

# Quantitative and Qualitative Linguistic Development

From 8 mos. to 19 yrs. old  
As indicated by the CHILDES database

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November 19, 2008

## Abstract

This report repeatedly makes two conflicting points:

1. General developmental trends are apparent in the data.
2. Conclusions are qualified by biases of the data.

## 1. Introduction

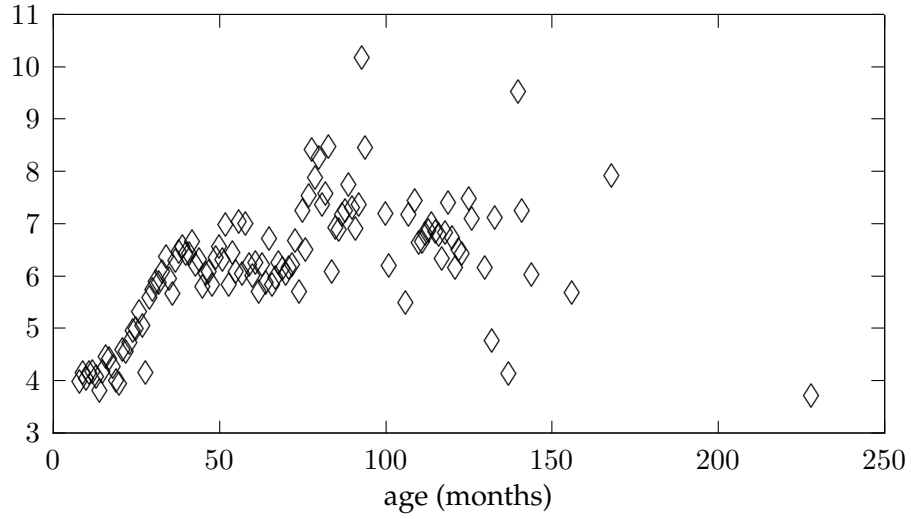
(1) Common claims:

- a. Utterance length increase with age.
- b. Vocabulary increases with age.
- c. Nouns are acquired before verbs.
- d. Kids often omit function words.

(2) Questions:

- a. Does motherese length increase with child's age?
- b. Does motherese vocabulary increase with child's age?
- c. Is motherese affected by assumptions about children's comprehension?
- d. Do adults usually use more verbs proportionally than kids?
- e. How can we quantify function word omitting when most of the most common words from the earliest age are function words? <-measure the percentage and see if its less than 26% (i.e. PTB)!!

Kids' Average Utterance Length by Kids' Age



Adults' Average Utterance Length by Kids' Age

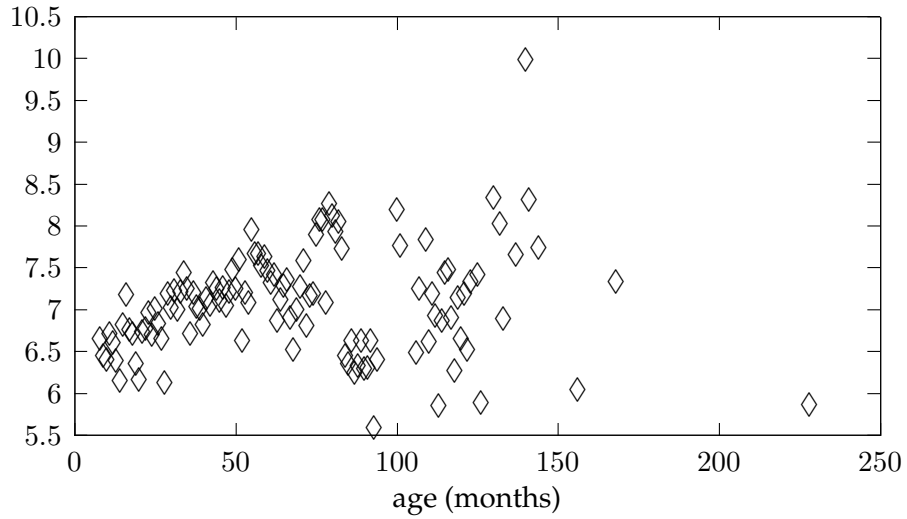


Table 1: Length Increases.

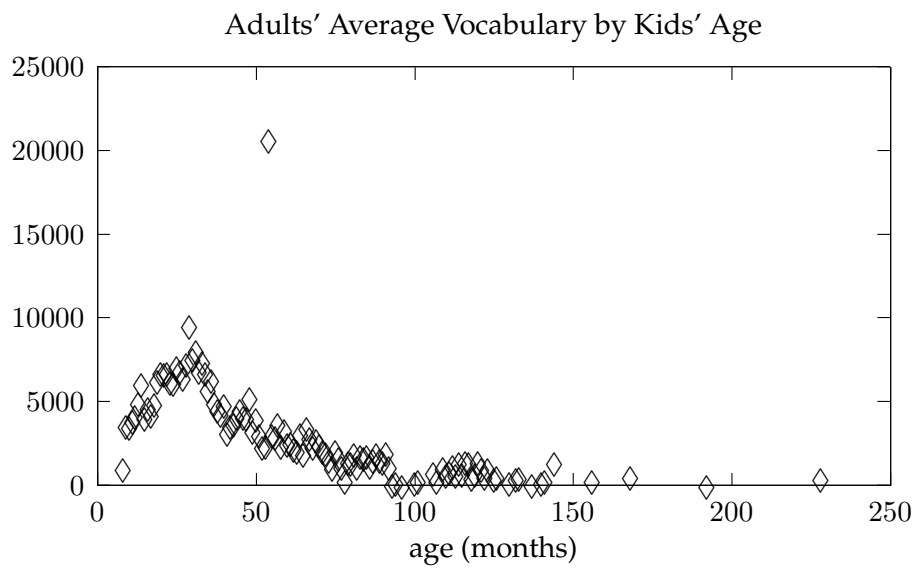
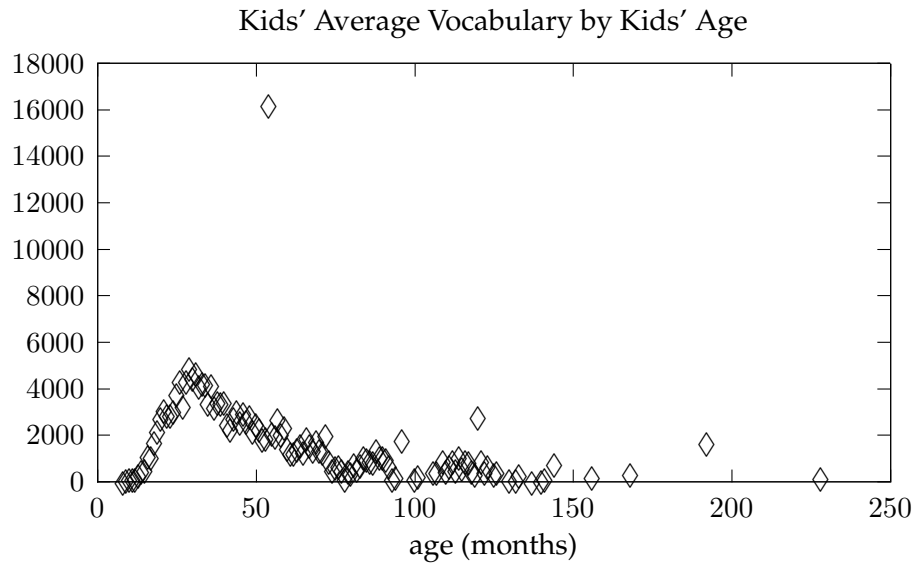


Table 2: Vocabulary Decreases with the Data.

