Kehm RD, Spector LG, Poynter JN, Vock DM, Osypuk TL. Socioeconomic status and childhood cancer incidence: a population-based multilevel analysis. Am J Epidemiol.

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Web Figure 1. Bivariate Associations Between Categorical SES and Combined Childhood Cancer Incidence; Registry-Based Case-Cohort Study, Linked Minnesota Birth and Cancer Records, 1989-2014 (Total Sample=14,854; Controls=11,907)

A. Individual-level SES (entire sample: n = 14,854)
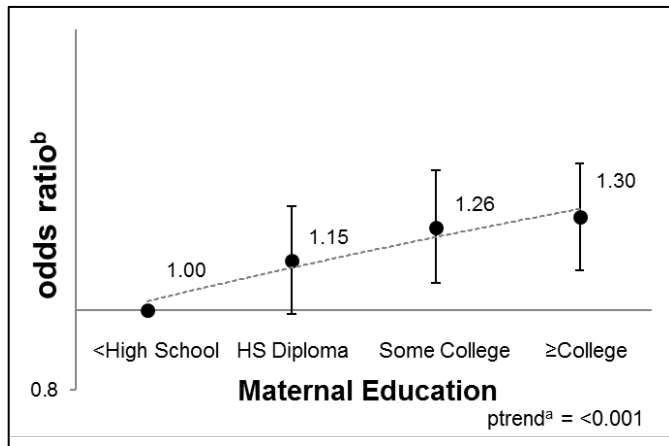
B. Neighborhood-level SES (entire sample: n = 14,854)
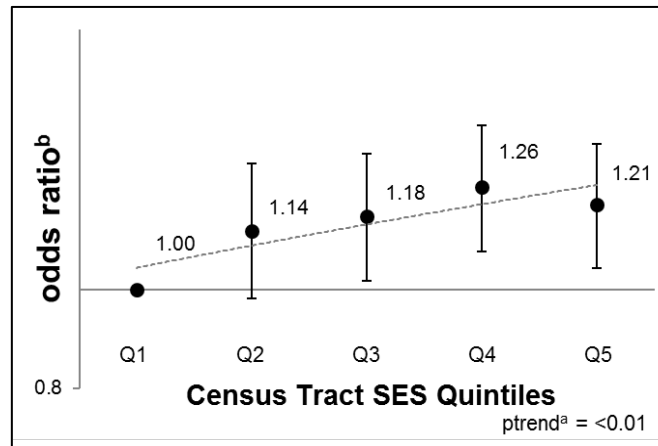
C. Individual-level SES (NH-whites only: n = 12,127)[c]
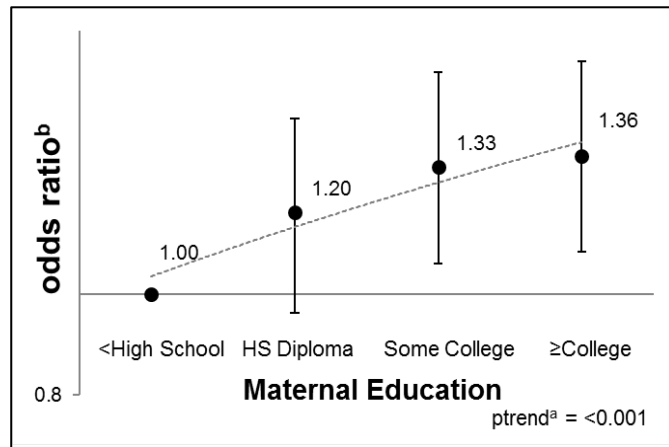
D. Neighborhood-level SES (NH-whites only: n = 12,127)[cd]
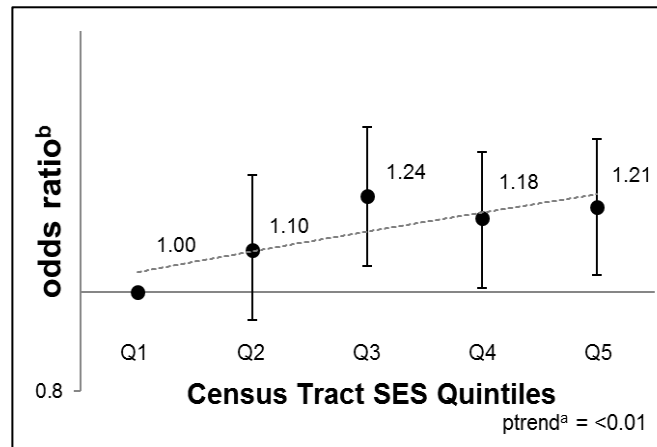
Abbreviations: HS, high school; NH, non-Hispanic; SES, socioeconomic status
[a]P-trend tests linear combination across categories; estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[b]Odds ratios and 95% confidenc intervals plotted on the log scale; reference = lowest SES category (<high school/Q1 neighborhood).
[c]Non-Hispanic White Sample: Cases = 2,496; controls = 9,631
[d]Census tract SES index values recategorized into quintiles among the restricted non-Hispanic white sample.

