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Health Correlates of Vaccination: Lessons from Florida's Medicaid Data

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Abstract

Embedded in the Florida Medicaid database from 1990 to 2010 are health histories of 14,235 children for whom complete records are available from birth through age 10. We have age-stratified these records, analyzed the data for correlations between vaccination status and diagnosis of nine health conditions. We have adjusted the correlations to compensate for differential diagnosis bias. Specifically, we stratified patient-years by the number of well-child visits recorded in each year (ICD-9 code V20), then computed correlations between vaccination status and diagnoses separately within each stratum. By comparing only children with the same number of well-child visits, we equalize the propensity to seek medical care across vaccinated and unvaccinated groups, thereby removing the confounding influence of differential diagnosis. Vaccines associated with the least detrimental outcomes were DTP-Hib, HPV, and pneumococcal disease. Vaccines associated with the most detrimental outcomes were influenza, MMR, and the various diphtheria-tetanus combinations. The flu vaccine carried the highest overall correlation with adverse health outcomes (R=0.172 with total diagnoses). The largest increased risks are that flu shots are associated with a 4-fold increase in risk of asthma and a 3-fold increase in risk of autism. Fully vaccinated children were more than twice as likely (47% vs. 21% per year) to be diagnosed with respiratory infections compared to unvaccinated children; Hib vaccination and all DT combinations were also associated with increased respiratory infection risk. The strongest adverse correlations are between various diseases and total vaccine burden: the aggregate number of vaccinations was associated with more than a 2-fold increase in risk of ADHD, autism, and asthma, and was positively correlated with eight of the nine diagnoses tracked.

Introduction

Vaccination is a vast public health program, widely assumed to be beneficial, though detailed evaluation of the risks and benefits of vaccines, individually and interactively, has never been undertaken. (1,2)

Evaluating the diverse effects of vaccination is challenging for two reasons. First is timing; the effects of vaccination, both protective and detrimental, can last a lifetime. Vaccination against chickenpox is less protective against much-later shingles than is a childhood case of chickenpox, (3) and adult measles is a greater risk in those who avoided the disease with vaccination in childhood. (4) Second is that some of the public health effects are communal; there are putative communal benefits in the form of herd immunity, and also costs, as when adults become more vulnerable to measles, mumps and chickenpox (shingles) because they have not had lifelong exposure to circulating viruses. (5)

There are, in addition, political obstacles to objective evaluation. A great deal of health data, coded by vaccination status, has been held in confidence by the US CDC and corresponding agencies in Europe and the UK. Databases such as the CDC's Vaccine Safety Datalink hold the potential for informing wise public health policies, yet these data are not

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fully available to independent researchers: a key limitation is that historical unedited versions of the datasets remain inaccessible to outside researchers, which limits transparency, reproducibility, and reliability of published findings. (6)

Vaccine distribution is lucrative for pharmaceutical companies and for pediatric practices. These powerful institutions are content with the status quo, and are not eager for detailed analysis of vaccine costs and benefits. The liability shield established by the National Vaccine Injury Compensation Program (NVICP) compounds this problem: by routing most vaccine injury claims away from civil courts and traditional product liability suits, it removes much of the market pressure that would otherwise push manufacturers toward safer and more effective products. (7) Meanwhile, there are millions of parents who believe that their children have been injured by vaccines, and they advocate against a very aggressive vaccine schedule, mandates and school requirements in particular.

In this context, the small windows that we have into generalized health effects of vaccination become important indicators. Mawson et al. (2017) conducted a pilot comparative study of over 660 homeschooled 6- to 12-year-old U.S. children and found that vaccinated children had significantly higher rates of allergic rhinitis, eczema, ADHD, autism spectrum disorder, and other chronic conditions than unvaccinated children. (8) In 2020, Lyons-Weiler and Thomas studied health outcomes based on vaccination status among children in the latter researcher's pediatric practice. Their publication (9) raised concerns, especially about the adaptation of a child's immune system after multiple vaccinations. The State Medical Board of Oregon rescinded Thomas's medical license, and timing strongly suggests that their action was retaliation for publication. The International Journal of Environmental Research and Public Health retracted the publication in 2021, without specifying a reason. Hooker and Miller (2020, 2021) have explored pediatric data made available by six different pediatric practices. (10,11) They found harms associated with vaccines given in the first year of life as well as in those children who were fully vaccinated. More recently, Mawson and Jacob (2025) analyzed Medicaid claims data for over 47,000 nine-year-old children and reported that vaccinated children were significantly more likely than unvaccinated children to be diagnosed with autism spectrum disorder, epilepsy, encephalopathy, tic disorders, and other neurodevelopmental disorders. (12) Lacking individual data by vaccination status, Coccia (13) correlated vaccination levels in 12 countries with prevalence of autism, and reported a positive correlation.

These examples highlight the paucity of independent studies (2) available to guide the policy decisions of public health officials. Even this handful of studies follows rather small cohorts only, lacking the data that could inform an analysis of community/population effects. Kennedy and Hooker (14) described the state of our epidemiological ignorance concerning vaccines.

A database of Medicaid patients, diagnoses, and medical procedures from the State of Florida, 1990-2010 provides a limited basis for beginning to explore the broad public health consequences of vaccination. In these data, Mawson (12) found an association between vaccination status and neurodevelopmental disorders in a subset of nine-year-old children. From this same data set, the present study looks for correlations between vaccination status and incidence of nine health conditions.

Methods

From more than ten million patients in the Florida Medicaid database, we selected 14,235 for whom there were comprehensive records from age 0 through age 10. **Table 1** summarizes the patients' vaccination status; and **Table 2**, their diagnoses.

We stratified the records by year, and correlated 11 diagnosis categories with 14 vaccination classes. Ages were listed in whole numbers of years as of the latest birthday. For each patient-year, vaccinations up to and including that year were included in the correlation, but not vaccinations received after the current year. From this record of 14,235*11 = 156,585 patient-years, we determined correlation coefficients between each vaccination and each diagnosis. Results are in **Table 3A**. **Table 3B** comprises the same correlations but with any age trend removed. In these correlations, each patient-year counts as a data point.

Each data point is a patient-year. Diagnoses in that data point are for that year alone. Vaccinations in that data point are from that year and all previous years. We wanted to include diagnoses that occurred promptly after vaccination, so it was important to include the current year's vaccinations in the history for each diagnosis. But this methodology admits the possibility that some of the correlated vaccinations occurred after the diagnosis (but in the same year). That possibility is material for influenza vaccine and asthma: a child already under care for wheezing or diagnosed asthma is more likely to be offered a flu

shot, so a same-year or later flu dose can follow the condition it appears to predict. Because records were aggregated by calendar year of age rather than by exact dates of service, we could not construct a sensitivity table limited to vaccinations in the first two years of life followed by a first asthma diagnosis at age 2 or later. We treat that missing analysis as a limitation rather than as evidence that temporal order has been established.