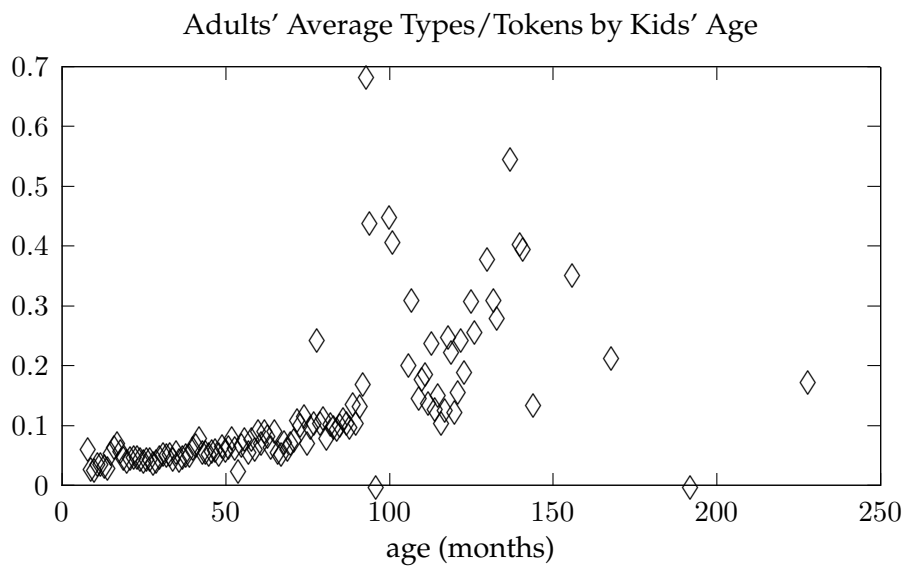
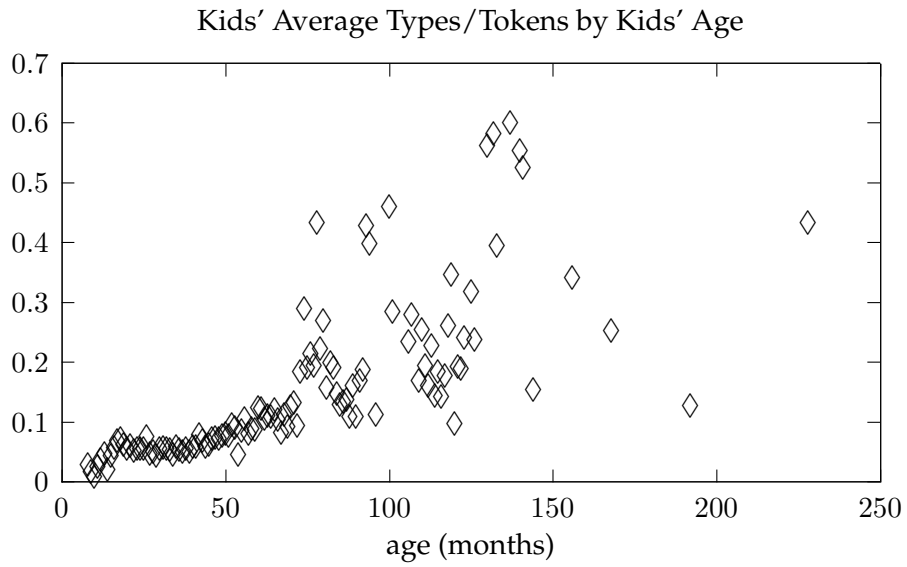


Table 3: Vocabulary Increases.

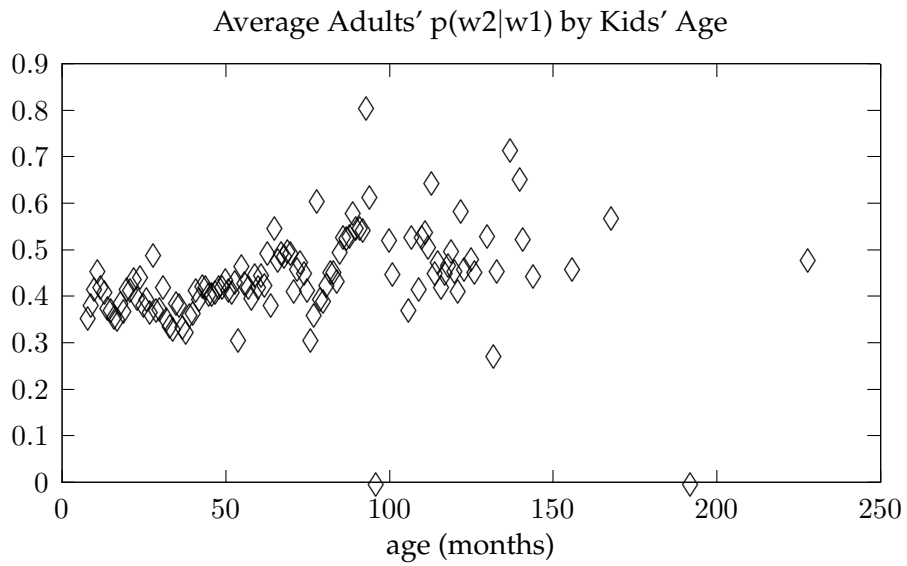
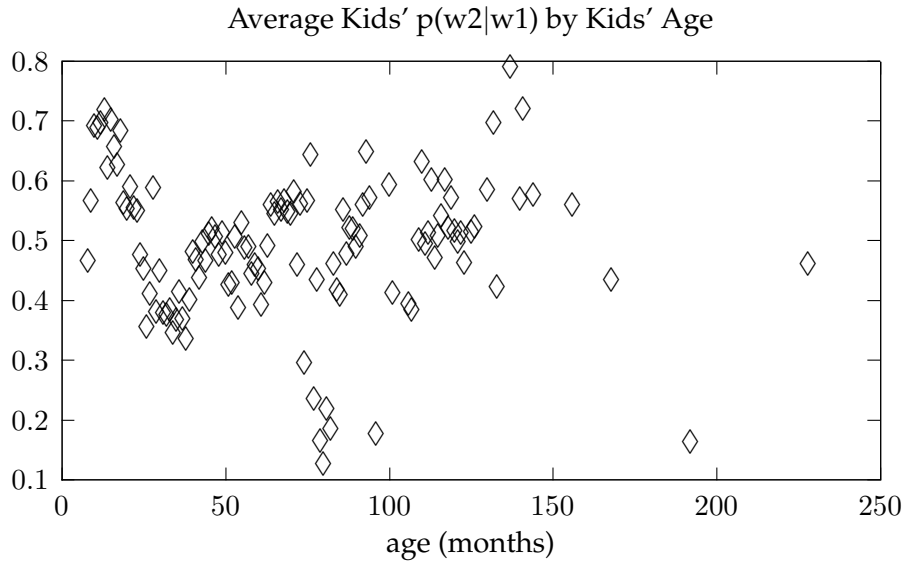


Table 4: Bigram Probabilities Decrease as Diversity Increases.