Web Table 1. Characteristics of Cases by Cancer Type; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854)

Variable	ALL (n = 673)	AML (n = 112)	Lymph (n = 311)	CNS (n = 662)	Neuro (n = 267)	Retino (n = 80)	Wilms' (n = 198)	Hepato (n = 50)	Rhabdo (n = 79)
Birth Characteristics									
Birth year, mean (SD)	1999 (6.2)	2000 (6.4)	1999 (6.5)	1999 (6.5)	2001 (7.3)	2002 (7.2)	2000 (6.7)	2001 (6.9)	1998 (5.9)
Female sex, %	45.8	50.0	34.4	45.9	40.8	53.8	44.4	28.0	41.8
Birth weight, mean (SD), grams	3,475 (588)	3,541 (583)	3,438 (574)	3,461 (560)	3,400 (328)	3,423 (549)	3,508 (640)	2,803 (1,118)	3,457 (552)
Gestation, mean (SD), weeks	38.9 (1.9)	39.1 (1.6)	39.0 (1.8)	39.0 (2.0)	38.7 (2.2)	39.0 (1.9)	38.8 (2.2)	36.1 (5.4)	38.7 (1.8)
First born, %	38.6	34.8	35.7	42.0	42.0	41.3	40.6	42.0	43.0
Mother's Characteristics									
Age at delivery, mean (SD), years	28.5 (5.8)	29.1 (5.6)	28.6 (5.2)	28.3 (5.5)	28.4 (5.9)	27.6 (5.7)	28.6 (5.7)	28.0 (5.9)	28.7 (6.2)
Non-Hispanic White, %	84.3	78.4	83.2	89.4	85.0	76.3	90.4	74.0	88.6
Education, %									
< high school diploma	8.9	9.3	6.9	9.1	8.7	10.4	7.1	22.5	10.3
high school diploma	28.0	9.3	28.2	25.8	26.4	19.5	26.5	32.7	33.3
some college	26.3	20.4	30.5	28.9	26.4	33.8	30.6	20.4	32.1
≥ bachelor's degree	36.9	37.0	34.4	36.2	38.5	36.4	35.7	24.5	24.4
Neighborhood SES, mean (SD)	0.07 (6.4)	0.05 (1.0)	0.11 (0.9)	0.13 (0.8)	0.00 (0.9)	0.05 (1.1)	0.09 (0.8)	−0.3 (1.2)	0.11 (0.8)

Abbreviations: ALL, acute lymphoblastic leukemia; AML, acute myeloid leukemia; CNS, central nervous system tumors; Hepato, hepatoblastoma; Lymph, lymphomas; Neuro, neuroblastoma; Retino, retinoblastoma; Rhabdo, rhabdomyosarcoma; SD, standard deviation; SES, socioeconomic status; Wilms', Wilms' tumor

Web Table 2. Correlation Matrix; Registry-Based Case-Cohort Study, Linked Minnesota Birth and Cancer Records, 1989-2014 (Total Sample=14,854)

Variable	Correlation[a]								
	1	2	3	4	5	6	7	8	9
1. Birth Year	1								
2. Female	−0.02	1							
3. Mother NH White	−0.16	0.01	1						
4. Maternal Age	0.05	0.01	0.18	1					
5. Birthweight	−0.04	−0.09	0.11	0.08	1				
6. Gestational Age	−0.08	0.03	0.02	−0.03	0.63	1			
7. First Born	0.01	0.02	0.03	−0.32	−0.09	0.02	1		
8. Maternal Education	0.10	0.00	0.28	0.45	0.10	−0.02	0.02	1	
9. Neighborhood SES[b]	−0.01	0.00	0.41	0.26	0.09	0.00	0.00	0.35	1

Abbreviations: NH, non-Hispanic; SES, socioeconomic status
[a]Pearson correlation estimated continuous/continuous associations; Spearman correlation estimated ordinal/continuous and ordinal/dichotomous associations; tetrachoric correlation estimated dichotomous/dichotomous associations; and biserial correlation estimated dichotomous/continuous associations.
[b]Higher values indicate higher neighborhood SES

Web Table 3. Associations Between Neighborhood SES and Childhood Cancer Incidence Estimated From Bivariate and Trivariate Models; Registry-Based Case-Cohort Study, Linked Minnesota Birth and Cancer Records, 1989-2014 (Total Sample=14,854; Controls=11,907)