For some of the stronger correlations, we looked for dose-response relationships and figures below relate the number of diagnoses to numbers of associated vaccinations.

Results

Figure 1A indicates a rate of autism more than 3x higher in children who have received multiple vaccinations for hepatitis B and MMR compared to unvaccinated children. Closely related is the apparently dose-dependent relationship between vaccinations and developmental delay (**Figure 1B**) with incidence rates in the most vaccinated children 2.5x higher compared to unvaccinated.

We have not reported p values because all p values for associations claimed in this text are very low. With thousands of diagnoses, many of the other p-values are too small to calculate. The ***largest*** p-value, conventionally calculated, is $p<10^{-12}$ for **Figure 1A**, which is based on only 152 autism cases. With such small numbers, uncertainties that cannot be quantified overwhelm the statistical uncertainties.

Respiratory infections are common in adults and even more common in children. **Figure 1C** shows a 21% probability that an unvaccinated child will seek medical attention for a respiratory infection in any given year. The comparable figure for a fully vaccinated child is 47%. **Figure 1D** shows the number of asthma diagnoses as a function of total vaccine dosages. Fully vaccinated children are 4x more likely to receive an asthma diagnosis compared to the unvaccinated. This is especially concerning because of the relationship between asthma and more serious auto-immune disorders. (15)

Of all vaccines in the set we examined, the flu vaccine was most highly correlated with adverse health outcomes. Asthma, developmental delay, strep throat, and undifferentiated other diagnoses were all associated with flu vaccines more than any other (**Figure 2**).

Influenza can be serious in small children, so some type of protection can be beneficial. But there is no herd immunity from flu vaccines, (16) and protection in any given year is partial at best. Hence, the side effects observed here should be relevant to any policy decisions regarding vaccinating children against influenza.

Table 4 presents cross correlations among the different diagnoses. The strength of these correlations complicates inferences about causal relationships between particular vaccines and particular side effects. Where appropriate, we used multivariate regressions to make a better guess at which associations are causal and which are incidental.

A legitimate question arises concerning the unadjusted numbers above: How much of the association between vaccination and higher disease rates is a reflection of differential diagnosis, unrelated to the biological effects of vaccination? To address this question, we used well-child doctor visits (for each patient-year) as a surrogate marker for propensity to seek medical attention.

From the full set of 156,545 patient-years, those with no recorded doctor visits were eliminated as less reliably connected to the Medicaid system. This exclusion was a conservative assumption to lessen the extent to which undiagnosed ailments bias our results.

Of the remaining 83,837 patient-years, a small number were eliminated because there were more than 100 diagnoses in a single year, and we suspect these might have been anomalous.

To quantify a family's propensity to seek medical help, we used the number of well-child doctor visits (ICD-9 code V20). We grouped patient-years according to the number of V20s in that year, and excluded all patient-years that had no well-child visits. We repeated the previous analysis in within each group, for children who had 1, 2, or 3 V20s within a given year of age. We omitted patient-years with zero well-child visits because these have the highest likelihood of undiagnosed illness. **Tables 5A**, **5B**, and **5C** show the correlation coefficients as tabulated in **Table 3**, but limited to patient-years in which 1, 2, and 3 well-child visits (respectively) were recorded. **Table 5D** is a weighted average of A, B, and C, using square roots of the respective numbers of patient-years as weights.

Correlations in **Table 5** are weaker than in **Table 3** because the effect of differential diagnosis has been compensated. We would argue that there is no reason to expect that a differential diagnosis bias exists in **Table 5**. If anything, there we expect a conservative bias, since 1) well-child visits are often

accompanied by scheduled vaccinations; and 2) parents with a predilection to avoid doctors' offices are less likely to go for well child check-ups than they are to seek a doctor's help when their child is ill. The numbers of patient-years (25380, 7090, and 2940, for 1, 2 and 3 visits per year, respectively) remain adequate for high statistical confidence.

We find in this table some indications of generalized protective effects, as well as some indications of increased risk. Among the protective effects, the largest are seen for Hep-A and flu shots, which both appear protective against ear infection, and for the Hib vaccine, which appears protective against ADHD. On the other side of the ledger, the largest increased risks emerge for flu shots, which are associated with a 4-fold increase in risk of asthma and a 3-fold increase in risk of autism, and for Hib vaccination along with all the DT variations, which are associated with increased risk of respiratory infections.

Figure 3 tabulates the yearly incidence of various diagnoses as a function of the total number of vaccine doses received up to the current year. Total of all diagnoses was nearly twice as high for fully vaccinated patient-years compared to unvaccinated. Diagnoses of streptococcus, fever, asthma, respiratory infections, and developmental delay all display dose-response relationships, with the largest percent increase typically between 0 and 1 vaccine doses.

Figure 4 shows protective effects of vaccines, i.e., diagnoses which decreased with the number of inoculations. A single Hep-A or influenza vaccination was found to be protective against ear infections, but boosters did not improve the protection. Hib vaccine was found to be protective against ADHD, and increasing doses improved the protection.

Rate of autism was found to increase by a factor 2½ with the first vaccine injection, but decreased with further vaccinations. A natural interpretation of this peculiar dose-response relationship is that susceptible children are likely to regress into autism with their first vaccination, and parents of affected children tend to avoid further vaccinations after the autism diagnosis.

Figure 5 offers dose-response relationships for some of the strongest correlations between disease and vaccination. A) Rate of asthma by number of flu shots; B) Rate of autism by number of flu shots; C) Respiratory diagnoses per patient by number of flu shots; D) Respiratory diagnoses per patient by number of DT shots (all DT-containing vaccines); E) Respiratory diagnoses per patient by number of Hib shots; F) Rate of asthma by number of MMR shots.

Figure 6 details some dose-response relationships for aggregate risk from multiple vaccinations of any type. A) Rate of developmental delay by total number of vaccinations; B) Respiratory infection diagnoses per patient per year by total number of vaccinations; C) Rate of asthma by total number of vaccinations; D) Rate of ADHD by total number of vaccinations.

Biological plausibility for several of these effects can be found in the literature on the non-specific (heterologous) effects of vaccines, developed by Peter Aaby, Christine Stabel Benn, and colleagues. (17) This work distinguishes live-attenuated vaccines, which broadly upregulate innate immunity through "trained immunity" and are associated with reduced unrelated infectious morbidity, (18) from non-live (inactivated, subunit, or toxoid) vaccines, which several studies associate with increased susceptibility to unrelated infections in early life. (17) This offers a plausible account for part of the pattern observed here: Hib and the DT-containing vaccines are non-live, and their association with increased respiratory infection risk is broadly consistent with the negative non-specific effects reported elsewhere for inactivated vaccines. (17) Ear infections are often secondary to viral upper respiratory inflammation, so a shift toward broader innate protection is not mechanistically implausible — though flu vaccines are themselves inactivated in most childhood formulations, complicating a clean live/non-live explanation for that particular finding.