## 2. Appendix 1: Kids' Unigram Counts by Kids' Age

AGE: 1	TOTAL: 517501	5855 I	1510 he	841 you	26 and	20 a	298 a
TOTAL: 248337	21194 I	3930 the	1426 the	813 it	24 no	20 it	261 it
38485 yy	12900 the	3879 xxx	1241 a	745 a	20 that	18 what	213 that
19972 0	12645 a	3243 you	1201 and	608 and	20 to	16 is	182 know
10627 xx	11629 you	3135 and	1020 you	597 0	19 you	14 the	179 well
6837 xxx	10733 it	2999 a	1006 one	558 this	18 know	14 know	162 of
3660 no	9705 and	2848 it	891 xxx	556 to	18 we	11 one	161 uh
3649 yyy	8997 yeah	2324 to	822 it	531 xxx	18 a	10 no	159 they
3151 a	7917 this	2177 this	744 to	524 oh	16 in	8 why	157 in
2873 it	7582 to	1964 that	679 was	517 yeah	16 yeah	8 do	139 what
2810 that	6971 xxx	1883 no	645 on	500 that	15 on	8 want	132 was
2766 the	6770 no	1745 yeah	624 yeah	470 &=laughs	15 what	7 it's	129 its
2492 Mommy	6362 xx	1635 one	616 xx	435 he	14 mmhm	7 yeah	122 have
2386 yeah	5978 is	1483 what	603 of	399 like	13 was	7 to	122 do
2025 I	5767 what	1337 is	595 that	395 on	13 they	6 need	121 yeah
1560 there	5705 yy	1329 he	565 no	395 no	13 don't	6 that	AGE: 19
1359 ball	5251 that	1217 don't	544 what	367 one	12 one	AGE: 14	TOTAL: 443
1341 oh	5236 in	1150 I'm	457 &=laughs	340 what	AGE: 12	TOTAL: 1263	17 it
1334 this	5207 one	1144 oh	449 but	AGE: 10	TOTAL: 4737	68 I	16 I
1300 go	4954 my	1115 know	AGE: 8	TOTAL: 39293	209 xxx	46 xxx	13 a
1280 what's	4779 on	AGE: 6	TOTAL: 20331	1509 I	194 I	30 a	11 truck
1271 in	AGE: 4	TOTAL: 46564	888 and	1193 and	155 the	29 and	10 xxx
AGE: 2	TOTAL: 565688	1895 I	882 I	1091 the	114 you	27 it	8 sit
TOTAL: 736590	24958 I	1620 and	611 the	936 you	110 a	25 to	8 in
29851 yy	15743 you	1314 the	495 to	832 a	106 and	23 gonna	8 down
21700 I	12743 the	1034 a	464 you	747 to	101 it	22 the	8 where
19774 xx	12195 it	992 you	440 a	693 it	86 this	21 no	8 go
18949 a	11947 a	847 to	399 it	506 he	70 yeah	21 I'm	7 no
17653 the	8171 and	741 it	388 um	466 that	62 that	20 this	7 book
15259 xxx	7885 to	638 he	299 he	442 like	62 can	19 it's	7 fire
13240 it	7202 xxx	605 um	281 my	441 um	62 to	19 yeah	7 yeah
13234 yeah	6239 yeah	551 that	274 in	416 know	59 no	18 when	6 fly
11735 no	6156 what	543 xxx	252 we	403 was	58 what	17 my	6 eat
10839 this	6078 this	528 my	250 this	400 we	55 mommy	17 mommy	5 pick
10375 you	6076 no	509 yeah	229 was	399 this	51 um	15 on	5 want
9802 that	5869 that	467 we	210 know	396 my	50 one	15 have	5 this
9046 and	5530 my	465 what	198 that	382 oh	48 I'm	14 you	5 what
8052 in	5451 is	457 in	191 on	366 in	47 zzz	13 can	
7271 is	4804 in	445 one	190 then	360 yeah	47 in	AGE: 16	
7010 my	4747 I'm	415 no	171 like	336 on	AGE: 13	TOTAL: 13041	
6469 on	4613 me	414 was	165 of	AGE: 11	TOTAL: 666	612 I	
6444 to	4478 on	388 they	AGE: 9	TOTAL: 1309	34 I	524 you	
6326 one	4452 one	AGE: 7	TOTAL: 39863	59 I	33 you	365 the	
5757 go	AGE: 5	TOTAL: 56354	1501 I	43 the	29 xxx	342 and	
AGE: 3	TOTAL: 144930	2033 I	984 the	27 it	21 this	327 to	

### 3. Appendix 2: Adults' Unigram Counts by Kids' Age

AGE: 1	12586 xx	10007 he	1442 no	58 don't	319 what	162 xxx	36 your
TOTAL: 1220007	12492 yeah	9952 don't	1426 in	56 of	272 this	150 that	35 and
50969 you	AGE: 3	9807 no	1318 okay	53 do	265 do	106 on	32 do
44110 the	TOTAL: 859177	9529 your	1243 they	53 your	231 like	104 your	28 in
29424 a	37117 you	AGE: 5	1152 this	50 this	229 yeah	88 like	28 that
23077 it	27159 the	TOTAL: 381841	1142	48 0	223 no	88 all	27 this
20998 that	18290 a	14554 you	AGE: 7	45 is	219 have	85 no	25 don't
16702 to	17363 it	11535 the	TOTAL: 114732	45 that's	218 he	85 do	25 can
16042 what	16891 to	8247 I	4879 you	AGE: 9	213 oh	84 right	23 gonna
15567 I	16779 I	7656 a	3181 the	TOTAL: 65331	211 on	84 in	23 go
15203 and	16399 what	7305 to	2842 I	2894 you	AGE: 11	83 of	22 on
15155 is	12833 that	7276 and	2439 it	1721 the	TOTAL: 4021	79 don't	22 xxx
13193 in	12409 and	7141 it	2298 to	1570 I	171 you	AGE: 13	22 okay
12860 this	10634 do	5772 what	2214 xxx	1476 it	140 the	TOTAL: 806	21 have
11864 on	10538 is	5544 that	2095 a	1126 to	85 I	46 you	AGE: 16
11750 that's	8348 in	4930 xxx	1766 what	1086 a	78 to	23 what	TOTAL: 0
11590 your	8176 this	3797 this	1709 and	1064 that	74 it	22 that	AGE: 19
11076 do	7892 oh	3656 is	1702 that	947 and	72 a	21 the	TOTAL: 2353
10130 oh	7246 on	3542 do	1266 no	827 xxx	61 and	21 it	133 you
9884 there	7155 okay	3521 in	1085 do	817 what	60 that	20 a	109 what's
9811 here	6712 have	3338 no	995 yeah	702 &=laughs	54 yeah	19 I	108 what
8868 can	6621 he	3252 of	939 don't	626 this	46 he	15 this	107 this
AGE: 2	6589 your	3229 yeah	919 this	613 do	44 like	14 oh	75 do
TOTAL: 1645349	6539 that's	3221 okay	894 of	599 oh	43 xxx	13 what's	71 a
67657 you	AGE: 4	3175 he	872 in	579 yeah	42 have	13 is	66 is
57030 the	TOTAL: 1246806	3074 on	868 is	577 like	42 what	11 and	62 the
38440 a	52733 you	AGE: 6	867 oh	562 on	37 is	10 know	59 good
33863 it	35665 the	TOTAL: 146621	857 okay	548 no	37 do	10 to	55 that
29207 to	31950 I	5213 you	AGE: 8	516 in	35 in	9 have	42 one
28179 I	25454 a	4506 the	TOTAL: 5649	504 don't	34 oh	9 like	34 say
27345 what	24682 it	3918 I	230 you	AGE: 10	33 on	8 that's	31 and
24907 that	21805 to	3116 and	163 I	TOTAL: 27392	32 we	8 okay	30 here
23069 and	18053 what	2706 a	152 the	1106 you	AGE: 12	8 right	28 it
21625 is	17577 and	2692 it	140 it	767 the	TOTAL: 9707	8 did	27 know
18536 in	16521 that	2691 to	104 &=laughs	745 I	466 you	AGE: 14	27 can
17474 do	11457 do	2261 what	99 a	583 it	287 the	TOTAL: 2392	26 girl
15743 this	11366 is	2004 that	88 to	544 to	228 I	146 you	26 to
14858 on	11136 in	1895 he	77 xxx	494 xxx	196 to	62 it	25 yeah
14724 that's	11128 xx	1756 yeah	73 no	443 a	172 and	51 I	
13832 oh	10749 on	1591 do	71 what	388 that	172 it	47 to	
13194 okay	10231 xxx	1465 xxx	70 that	383 and	169 a	46 the	
13100 your	10013 this	1457 is	65 and	351 &=laughs	169 what	41 a	