Model	All Cancers Combined (n = 2,947)				Acute Lymphoblastic Leukemia (n = 673)			
	OR	95% CI	P[a]	%[b]	OR	95% CI	P[a]	%[b]
Bivariate[c]	1.09	1.04, 1.14	<0.001		1.10	1.01, 1.20	0.03	
Trivariate *adjusted for:*								
Race/Ethnicity[d]	1.05	1.00, 1.11	0.04	39	1.08	0.99, 1.19	0.10	18
Maternal Age	1.08	1.03, 1.13	<0.01	14	1.09	0.99, 1.18	0.07	15
Birthweight	1.08	1.04, 1.13	<0.001	5	1.09	1.00, 1.19	0.05	10
Gestational Age	1.09	1.04, 1.14	<0.001	0	1.10	1.01, 1.20	0.03	0
First Born	1.09	1.04, 1.14	<0.001	0	1.10	1.01, 1.20	0.03	0
Sex	1.09	1.04, 1.14	<0.001	−1	1.10	1.01, 1.20	0.03	0
Birth Year	1.09	1.04, 1.14	<0.001	0	1.10	1.01, 1.20	0.03	0
Model	Lymphomas (n = 311)				Central Nervous System Tumors (n = 662)			
	OR	95% CI	P[a]	%[b]	OR	95% CI	P[a]	%[b]
Bivariate[c]	1.14	1.01, 1.30	0.04		1.18	1.08, 1.29	<0.001	
Trivariate *adjusted for:*								
Race/Ethnicity[d]	1.15	1.00, 1.31	0.05	0	1.09	0.99, 1.20	0.09	49
Maternal Age	1.13	0.99, 1.28	0.07	12	1.18	1.08, 1.30	<0.01	0
Birthweight	1.14	1.00, 1.29	0.04	3	1.17	1.07, 1.28	<0.01	4
Gestational Age	1.15	1.01, 1.30	0.04	0	1.18	1.08, 1.29	<0.001	0
First Born	1.15	1.01, 1.30	0.04	0	1.18	1.08, 1.29	<0.001	0
Sex	1.15	1.01, 1.30	0.04	−1	1.18	1.08, 1.29	<0.001	0
Birth Year	1.15	1.01, 1.30	0.04	−1	1.18	1.08, 1.29	<0.001	0

Abbreviations: CI, confidence interval; OR, odds ratio; SES, socioeconomic status
[a]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[b]Compares the beta coefficients for maternal education predicting cancer incidence estimated from bivariate and trivariate models (i.e. βbivar-βtrivar/βbivar).
[c]Equal to Model 1A in Table 2
[d]Equal to Model 2A in Table 2

Web Table 4. Associations Between Established Risk Factors and Childhood Cancer Incidence, Unadjusted and Adjusted for SES, by Cancer Type; Registry-Based Case-Cohort Study, Linked Minnesota Birth and Cancer Records, 1989-2014 (Total Sample=14,854; Controls=11,907)

	Acute Lymphoblastic Leukemia (*n* = 673)						Acute Myeloid Leukemia (*n* = 112)						Lymphomas (*n* = 311)					
	Adjusted for demographic and birth covariates (SES excluded from model)[a]			Adjusted for demographic, birth, and SES covariates (SES included in model)[b]			Adjusted for demographic and birth covariates (SES excluded from model)[a]			Adjusted for demographic, birth, and SES covariates (SES included in model)[b]			Adjusted for demographic and birth covariates (SES excluded from model)[a]			Adjusted for demographic, birth, and SES covariates (SES included in model)[b]		
Variable	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]
Race/Ethnicity[d]	1.11	0.89, 1.39	0.34	1.03	0.81, 1.32	0.79	0.73	0.46, 1.17	0.20	0.70	0.42, 1.18	0.19	1.06	0.77, 1.45	0.73	0.89	0.64, 1.26	0.52
Maternal Age[e]	1.05	0.98, 1.13	0.17	1.02	0.94, 1.11	0.56	1.16	0.98, 1.38	0.09	1.16	0.96, 1.41	0.12	1.08	0.97, 1.20	0.17	1.02	0.90, 1.15	0.79
Birthweight[f]	1.20	1.10, 1.30	<0.001	1.19	1.09, 1.30	<0.001	1.23	1.00, 1.52	0.05	1.23	1.00, 1.52	0.05	0.97	0.85, 1.10	0.61	0.96	0.84, 1.09	0.50
Gestational Age[g]	0.92	0.88, 0.97	<0.001	0.92	0.88, 0.97	<0.01	0.99	0.87, 1.13	0.88	0.99	0.87, 1.13	0.90	1.04	0.97, 1.13	0.27	1.05	0.97, 1.13	0.23
First Born[h]	1.08	0.91, 1.28	0.37	1.06	0.89, 1.26	0.53	1.00	0.66, 1.51	0.99	1.00	0.66, 1.53	0.99	0.92	0.72, 1.19	0.54	0.88	0.68, 1.14	0.33