The proposed links to ADHD and autism are supported by the pediatric data reported in Mawson et al. (8,12) and Hooker et al., (10,11) discussed above, and find further mechanistic grounding in the work of Shaw and Tomljenovic, who propose several pathways by which the vaccine schedule could plausibly affect neurodevelopment. (19) These include cumulative antigenic or adjuvant load, aluminum-driven neuroinflammation, and a broader "immune activation" model, in which closely spaced early vaccinations provoke systemic inflammation with downstream effects on neurodevelopment and Th1/Th2 immune balance. Taken together, the observational associations reported by Mawson and Hooker and the mechanistic pathways proposed by Shaw and Tomljenovic offer a coherent picture: a biologically plausible route by which the current vaccine schedule could contribute to elevated rates of ADHD and autism, consistent with the pattern of increased risk shown in the table above.

In general, the highest correlations were seen with various ailments and the total number of vaccinations. Total number of vaccinations was associated

with more than a twofold increase in risk of ADHD, autism, and asthma. These correlations suggest a cumulative effect on the immune system from the burden of repeated challenges in the early years. Interactions between combinations of vaccines have never been investigated, let alone cumulative effects of an entire vaccine schedule. This is necessary future work, with deep implications for public health policy.

Discussion

It is relatively rare that a large data set becomes available from which vaccination status can be linked to downstream health effects. We have looked into a window of one demographic in one state over a period of two decades, not in the immediate past. Conclusions from this window can only be suggestive.

The primary potential bias in this data set came from the fact that parents who do not vaccinate their children are less likely to seek medical attention for other issues. We see this bias in the correlation between vaccination status and the number of well-child visits, which is in most cases higher than the correlation between vaccination status and diagnoses of disease.

In order to address this bias, we stratified data by patient-years, and divided the patient-years according to the number of well-child visits for each patient-year. We sought correlations between vaccination status and disease only within each grouping of patient-years, where the number of well-child visits was the same over the entire group. We claim that this effectively eliminates the bias arising from undiagnosed illness.

We document some protective effects of vaccination, presumably in part due to cross immunity. However, these apparent protective effects should also be weighed against the possibility of a healthy vaccinee effect — a well-documented confounding bias in which individuals who are already healthier, or whose caregivers are more health-conscious and more diligent about accessing medical care generally, are more likely to be vaccinated on schedule in the first place. (20)

We also find some disturbing correlations between vaccinations and disease risk. Flu vaccine and the DT combinations, collectively, appear to be the most worrisome. They are associated with asthma, ADHD, and other conditions that may be related to auto-immunity.

The strongest correlations are between various diseases and total number of vaccinations. The message is that the childhood vaccination schedule must be evaluated as a whole. The aggregate burden on the immune system of many vaccine challenges during the few years when the immune system is not yet fully mature appears to be broadly damaging to health.

Limitations in Context

The Discussion above interprets our findings through a lens of biological plausibility and consistency with prior independent work. But any fair reading must reckon with what this dataset cannot tell us.

This version of the Florida Medicaid database is, frankly, a thin reed on which to rest broad conclusions. People cycle in and out of Medicaid, move across state lines, and access vaccines through the federal Vaccines for Children program — all outside the view of this dataset. A child we classify as "unvaccinated" may have received every shot on the CDC schedule at a county health clinic. This misclassification is not random noise; it is *directional*, and it works against us. Contamination of the unvaccinated group with vaccinated children can only dilute the associations we report. The true effect sizes are plausibly larger than what appears in our tables.

The observation window closes in 2010, when the childhood schedule was roughly half its current size. The cumulative antigenic and adjuvant load has only increased since. If total vaccine burden drives the dose-response relationships we see for asthma, ADHD, and developmental delay — as **Figures 1**, **2**, and **6** suggest — then a study conducted on today's children might find stronger, not weaker, associations. This dataset may be capturing an earlier, milder version of the phenomenon.

One hundred and fifty-two autism cases across 14,235 children is a prevalence of roughly 1%, well below contemporary estimates. This almost certainly reflects the diagnostic practices of an earlier era combined with the Medicaid demographic, where less severe presentations may never receive a formal code. The correlations we find between vaccination and autism — particularly the threefold increase associated with flu shots — emerge despite this undercount. A dataset with more complete case ascertainment would offer greater statistical power and potentially reveal associations obscured here.

We have demonstrated correlation, dose-response gradients, and persistence after stratification for

healthcare-seeking behavior. None of this proves causation. A child with early respiratory vulnerability may be more likely to receive a flu shot and more likely to later develop asthma, with the vaccination serving as marker rather than mechanism. The temporal structure of our analysis — counting only vaccinations administered up to the diagnosis year — reduces but does not eliminate this concern. The concern is especially relevant for influenza vaccine and asthma. Pediatricians routinely recommend annual influenza vaccination once asthma is established, and a formal asthma diagnosis is uncommon before age 2 because early wheezing is often attributed to bronchiolitis or other transient causes. A more informative test of directionality would restrict the exposure window to vaccine doses received in the first two years of life and then ask whether a first asthma code appears at age 2 or later. The present dataset and analytic structure — yearly aggregates rather than dated event sequences — did not support that sensitivity table. Absence of an age-0–2 lag analysis is therefore a limitation of the study; it does not rule out reverse causation. The stratified analysis by well-child visits addresses differential diagnosis bias but cannot fully resolve questions of reverse causation for conditions with insidious onset.

The dataset is silent on breastfeeding, birth complications, gestational age, maternal health, household environment, and a dozen other variables that shape pediatric outcomes. We cannot rule out the possibility that some unmeasured confounder drives both vaccination uptake and disease risk in ways uncorrelated with well-child visit frequency. That said, the *healthy vaccinee effect* documented in the influenza literature — where healthier, more advantaged children are *more* likely to be vaccinated — would, if operating here, bias results *toward* apparent protection, not harm. The fact that we find harm despite this potential bias is noteworthy.

Treating 156,585 patient-years as independent observations inflates effective sample size. We have responded by de-emphasizing p-values entirely and focusing on correlation magnitudes and the consistency of dose-response patterns. Readers accustomed to null hypothesis significance testing as the arbiter of scientific validity may find this unsatisfying. We find it more honest than reporting p-values that are artifactually small.

These limitations are real. They are also, in a sense, the point. The fact that a twenty-year-old Medicaid dataset from a single state — with all its gaps, misclassifications, and missing covariates — represents one of the better windows available into the real-world health effects of the childhood vaccine schedule is itself a damning indictment of public health governance. The Vaccine Safety Datalink, with linked records on millions of children, sits behind CDC firewalls, accessible only to researchers who have passed an opaque vetting process and whose results must survive agency review before publication. Insurance claims databases with far richer covariate information remain proprietary. The federal government could fund and mandate the comprehensive, independent safety studies that the existing literature — including this paper — can only gesture toward. It has chosen not to.