## 4. Appendix 3: Kids' Unigram Morphology Counts by Kids' Age

AGE: 1	TOTAL: 517501	16575 pro	5870 pro	3665 v	85 n	39 unk	525 co
TOTAL: 248337	51209 pro	13455 n	3692 v	2873 co	54 det	30 co	346 conj:coo
22829 n	43618 n	12500 v	2748 co	2094 det	47 prep	21 adj	333 adj
10793 unk	40650 v	9636 co	2696 det	1732 prep	35 n:prop	19 pro:wh	236 adv
10007 co	30147 det	8551 det	2518 prep	1115 adj	35 adj	16 v&3S	233 n:prop
7803 v	28090 co	5531 prep	1768 n:prop	992 n:prop	33 fil	16 aux	199 part-PROG
6096 n:prop	17506 prep	4944 unk	1738 adj	983 adv	25 n-PL	15 pro:dem	198 pro:poss:det
5399 pro	11951 n:prop	4032 adj	1716 unk	913 unk	24 adv	15 prep	197 n-PL
3631 det	10754 adv:loc	3748 n:prop	1207 adv	906 fil	22 part-PROG	15 adv:loc	180 v&PAST
3559 adv:loc	10366 adj	3422 conj:coo	1180 conj:coo	712 part-PROG	20 adv:loc	15 adv	177 qn
3248 adj	9636 adv	3345 adv	1132 v&PAST	685 conj:coo	20 v&PAST	12 pro:indef	172 adv:loc
3008 fil	8604 pro:dem	2728 det:num	994 fil	668 aux	18 conj:coo	9 qn	167 fil
2198 pro:dem	8349 conj:coo	2575 pro:dem	966 det:num	665 pro:dem	17 qn	9 fil	163 adv:int
1898 chi	7663 unk	2514 n-PL	748 n-PL	614 adv:loc	17 pro:wh	9 n:prop	158 aux
1668 n-PL	7039 n-PL	2354 adv:loc	737 aux	587 inf	17 pro:poss:det	9 aux~neg	142 inf
1644 adv	6968 part-PROG	2276 part-PROG	718 n:let	575 v&PAST	17 aux	9 inf	AGE: 19
1634 prep	6758 pro:poss:det	2273 fil	710 qn	544 n-PL	16 det:num	AGE: 14	TOTAL: 443
1515 pm	6326 aux	2260 v&PAST	695 inf	493 qn	AGE: 12	TOTAL: 1263	148 n
1499 qn	6254 pro:wh	2090 inf	676 adv:loc	AGE: 10	TOTAL: 4737	133 pro	63 v
1376 fs	5911 adv:wh	2069 qn	AGE: 8	TOTAL: 39293	543 n	108 v	41 pro
1338 part-PROG	5794 qn	AGE: 6	TOTAL: 20331	4263 pro	522 pro	102 n	22 det
1257 on	AGE: 4	TOTAL: 46564	2406 pro	3191 n	426 v	78 co	22 adj
AGE: 2	TOTAL: 565688	5035 pro	1623 n	2902 v	323 co	52 det	19 co
TOTAL: 736590	67755 pro	3940 n	1453 v	1914 co	314 det	41 unk	16 adv:loc
66478 n	52181 n	3213 v	1008 det	1879 det	213 unk	36 prep	14 n-PL
45852 v	50869 v	2438 co	874 prep	1642 prep	205 prep	33 adv	10 unk
45778 pro	33286 co	2334 det	815 co	1117 conj:coo	112 conj:coo	31 part-PROG	8 adv:wh
38364 co	31522 det	1885 prep	695 conj:coo	1007 n:prop	106 adj	30 inf	6 part-PROG
34466 det	19920 prep	1548 conj:coo	463 fil	944 adv	104 aux	29 adj	6 det:num
18755 adv:loc	14390 n:prop	1223 n:prop	458 n:prop	942 adj	103 pro:dem	27 aux	5 pro:dem
18390 unk	13063 adv	1084 adj	453 adv	742 fil	98 adv	26 conj:coo	5 on
16925 n:prop	13046 adj	994 adv	432 v&PAST	676 v&PAST	95 adv:loc	23 fil	5 pro:wh
16762 prep	11772 unk	905 v&PAST	413 adj	608 pro:poss:det	92 fil	22 n:prop	5 prep
11951 pro:dem	10775 adv:loc	801 fil	360 pro:poss:det	602 n-PL	89 n:prop	22 adv:loc	4 v&ZERO
11935 adj	10614 conj:coo	798 det:num	322 n-PL	560 part-PROG	84 part-PROG	22 conj:subor	3 qn
10850 adv	8995 part-PROG	782 n-PL	272 det:num	548 adv:loc	72 inf	20 pro:dem	3 n:prop
7975 pro:poss:det	8844 pro:dem	773 pro:poss:det	264 inf	505 inf	71 qn	20 pro:poss:det	3 pro:poss:det
7762 n-PL	8193 fil	649 unk	232 adv:loc	501 unk	67 n-PL	17 pro~aux&1S	
7751 part-PROG	7925 pro:poss:det	578 qn	217 part-PROG	479 qn	66 pro:wh	AGE: 16	
7077 fil	7898 n-PL	567 part-PROG	209 pro:dem	434 pro:dem	AGE: 13	TOTAL: 13041	
7022 qn	7745 v&PAST	532 adv:loc	192 qn	AGE: 11	TOTAL: 666	1452 pro	
5411 v&ZERO	7554 det:num	494 pro:wh	AGE: 9	TOTAL: 1309	94 pro	953 v	
5375 conj:coo	7450 inf	AGE: 7	TOTAL: 39863	148 pro	73 v	876 n	
4967 pro:wh	AGE: 5	TOTAL: 56354	4527 pro	107 v	71 n	599 prep	
AGE: 3	TOTAL: 144930	7086 n	3719 n	98 co	49 det	573 det	