	Central Nervous System Tumors (*n* = 662)						Neuroblastoma (*n* = 267)						Retinoblastoma (*n* = 80)					
Variable	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]
Race/Ethnicity[d]	1.83	1.41, 2.36	<0.001	1.66	1.26, 2.19	<0.001	1.38	0.97, 1.96	0.08	1.40	0.95, 2.06	0.09	0.82	0.48, 1.42	0.49	0.66	0.37, 1.19	0.17
Maternal Age[e]	1.03	0.95, 1.10	0.49	1.00	0.92, 1.08	0.94	1.04	0.93, 1.17	0.49	1.02	0.89, 1.16	0.77	0.93	0.75, 1.14	0.48	0.82	0.64, 1.06	0.13
Birthweight[f]	1.07	0.98, 1.17	0.12	1.07	0.98, 1.17	0.15	1.06	0.92, 1.22	0.40	1.06	0.92, 1.21	0.43	1.06	0.83, 1.37	0.63	1.05	0.81, 1.35	0.72
Gestational Age[g]	1.00	0.95, 1.05	0.94	1.00	0.95, 1.05	0.99	0.94	0.87, 1.01	0.09	0.94	0.87, 1.01	0.09	1.01	0.87, 1.17	0.92	1.01	0.87, 1.18	0.88
First Born[h]	1.18	0.99, 1.39	0.06	1.15	0.97, 1.37	0.11	1.19	0.91, 1.55	0.20	1.17	0.89, 1.53	0.26	1.06	0.66, 1.71	0.81	0.96	0.59, 1.57	0.87

	Wilms' Tumor (*n* = 198)						Hepatoblastoma (*n* = 50)						Rhabdomyosarcoma (*n* = 79)					
Variable	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]
Race/Ethnicity[d]	2.04	1.25, 3.31	<0.01	2.05	1.22, 3.46	0.01	0.76	0.39, 1.48	0.42	1.05	0.49, 2.24	0.91	1.41	0.68, 2.94	0.36	1.54	0.70, 3.38	0.28
Maternal Age[e]	1.03	0.90, 1.18	0.63	1.03	0.89, 1.20	0.71	1.04	0.81, 1.35	0.73	1.21	0.92, 1.59	0.17	1.13	0.91, 1.39	0.26	1.23	0.98, 1.54	0.08
Birthweight[f]	1.31	1.12, 1.53	<0.01	1.31	1.12, 1.53	<0.01	0.82	0.59, 1.13	0.23	0.84	0.61, 1.16	0.30	1.26	0.98, 1.62	0.08	1.28	0.99, 1.65	0.06
Gestational Age[g]	0.88	0.81, 0.96	0.01	0.88	0.81, 0.96	0.01	0.85	0.75, 0.97	0.02	0.85	0.75, 0.97	0.01	0.87	0.76, 0.99	0.04	0.86	0.76, 0.99	0.04
First Born[h]	1.18	0.87, 1.61	0.28	1.18	0.86, 1.61	0.30	1.12	0.61, 2.06	0.70	1.26	0.68, 2.35	0.46	1.40	0.86, 2.29	0.17	1.52	0.93, 2.50	0.10

Abbreviations: CI, confidence interval; NH, non-Hispanic; OR, odds ratio; SES, socioeconomic status
[a]Adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, and gestational age
[b]Adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, gestational age, maternal education, and neighborhood SES
[c]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[d]Compares non-Hispanic white mother versus otherwise
[e]Compares 5-year change in maternal age
[f]Compares 500-gram change in birthweight
[g]Compares 1-week change in gestational age
[h]Compares first live birth versus otherwise

Web Table 5. Associations Between Paternal Involvement and Combined Childhood Cancer Incidence; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854; Controls=11,907)

Model	Paternal Information Recorded on the Birth Record (Versus Missing)[a]		
	OR	95% CI	P[b]
1A[c]	1.25	1.07, 1.47	<0.01
2A[d]	1.18	1.00, 1.38	0.05
3A[e]	1.13	0.96, 1.33	0.15
4A[f]	1.12	0.95, 1.32	0.19
5A[g]	1.11	0.93, 1.31	0.21

