Online supplementary material for "Spending on Young Children With Autism Spectrum Disorder in Employer-Sponsored Plans, 2011–2017"

Contents

1. Addendum on Data and Methods
2. Supplementary Tables S1—S9
3. Supplementary Figure S1

Addendum on Data and Methods

The IBM® MarketScan® Commercial and Medicare Supplemental Research Databases contain individual-level, de-identified, integrated inpatient and outpatient medical (both the facility and physician/provider component), prescription drug and mental health claims, and enrollment information submitted to IBM Watson Health™ by commercial payers under business agreements with large employers and health plans. Data about individual patients are integrated from all providers of care, maintaining healthcare utilization and cost record connections at the patient level. Used primarily for research, these databases are fully compliant with U.S. privacy laws and regulations (i.e., HIPAA). Research using MarketScan data has been widely published in peer-reviewed medical and health services journals.

Since their creation in the early 1990s, the MarketScan databases have grown into one of the largest collections of de-identified patient-level data in the United States. The claims information contained in the databases is drawn from UB04 and CMS1500 forms, and represents transactions fully adjudicated and paid under employer-sponsored group health plans, including Medicare supplemental plans.

There are two distinct types of data contributors in the Commercial databases: Employer and Health plan. The former refers to plans sponsored by large employers where the employer is the source of data. These are large, self-insured employers that bear the insurance risk and contract with health plans to administer plans for their employees and family members, although a small number of covered beneficiaries are in fully-insured plans with a fixed payment per member per month. The second data source are commercial health plans that sell insurance to other, mostly fully-insured employers, in which case the plan bears the financial risk. The original MarketScan databases were populated solely by large employers. Subsequently, the numbers of health plans increased initially before decreasing in more recent years.

The MarketScan Commercial and Medicare Supplemental population includes enrolled employees, retirees and their covered dependents. All 50 US states are represented, and all types of health plans, including comprehensive, PPO, EPO, HMO, POS, CDHP and HDHP plan types. The databases classify health plans into 8 types, 2 of which are classified as capitated plan types: health maintenance organization (HMO) and capitated or partially capitated point of service (POS) plans. By "capitated" it is meant that for some or all services providers are paid a fixed amount per member per month rather than being reimbursed for individual services or encounters.

MarketScan databases also identify health plans that have carve-outs for either outpatient pharmaceuticals or mental health and substance abuse (MHSA) services. A carve-out means that the health plan subcontracts to another company that administers payments for those services, and the data on those services may not be reported back to the health plan and then reported to IBM Watson Health. That does not mean that the health plans do not cover those services, only that the claims and encounters data are likely to be incomplete for those services.

Each covered member of a household enrolled in a participating plan is assigned a unique enrollee ID variable that is used to link claims at the patient level. As long as someone remains enrolled, or becomes reenrolled, in the same plan or, for self-insured employers, any plan sponsored by the same employer, their encounters can be tracked using that enrollee ID. An individual enrollee ID may disappear from the MarketScan database if the enrollee dies, disenrolls, the plan ceases contributing data to IBM Watson

Health, or the primary enrollee changes employer or, for health plans contracting with small employers, changes health plans.

MarketScan databases report three types of payments. Total payments represent total allowable charges, i.e., the amount of money that the plan determines the provider should receive for a submitted claim. That is the sum of plan payments, i.e., actual reimbursements to providers, and out-of-pocket payments, i.e., the amount that patients are responsible for. Out-of-pocket payments include the amounts of copays and deductibles. Total expenditures in this study represent total payments.

We accessed the MarketScan data using the IBM MarketScan Treatment Pathways 4.0. Treatment Pathways is an online analytic platform with a visual interface that includes a subset of variables from MarketScan databases. It is restricted to plans that both cover prescription drugs and do not have pharmaceutical carve-outs. Treatment Pathways has a MHSA Coverage indicator variable that can be used to exclude plans with MHSA carve-outs.

MarketScan Commercial and Medicare data have limited demographic information: age and sex; race/ethnicity information is absent. Geographic information in the Treatment Pathways version is limited to the nine U.S. Census divisions, which can be aggregated to the four Census regions, and rural (non-metropolitan) vs. urban residence. The geographic information is based on the location of the primary enrollee whereas dependent enrollees may reside elsewhere, even in a different state. The data submitted to IBM Watson Health is a convenience sample. The demographic and geographic distributions in these databases differ somewhat from the national distribution of the privately insured population.