## 5. Appendix 4: Adults' Unigram Morphology Counts by Kids' Age

AGE: 1	13361 inf	16702 inf	2066 v&PAST	96 aux	495 adv:loc	202 n:prop	55 adj
TOTAL: 1220007	13306 v&3S	16647 qn	2059 qn	95 adv:loc	487 part-PROG	196 unk	53 aux
76067 n	AGE: 3	16331 n-PL	1802 part-PROG	93 pro:poss:det	484 conj:coo	181 pro:wh	49 adv
75345 v	TOTAL: 859177	16010 pro:poss:det	1778 pro:dem	90 conj:coo	475 inf	170 qn	43 n:prop
73221 pro	80288 pro	AGE: 5	1754 inf	86 pro:wh	415 aux	166 conj:coo	41 part-PROG
48385 det	65367 v	TOTAL: 381841	1733 fil	81 qn	383 pro:dem	160 part-PROG	40 inf
43857 co	61355 n	38828 pro	AGE: 7	80 n-PL	378 pro:wh	152 v&PAST	39 qn
27289 prep	41454 det	32577 v	TOTAL: 114732	75 fil	375 qn	147 inf	38 adv:loc
26488 adv:loc	38394 co	31126 n	12522 pro	AGE: 9	368 fil	146 adv:loc	37 conj:coo
22212 adj	30777 prep	20777 co	11183 n	TOTAL: 65331	358 n-PL	133 aux	36 pro:poss:det
19727 n:prop	20892 adj	20103 det	10564 v	7525 pro	AGE: 11	121 pro:dem	32 pro:dem
14209 adv	16810 n:prop	17043 prep	6366 co	6428 v	TOTAL: 4021	117 pro:poss:det	31 unk
13784 pro:dem	16598 adv	11122 adj	5732 det	5296 n	421 pro	AGE: 13	30 n-PL
12753 aux	16513 pro:wh	10183 n:prop	4886 prep	3777 co	336 v	TOTAL: 806	29 conj:subor
11743 pro:wh	14902 adv:loc	9333 adv	3397 unk	3178 det	302 n	94 pro	AGE: 16
10701 part-PROG	13239 aux	7605 n-PL	3339 adj	2926 prep	215 co	78 v	TOTAL: 0
10293 pro:poss:det	11411 conj:coo	7303 conj:coo	3217 n:prop	1806 adj	204 det	77 n	AGE: 19
10107 n-PL	10987 part-PROG	6377 adv:loc	2994 adv	1608 adv	202 prep	48 det	TOTAL: 2353
9277 v&3S	10892 pro:dem	6194 pro:wh	1924 conj:coo	1431 unk	126 adj	46 co	320 n
9083 qn	10737 n-PL	6114 unk	1912 adv:loc	1427 n:prop	113 n:prop	36 adj	220 v
8560 inf	10044 inf	5782 qn	1906 inf	1196 adv:loc	94 adv	34 prep	186 pro
8361 conj:coo	9263 qn	5714 aux	1906 pro:wh	1157 part-PROG	79 part-PROG	27 pro:wh	180 det
AGE: 2	9027 pro:poss:det	5488 pro:dem	1873 part-PROG	1098 aux	74 n-PL	26 pro:dem	143 co
TOTAL: 1645349	8060 v&PAST	5476 part-PROG	1702 aux	1093 conj:coo	71 qn	19 adv	135 pro:dem
119015 pro	AGE: 4	5085 v&PAST	1574 qn	1052 inf	68 conj:coo	15 conj:coo	107 pro:wh
102977 n	TOTAL: 1246806	4870 inf	1543 fil	986 pro:dem	65 fil	15 n-PL	106 adj
98091 v	138599 pro	AGE: 6	1481 pro:dem	977 qn	64 adv:loc	12 pro:wh~v&3S	101 pro:wh~v&3S
73007 det	112663 v	TOTAL: 146621	1399 n-PL	931 n-PL	63 det:num	12 v&3S	87 aux
62465 co	103961 n	15843 pro	AGE: 8	915 fil	61 aux	12 adv:loc	79 prep
45567 prep	68401 co	12269 v	TOTAL: 5649	872 pro:wh	56 inf	12 v&PAST	74 adv:loc
30944 adj	64319 det	11441 n	747 pro	AGE: 10	55 unk	11 qn	63 v&3S
30285 adv:loc	51784 prep	9122 co	588 v	TOTAL: 27392	52 pro:dem	11 n:prop	37 pro:indef
24679 pro:wh	34619 n:prop	7730 det	527 n	3043 pro	AGE: 12	11 aux~neg	35 conj:coo
24441 adv	33508 adj	5792 prep	410 co	2537 v	TOTAL: 9707	10 aux	32 n-PL
23049 n:prop	30768 adv	4582 adj	311 det	2356 n	1126 pro	AGE: 14	31 n:prop
19511 aux	24790 adv:loc	3886 n:prop	291 prep	1405 co	879 v	TOTAL: 2392	27 part-PROG
19283 part-PROG	20935 conj:coo	3583 adv	210 adj	1338 det	814 n	257 pro	25 adv:int
18345 pro:dem	20748 unk	3542 conj:coo	179 n:prop	1204 prep	468 prep	214 v	23 adv
16080 n-PL	20524 pro:wh	2503 n-PL	139 adv	776 adj	462 co	146 n	
15731 conj:coo	19837 part-PROG	2486 pro:wh	118 unk	774 unk	433 det	119 prep	
14592 pro:poss:det	17829 aux	2199 aux	113 part-PROG	734 adv	315 adj	111 co	
13938 qn	17209 v&PAST	2170 adv:loc	98 inf	706 n:prop	230 adv	88 det	