Abbreviations: CI, confidence interval; OR, odds ratio
[a]Paternal involvement modeled as 0 if father's race, ethnicity, age, and education were all missing from the birth certificate (N=1,188; 198 cases; 990 controls); modeled as 1 if otherwise.
[b]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[c]Model 1A bivariate
[d]Model 2A adjusted for maternal race/ethnicity
[e]Model 3A adjusted for maternal race/ethnicity, maternal age, birth order, birth year, and sex
[f]Model 4A adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, and gestational age
[g]Model 5A adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, gestational age, and neighborhood SES

Web Table 6. Associations Between SES and Combined Childhood Cancer Incidence Stratified by Rural/Urban Status; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854; Controls=11,907)

Model	Urban[a] (n = 11,907)			Rural[a] (n = 2,947)		
	OR	95% CI	P[b]	OR	95% CI	P[b]
Maternal Education						
1A[c]	1.09	1.04, 1.14	<0.001	1.08	0.97, 1.20	0.18
2A[d]	1.05	1.01, 1.11	0.03	1.08	0.97, 1.21	0.18
3A[e]	1.03	0.97, 1.08	0.33	1.09	0.97, 1.23	0.16
4A[f]	1.02	0.97, 1.08	0.43	1.09	0.96, 1.23	0.18
5A[g]	1.02	0.96, 1.07	0.57	1.09	0.96, 1.23	0.19
Neighborhood SES						
1B[c]	1.10	1.05, 1.15	<0.001	1.04	0.86, 1.25	0.69
2B[d]	1.06	1.00, 1.11	0.03	1.04	0.86, 1.26	0.71
3B[e]	1.04	0.99, 1.10	0.12	1.06	0.87, 1.30	0.55
4B[f]	1.04	0.99, 1.09	0.16	1.07	0.87,1.30	0.52
5B[g]	1.02	0.96, 1.07	0.57	1.09	0.96, 1.23	0.19

Abbreviations: CI, confidence interval; OR, odds ratio; SES, socioeconomic status
[a]Rural Urban Commuting Area (RUCA) codes used to categorize census tracts as urban (RUCA < 7) or rural (RUCA ≥ 7). Urban: cases = 1,976; controls = 9,931. Rural: cases = 516; controls = 2,431.
[b]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[c]Model 1A/B bivariate
[d]Model 2A/B adjusted for maternal race/ethnicity
[e]Model 3A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, and sex
[f]Model 4A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, and gestational age
[g]Model 5A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, gestational age, and neighborhood SES/maternal education

Web Table 7. Correlation Matrix of the Five Census Tract Measures Included in the Neighborhood SES Composite Index; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (N=14,854)

SES Measure	Pearson Correlation				
	1	2	3	4	5
1. % below poverty line	1				
2. % aged 16+ unemployed	0.69	1			
3. % age 25+ < HS education	0.68	0.60	1		
4. % welfare or public assistance	0.83	0.67	0.71	1	
5. % female headed household	0.74	0.52	0.44	0.70	1

Abbreviations: HS, high school; SES, socioeconomic status

Web Table 8. Associations Between Dimensions of Neighborhood SES and Combined Childhood Cancer Incidence; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854; Controls=11,907)

Model	Poverty[a] (SD = 0.09)			<HS Education[a] (SD = 0.09)			Unemployed[a] (SD = 0.03)			Welfare[a] (SD = 0.06)			Female HH[a] (SD = 0.13)		
	OR	95% CI	P[b]	OR	95% CI	P[b]	OR	95% CI	P[b]	OR	95% CI	P[b]	OR	95% CI	P[b]
1B[c]	1.10	1.04, 1.15	<0.001	1.04	0.99, 1.09	0.09	1.07	1.02, 1.11	0.01	1.10	1.04, 1.15	<0.01	1.10	1.05, 1.15	<0.001
2B[d]	1.06	1.00, 1.12	0.04	1.02	0.97, 1.07	0.48	1.04	0.99, 1.09	0.11	1.06	1.00, 1.12	0.05	1.06	1.00, 1.11	0.03
3B[e]	1.04	0.99, 1.10	0.11	1.00	0.95, 1.05	0.95	1.03	0.98, 1.08	0.23	1.04	0.98, 1.10	0.15	1.05	1.00, 1.11	0.06
4B[f]	1.04	0.99, 1.10	0.15	1.00	0.95, 1.05	0.87	1.03	0.98, 1.08	0.26	1.04	0.98, 1.10	0.18	1.05	0.99, 1.10	0.08
5B[g]	1.04	0.98, 1.09	0.19	0.99	0.94, 1.04	0.69	1.02	0.98, 1.08	0.32	1.04	0.98, 1.10	0.23	1.05	0.99, 1.10	0.10

Abbreviations: CI, confidence interval; Female HH, % female headed households within census tract; HS Education , % aged 25+ with less than a high school education within census tract; OR, odds ratio; Poverty, % below poverty line within census tract; SD, standard deviation; Unemployed, % aged 16+ in the workforce unemployed within census tract; Welfare, % on welfare or public assistance within census tract

[a]Neighborhood SES variables reverse coded and standardized so that a 1-unit change reflects a 1-standard deviation decrease (e.g. Model 1B indicates that a 1-SD (9%) decrease in census tract % poverty is associated with a 10% increased odds of combined childhood cancer incidence.

