b>0.71 to 0.87</b>
Autism spectrum disorder	268 (0.1)	338 (0.2)	126 (0.1)	177 (0.2)	NA		<b>0.72</b>	<b>0.57 to 0.89</b>
Infectious diseases								
Pneumonia	49,719 (24.2)	47,624 (28.3)	22,484 (23.9)	26,080 (27.7)	<b>0.86</b>	<b>0.85 to 0.88</b>	<b>0.87</b>	<b>0.86 to 0.89</b>
Acute bronchiolitis	12,079 (5.9)	13,081 (7.8)	5,505 (5.9)	6,994 (7.4)	<b>0.79</b>	<b>0.76 to 0.81</b>	<b>0.83</b>	<b>0.78 to 0.88</b>
Tonsillectomy or adenoidectomy	7,018 (3.4)	6,134 (3.7)	3,193 (3.4)	3,436 (3.7)	<b>0.94</b>	<b>0.89 to 0.98</b>	<b>0.93</b>	<b>0.89 to 0.97</b>
Gastrointestinal diseases								
Hypertrophic pyloric stenosis	34 (0.02)	151 (0.09)	18 (0.02)	75 (0.08)	<b>0.27</b>	<b>0.14 to 0.40</b>	NA	
Intussusception	903 (0.4)	824 (0.5)	424 (0.5)	461 (0.5)	0.92	0.81 to 1.05	0.92	0.79 to 1.07
Heart diseases								
Kawasaki disease	1220 (0.6)	1031 (0.6)	575 (0.6)	574 (0.6)	1.00	0.89 to 1.12	0.82	0.34 to 1.30
Hemato-oncologic diseases								
Malignancy	415 (0.2)	358 (0.2)	191 (0.2)	178 (0.2)	1.07	0.88 to 1.32	1.01	0.81 to 1.26
Allergic diseases								
Asthma	5,884 (2.9)	6,120 (3.6)	2,656 (2.8)	3,149 (3.4)	<b>0.84</b>	<b>0.80 to 0.89</b>	<b>0.87</b>	<b>0.82 to 0.93</b>
Atopic dermatitis	23,422 (11.4)	16,216 (9.6)	9,983 (10.6)	8,838 (9.4)	<b>1.13</b>	<b>1.10 to 1.16</b>	<b>1.10</b>	<b>1.06 to 1.14</b>
Chronic urticaria	1,383 (0.7)	1058 (0.6)	632 (0.7)	561 (0.6)	<b>1.13</b>	<b>1.01 to 1.26</b>	<b>1.14</b>	<b>1.01 to 1.28</b>
Other diseases								
Alopecia areata	32 (0.02)	43 (0.03)	10 (0.01)	27 (0.03)	<b>0.47</b>	<b>0.18 to 0.77</b>	0.97	0.88 to 1.08