## 6. Appendix 5: Kids' Bigram Counts by Kids' Age

AGE: 1	TOTAL: 374839	752 I don't	336 he ate	94 do you	5 and they	4 I don't	40 did you
TOTAL: 102083	2194 I don't	382 don't know	320 ate through	87 he was	4 don't know	4 I need	39 I think
11367 yy yy	2016 I want	363 I want	260 but he	86 I have	4 to be	4 what this	38 and I
1060 xx xx	1401 yy yy	355 I know	248 was still	86 this is	4 t@l v@l	4 I think	35 to be
684 xx yy	1294 in the	353 and then	245 still hungry	86 in the	4 oh I	4 this is	35 don't know
609 yy xx	1153 this is	345 want to	242 I don't	77 can I	3 know what	3 a big	35 I mean
587 what's that	1131 don't know	339 this is	186 in the	72 have to	3 feed him	3 you want	33 want to
487 xxx xxx	998 on the	306 in the	151 do you	71 I'm gonna	3 the caterpillar	3 it is	30 you have
359 I want	966 want to	282 have to	134 slice of	67 oh yeah	3 I got	3 want to	28 to go
353 in the	923 this one	258 do you	131 a little	66 I like	3 of the	3 come on	27 in the
347 what's this	879 what is	254 going to	130 I know	66 he ate	3 a perm	3 what is	27 I was
320 no no	837 I got	249 I have	123 can I	63 don't know	3 I like	2 don't know	26 I know
237 on the	788 going to	238 you know	123 of the	62 on the	3 my t@l	2 always say	26 of the
236 uh oh	786 I have	232 and I	122 was a	61 look at	3 in there	2 big one	25 I have
235 this is	708 can I	232 I'm gonna	119 how do	60 ate through	3 last time	2 put it	25 a lot
229 in there	697 do it	227 he ate	119 piece of	60 and then	3 to get	2 I was	AGE: 19
181 yy Mommy	693 do you	223 on the	116 don't know	55 I can	3 on the	AGE: 14	TOTAL: 191
180 that's a	663 gon (t)a	210 know what	111 one slice	52 of the	AGE: 12	TOTAL: 957	6 fire truck
173 yyy yyy	644 I wanna	209 I can	107 through one	AGE: 10	TOTAL: 3487	14 I'm gonna	5 I want
168 close it	639 I can't	200 this one	AGE: 8	TOTAL: 31401	22 and then	9 a little	4 sit down
163 put it	632 and I	AGE: 6	TOTAL: 16913	238 you know	20 in the	8 I wanna	3 drop it
163 do it	AGE: 4	TOTAL: 36828	122 and then	149 I don't	18 we can	8 I don't	3 pick it
AGE: 2	TOTAL: 422213	187 and then	116 you know	136 and then	16 I have	6 I want	3 eat it
TOTAL: 481123	2581 I don't	162 I don't	93 in the	112 I like	16 I don't	6 I have	3 I pet
7320 yy yy	1590 I want	147 in the	84 and I	102 in the	15 can I	6 can I	3 pet nice
3066 I want	1186 in the	135 and I	71 I don't	100 and I	14 I'm gonna	5 c(an) I	3 this one
2129 in the	1111 I have	130 you know	58 it was	92 it was	14 on the	4 (be)cause it's	2 I pick
2008 this is	1029 don't know	112 I know	58 and he	86 I have	13 I can	4 and when	2 what's that
1813 I don't	1022 have to	102 and he	57 I was	81 I know	13 have a	4 dancin(g) school	2 it off
1667 what's that	1020 I got	97 I have	56 I have	77 do you	12 have some	4 and again	2 a fire
1428 on the	1000 you know	91 he was	54 going to	73 have a	11 I want	4 a xxx	2 open the
1357 xx xx	983 this is	90 when I	53 have to	71 he was	11 this is	4 I was	2 a ladder
1124 this one	948 do you	81 I got	53 do you	70 have to	11 don't know	4 put the	2 truck go
1121 xx yy	922 I know	77 don't know	49 on the	69 going to	11 the xxx	4 again and	2 lay down
1097 I wanna	883 know what	76 know what	46 and they	68 don't know	10 know what	4 little man	2 where fire
1090 that's a	848 I'm gonna	75 going to	45 and um	67 I was	10 and I	4 is this	2 where horse
1072 yy xx	831 ha ha	75 and my	43 I want	65 on the	10 what are	4 on the	2 sit back
981 in there	814 on the	74 it was	42 when I	63 and he	10 you can	4 gonna bring	
970 I'm gonna	795 want to	73 on the	42 I got	55 like that	9 is this	AGE: 16	
964 right there	747 I can	70 have a	40 to go	49 I think	AGE: 13	TOTAL: 11248	
916 wan(t) (t)a	745 can I	68 I was	39 know what	AGE: 11	TOTAL: 482	103 you know	
904 want to	723 do it	68 have to	AGE: 9	TOTAL: 987	10 know what	57 I don't	
860 put it	720 I wanna	AGE: 7	TOTAL: 28586	7 it was	9 you know	56 do you	
854 no no	AGE: 5	TOTAL: 40624	144 I don't	7 I know	6 do you	49 it was	
AGE: 3	TOTAL: 105420	388 he was	108 I know	5 I don't	4 0do you	43 going to	

## 7. Appendix 6: Adults' Bigram Counts by Kids' Age

AGE: 1	2620 what are	1613 come on	200 it was	11 I know	46 and then	20 it was	9 if you
TOTAL: 901115	2586 you like	1611 I think	199 to do	10 on the	45 I know	19 go to	8 to go
4976 in the	AGE: 3	1561 don't know	198 are you	9 to go	43 this is	19 a little	8 dancin(g) school
4623 do you	TOTAL: 673175	1512 I have	196 don't know	9 in the	43 you don't	18 that's right	7 Miss Beverly
4096 you want	4683 do you	AGE: 5	195 you want	9 you want	42 look at	18 and then	7 have to
3769 can you	2685 in the	TOTAL: 302088	195 on the	9 with the	37 it was	17 are you	6 are you
3606 are you	2460 I don't	1493 do you	AGE: 7	8 you have	36 I was	17 I think	6 when you
3303 is that	2427 did you	1201 in the	TOTAL: 86772	8 you don't	36 do it	17 to the	6 how come
3240 on the	2245 are you	995 I don't	472 do you	AGE: 9	35 I think	16 what do	6 for you
3073 that's a	2152 you want	992 you know	367 you know	TOTAL: 50005	34 of the	16 you like	6 is it
3059 you wanna	1951 you know	821 did you	357 I don't	251 do you	AGE: 11	16 know what	6 you want
2893 what's that	1811 on the	792 you want	310 you want	194 I don't	TOTAL: 3202	16 did you	5 what's this
2555 look at	1810 have to	783 are you	249 in the	187 you can	15 do you	AGE: 13	5 on your
2012 what is	1805 going to	777 have to	244 all right	181 you know	15 I don't	TOTAL: 601	5 what is
1976 you can	1664 I think	755 want to	232 have to	151 did you	12 a little	7 what's this	AGE: 16
1905 you like	1658 you have	743 you can	212 want to	133 if you	11 you have	6 did you	TOTAL: 0
1819 that's right	1647 is that	733 going to	209 are you	128 you have	11 of the	5 you have	AGE: 19
1804 put it	1582 you can	708 this is	206 you can	122 in the	11 you know	5 what is	TOTAL: 1748
1799 what's this	1495 what is	662 on the	205 did you	117 have to	11 have to	4 don't know	65 what's this
1769 I don't	1474 this is	613 of the	194 on the	113 and then	10 when you	4 I don't	52 do you
1755 I think	1412 want to	608 you have	186 you have	113 I think	10 did you	4 do you	27 this one
1736 a little	1367 what are	546 and then	167 don't know	113 are you	10 it was	3 you like	24 what is
AGE: 2	1299 what do	534 you don't	164 of the	106 you want	9 in the	3 is this	23 you know
TOTAL: 1281360	1295 don't know	526 know what	162 a little	106 on the	9 you want	3 looks like	23 good girl
7831 do you	AGE: 4	511 to the	156 I think	103 this is	8 he ate	3 to drive	21 what do
6535 in the	TOTAL: 979073	488 a little	153 I know	96 I know	8 are you	3 oh it	20 and what's
4684 are you	4600 do you	AGE: 6	149 you don't	89 do it	8 you got	3 you want	20 can you
4631 you want	3653 I don't	TOTAL: 114573	149 no no	87 don't know	8 he was	3 may I	20 what this
4308 on the	3370 in the	513 do you	AGE: 8	86 you don't	8 thank you	3 look at	19 know what
3878 I don't	3187 you know	460 you know	TOTAL: 4178	86 you wanna	8 you can	3 the dog	19 very good
3761 did you	2737 you want	422 in the	21 I don't	AGE: 10	7 is the	3 you know	18 what's that
3687 is that	2654 did you	363 I don't	18 do you	TOTAL: 20935	7 oh yeah	3 what shape	17 you do
3609 I think	2452 are you	340 have to	16 if you	79 do you	AGE: 12	3 have fun	17 you say
3169 that's a	2400 have to	279 did you	16 it was	75 have to	TOTAL: 7960	3 what's that	16 is that
2992 what is	2295 on the	271 and then	15 I have	74 you can	40 on the	AGE: 14	15 do with
2936 can you	2157 you can	248 know what	14 can I	71 I don't	36 in the	TOTAL: 1981	15 look at
2902 you know	2137 you have	243 and he	14 no no	66 you know	33 all right	16 you can	15 this here
2868 you can	1790 you don't	240 going to	14 have to	62 did you	32 do you	13 do you	14 this is
2850 going to	1767 a little	231 I know	13 did you	58 in the	31 you know	11 you don't	
2768 you have	1724 this is	208 want to	13 you know	51 on the	25 I don't	10 you do	
2739 a little	1714 want to	205 this is	12 are you	49 to do	23 you can	10 I think	
2712 have to	1641 to the	201 he said	12 you can	47 you have	20 to be	10 and then	