Continuous enrollment in Treatment Pathways is calculated using data from the MarketScan Detail Enrollment table. Continuous enrollment within Treatment Pathways bridges up to a 45-day gap between actual enrollment eras and the 45-day rule is applied as many times as appropriate for a patient.

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Table S1. Inclusion and exclusion criteria for study sample by calendar year, 2011-2017

Enrollees (N)	Exclusion (%)	Criterion
2011		
46,313,275		Any enrollment in calendar year, all ages, all plan types
30,773,534	33.6	Exclude partial enrollment
24,460,921	20.5	Exclude capitated plans
20,843,920	14.8	Require outpatient claim
11,775,831	43.5	Restrict to large employer plans
11,185,327	5.0	Restrict to MHSA coverage
760,791	93.2	Ages 3-7 years at beginning of calendar year
2012		
46,794,137		Any enrollment in calendar year, all ages, all plan types
31,339,906	33.0	Exclude partial enrollment
25,559,453	18.4	Exclude capitated plans
21,809,781	14.7	Require outpatient claim
12,406,052	43.1	Restrict to large employer plans
11,719,357	5.5	Restrict to MHSA coverage
786,994	93.3	Ages 3-7 years at beginning of calendar year
2013		
38,793,170		Any enrollment in calendar year, all ages, all plan types
25,877,256	33.3	Exclude partial enrollment
21,497,060	16.9	Exclude capitated plans
18,411,413	14.4	Require outpatient claim
12,729,679	30.9	Restrict to large employer plans
12,063,095	5.2	Restrict to MHSA coverage
803,608	93.3	Ages 3-7 years at beginning of calendar year
2014		
39,066,404		Any enrollment in calendar year, all ages, all plan types
25,973,543	33.5	Exclude partial enrollment
21,584,854	16.9	Exclude capitated plans
18,511,369	14.2	Require outpatient claim
12,746,647	31.1	Restrict to large employer plans
12,129,305	4.8	Restrict to MHSA coverage
795,693	93.4	Ages 3-7 years at beginning of calendar year
2015		
29,558,981		Any enrollment in calendar year, all ages, all plan types
20,215,746	31.6	Exclude partial enrollment
17,707,533	12.4	Exclude capitated plans
15,226,611	14.0	Require outpatient claim
12,202,366	19.9	Restrict to large employer plans
11,614,483	4.8	Restrict to MHSA coverage
756,019	93.5	Ages 3-7 years at beginning of calendar year
2016		
28,805,675		Any enrollment in calendar year, all ages, all plan types

19,784,521	31.3	Exclude partial enrollment
17,352,335	12.3	Exclude capitated plans
14,932,743	13.9	Require outpatient claim
12,094,506	19.0	Restrict to large employer plans
11,469,264	5.2	Restrict to MHSA coverage
742,661	93.5	Ages 3-7 years at beginning of calendar year
2017		
26,230,543		Any enrollment in calendar year, all ages, all plan types
18,334,812	30.1	Exclude partial enrollment
16,028,065	12.6	Exclude capitated plans
13,815,585	13.8	Require outpatient claim
11,834,373	14.3	Restrict to large employer plans
11,214,462	5.2	Restrict to MHSA coverage
722,348	93.6	Ages 3-7 years at beginning of calendar year

Table S2. Procedure codes for behavioral and mental health services.