<i>ICD-10 code-based childhood diseases</i>								
Gastrointestinal diseases								
Irritable bowel syndrome	4,481 (2.18)	4,247 (2.52)	2,006 (2.13)	2,354 (2.50)	<b>0.85</b>	<b>0.80 to 0.90</b>	<b>0.85</b>	<b>0.79 to 0.93</b>
Acute pancreatitis	27 (0.01)	20 (0.01)	14 (0.01)	10 (0.01)	1.40	0.62 to 3.15	1.40	0.63 to 3.15
Chronic viral (B, C) hepatitis	28 (0.01)	20 (0.01)	94 (0.10)	156 (0.17)	0.55	0.26 to 1.15	0.83	0.25 to 2.73
Cardiovascular diseases								
Arrhythmia	76 (0.08)	59 (0.04)	36 (0.04)	22 (0.02)	1.64	0.96 to 2.78	1.13	0.57 to 2.21
Acute myocarditis	11 (0.01)	9 (0.01)	4 (0.00)	2 (0.00)	2.00	0.37 to 10.92	1.50	0.26 to 8.98
Hemato-oncologic diseases								
Idiopathic thrombo-cytopenic purpura	485 (0.52)	400 (0.24)	236 (0.25)	205 (0.22)	1.15	0.96 to 1.39	1.03	0.82 to 1.29
Iron deficiency anemia	26,471(28.15)	9,723 (5.78)	11,887(12.64)	5,220 (5.55)	<b>2.28</b>	<b>2.21 to 2.35</b>	<b>1.47</b>	<b>1.40 to 1.53</b>
Hemolytic anemia	124 (0.06)	71 (0.04)	51 (0.05)	39 (0.04)	1.31	0.86 to 1.99	0.95	0.52 to 1.76
Kidney diseases								
Nephrotic syndrome	35 (0.02)	33 (0.02)	20 (0.02)	21 (0.02)	0.95	0.52 to 1.76	1.0	0.53 to 1.89
Chronic kidney diseases	4 (0.00)	3 (0.00)	3 (0.00)	2 (0.00)	1.5	0.26 to 8.98	1.5	0.26 to 8.98
Henoch-Schönlein purpura	1308 (1.39)	1138 (0.68)	590 (0.63)	621 (0.66)	0.95	0.85 to 1.06	NA	
Endocrine diseases								
Congenital hypothyroidism	200 (0.10)	136 (0.08)	210 (0.22)	185 (0.20)	1.33	0.98 to 1.82	<b>1.49</b>	<b>1.06 to 2.10</b>
Goiter	343 (0.36)	267 (0.16)	92 (0.10)	91 (0.10)	0.93	0.74 to 1.16	0.94	0.75 to 1.27
Hashimoto's disease	27 (0.01)	25 (0.01)	14 (0.01)	11 (0.01)	1.27	0.58 to 2.80	1.27	0.58 to 2.80
Myasthenia gravis	17 (0.01)	10 (0.01)	8 (0.01)	6 (0.01)	1.33	0.47 to 3.84	1.34	0.47 to 3.84
Central precocious puberty	115 (0.12)	105 (0.06)	41 (0.04)	51 (0.05)	0.80	0.53 to 1.21	0.43	0.11 to 1.76
Allergic diseases								
Anaphylaxis	125 (0.06)	83 (0.05)	153 (0.16)	88 (0.09)	1.44	0.97 to 2.14	1.29	0.84 to 1.97
Food allergy	2754 (1.34)	1899 (1.13)	1231 (1.31)	1085 (1.15)	<b>1.13</b>	<b>1.05 to 1.23</b>	1.59	0.87 to 2.91
Rheumatic diseases								
Juvenile rheumatoid arthritis	118 (0.06)	107 (0.06)	58 (0.06)	65 (0.07)	0.87	0.61 to 1.23	0.85	0.60 to 1.21

NA, not applicable; RR, risk ratio; N , n u m b e r .

Table S6. The risk of all-cause hospitalization and intensive care unit admission during childhood in children breastfed in their first 4 to 6 months of age, when formula fed infants during the first 4 to 6 months of age were considered reference group

Variables	Feeding types	Unmatched, N (%)	Matched, N (%)	RR	95% CI
All-cause hospitalization					
> 6 months of age	Formula feeding	98,057 (58.3)	54,079 (57.5)	Ref.	
	Breastfeeding	109,841 (53.4)	50,102 (53.3)	<b>0.93</b>	<b>0.92 to 0.94</b>
> 24 months of age	Formula feeding	76,682 (45.6)	42,339 (45.0)	Ref.	
	Breastfeeding	85,091 (41.4)	38,891 (41.4)	<b>0.93</b>	<b>0.91 to 0.93</b>
All-cause ICU admission					
> 6 months of age	Formula feeding	876 (0.52)	480 (0.5)	Ref.	
	Breastfeeding	849 (0.41)	375 (0.4)	<b>0.78</b>	<b>0.68 to 0.89</b>
> 24 months of age	Formula feeding	492 (0.29)	259 (0.3)	Ref.	
	Breastfeeding	509 (0.25)	221 (0.2)	0.85	0.71 to 1.02
All-cause death					
> 6 months of age	Formula feeding	196 (0.12)	97 (0.1)	Ref.	
	Breastfeeding	230 (0.11)	110 (0.1)	1.17	0.86 to 1.49
> 24 months of age	Formula feeding	145 (0.09)	69 (0.07)	Ref.	
	Breastfeeding	158 (0.08)	75 (0.08)	1.15	0.78 to 1.51
Number of all-cause hospitalizations					
0	Formula feeding	70,210 (41.7)	39,947 (42.5)		
	Breastfeeding	95,966 (46.6)	43,924 (46.7)	Ref.	
1-2	Formula feeding	56,348 (33.5)	31,460 (33.5)		
	Breastfeeding	67,251 (32.7)	30,707 (32.7)	<b>0.89</b>	<b>0.87 to 0.91</b>
3-5	Formula feeding	27,068 (16.1)	14,877(15.8)		
	Breastfeeding	29,043 (14.1)	13,283 (14.1)	<b>0.81</b>	<b>0.79 to 0.83</b>
≥ 6	Formula feeding	14,641 (8.7)	7,742 (8.2)		
	Breastfeeding	13,547 (6.6)	6,112 (6.5)	<b>0.72</b>	<b>0.69 to 0.74</b>