## 8. Appendix 7: Kids' Bigram Morphology Counts by Kids' Age

AGE: 1	2236 co pro	2777 v inf	AGE: 7	1308 pro v	20 v pro	15 v pro	148 v pro
TOTAL: 102083	AGE: 3	AGE: 5	TOTAL: 40624	1065 det n	13 co pro	12 v det	139 prep det
2400 det n	TOTAL: 374839	TOTAL: 105420	1412 det n	645 v pro	13 inf v	10 v pro:wh	138 pro v&PAST
1903 n n	16177 det n	4350 pro v	1364 pro v	475 inf v	13 pro aux~neg	10 aux pro	116 inf v
1649 v pro	14038 pro v	4239 det n	809 pro v&PAST	441 prep det	12 prep det	8 pro:poss:det n	114 n prep
1558 pro v	7392 v pro	2082 v pro	679 v pro	434 pro v&PAST	12 pro v&PAST	7 pro aux~neg	104 v prep
834 v adv:loc	5587 prep det	1679 pro v&PAST	538 adj n	394 v det	10 n n	7 aux~neg v	100 conj:coo pro
787 unk unk	5285 v det	1657 inf v	537 inf v	341 v prep	10 aux~neg v	7 det adj	92 adj n
779 v n	4435 inf v	1507 prep det	522 prep det	326 aux pro	9 prep pro	6 pro v&PAST	90 v det
653 unk n	3911 pro:poss:det	1504 v det	500 n prep	312 n prep	8 pro aux	6 inf v	88 prep n
625 fs n	n	1311 aux~neg v	481 det adj	303 det adj	8 det adj	6 n prep	77 n n
601 adj n	3884 v prep	1311 pro aux~neg	461 aux pro	303 adj n	8 aux v	5 adj n	76 det adj
588 pro:wh~v&3S	3664 pro v&PAST	1034 v prep	448 n n	296 aux~neg v	7 v det	4 pro:wh pro	74 aux pro
pro:dem	3559 aux~neg v	1028 n n	442 n:let n:let	272 pro aux~neg	7 conj:coo pro	4 conj:subor pro	72 pro aux~neg
574 n:prop n	3553 pro aux~neg	1022 det adj	380 pro aux~neg	268 pro aux	7 v prep	4 det pro:indef	65 pro aux
572 v det	3385 n n	1010 adj n	372 v det	264 n n	6 prep	4 v adv:loc	65 aux~neg v
556 pro:poss:det n	3162 det adj	944 pro:poss:det n	351 aux~neg v	253 co co	pro:poss:det	4 n unk	61 v inf
556 co co	3141 n prep	937 n prep	337 n:prop pro	252 co pro	5 n:prop n:prop	4 pro:dem v&3S	AGE: 19
553 prep det	3016 adj n	935 co pro	337 v&PAST prep	235 pro:poss:det n	5 v pro:dem	AGE: 14	TOTAL: 191
506 pm n	2751 aux pro	913 aux pro	315 prep n:prop	212 n:let n:let	AGE: 12	TOTAL: 957	17 pro v
440 pm v	2739 pro aux	872 det:num	311 conj:coo pro	AGE: 10	TOTAL: 3487	46 pro v	16 det n
428 qn n	2618 co pro	det:num	310 prep det:num	TOTAL: 31401	166 det n	23 det n	14 n n
398 n:prop v	2589 prep pro	867 conj:coo pro	AGE: 8	1176 pro v	143 pro v	23 inf v	12 v pro
AGE: 2	2185 aux v	827 pro aux	TOTAL: 16913	967 det n	73 prep det	18 v pro	10 v adv:loc
TOTAL: 481123	AGE: 4	AGE: 6	625 pro v	489 pro v&PAST	67 v pro	17 aux pro	8 adv:wh n
19778 det n	TOTAL: 422213	TOTAL: 36828	523 det n	463 v pro	59 inf v	16 part-PROG inf	7 n v
13530 pro v	17762 pro v	1250 pro v	338 pro v&PAST	408 inf v	58 v det	16 det adj	6 adj n
7926 v pro	16481 det n	1246 det n	269 v pro	356 prep det	56 pro aux	14 pro~aux&1S	6 v det
6051 n n	9654 v pro	659 pro v&PAST	233 prep det	352 v det	43 aux v	part-PROG	4 v n
5977 v det	6050 inf v	517 v pro	211 inf v	341 pro:poss:det n	41 n prep	14 pro:poss:det n	3 prep n
5505 prep det	5947 v det	502 prep det	203 pro:poss:det n	308 n prep	40 pro v&PAST	13 adj n	3 v adj
4850 pro:poss:det	5659 pro v&PAST	387 conj:coo pro	197 conj:coo pro	282 conj:coo pro	39 n n	10 v inf	3 det pro:indef
n	5467 prep det	379 pro:poss:det n	179 co pro	270 co pro	36 aux pro	10 conj:subor pro	3 pro:poss:det n
3588 v prep	4818 pro aux~neg	374 inf v	168 n prep	243 adj n	36 pro:poss:det n	9 v det	2 det:num
3571 adv:loc	4732 pro:poss:det	349 v det	153 v det	240 v prep	36 v prep	9 pro aux~neg	det:num
adv:loc	n	317 n prep	139 v prep	234 n n	33 det adj	7 conj:coo pro	2 v&ZERO pro
3545 adj n	4728 aux~neg v	314 co pro	124 det adj	217 pro aux~neg	29 aux~neg v	7 co pro	2 pro:wh~v&3S
3403 v n	4331 n n	306 det adj	118 adj n	208 det adj	27 pro aux~neg	7 v n	pro:dem
3193 aux~neg v	4153 v prep	295 pro aux~neg	109 n pro	208 aux~neg v	27 conj:coo pro	7 v prep	2 pro v~inf
3104 inf v	3567 adj n	291 v prep	107 pro aux~neg	205 conj:subor pro	26 pro~aux&1S	7 pro aux	2 pro adj
3032 v adv:loc	3565 det adj	287 adj n	107 n n	197 prep n	part-PROG	6 prep det	2 adv:loc adv:loc
2911 n prep	3563 co pro	274 aux~neg v	106 prep n	189 prep pro	26 n pro	AGE: 16	
2679 pro aux~neg	3497 n prep	270 n n	102 aux~neg v	AGE: 11	AGE: 13	TOTAL: 11248	
2651 det adj	3389 aux pro	263 conj:subor pro	102 v&PAST det	TOTAL: 987	TOTAL: 482	501 pro v	
2614 prep pro	3217 pro aux	218 n pro	AGE: 9	42 pro v	40 pro v	268 det n	
2276 pro v&PAST	3100 prep pro	217 prep n	TOTAL: 28586	31 det n	25 det n	149 co pro	