a. Behavioral intervention-related procedure codes

96125	Standardized cognitive performance testing per hour of a qualified health care professional's time, both face-to-face administering tests to the patient and time interpreting these test results and preparing the report
96150	Health and behavioral assessment, initial, each 15 minutes
96151	Health and behavioral reassessment, each 15 minutes
96152	Health and behavior intervention, individual, each 15 minutes
96153	Health and behavior intervention, each 15 minutes, face-to-face
96154	Health and behavior intervention, each 15 minutes, group, 2 or more
96155	Health and behavior intervention to family, without patient present
97532	Development of cognitive skills to improve attention, memory, problem-solving (includes compensatory training) direct (one-on-one) patient contact by the provider, each 15 minutes
97533	Sensory integrative techniques to enhance sensory processing and promote adaptive responses to environmental demands, direct (one-on-one) patient contact by the provider, each 15 minutes
99484	Care management services for behavioral health conditions, at least 20 minutes of clinical staff time, directed by a physician or other qualified health care professional, per calendar month, with the following required elements: initial assessment or follow-up
99499	Unlisted evaluation and management service
H0004	Behavioral health counseling and therapy, per 15 minutes
H0030	Behavioral health hotline service
H0031	Mental health assessment, by non-physician
H0032	Mental health service plan development by non-physician
H2012	Behavioral health day treatment, per hour
H2014	Skills training and development, per 15 minutes
H2019	Therapeutic behavioral services, per 15 minutes
H2020	Therapeutic behavioral services, per diem
0359T	0359T Behavior identification assessment, by the physician or other qualified health care professional, face-to-face with patient and caregiver(s), includes administration of standardized and non-standardized tests, detailed behavioral history, and patient observation
0360T	Observational behavioral follow-up assessment, includes physician or other qualified health care professional direction with interpretation and report, administered by one technician; first 30 minutes of technician time, face-to-face with the patient
0361T	Observational behavioral follow-up assessment, includes physician or other qualified health care professional direction with interpretation and report, administered by one technician; each additional 30 minutes of technician time, face-to-face
0362T	Exposure behavioral follow-up assessment, includes physician or other qualified health care professional direction with interpretation and report, administered by physician or other qualified health care professional
0363T	Exposure behavioral follow-up assessment, includes physician or other qualified health care professional direction with interpretation and report, administered by physician or other qualified health care professional
0364T	Adaptive behavior treatment by protocol, administered by technician, face-to-face with one patient; first 30 minutes of technician time
0365T	Adaptive behavior treatment by protocol, administered by technician, face-to-face with one patient; each additional 30 minutes of technician time (List separately in addition to code for primary procedure)
0366T	Group adaptive behavior treatment by protocol, administered by technician, face-to-face with two or more patients; first 30 minutes of technician time
0367T	Group adaptive behavior treatment by protocol, administered by technician, face-to-face with two or more patients; each additional 30 minutes of technician time (List separately in

	addition to code for primary procedure)
0368T	Adaptive behavior treatment with protocol modification administered by physician or other qualified health care professional with one patient; first 30 minutes of patient face-to-face time
0369T	Adaptive behavior treatment with protocol modification administered by physician or other qualified health care professional with one patient; each additional 30 minutes of patient face-to-face time (List separately in addition to code for primary procedure)
0370T	Family adaptive behavior treatment guidance, administered by physician or other qualified health care professional (without the patient present)
0371T	Multiple-family group adaptive behavior treatment guidance, administered by physician or other qualified health care professional (without the patient present)
0372T	Adaptive behavior treatment social skills group, administered by physician or other qualified health care professional face-to-face with multiple patients
0373T	Exposure adaptive behavior treatment with protocol modification requiring two or more technicians for severe maladaptive behavior(s); first 60 minutes of technicians' time, face-to-face with patient
0374T	Exposure adaptive behavior treatment with protocol modification requiring two or more technicians for severe maladaptive behavior(s); each additional 30 minutes of technicians' time face-to-face with patient
G0176	Activity therapy, such as music, dance, art or play therapies not for recreation, related to the care and treatment of patient's disabling mental health problems, per session (45 minutes or more)
G0502	Initial psychiatric collaborative care management, first 70 minutes in the first calendar month of behavioral health care manager activities, in consultation with a psychiatric consultant, and directed by the treating physician or other qualified health provider
G0503	Subsequent psychiatric collaborative care management, first 60 minutes in a subsequent month of behavioral health care manager activities, in consultation with a psychiatric consultant, and directed by the treating physician or other qualified health provider
G0504	Initial or subsequent psychiatric collaborative care management, each additional 30 minutes in a calendar month of behavioral health care manager activities, in consultation with a psychiatric consultant, and directed by the treating physician or other qualified health provider
G0506	Comprehensive assessment of and care planning for patients requiring chronic care management services (list separately in addition to primary monthly care management service)
G0507	Care management services for behavioral health conditions, at least 20 minutes of clinical staff time, directed by a physician or other qualified health care professional, per calendar month, with the following required elements: initial assessment
G0511	Rural health clinic or federally qualified health center (rhc or fqhc) only, general care management, 20 minutes or more of clinical staff time for chronic care management services or behavioral health integration services directed by an rhc or fqhc
G8539	Functional outcome assessment documented as positive using a standardized tool and a care plan based on identified deficiencies on the date of functional outcome assessment, is documented
G9012	Other specified case management service not elsewhere classified
S5108	Home care training to home care client, per 15 minutes
S5109	Home care training to home care client, per session
S5110	Home care training to home care client, per 15 minutes
S5111	Home care training to home care client, per session
S9480	Intensive outpatient psychiatric services, per diem
S9484	Crisis intervention mental health services, per hour
S9485	Crisis intervention mental health services, per diem
T1040	Medicaid certified community behavioral health clinic services, per diem
T1041	Medicaid certified community behavioral health clinic services, per month