Our findings are suggestive, not definitive. They point toward hypotheses that demand rigorous testing in larger, more complete datasets with better covariate control. The proper response to this paper is not to dismiss it for its limitations — every observational study has them — but to insist that the data necessary to overcome those limitations be made available to the independent scientific community without gatekeeping by agencies with vested interests in the status quo.

Conclusion

In no other field has the investment in public health been so high, based on such a small volume of real-world data. Much of the data that could inform a wise vaccination schedule is held by governments and HMOs, outside the public domain. Comparable linked claims already exist in every state's Medicaid data warehouse. Those state files should be de-identified and released to independent analysts so that the Florida findings can be replicated, refined, and tested at national scale.

As long as these data remain unavailable for analysis, the status quo prevails. The status quo is in the interest of pediatric practices, vaccine manufacturers, and the regulatory agencies that the manufacturers have captured. (21) The status quo is (potentially) bad for child patients, and their parents, who have no organized representation. But it is also (potentially) bad for health insurance companies and HMOs, which are not only paying the cost of vaccinations that have questionable value; they are also paying for the downstream treatment of diseases whose prevalence is increased by the vaccination schedule. The most promising next step is for state Medicaid agencies, insurance companies, and HMOs to de-identify the files already sitting in their data banks and release them to academic researchers who can, collectively, offer a much-needed scientific debate, which might then inform policy.

The take-home message is that those empowered to form public health policy have an urgent need to review all vaccines for safety, using better data than is available from legacy Florida Medicaid datasets. That review cannot proceed at the necessary scale until the data already present in each state's data banks are made available for independent analysis.

Table 1. Vaccine Configurations

	Number of Patients
All Patients	14,235
Total Patient Years	156,585
No vaccines	4,532
At least 1 vaccination	9,703
At least 1 Hep-B	4,017
At least 1 Hep-A	841
At least 1 MMR	5,378
At least 1 Flu	1,213
At least 1 DTP	3,590
At least one DTaP	4,931
At least one combination including Diphtheria & Tetanus	8,230
At least 1 Varicella	3,198
At least 1 Oral polio	4,965
At least 1 Injected polio	3,724
At least 1 HPV	102
At least one Pneumonia	1,455
At least one Hib	2,028
At least one Other	7,038

Table 2. Diseases

Disease	Number of Patients
Autism	152
Developmental delay	4,411
ADHD	2,267
Respiratory infection	12,238
Ear infection	9,810
Asthma	4,360
Skin rash	3,053
Streptococcus	951
Fever	4,639
Other	14,026

Table 3A. Vaccinations across the top are correlated with diagnoses along the left column. Values listed are correlation coefficients. Color scale: cells are shaded on a green-yellow-red gradient, with green indicating the most negative correlation coefficients (protective associations), yellow indicating values near zero, and red indicating the most positive correlation coefficients (associations with increased risk).

Cross-Corr	ALL	MMR	Hep-B	Hep-A	OPV	IPV	HPV	Pneu	DTP	DTaP	DTP-Hib	DT-all	Flu	Hib	Varic	Other
All	0.1449	0.1313	0.0918	0.0602	0.0168	0.1220	0.0092	0.0940	0.0052	0.1181	0.0180	0.1109	0.1716	0.0811	0.1247	0.0872
Other	0.1198	0.0966	0.0772	0.0571	0.0207	0.0970	0.0072	0.0739	0.0092	0.0932	0.0176	0.0916	0.1369	0.0653	0.0962	0.0784
DevDel	0.0866	0.0931	0.0556	0.0350	-0.0119	0.0900	0.0031	0.0716	-0.0176	0.0868	0.0027	0.0633	0.1202	0.0528	0.0893	0.0363
Autism	0.0054	0.0058	0.0032	0.0110	-0.0110	0.0156	-0.0007	0.0055	-0.0085	0.0110	-0.0052	0.0022	0.0309	0.0068	0.0100	-0.0037
Asthma	0.0821	0.0710	0.0580	0.0248	0.0188	0.0583	0.0073	0.0527	0.0104	0.0582	0.0197	0.0609	0.1080	0.0481	0.0645	0.0455
ADHD	0.0205	0.0385	0.0090	0.0103	0.0107	0.0134	0.0037	-0.0015	0.0118	0.0114	0.0055	0.0189	0.0185	0.0004	0.0245	0.0100
Ear Inf	0.0802	0.0361	0.0531	-0.0048	0.0473	0.0404	-0.0002	0.0412	0.0331	0.0506	0.0347	0.0761	0.0072	0.0471	0.0367	0.0717
Resp	0.1203	0.0886	0.0757	0.0388	0.0409	0.0826	0.0184	0.0615	0.0345	0.0849	0.0272	0.1016	0.0826	0.0758	0.0830	0.0826
Skin Rash	0.0435	0.0239	0.0276	0.0174	0.0142	0.0361	0.0085	0.0265	0.0154	0.0343	0.0087	0.0407	0.0180	0.0350	0.0285	0.0217
Strep	0.0495	0.0551	0.0287	0.0163	-0.0082	0.0440	-0.0002	0.0423	-0.0122	0.0415	-0.0053	0.0313	0.0961	0.0268	0.0498	0.0347
Fever	0.0548	0.0386	0.0365	0.0493	0.0087	0.0466	0.0080	0.0371	0.0003	0.0500	0.0100	0.0449	0.0470	0.0421	0.0450	0.0243

Table 3B. Same as 3A except that an age trend for each diagnosis was subtracted out for each patient-year. Color scale: as in Table 3A, green indicates the most negative correlation coefficients (protective associations), yellow indicates values near zero, and red indicates the most positive correlation coefficients (associations with increased risk).

Age removed	ALL	MMR	Hep-B	Hep-A	OPV	IPV	HPV	Pneu	DTP	DTaP	DTP-Hib	DT-all	Flu	Hib	Varic	Other
All	0.1495	0.1390	0.0934	0.0646	0.0186	0.1251	0.0106	0.0951	0.0064	0.1216	0.0183	0.1147	0.1767	0.0820	0.1302	0.0893
Other	0.1282	0.1106	0.0800	0.0652	0.0240	0.1027	0.0098	0.0759	0.0114	0.0996	0.0183	0.0985	0.1461	0.0670	0.1061	0.0823
DevDel	0.0826	0.0863	0.0543	0.0311	-0.0136	0.0873	0.0019	0.0707	-0.0187	0.0837	0.0024	0.0600	0.1158	0.0521	0.0845	0.0344
Autism	0.0031	0.0018	0.0024	0.0087	-0.0119	0.0140	-0.0014	0.0049	-0.0091	0.0092	-0.0054	0.0002	0.0284	0.0064	0.0072	-0.0048
Asthma	0.0848	0.0756	0.0589	0.0275	0.0198	0.0601	0.0081	0.0533	0.0111	0.0602	0.0199	0.0631	0.1110	0.0486	0.0677	0.0467
ADHD	0.0105	0.0215	0.0057	0.0004	0.0066	0.0066	0.0005	-0.0038	0.0091	0.0036	0.0047	0.0106	0.0075	-0.0015	0.0125	0.0053
Ear Inf	0.1122	0.0875	0.0642	0.0243	0.0606	0.0618	0.0091	0.0491	0.0421	0.0750	0.0381	0.1028	0.0401	0.0541	0.0732	0.0875
Resp	0.1397	0.1202	0.0824	0.0571	0.0486	0.0958	0.0243	0.0662	0.0397	0.0999	0.0290	0.1176	0.1034	0.0800	0.1055	0.0919
Skin Rash	0.0524	0.0389	0.0306	0.0262	0.0177	0.0422	0.0112	0.0285	0.0178	0.0412	0.0095	0.0480	0.0277	0.0367	0.0391	0.0259
Strep	0.0466	0.0501	0.0277	0.0134	-0.0094	0.0420	-0.0011	0.0416	-0.0130	0.0392	-0.0055	0.0289	0.0929	0.0263	0.0463	0.0333
Fever	0.0608	0.0488	0.0385	0.0553	0.0112	0.0508	0.0098	0.0385	0.0019	0.0547	0.0105	0.0499	0.0537	0.0433	0.0522	0.0271