Values in bold are considered to be significant.

CI, confidence interval; ICU, intensive care unit; N, number; Ref. reference

Table S7. The risk of all-cause hospitalization and intensive care unit admission after 24 months of age and their growth in children stratified into the duration of exclusive breastfeeding (first 4 to 6 months of age or over 6 months of age), when formula fed infants during the first 4 to 6 months of age were considered reference group

Exclusive BMF duration	Matched, N (%)	RR	95% CI
All-cause hospitalization after 24 months of age			
Formula feeding	26,446 (45.5)	Ref.	
4~6 months of age	19,715 (41.5)	<b>0.849</b>	<b>0.828 to 0.870</b>
≥ 6 months of age	4,561 (42.5)	<b>0.886</b>	<b>0.849 to 0.923</b>
All-cause ICU admission after 24 months of age			
Formula feeding	159 (0.3)	Ref.	
4~6 months of age	112 (0.2)	0.861	0.676 to 1.097
≥ 6 months of age	23 (0.2)	0.783	0.506 to 1.213
All-cause death after 24 months of age			
Formula feeding	42 (0.1)	Ref.	
4~6 months of age	42 (0.1)	1.223	0.797 to 1.876
≥ 6 months of age	9 (0.1)	1.161	0.565 to 2.385
Overweight			
Formula feeding	10,250 (18.7)	Ref.	
4~6 months of age	7,863 (17.5)	<b>-0.068</b>	<b>-0.095 to 0.042</b>
≥ 6 months of age	1,938 (19.1)	0.019	-0.025 to 0.063
Obesity			
Formula feeding	3,997 (7.3)	Ref.	
4~6 months of age	2,828 (6.3)	<b>-0.149</b>	<b>-0.196 to -0.102</b>
≥ 6 months of age	719 (7.1)	-0.031	-0.108 to 0.046
-1.64 < HFA z score ≤ -1.03			
Formula feeding	4,345 (7.9)	Ref.	
4~6 months of age	3,218 (7.2)	<b>-0.103</b>	<b>-0.147 to -0.059</b>
≥ 6 months of age	800 (7.9)	-0.008	-0.080 to 0.065
Short stature			
Formula feeding	1,076 (2.0)	Ref.	
4~6 months of age	702 (1.6)	<b>-0.230</b>	<b>-0.324 to -0.136</b>
≥ 6 months of age	190 (1.9)	-0.050	-0.202 to 0.103

RR, risk ratio; CI, confidence interval; ICU, intensive care unit; N, number; HFA, height for age; Ref., reference; BMI, body mass index

Overweight was defined as BMI z score  $\geq 1.03$  and obesity as BMI z score  $\geq 1.64$ .

Short stature as HFA z score was defined as height for age z score  $\leq -1.63$ .

Values in bold are considered to be significant.