b. Mental health procedure codes

90791	Initial evaluation provided by a non-physician/no medical services. Includes psychiatric/psychological assessment, history, mental status and recommendations; may include communication with family, others, and review and ordering of diagnostic studies.
90792	Initial evaluation, including psychiatric/psychological diagnostic interview with medical services
90801	Psychiatric diagnostic interview examination
90802	Interactive psychiatric diagnostic interview examination using play equipment, physical devices, language interpreter, or other mechanisms of communication
90804	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 20 to 30 minutes face-to-face with the patient;
90805	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 20 to 30 minutes face-to-face with the patient; with medical evaluation and management services
90806	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 45 to 50 minutes face-to-face with the patient
90807	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 45 to 50 minutes face-to-face with the patient; with medical evaluation and management services
90808	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 75 to 80 minutes face-to-face with the patient
90809	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 75 to 80 minutes face-to-face with the patient; with medical evaluation and management services
90810	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 20 to 30 minutes face-to-face with the patient
90811	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 20 to 30 minutes face-to-face with the patient; with medical evaluation and management services
90812	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 45 to 50 minutes face-to-face with the patient
90813	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 45 to 50 minutes face-to-face with the patient; with medical evaluation and management services
90814	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 75 to 80 minutes face-to-face with the patient
90815	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 75 to 80 minutes face-to-face with the patient; with medical evaluation and management services
90816	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an inpatient hospital, partial hospital or residential care setting, approximately 20 to 30 minutes face-to-face with the patient
90817	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an inpatient hospital, partial hospital or residential care setting, approximately 20 to 30 minutes face-to-face with the patient; with medical evaluation and management services
90818	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an inpatient hospital, partial hospital or residential care setting, approximately 45 to 50 minutes face-to-face with the patient

90819	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an inpatient hospital, partial hospital or residential care setting, approximately 45 to 50 minutes face-to-face with the patient; with medical evaluation and management services
90820	Diagnostic interview
90821	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an inpatient hospital, partial hospital or residential care setting, approximately 75 to 80 minutes face-to-face with the patient
90822	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an inpatient hospital, partial hospital or residential care setting, approximately 75 to 80 minutes face-to-face with the patient; with medical evaluation and management services
90823	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an inpatient hospital, partial hospital or residential care setting, approximately 20 to 30 minutes face-to-face with the patient
90824	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an inpatient hospital, partial hospital or residential care setting, approximately 20 to 30 minutes face-to-face with the patient; with medical evaluation and management services
90825	Evaluation of tests/records
90826	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an inpatient hospital, partial hospital or residential care setting, approximately 45 to 50 minutes face-to-face with the patient;
90827	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an inpatient hospital, partial hospital or residential care setting, approximately 45 to 50 minutes face-to-face with the patient; with medical evaluation and management services
90828	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an inpatient hospital, partial hospital or residential care setting, approximately 75 to 80 minutes face-to-face with the patient
90829	Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an inpatient hospital, partial hospital or residential care setting, approximately 75 to 80 minutes face-to-face with the patient; with medical evaluation and management services
90830	Crisis intervention, 60 minutes
90832	Psychotherapy, 30 minutes with patient
90833	Psychotherapy, 30 minutes with patient when performed with an evaluation and management service (List separately in addition to the code for primary procedure)
90834	Psychotherapy, 45 minutes with patient
90835	Special interview
90836	Psychotherapy, 45 minutes with patient when performed with an evaluation and management service (List separately in addition to the code for primary procedure)
90837	Psychotherapy, 60 minutes with patient
90838	Psychotherapy, 60 minutes with patient when performed with an evaluation and management service (List separately in addition to the code for primary procedure)
90839	Psychotherapy for crisis; first 60 minutes
90840	Psychotherapy for crisis; each additional 30 minutes (List separately in addition to code for primary service)
90841	Psychotherapy
90842	Psychotherapy, 75-80 min.
90843	Psychotherapy, 20-30 min.