## 9. Appendix 8: Adults' Bigram Morphology Counts by Kids' Age

AGE: 1	5743 pro part-	8774 aux pro	1030 co pro	46 n n	195 pro aux	74 pro aux~neg	19 v det
TOTAL: 901115	PROG	8527 co pro	947 aux~neg v	45 co pro	189 det adj	70 prep n	18 pro:poss:det n
30233 det n	5632 pro aux	8159 pro aux~neg	883 pro aux~neg	45 det adj	183 pro aux~neg	67 n n	18 aux v
23786 pro v	5581 prep pro	7867 n n	860 conj:coo pro	43 aux pro	180 aux pro	65 co pro	17 co pro
13213 v pro	AGE: 3	7209 pro aux	852 pro:poss:det n	43 pro aux	177 aux~neg v	63 v det	17 v prep
10559 prep det	TOTAL: 673175	7137 prep pro	821 pro aux	43 pro aux~neg	172 co pro	62 aux pro	16 pro aux~neg
9749 v det	24328 pro v	6480 v adv:loc	763 n n	38 co co	168 v inf	56 pro aux	15 conj:subor pro
8036 aux pro	23204 det n	AGE: 5	727 prep pro	34 prep n	149 prep n	54 prep pro	15 aux~neg v
7270 v prep	11834 v pro	TOTAL: 302088	AGE: 7	AGE: 9	AGE: 11	AGE: 13	13 part-PROG inf
6980 inf v	9549 prep det	11089 pro v	TOTAL: 86772	TOTAL: 50005	TOTAL: 3202	TOTAL: 601	AGE: 16
6708 v adv:loc	8189 inf v	10320 det n	3628 pro v	2240 pro v	110 pro v	34 pro v	TOTAL: 0
6459 adj n	7729 aux pro	5406 v pro	3137 det n	1608 det n	95 det n	26 det n	AGE: 19
6320 pro:poss:det n	7146 v det	4485 prep det	1941 v pro	1148 v pro	56 v pro	11 v pro	TOTAL: 1748
n	6473 v prep	3888 inf v	1528 inf v	845 inf v	49 inf v	9 v det	112 pro v
5401 det adj	6418 n prep	3625 v det	1229 prep det	713 prep det	40 v det	9 pro:wh~v&3S	111 det n
5179 n prep	5932 adj n	3358 n prep	1226 v det	673 v det	38 prep det	pro:dem	74 aux pro
4640 n n	5763 det adj	3317 v prep	1031 v prep	607 v prep	37 det adj	9 v prep	68 pro:wh~v&3S
4038 v inf	5364 pro v&PAST	3147 pro v&PAST	1027 n prep	590 n prep	36 co pro	8 prep det	pro:dem
3882 aux~neg v	5060 pro:poss:det n	2917 det adj	939 pro v&PAST	504 pro aux	33 pro v&PAST	8 pro aux~neg	44 adj n
3734 adv:loc	n	2826 adj n	920 adj n	498 aux~neg v	33 n prep	8 aux pro	40 prep det
adv:loc	4861 aux~neg v	2774 aux pro	825 aux pro	497 pro v&PAST	32 aux~neg v	8 adj n	37 v prep
3490 v&ZERO pro	4654 co pro	2555 aux~neg v	819 det adj	489 aux pro	30 adj n	7 aux&PAST pro	29 pro:wh~v&3S
3447 co pro	4536 pro aux~neg	2447 co pro	811 aux~neg v	470 adj n	28 pro aux	7 det adj	det
3371 pro aux	4458 n n	2429 pro aux~neg	740 co pro	459 pro aux~neg	28 prep n	7 pro v&PAST	28 pro:wh
AGE: 2	4201 pro aux	2428 pro:poss:det n	722 v inf	448 co pro	27 aux pro	7 pro:poss:det n	pro:dem
TOTAL: 1281360	3879 prep pro	n	714 pro aux~neg	415 pro:poss:det n	26 pro aux~neg	7 aux~neg v	28 det pro:indef
42273 det n	3518 aux&PAST	2276 n n	711 pro:poss:det n	408 prep pro	25 v prep	6 co pro	27 v pro:wh
37195 pro v	pro	2171 pro aux	706 pro aux	397 det adj	24 v inf	5 v&3S pro:dem	27 n co
17817 v pro	AGE: 4	2032 prep pro	669 n n	388 v inf	24 n n	5 n prep	24 pro:dem v&3S
16345 prep det	TOTAL: 979073	1980 prep n	664 prep pro	383 conj:subor pro	21 prep pro	5 pro:wh n	23 adv:int adj
12326 v det	39079 pro v	AGE: 6	AGE: 8	AGE: 10	AGE: 12	5 n v&3S	23 v pro
12163 aux pro	34951 det n	TOTAL: 114573	TOTAL: 4178	TOTAL: 20935	TOTAL: 7960	AGE: 14	22 v n
10647 inf v	20192 v pro	4470 pro v	202 pro v	835 pro v	311 pro v	TOTAL: 1981	22 pro:dem
9692 v prep	14116 prep det	3828 det n	168 det n	716 det n	238 det n	74 pro v	adv:loc
9567 n prep	13576 inf v	2004 v pro	127 v pro	456 v pro	173 v pro	46 det n	22 v&3S pro:dem
9006 det adj	12319 v det	1504 prep det	78 inf v	372 inf v	127 prep det	36 v pro	21 pro:wh aux
8645 adj n	11584 pro v&PAST	1445 pro v&PAST	76 prep det	320 prep det	123 inf v	31 inf v	21 v det
8578 pro:poss:det n	10544 v prep	1412 v det	66 n prep	285 v det	103 pro v&PAST	27 pro aux	
n	10095 n prep	1386 inf v	61 v prep	245 pro v&PAST	91 v prep	24 n prep	
7238 co pro	9480 pro:poss:det n	1168 det adj	58 v det	240 v prep	89 n prep	21 prep pro	
7107 n n	n	1113 adj n	55 pro:poss:det n	231 n prep	78 pro:poss:det n	21 prep n	
6459 aux~neg v	9244 adj n	1088 v prep	54 aux~neg v	201 adj n	78 adj n	20 prep det	
5869 pro v&PAST	8853 det adj	1085 n prep	53 prep pro	200 pro:poss:det n	75 aux~neg v	20 aux pro	
5766 pro aux~neg	8844 aux~neg v	1031 aux pro	50 adj n	197 n n	75 det adj	20 pro v&PAST	