Table 4. Cross correlations among the different diagnoses. The strength of these correlations complicates inferences about causal relationships between particular vaccines and particular side effects. Color scale: cells are shaded on a green-yellow-red gradient, with green indicating the most negative correlation coefficients, yellow indicating values near zero, and red indicating the most positive correlation coefficients.

Age removed	All	Other	DevDel	Autism	Asthma	ADHD	Ear Inf	Resp	Skin Rash	Strep	Fever
All	1.0000	0.8413	0.6511	0.1565	0.2547	0.2852	0.2647	0.4506	0.0841	0.4649	0.1465
Other	0.8413	1.0000	0.3181	0.0625	0.1645	0.0883	0.1949	0.3471	0.0713	0.2412	0.1455
DevDel	0.6511	0.3181	1.0000	0.0986	0.0958	0.0337	0.0989	0.1370	0.0204	0.2053	0.0376
Autism	0.1565	0.0625	0.0986	1.0000	0.0162	0.0054	0.0082	0.0149	0.0050	0.0185	0.0113
Asthma	0.2547	0.1645	0.0958	0.0162	1.0000	0.0192	0.1201	0.2257	0.0461	0.0466	0.0461
ADHD	0.2852	0.0883	0.0337	0.0054	0.0192	1.0000	0.0132	0.0193	0.0108	-0.0025	0.0138
Ear Inf	0.2647	0.1949	0.0989	0.0082	0.1201	0.0132	1.0000	0.2750	0.0731	0.0429	0.0933
Resp	0.4506	0.3471	0.1370	0.0149	0.2257	0.0193	0.2750	1.0000	0.0960	0.1354	0.1084
Skin Rash	0.0841	0.0713	0.0204	0.0050	0.0461	0.0108	0.0731	0.0960	1.0000	0.0072	0.0688
Strep	0.4649	0.2412	0.2053	0.0185	0.0466	-0.0025	0.0429	0.1354	0.0072	1.0000	0.0300
Fever	0.1465	0.1455	0.0376	0.0113	0.0461	0.0138	0.0933	0.1084	0.0688	0.0300	1.0000

Table 5A. Correlations of each vaccination with each diagnosis across patient-years as in Table 3, but limited to patient-years with exactly 1 well-patient visit.

	At least one and not more than 100 doctor visits					Exactly 1 healthy patient visit										
<100 visits	ALL	MMR	Hep-B	Hep-A	OPV	IPV	HPV	Pneu	DTP	DTaP	DTP-Hib	DT-all	Flu	Hib	Varic	Other
All	0.1141	0.0880	0.0732	0.0248	0.0251	0.0864	0.0103	0.0619	0.0257	0.0851	0.0076	0.0949	0.1058	0.0664	0.0733	0.0689
Other	0.0734	0.0439	0.0537	0.0224	0.0080	0.0621	0.0064	0.0417	0.0219	0.0536	-0.0092	0.0590	0.0800	0.0486	0.0351	0.0463
DevDel	0.0505	-0.0125	0.0419	-0.0277	0.0606	0.0049	-0.0057	0.0115	0.0513	0.0142	0.0342	0.0558	-0.0316	0.0262	-0.0032	0.0713
Autism	-0.0052	-0.0173	-0.0115	0.0009	-0.0092	0.0103	-0.0013	-0.0023	-0.0061	0.0025	-0.0109	-0.0045	0.0086	-0.0011	-0.0099	0.0026
Asthma	0.0654	0.0592	0.0454	0.0146	0.0222	0.0349	0.0117	0.0342	0.0244	0.0326	0.0107	0.0463	0.0960	0.0382	0.0411	0.0357
ADHD	-0.0013	0.0332	-0.0129	0.0102	0.0150	-0.0111	0.0008	-0.0202	0.0198	-0.0173	0.0128	0.0014	0.0158	-0.0268	0.0177	-0.0009
Ear Inf	0.0505	-0.0125	0.0419	-0.0277	0.0606	0.0049	-0.0057	0.0115	0.0513	0.0142	0.0342	0.0558	-0.0316	0.0262	-0.0032	0.0713
Resp	0.1031	0.0546	0.0700	0.0176	0.0424	0.0652	0.0297	0.0465	0.0458	0.0613	0.0253	0.0895	0.0577	0.0868	0.0516	0.0615
Skin Rash	0.0235	-0.0060	0.0248	0.0129	0.0052	0.0199	-0.0024	0.0125	0.0034	0.0213	-0.0007	0.0204	0.0037	0.0359	0.0017	0.0107
Strep	0.0140	0.0375	0.0004	-0.0007	-0.0114	0.0119	0.0051	0.0137	-0.0187	0.0130	-0.0043	0.0028	0.0218	0.0074	0.0365	0.0101
Fever	0.0230	0.0077	0.0127	0.0379	-0.0019	0.0179	0.0055	0.0224	-0.0038	0.0206	-0.0056	0.0157	0.0255	0.0221	0.0209	0.0110
Healthy	0.1320	-0.04802	0.148958	0.014871	0.044733	0.113349	0.024013	0.106372	0.028879	0.114759	0.037882	0.130626	0.006291	0.138921	0.003626	0.062237

Table 5B. Correlations of each vaccination with each diagnosis across patient-years as in Table 3, but limited to patient-years with exactly 2 well-patient visits.