90844	Psychotherapy, 45-50 min.
90845	Psychoanalysis
90846	Family psychotherapy (without the patient present), 50 minutes
90847	Family psychotherapy (conjoint psychotherapy) (with patient present), 50 minutes
90849	Multiple-family group psychotherapy
90853	Group psychotherapy (other than of a multiple-family group)
90855	Individual psychotherapy
90857	Interactive group psychotherapy
90862	Pharmacologic management, including prescription, use, and review of medication with no more than minimal medical psychotherapy
90863	Pharmacologic management, including prescription and review of medication, when performed with psychotherapy services (List separately in addition to the code for primary procedure)
90865	Narco-synthesis for psychiatric diagnostic and therapeutic purposes (e.g., sodium amobarbital (Amytal) interview)
90885	Psychiatric evaluation of hospital records, other psychiatric reports, psychometric and/or projective tests, and other accumulated data for medical diagnostic purposes
90887	Interpretation or explanation of results of psychiatric, other medical examinations and procedures, or other accumulated data to family or other responsible persons, or advising them how to assist patient
90889	Preparation of report of patient's psychiatric status, history, treatment, or progress (other than for legal or consultative purposes) for other individuals, agencies, or insurance carriers
90899	Unlisted psychiatric service or procedure
99492	Initial psychiatric collaborative care management, first 70 minutes in the first calendar month of behavioral health care manager activities, in consultation with a psychiatric consultant, and directed by the treating physician or other qualified health care provider
99493	Subsequent psychiatric collaborative care management, first 60 minutes in a subsequent month of behavioral health care manager activities, in consultation with a psychiatric consultant, and directed by the treating physician or other qualified health care
99494	Initial or subsequent psychiatric collaborative care management, each additional 30 minutes in a calendar month of behavioral health care manager activities, in consultation with a psychiatric consultant, and directed by the treating physician or other qualified heath care
G0512	Rural health clinic or federally qualified health center (RHC/FQHC) only, psychiatric collaborative care model (psychiatric COCM), 60 minutes or more of clinical staff time for psychiatric COCM services directed by an RHC or FQHC practitioner

Table S3. Numbers of children ages 3–7 years continuously enrolled in MarketScan Commercial large employer non-capitated plans in 2017 by US Census division, rural vs. non-rural residence, and sex. Children with current-year autism spectrum disorder (ASD) diagnoses had ≥2 ASD claims on separate days in the calendar year.

	All children ages 3–7 years		Children with current-year ASD diagnoses		Administrative prevalence of current-year ASD
Census division	Numbers	Distribution	Numbers	Distribution	
New England	31,947	4.4%	501	6.6%	1.6%
Middle Atlantic	114,357	15.9%	1,417	18.8%	1.2%
South Atlantic	13,583	18.8%	1,436	19.0%	1.1%
East South Central	69,865	9.7%	640	8.5%	0.9%
West South Central	90,128	12.5%	819	10.9%	0.9%
East North Central	124,073	17.2%	1,091	14.5%	0.9%
West North Central	45,122	6.3%	378	5.0%	0.8%
Mountain	40,226	5.6%	386	5.1%	1.0%
Pacific	69,842	9.7%	875	11.6%	1.3%
Missing region	949	0.1%	18	0.2%	1.9%
Total	722,348		7,561		1.0%
Rural vs. non-rural residence					
Non-rural	645,216	89.4%	7,002	92.8%	1.1%
Rural	76,586	10.6%	543	7.2%	0.7%
Missing	546	0.1%	16	0.2%	2.9%
Total	722,348		7,561		1.0%
Sex					
Male	370,476	51.3%	6,042	79.9%	1.6%
Female	351,871	48.7%	1,519	20.1%	0.4%

Table S4. Mean out-of-pocket (OOP) spending in 2017 US dollars [adjusted using GDP deflator] for children ages 3–7 years continuously enrolled in large employer non-capitated plans* by calendar year. Children with current-year autism spectrum disorder [ASD] diagnoses had ≥2 ASD claims on separate days in the calendar year.