[b]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.

[c]Model 1B bivariate

[d]Model 2B adjusted for maternal race/ethnicity

[e]Model 3B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, and sex

[f]Model 4B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, and gestational age

[g]Model 5B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, gestational age, and maternal education

Web Table 9. Testing Validity of Linearly Interpolated Census Tract SES Composite Index: Associations Between Neighborhood SES and Combined Childhood Cancer Incidence; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854; Controls=11,907)

| Model | All Participants (*n* = 14,854) | | | | | | Participants Born Within 2 Years of US Census (*n* = 10,762)[a] | | | | | |
| | Linearly Interpolated Neighborhood SES | | | Non-Interpolated Neighborhood SES[b] | | | Linearly Interpolated Neighborhood SES | | | Non-Interpolated Neighborhood SES[b] | | |
	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]	OR	95% CI	P[c]
1B[d]	1.09	1.04, 1.14	<0.001	1.09	1.04, 1.14	<0.001	1.10	1.04, 1.15	<0.001	1.09	1.04, 1.15	<0.01
2B[e]	1.05	1.00, 1.11	0.04	1.05	1.00, 1.10	0.04	1.07	1.01, 1.13	0.02	1.07	1.01, 1.13	0.02
3B[f]	1.04	0.99, 1.09	0.12	1.04	0.99, 1.09	0.12	1.06	1.00, 1.12	0.05	1.05	1.00, 1.11	0.07
4B[g]	1.04	0.99, 1.09	0.16	1.04	0.99, 1.09	0.15	1.05	1.00, 1.12	0.07	1.05	0.99, 1.11	0.08
5B[h]	1.03	0.98, 1.09	0.21	1.03	0.98, 1.09	0.20	1.05	0.99, 1.11	0.08	1.05	0.99, 1.11	0.10

Abbreviations: CI, confidence interval; OR, odds ratio; SES, socioeconomic status
[a]Includes children born between 1989-1992 (2-year window around 1990 census); 1998-2002 (2-year window around 2000 census); and 2003-2011 (2-year window around 2005-2009 ACS 5-year estimates). Cases = 2,134; controls = 8,628.
[b]Non-interpolated SES values assigned based on US Census (1990, 2000, or 2005-2009 ACS) occurring closest to the given birth year. Therefore, births between 1989 and 1995 were assigned 1990 census values; births 1996-2002 were assigned 2000 census values; and births 2003-2014 were assigned 2005-2009 ACS 5-year estimates.
[c]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[d]Model 1B bivariate
[e]Model 2B adjusted for maternal race/ethnicity
[f]Model 3B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, and sex
[g]Model 4B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, and gestational age
[h]Model 5B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, gestational age, and maternal education

Web Table 10. Associations Between SES and Incidence of Childhood Lymphomas Stratified by Cancer Subtype; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854; Controls=11,907)

Model	Hodgkin Lymphoma (n = 67)			Non-Hodgkin Lymphoma Excluding Burkitt (n = 97)			Burkitt Lymphoma (n = 47)			Other and Unspecified Lymphoma (n = 100)		
	OR	95% CI	P[a]	OR	95% CI	P[a]	OR	95% CI	P[a]	OR	95% CI	P[a]
Maternal Education												
1A[b]	0.98	0.77, 1.25	0.89	0.97	0.79, 1.78	0.74	1.25	0.92, 1.68	0.15	1.33	1.08, 1.64	<0.01
2A[c]	0.97	0.76, 1.25	0.84	0.99	0.80, 1.22	0.91	1.12	0.82, 1.53	0.46	1.35	1.09, 1.67	<0.01
3A[d]	1.02	0.76, 1.35	0.92	1.05	0.83, 1.33	0.67	1.22	0.86, 1.75	0.27	1.23	0.97, 1.56	0.09
4A[e]	1.01	0.76, 1.34	0.95	1.07	0.84, 1.35	0.59	1.21	0.85, 1.73	0.29	1.23	0.97, 1.57	0.09
5A[f]	1.01	0.76, 1.35	0.94	1.05	0.83, 1.34	0.67	1.19	0.83, 1.71	0.34	1.17	0.92, 1.49	0.21
Neighborhood SES												
1B[b]	0.99	0.79, 1.25	0.95	1.00	0.82, 1.21	0.98	1.33	0.92, 1.93	0.13	1.48	1.12, 1.95	<0.01
2B[c]	0.98	0.76, 1.27	0.88	1.04	0.83, 1.28	0.75	1.13	0.75, 1.69	0.56	1.53	1.15, 2.05	<0.01
3B[d]	1.00	0.76, 1.31	0.99	1.07	0.85, 1.34	0.55	1.16	0.76, 1.77	0.51	1.43	1.08, 1.91	0.01
4B[e]	1.00	0.76, 1.31	0.98	1.08	0.86, 1.36	0.48	1.16	0.76, 1.78	0.50	1.43	1.07, 1.91	0.01
5B[f]	1.01	0.76, 1.35	0.96	1.05	0.83, 1.33	0.67	1.19	0.83, 1.71	0.34	1.39	1.04, 1.85	0.03