	At least one and not more than 100 doctor visits					Exactly 2 healthy patient visits										
≤100 visits	ALL	MMR	Hep-B	Hep-A	OPV	IPV	HPV	Pneu	DTP	DTaP	DTP-Hib	DT-all	Flu	Hib	Varic	Other
All	0.0940	0.0801	0.0630	0.0108	-0.0168	0.0950	-0.0072	0.0617	0.0039	0.0897	0.0031	0.0846	0.0858	0.0611	0.0726	0.0379
Other	0.0505	0.0481	0.0272	0.0137	-0.0218	0.0634	-0.0015	0.0263	-0.0098	0.0559	-0.0058	0.0431	0.0733	0.0344	0.0357	0.0187
DevDel	0.0560	0.0640	0.0381	0.0036	-0.0235	0.0657	-0.0060	0.0461	-0.0212	0.0648	0.0027	0.0475	0.0350	0.0291	0.0720	0.0132
Autism	-0.0236	-0.0167	-0.0166	0.0143	-0.0195	-0.0180	-0.0015	-0.0092	-0.0087	-0.0207	-0.0086	-0.0253	0.0054	-0.0134	0.0018	-0.0164
Asthma	0.0650	0.0542	0.0274	0.0127	0.0052	0.0428	0.0015	0.0289	0.0085	0.0431	0.0169	0.0483	0.0754	0.0447	0.0539	0.0549
ADHD	0.0035	0.0350	0.0009	0.0108	0.0232	-0.0157	-0.0047	-0.0259	0.0255	-0.0066	0.0095	0.0109	0.0187	-0.0309	0.0099	0.0114
Ear Inf	0.0188	-0.0431	0.0249	-0.0350	0.0048	0.0097	-0.0054	0.0456	0.0283	0.0079	0.0042	0.0232	-0.0360	0.0392	-0.0217	0.0148
Resp	0.1055	0.0603	0.0881	0.0038	0.0110	0.0942	-0.0093	0.0756	0.0485	0.0811	-0.0012	0.0968	0.0449	0.1029	0.0466	0.0286
Skin Rash	0.0215	-0.0052	0.0242	-0.0091	0.0075	0.0165	0.0060	0.0106	0.0286	0.0127	-0.0110	0.0245	0.0142	0.0225	0.0035	0.0093
Strep	0.0145	0.0310	-0.0004	0.0088	-0.0019	0.0048	-0.0026	-0.0015	-0.0096	0.0081	0.0068	0.0140	0.0525	-0.0085	0.0190	0.0262
Fever	0.0175	0.0063	0.0107	0.0116	-0.0033	0.0181	0.0016	0.0234	-0.0053	0.0245	0.0021	0.0205	0.0073	0.0112	0.0044	0.0036
Healthy	0.0653	-0.07999	0.085634	-0.04533	-0.00555	0.080118	0.004009	0.115672	0.014491	0.070966	0.001592	0.072665	-0.03702	0.103562	-0.03667	0.007029

Table 5C. Correlations of each vaccination with each diagnosis across patient-years as in Table 3, but limited to patient-years with exactly 3 well-patient visits.

	At least one and not more than 100 doctor visits					Exactly 3 healthy patient visits										
≤100 visits	ALL	MMR	Hep-B	Hep-A	OPV	IPV	HPV	Pneu	DTP	DTaP	DTP-Hib	DT-all	Flu	Hib	Varic	Other
All	0.1403	0.0980	0.1032	-0.0054	0.0307	0.1215	-0.0070	0.0861	0.0024	0.1317	0.0184	0.1310	0.1164	0.0833	0.0664	0.0794
Other	0.1087	0.0797	0.0790	0.0130	0.0177	0.1026	-0.0154	0.0552	0.0006	0.1075	-0.0002	0.1020	0.0771	0.0697	0.0450	0.0664
DevDel	0.0453	0.0224	0.0264	0.0098	-0.0174	0.0527	0.0231	0.0585	-0.0376	0.0644	-0.0162	0.0321	0.0730	0.0159	0.0319	0.0209
Autism	0.0177	0.0350	0.0127	-0.0068	-0.0175	0.0432	-0.0020	0.0204	-0.0167	0.0295	-0.0122	0.0140	-0.0091	0.0190	0.0123	-0.0116
Asthma	0.1175	0.1077	0.0718	0.0173	0.0786	0.0502	-0.0126	0.0186	0.0369	0.0770	0.0451	0.1011	0.2128	0.0377	0.0780	0.0805
ADHD	0.0145	0.0379	0.0132	0.0083	0.0274	0.0060	0.0258	-0.0155	0.0158	-0.0032	0.0421	0.0220	0.0270	-0.0161	0.0151	-0.0021
Ear Inf	0.0346	-0.0110	0.0280	-0.0476	0.0502	0.0027	-0.0240	0.0348	0.0356	0.0046	0.0422	0.0441	-0.0499	0.0281	-0.0117	0.0530
Resp	0.1102	0.0836	0.0828	-0.0286	0.0420	0.0752	-0.0287	0.0603	0.0368	0.0853	0.0225	0.1035	0.0479	0.0873	0.0686	0.0581
Skin Rash	0.0236	-0.0088	0.0247	-0.0252	-0.0037	0.0316	-0.0103	0.0299	0.0173	0.0234	-0.0037	0.0283	-0.0229	0.0313	0.0114	0.0046
Strep	0.0260	0.0693	0.0052	-0.0103	-0.0027	0.0167	-0.0032	0.0078	-0.0198	0.0223	-0.0038	0.0163	0.0703	0.0076	0.0338	0.0148
Fever	0.0516	0.0433	0.0551	-0.0167	0.0231	0.0273	-0.0132	0.0257	-0.0125	0.0640	0.0187	0.0566	-0.0060	0.0592	0.0066	0.0136
Healthy	0.0248	-0.10705	0.068739	-0.07687	-0.04033	0.065791	-0.02694	0.085183	0.007662	0.042861	-0.00563	0.041871	-0.06112	0.073205	-0.06277	-0.00675

Table 5D. Correlations of each vaccination with each diagnosis across patient-years. This is a weighted average of correlations for patient-years recording 1, 2, and 3 well-patient visits (Tables 5a, b, and c respectively). Color scale: as in Table 3, green indicates the most negative correlation coefficients (protective associations), yellow indicates values near zero, and red indicates the most positive correlation coefficients (associations with increased risk).