Year	All enrollees		Enrollees with current-year ASD		Enrollees without current-year ASD		Ratio of mean OOP spending for children with ASD to OOP spending for other children [median]
	Mean (SD) [median] OOP spending [2017 $]	Share of mean OOP spending in percent [median]	Mean (SD) [median] OOP spending [2017 $]	Share of mean OOP spending in percent [median]	Mean (SD) [median] OOP spending [2017 $]	Share of mean OOP spending in percent [median]	
2011	383 (682) [160]	18.4 [22.7]	1885 (2015) [1325]	13.0 [21.2]	375 (657) [159]	18.5 [22.7]	5.0 [8.3]
2012	398 (739) [158]	19.2 [22.8]	1928 (1894) [1411]	13.6 [22.4]	389 (717) [156]	19.4 [22.6]	5.0 [9.0]
2013	409 (784) [156]	19.5 [23.1]	2075 (2111) [1485]	13.7 [22.6]	397 (755) [154]	19.7 [23.0]	5.2 [9.7]
2014	422 (838) [155]	20.0 [23.3]	2087 (2197) [1522]	13.3 [22.3]	409 (806) [152]	20.3 [23.0]	5.1 [10.0]
2015	448 (847) [161]	20.0 [24.1	2152 (2040) [1608]	12.6 [23.4]	432 (813) [518]	20.5 [23.9]	5.0 [10.2]
2016	463 (849) [167]	19.8 [24.7]	2218 (2028) [1706]	12.5 [22.6]	446 (812) [164]	20.4 [24.5]	5.0 [10.4]
2017	471 (870) [167]	19.9 [24.6]	2299 (2138) [1788]	11.5 [22.0]	451 (825) [164]	20.6 [24.5]	5.1 [10.9]
% change, 2011-2017	23§ [4]		22§ [35]		20§ 3]		

Note: *Source: MarketScan Commercial database, 2011–2017.

[§] *p*-values < 0.001 in two-sample t-tests (immediate form) for the changes between 2011 and 2017 in mean expenditures.

[¶] *p*-values < 0.001 in two-sample tests of proportions (immediate form) for the changes between 2011 and 2017 in percentage of enrollees with current-year ASD and in spending on children with ASD as percent of spending on all children.

GDP: Gross Domestic Product

OOP: Out-of-pocket

SD: Standard Deviation

Table S5. Numbers of children ages 3–7 years continuously enrolled in MarketScan Commercial mostly fully-insured plans by calendar year and mean spending in 2017 US dollars (adjusted using GDP deflator). Children with current-year autism spectrum disorder (ASD) diagnoses had ≥2 ASD claims on separate days in the calendar year.

Year	All enrollees		Enrollees with current-year ASD		Enrollees without current-year ASD		Spending on children with ASD as percent of spending on all children
	N	Mean (median) spending (2017 $)	N (%)	Mean (median) spending (2017 $)	N	Mean (median) spending (2017 $)	
2011	546,529	2,018 (692)	3,885 (0.71)	14,193 (5,922)	542,644	1,931 (697)	5.0
2012	535,188	2,041 (679)	4,041 (0.76)	18,349 (6,057)	531,147	1,917 (680)	6.8
2013	242,325	2,054 (659)	1,826 (0.75)	17,928 (6,738)	240,499	1,934 (633)	6.6
2014	308,594	1,951 (661)	2,559 (0.83)	15,888 (6,980)	306,035	1,835 (635)	6.8
2015	116,999	2,058 (667)	1,099 (0.94)	19,936 (7,097)	115,900	1,888 (654)	9.1
2016	109,232	2,202 (676)	1,218 (1.12)	20,950 (7,731)	108,014	1,991 (642)	10.6
2017	112,001	2,127 (679)	1,309 (1.17)	20,504 (8,400)	110,692	1,910 (653)	11.3
% change, 2011-2017		5 (-2)		44 (42)		-1 (-6)	

Table S6. Numbers of children ages 3–7 years continuously enrolled in MarketScan Commercial large employer capitated plans by calendar year and mean spending in 2017 US dollars (adjusted using GDP deflator). Children with current-year autism spectrum disorder (ASD) diagnoses had ≥2 ASD claims on separate days in the calendar year.