Table S8. Gender differences of risk of childhood diseases in children who were breastfed in the first 4 to 6 months of age with children fed formula milk as the reference group

<i>Certainly defined childhood diseases</i>	<b>Risk Difference</b>			
	<b>Boys</b>		<b>Girls</b>	
	Estimation	95% CI	Estimation	95% CI
Febrile convulsion	<b>-0.13</b>	<b>-0.18 to -0.09</b>	<b>-0.12</b>	<b>-0.17 to -0.07</b>
Epilepsy	-0.04	-0.27 to 0.20	-0.01	-0.24 to 0.22
Attention deficit hyperactivity disorder	<b>-0.17</b>	<b>-0.29 to -0.04</b>	<b>-0.39</b>	<b>-0.70 to -0.09</b>
Autism spectrum disorder	<b>-0.39</b>	<b>-0.60 to -0.19</b>	-0.37	-0.81 to 0.08
Pneumonia	<b>-0.15</b>	<b>-0.17 to -0.13</b>	<b>-0.15</b>	<b>-0.17 to -0.12</b>
Acute bronchiolitis	<b>-0.24</b>	<b>-0.29 to -0.20</b>	<b>-0.23</b>	<b>-0.29 to -0.18</b>
Tonsillectomy or adenoidectomy	<b>-0.07</b>	<b>-0.13 to -0.01</b>	-0.07	-0.15 to 0.01
Hypertrophic pyloric stenosis with pyloromyotomy	<b>-1.27</b>	<b>-1.83 to -0.72</b>	<b>-2.16</b>	<b>-3.62 to -0.6</b>
Intussusception requiring air or manual reduction	-0.07	-0.23 to 0.09	-0.10	-0.32 to 0.12
Kawasaki disease with IVIG and aspirin	-0.08	-0.24 to 0.07	0.12	-0.06 to 0.29
Malignancy	0.04	-0.24 to 0.31	0.11	-0.19 to 0.41
Asthma exacerbation requiring hospitalization	<b>-0.20</b>	<b>-0.27 to -0.13</b>	<b>-0.12</b>	<b>-0.20 to -0.04</b>
Atopic dermatitis	<b>0.14</b>	<b>0.09 to 0.17</b>	<b>0.11</b>	<b>0.07 to 0.15</b>
Chronic urticaria	0.11	-0.04 to 0.25	0.14	-0.04 to 0.32
Alopecia areata	-0.68	-1.59 to 0.23	<b>-1.48</b>	<b>-2.74 to -0.23</b>

Values in bold are considered to be significant.



Table S9. Risk of all-cause admission in children who were breastfed in the first 4-6 months of age when stratified by gender

	Variables	Unmatched, N (%)	Matched, N (%)	Estimate	Wald 95% CI
Boys	All-cause hospitalization after birth				
	Formula feeding	61879 (69.08)	33114 (69.01)	Ref.	
	Breastfeeding	64499 (63.48)	30320 (63.19)	<b>-0.07</b>	<b>-0.08 to -0.06</b>
	All-cause hospitalization after 6 months of age				
	Formula feeding	54255 (60.57)	29172 (60.79)	Ref.	
	Breastfeeding	56462 (55.57)	26558 (55.35)	<b>-0.08</b>	<b>-0.09 to -0.07</b>
Girls	All-cause hospitalization after birth				
	Formula feeding	49820 (63.31)	28068 (58.49)	Ref.	
	Breastfeeding	60532 (58.09)	26682 (55.60)	<b>-0.07</b>	<b>-0.08 to -0.06</b>
	All-cause hospitalization after 6 months of age				
	Formula feeding	43525 (55.31)	24755 (51.59)	Ref.	
	Breastfeeding	53063 (50.93)	23409 (48.78)	<b>-0.07</b>	<b>-0.08 to -0.06</b>

Ref, reference; CI, confidence interval; N, number.

Values in bold are considered to be significant.

Table S10. Effect of breastfeeding during the first 4 to 6 months of age on body weight and height during childhood