	weighted average of H=1,2,3 healthy visits																
≤100 visits	ALL	MMR	Hep-B	Hep-A	OPV	IPV	HPV	Pneu	DTP	DTaP	DTP-Hib	DT-all	Flu	Hib	Varic	Other	
All	0.0993	0.0797	0.0553	0.0323	0.0153	0.0676	0.0111	0.0464	0.0137	0.0722	0.0035	0.0798	0.1126	0.0448	0.0750	0.0655	0.0546
Other	0.0506	0.0210	0.0356	0.0290	0.0083	0.0361	0.0044	0.0113	0.0117	0.0333	-0.0023	0.0410	0.0796	0.0193	0.0228	0.0428	0.0278
DevDel	0.0497	0.0318	0.0239	0.0004	0.0186	0.0242	0.0069	0.0328	0.0101	0.0384	0.0065	0.0432	0.0344	0.0209	0.0337	0.0412	0.0260
Autism	-0.0064	-0.0041	-0.0104	0.0042	-0.0171	0.0034	-0.0018	0.0015	-0.0106	-0.0010	-0.0111	-0.0120	0.0264	-0.0040	0.0063	-0.0032	-0.0025
Asthma	0.0679	0.0656	0.0385	0.0116	0.0105	0.0384	0.0065	0.0344	0.0144	0.0366	0.0093	0.0445	0.0888	0.0416	0.0501	0.0416	0.0375
ADHD	0.0120	0.0414	-0.0042	0.0358	0.0052	0.0045	0.0114	-0.0025	0.0090	0.0023	-0.0031	0.0057	0.0454	-0.0136	0.0272	0.0006	0.0111
Ear Inf	0.0327	-0.0050	0.0218	-0.0365	0.0543	-0.0138	-0.0119	0.0043	0.0454	-0.0008	0.0297	0.0421	-0.0423	0.0097	-0.0068	0.0576	0.0113
Resp	0.0959	0.0536	0.0545	0.0173	0.0451	0.0492	0.0182	0.0366	0.0544	0.0471	0.0150	0.0836	0.0528	0.0683	0.0488	0.0655	0.0504
Skin Rash	0.0050	-0.0170	0.0045	0.0089	0.0095	0.0011	0.0013	0.0003	0.0130	-0.0035	0.0038	0.0074	0.0006	0.0129	-0.0097	0.0040	0.0026
Strep	0.0083	0.0283	-0.0112	-0.0026	-0.0065	0.0001	0.0012	0.0093	-0.0125	0.0037	-0.0095	-0.0018	0.0342	-0.0075	0.0248	0.0250	0.0052
Fever	0.0245	0.0104	0.0147	0.0400	-0.0017	0.0192	-0.0018	0.0233	-0.0051	0.0228	0.0057	0.0212	0.0242	0.0245	0.0201	0.0026	0.0153
	0.0400	0.0278	0.0203	0.0128	0.0129	0.0209	0.0041	0.0180	0.0131	0.0228	0.0043	0.0322	0.0415	0.0197	0.0266	0.0312	Averages

Figure 1 (A) Autism diagnoses in relation to numbers of HepB and MMR vaccinations; (B) Developmental delays in relation to numbers of HepB and MMR vaccinations; (C) Respiratory infections and vaccine doses; (D) Asthma diagnoses and vaccine doses.



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Figure 2 tabulates the yearly incidence of various diagnoses as a function of the total number of influenza vaccine doses received up to the current year. (A) Streptococcus; (B) Fever; (C) Asthma; (D) Respiratory infections; (E) Developmental delay; (F) All Diagnoses. All six graphs display dose-response relationships.



Figure 3 tabulates the yearly incidence of various diagnoses as a function of the total number of vaccine doses received up to the current year. (A) All diagnoses; (B) Streptococcus; (C) Fever; (D) Asthma; (E) Respiratory infections; (F) Developmental delay. All six graphs display dose-response relationships.



Figure 4. Protective effects of vaccines that are correlated with lower rates of certain diagnoses. Ear infection data for the flu shot may be explained by lower rates of respiratory infections that can spread to the ear. Autism appears not to be associated with the cumulative vaccine burden, but rather a rare event from a single vaccine, which may reflect where parents stopped vaccinating after an autism-related adverse event.