Year	All enrollees		Enrollees with current-year ASD		Enrollees without current-year ASD		Spending on children with ASD as percent of spending on all children
	N	Mean (median) spending (2017 $)	N (%)	Mean (median) spending (2017 $)	N	Mean (median) spending (2017 $)	
2011	163,512	1,866 (623)	835 (0.51)	9,861 (4,532)	162,677	1,825 (618)	2.7
2012	153,614	1,865 (598)	948 (0.62)	10,669 (4,691)	152,666	1,810 (593)	3.5
2013	146,488	1,934 (586)	1,183 (0.81)	16,652 (7,520)	145,305	1,814 (579)	7.0
2014	84,601	2,087 (620)	770 (0.91)	18,114 (8,150)	83,831	1,940 (612)	7.9
2015	89,045	2,247 (663)	960 (1.08)	22,140 (9,101)	88,085	2,030 (653)	10.6
2016	90,025	2,359 (668)	1,134 (1.26)	23,999 (9,839)	88,891	2,083 (658)	12.8
2017	84,497	2,509 (688)	1,209 (1.43)	28,069 (11,348)	83,288	2,138 (674)	16.0
% change, 2011-2017		34 (10)		185 (150)		17 (9)	

Table S7. Mean expenditures for children ages 3–5 and 6–7 years continuously enrolled in MarketScan Commercial large employer non-capitated plans by calendar year and mean spending in 2017 US dollars (adjusted using GDP deflator). Children with current-year autism spectrum disorder (ASD) diagnoses had ≥2 ASD claims on separate days in the calendar year.

Year	Ages 3-5 years			Ages 6-7 years		
	All expenditures	Behavioral Health expenditures	Behavioral Health share (%)	All expenditures	Behavioral Health expenditures	Behavioral Health share (%)
2011	13,863	2,266	16%	12,365	1,096	9%
2012	14,061	2,410	17%	11,964	1,392	12%
2013	14,927	3,148	21%	13,549	1,856	14%
2014	16,259	3,676	23%	13,665	2,395	18%
2015	18,566	5,700	31%	13,903	3,654	26%
2016	19,499	7,609	39%	14,455	4,539	31%
2017	22,182	10,164	46%	16,830	5,724	34%
% change, 2011-2017	60%	348%		36%	422%	

Table S8. Mean spending in 2017 US dollars [adjusted using GDP deflator] for children ages 8–17 years continuously enrolled in large employer non-capitated plans* by calendar year with ≥2 autism spectrum disorder [ASD] diagnoses on separate days in the calendar year.

Year	All Spending 2017 US$	Behavioral Intervention-Related (non-Emergency) Spending 2017 US$		Other Outpatient Services Spending 2017 US$		Inpatient Services Spending 2017 US$		Outpatient Pharmacy Spending 2017 US$	
	Mean	Mean	% of all spending	Mean	% of all spending	Mean	% of all spending	Mean	% of all spending
2011	11,757	346	2.9	5,636	47.9	2,324	19.8	3,451	29.4
2012	12,130	464	3.8	5,753	47.4	2,508	20.7	3,404	28.1
2013	12,487	571	4.6	6,077	48.7	2,404	19.2	3,435	27.5
2014	13,336	726	5.4	6,189	46.4	2,644	19.8	3,780	28.3
2015	13,663	1,222	8.9	6,055	44.3	2,624	19.2	3,763	27.5
2016	14,397	1,833	12.7	6,373	44.3	2,748	19.1	3,442	23.9
2017	14,650	2,261	15.4	6,402	43.7	2,876	19.6	3,112	21.2
% change, 2011–2017	25	553		14		24		-10	

Table S9. Numbers of children ages 3–7 years continuously enrolled in MarketScan Commercial large employer non-capitated plans by calendar year and mean spending in 2017 US dollars (adjusted using GDP deflator).