Abbreviations: CI, confidence interval; OR, odds ratio; SES, socioeconomic status
[a]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[b]Model 1A/B bivariate
[c]Model 2A/B adjusted for maternal race/ethnicity
[d]Model 3A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, and sex
[e]Model 4A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, and gestational age
[f]Model 5A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, gestational age, and neighborhood SES/maternal education

Web Table 11. Associations Between Maternal Education and Incidence of Childhood Central Nervous System Tumors Stratified by Cancer Subtype; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854; Controls=11,907)

	Ependyomas and Choroid Plexus Tumors (n = 87)			Astrocytomas (n = 305)			Intracranial and Intraspinal Tumors (n = 119)			Other Specified and Unspecified CNS Tumors (n = 151)		
Model	OR	95% CI	P[a]	OR	95% CI	P[a]	OR	95% CI	P[a]	OR	95% CI	P[a]
Maternal Education												
1A[b]	1.21	0.97, 1.51	0.08	1.07	0.96, 1.20	0.24	0.96	0.80, 1.15	0.64	1.12	1.04, 1.21	<0.01
2A[c]	1.15	0.92, 1.45	0.22	1.01	0.89, 1.14	0.89	0.90	0.75, 1.09	0.27	1.06	0.97, 1.15	0.18
3A[d]	1.13	0.88, 1.47	0.34	1.02	0.89, 1.16	0.82	0.95	0.76, 1.18	0.63	1.06	0.96, 1.16	0.24
4A[e]	1.13	0.87, 1.46	0.35	1.01	0.88, 1.16	0.89	0.94	0.76, 1.17	0.60	1.05	0.96, 1.16	0.29
5A[f]	1.16	0.89, 1.51	0.27	0.99	0.87, 1.14	0.93	0.93	0.75, 1.16	0.54	1.04	0.95, 1.15	0.42
Neighborhood SES												
1B[b]	1.00	0.82, 1.24	0.97	1.20	1.05, 1.37	<0.01	1.10	0.91, 1.34	0.33	1.18	1.08, 1.29	<0.001
2B[c]	0.89	0.71, 1.13	0.33	1.11	0.96, 1.28	0.17	1.02	0.82, 1.27	0.85	1.09	0.99, 1.20	0.09
3B[d]	0.87	0.69, 1.10	0.25	1.12	0.96, 1.30	0.14	1.06	0.85, 1.33	0.60	1.09	0.98, 1.20	0.10
4B[e]	0.87	0.69, 1.10	0.25	1.12	0.96, 1.30	0.15	1.06	0.85, 1.33	0.60	1.09	0.98, 1.20	0.11
5B[f]	0.82	0.67, 1.08	0.18	1.12	0.96, 1.30	0.15	0.93	0.75, 1.16	0.54	1.04	0.95, 1.15	0.42

Abbreviations: CI, confidence interval; OR, odds ratio; SES, socioeconomic status
[a]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[b]Model 1A/B bivariate
[c]Model 2A/B adjusted for maternal race/ethnicity
[d]Model 3A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, and sex
[e]Model 4A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, and gestational age
[f]Model 5A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, gestational age, and neighborhood SES/maternal education

Web Table 12. Associations Between SES and Combined Childhood Cancer Incidence Stratified by Age Group at Diagnosis; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854; Controls=11,907)