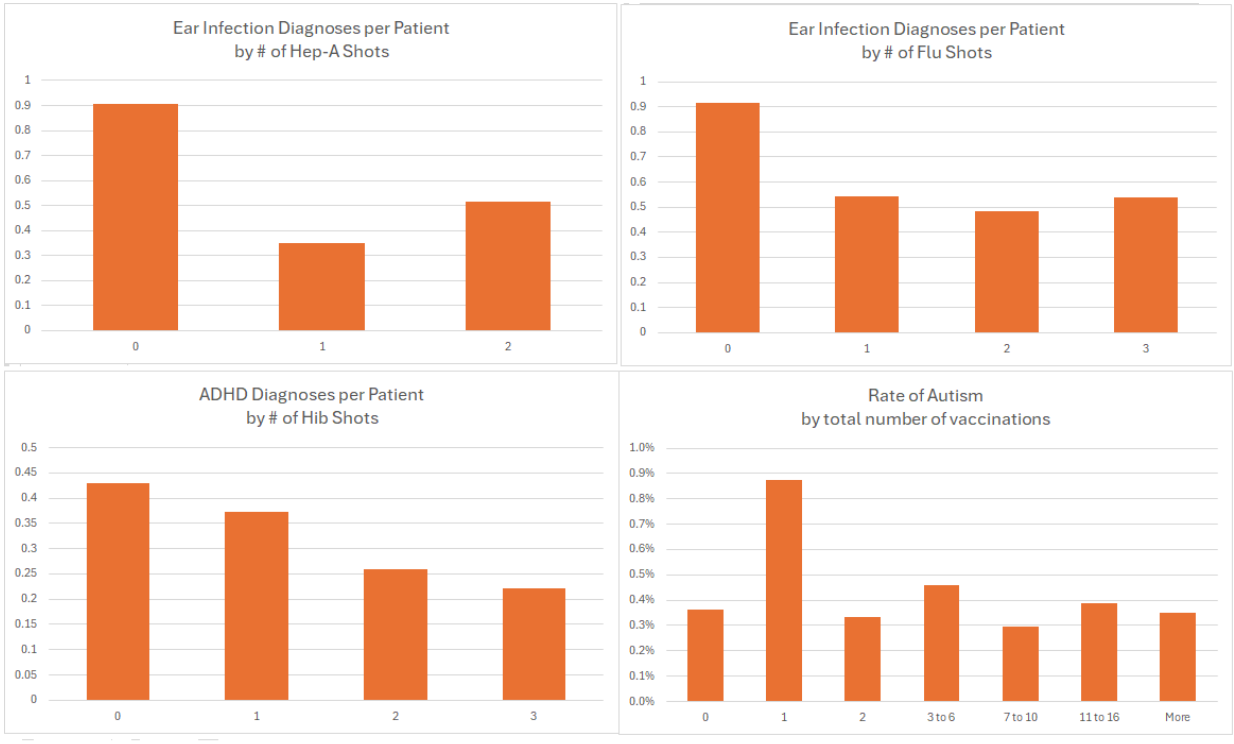
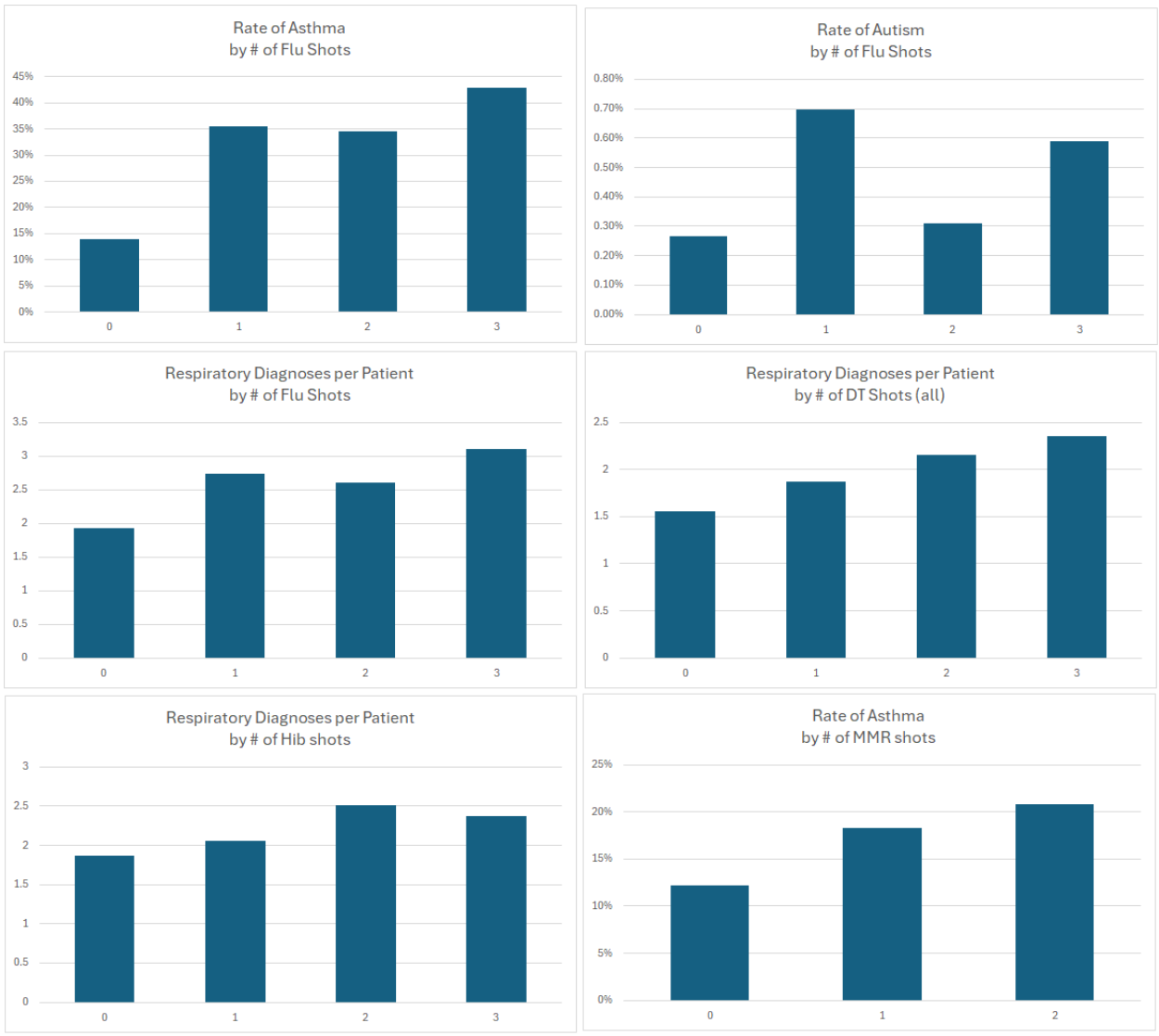
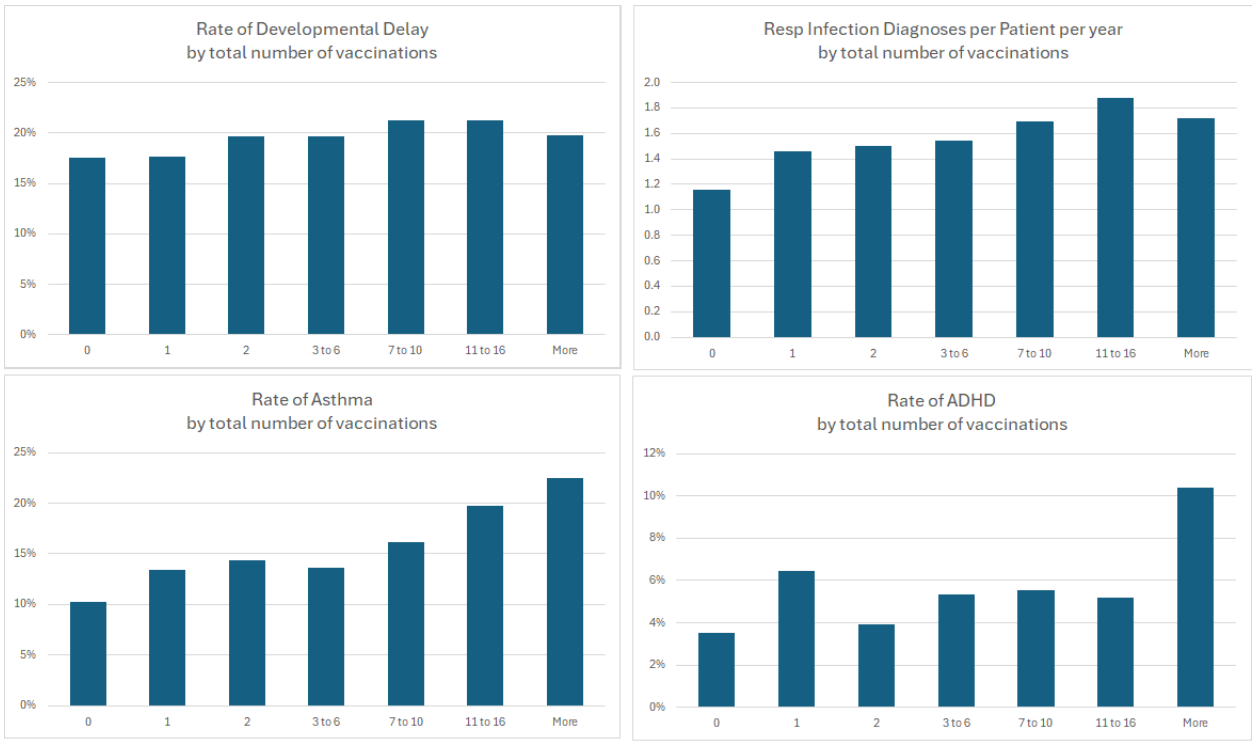


Figure 5. These are strongest indications of increased risk from individual vaccines. (A) Rate of asthma by number of flu shots; (B) Rate of autism by number of flu shots; (C) Respiratory diagnoses per patient by number of flu shots; (D) Respiratory diagnoses per patient by number of DT shots (all DT-containing vaccines); (E) Respiratory diagnoses per patient by number of Hib shots; (F) Rate of asthma by number of MMR shots.



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Figure 6. These are the strongest associations with aggregate risk from multiple vaccinations. (A) Rate of developmental delay by total number of vaccinations; (B) Respiratory infection diagnoses per patient per year by total number of vaccinations; (C) Rate of asthma by total number of vaccinations; (D) Rate of ADHD by total number of vaccinations.



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