Year	Enrollees with current-year ASD (≥2 ASD claims in calendar year)		Enrollees with ASD (≥1 ASD claim in calendar year and a second claim <12 months		Enrollees with ASD (≥1 ASD claim in calendar year and a second claim in 5 years		Enrollees with 5-year ASD (≥2 ASD claims on separate days in 5 calendar years)	
	N (%)	Mean (median) spending (2017 $)	N (%)	Mean (median) spending (2017 $)	N (%)	Mean (median) spending (2017 $)	N (%)	Mean (median) spending (2017 $)
2011	4,246 (0.56)	13,198 (6,245)	4,821 (0.63)	12,602 (5,727)	5,550 (0.73)	11,720 (5,354)	10,089 (1.33)	8,685 (3,563)
2012	4,813 (0.61)	13,126 (6,303)	5,406 (0.69)	12,436 (5,891)	6,140 (0.78)	11,628 (5,441)	10,907 (1.39)	8,983 (3,643)
2013	5,382 (0.67)	14,316 (6,573)	6,021 (0.75)	13,495 (6,009)	6,791 (0.85)	12,605 (5,483)	11,684 (1.45)	9,807 (3,743)
2014	6,090 (0.77)	15,140 (6,830)	6,796 (0.85)	14,118 (6,216)	--	--	--	--
2015	6,550 (0.87)	16,600 (6,871)	7,245 (0.96)	15,554 (6,300)	--	--	--	--
2016	6,989 (0.94)	17,387 (7,535)	7,669 (1.03)	16,341 (6,824)	--	--	--	--

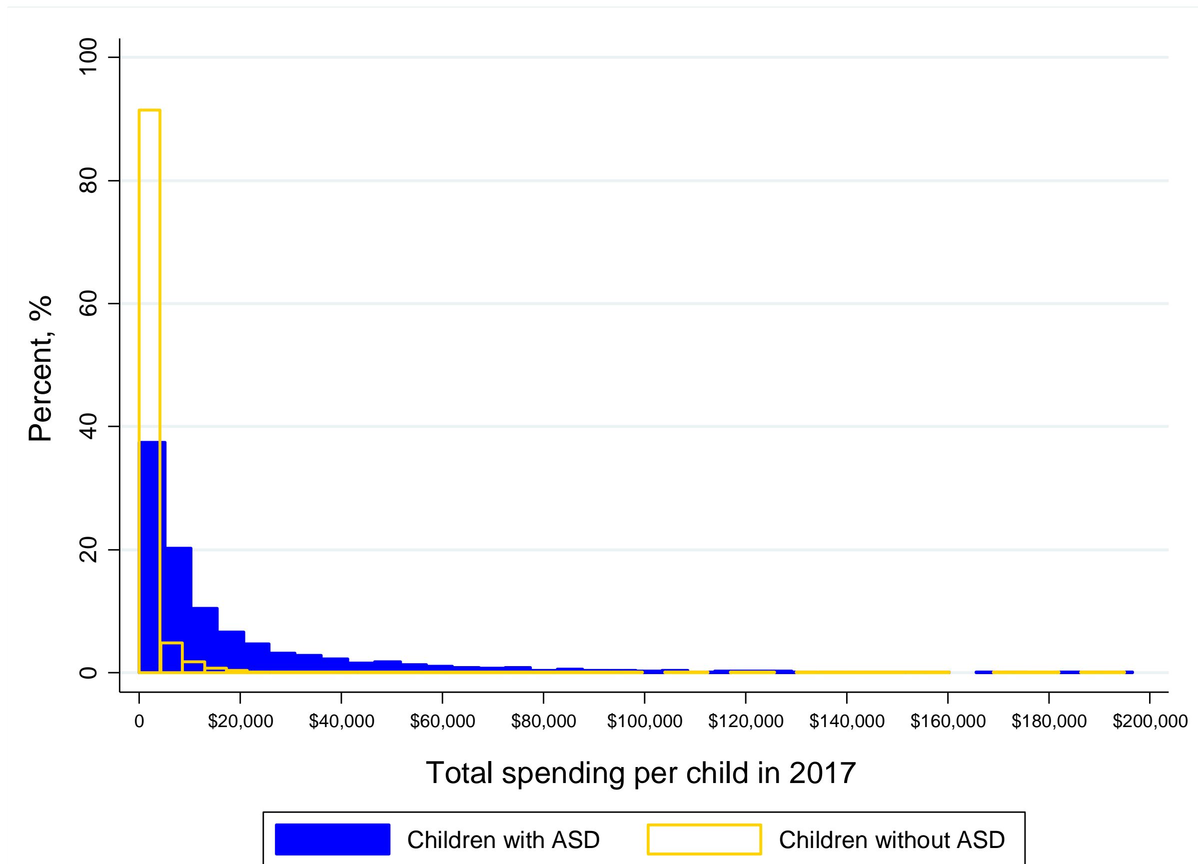

Figure S1. Distribution of total per-child expenditures in 2017 for children ages 3-7 years with and without current-year ASD diagnoses, MarketScan Commercial data