Model	0-4 Years (n = 1,702)			5-9 Years (n = 690)			10-14 Years (n = 555)		
	OR	95% CI	P[a]	OR	95% CI	P[a]	OR	95% CI	P[a]
Maternal Education									
1A[b]	1.11	1.05, 1.17	<0.001	1.08	1.00, 1.16	0.07	1.00	0.92, 1.09	0.96
2A[c]	1.10	1.04, 1.16	<0.01	1.04	0.96, 1.13	0.29	0.94	0.86, 1.03	0.21
3A[d]	1.03	0.97, 1.10	0.31	1.06	0.97, 1.17	0.2	1.01	0.91, 1.12	0.81
4A[e]	1.03	0.97, 1.09	0.41	1.06	0.96, 1.16	0.26	1.01	0.91, 1.12	0.85
5A[f]	1.02	0.96, 1.09	0.53	1.05	0.96, 1.15	0.31	1.01	0.91, 1.12	0.92
Neighborhood SES									
1B[b]	1.09	1.03, 1.15	<0.01	1.09	1.00, 1.18	0.05	1.08	0.99, 1.18	0.10
2B[c]	1.08	1.01, 1.15	0.02	1.04	0.95, 1.14	0.38	0.99	0.90, 1.10	0.88
3B[d]	1.05	0.98, 1.11	0.14	1.04	0.95, 1.15	0.35	1.03	0.93, 1.15	0.53
4B[e]	1.04	0.98, 1.11	0.18	1.04	0.95, 1.14	0.39	1.03	0.93, 1.15	0.56
5B[f]	1.02	0.96, 1.09	0.53	1.03	0.94, 1.14	0.50	1.03	0.93, 1.15	0.57

Abbreviations: CI, confidence interval; OR, odds ratio; SES, socioeconomic status
[a]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[b]Model 1A/B bivariate
[c]Model 2A/B adjusted for maternal race/ethnicity
[d]Model 3A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, and sex
[e]Model 4A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, and gestational age
[f]Model 5A/B adjusted for maternal race/ethnicity, maternal age, birth order, birth year, sex, birthweight, gestational age, and neighborhood SES/maternal education

Web Table 13. Associations Between SES and Combined Childhood Cancer Incidence Stratified by Race and Ethnicity; Registry-Based Case-Cohort Study, Minnesota Cancer Surveillance System Linked to Minnesota Birth Registry, 1989-2014 (Total Sample=14,854; Controls=11,907)

	Non-Hispanic White[a] (n = 12,127)			Non-Hispanic Black[b] (n = 883)			Hispanic[c] (n = 749)			Other[d] (n = 1,013)		
	OR	95% CI	P[e]	OR	95% CI	P[e]	OR	95% CI	P[e]	OR	95% CI	P[e]
Maternal Education												
1A[f]	1.08	1.03, 1.13	<0.01	0.96	0.78, 1.20	0.74	0.98	0.82, 1.17	0.84	0.94	0.81, 1.10	0.46
3A[g]	1.06	1.01, 1.12	0.02	0.91	0.72, 1.16	0.45	0.96	0.80, 1.17	0.70	0.89	0.75, 1.07	0.22
4A[h]	1.06	1.00, 1.12	0.04	0.90	0.71, 1.15	0.41	0.96	0.79, 1.17	0.68	0.90	0.75, 1.08	0.27
5A[i]	1.05	1.00, 1.11	0.07	0.92	0.72, 1.17	0.50	0.96	0.79, 1.17	0.71	0.89	0.74, 1.08	0.24
Neighborhood SES												
1B[f]	1.08	1.02, 1.16	0.01	0.97	0.86, 1.10	0.65	0.98	0.85, 1.15	0.84	1.02	0.92, 1.13	0.69
3B[g]	1.07	1.00, 1.14	0.05	0.95	0.84, 1.08	0.43	0.98	0.84, 1.15	0.82	1.01	0.90, 1.13	0.88
4B[h]	1.06	1.00, 1.14	0.07	0.95	0.83, 1.07	0.39	0.98	0.84, 1.14	0.80	1.01	0.90, 1.13	0.87
5B[i]	1.05	0.99, 1.13	0.12	0.95	0.84, 1.09	0.49	0.99	0.84, 1.15	0.85	1.03	0.92, 1.15	0.64

Abbreviations: CI, confidence interval; OR, odds ratio; SES, socioeconomic status
[a]Cases = 2,496; controls = 9,631
[b]Cases = 113; controls 770
[c]Cases = 147; controls = 602
[d]Cases = 179; controls = 834
[e]P-values estimated from a logistic mixed model with a random intercept for census tract clustering using a two-sided hypothesis test.
[f]Model 1A/B bivariate
[g]Model 3A/B adjusted for maternal age, birth order, birth year, and sex
[h]Model 4A/B adjusted for maternal age, birth order, birth year, sex, birthweight, and gestational age
[i]Model 5A/B adjusted for maternal age, birth order, birth year, sex, birthweight, gestational age, and neighborhood SES/maternal education