Variables, N (%)		Feeding types	All data	Matched data	Estimate	Wald 95% CI
All	Body weight					
	Overweight	FMF	40,572 (19.7)	21,950 (23.3)	Ref.	
		BMF	47,542 (28.3)	22,670 (24.1)	<b>-0.03</b>	<b>-0.05 to -0.01</b>
	Obesity	FMF	16,291 (7.9)	8,142 (8.7)	Ref.	
		BMF	17,532 (10.4)	9,111 (9.7)	<b>-0.11</b>	<b>-0.14 to -0.08</b>
	Height					
	-1.63 < HFA z score ≤ -1.03	FMF	11,929 (7.1)	6,846 (7.3)	Ref.	
		BMF	15,521 (7.5)	6,364 (6.8)	<b>-0.08</b>	<b>-0.11 to -0.05</b>
Boys	Short stature	FMF	3,014 (1.8)	1,431 (1.5)	Ref.	
		BMF	3,014 (1.8)	1,715 (1.8)	<b>-0.19</b>	<b>-0.26 to -0.12</b>
	Body weight					
	Overweight	FMF	21,520 (24.03)	11,745 (24.48)	Ref.	
		BMF	23,334 (22.96)	11,147 (23.23)	<b>-0.10</b>	<b>-0.13 to -0.07</b>
	Obesity	FMF	8,598 (9.60)	4,703 (9.80)	Ref.	
		BMF	8,495 (8.36)	4,110 (8.57)	<b>-0.18</b>	<b>-0.23 to -0.14</b>
	Height					
Girls	-1.63 < HFA z score ≤ -1.03	FMF	6,259 (7.0)	3,514 (7.2)	Ref.	
		BMF	7,565 (7.5)	3,273 (6.8)	<b>-0.06</b>	<b>-0.11 to -0.02</b>
	Short stature	FMF	1,537 (1.7)	871 (1.8)	Ref.	
		BMF	1,689 (1.7)	707 (1.5)	<b>-0.20</b>	<b>-0.30 to -0.10</b>
	Body weight					
	Overweight	FMF	19,052 (24.21)	10,925 (22.77)	Ref.	
		BMF	24,208 (23.23)	10,803 (22.51)	<b>-0.07</b>	<b>-0.10 to -0.04</b>
	Obesity	FMF	7,693 (9.78)	4,408 (9.19)	Ref.	
		BMF	9,037 (8.67)	3,727 (7.77)	<b>-0.16</b>	<b>-0.21 to -0.12</b>
Girls	Body height					
	-1.63 < HFA z score ≤ -1.03	FMF	5,670 (7.2)	3,332 (7.4)	Ref.	
		BMF	7,956 (7.6)	3,091 (6.7)	<b>-0.10</b>	<b>-0.15 to -0.05</b>
	Short stature	FMF	1,477 (1.9)	844 (1.9)	Ref.	
		BMF	1,907 (1.8)	724 (1.6)	<b>-0.18</b>	<b>-0.28 to -0.08</b>

N, number; CI, confidence interval; Ref. reference; BMI, body mass index; HFA, height for age; FMF, formula milk feeding; BMF, breastmilk feeding.

Values in bold are considered to be significant.

Overweight was defined as BMI z score  $\geq 1.03$  and obesity as BMI z score  $\geq 1.64$ .

Short stature as HFA z score was defined as height for age z score  $\leq -1.63$ .

Table S11. Comparisons of the results of the previous studies on association between breastfeeding and ICD-10 code-based childhood diseases

Childhood diseases	Previous studies	Present study
Gastrointestinal diseases		
Irritable bowel syndrome	NA	↓
Acute pancreatitis	NA	No association
Chronic viral (B, C) hepatitis	No association <sup>71</sup>	No association
Cardiovascular diseases		
Arrhythmia	NA	No association
Acute myocarditis	NA	No association
Hemato-oncologic diseases		
Idiopathic thrombocytopenic purpura	NA	No association
Iron deficiency anemia	↑ <sup>72</sup>	↑
Hemolytic anemia	NA	No association
Kidney diseases		
Nephrotic syndrome	NA	No association
Chronic kidney diseases	↓ <sup>73</sup>	No association
Henoch-schönlein purpura	↓ <sup>74</sup>	No association
Endocrine diseases		
Congenital hypothyroidism	No association <sup>75</sup>	No association
Goiter	NA	No association
Hashimoto's disease	NA	No association
Myasthenia gravis	NA	No association
Central precocious puberty	↓ <sup>76</sup>	No association
Allergic diseases		
Anaphylaxis	NA	No association
Food allergy	Controversial <sup>77, 78</sup>	↑
Rheumatic diseases		
Juvenile rheumatoid arthritis	↓ <sup>79</sup>	No association

↓ breastfeeding shows the protective effects on each disease

↑ breastfeeding shows the increased associations with each disease.

NA: not applicable –no research has been identified.

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