

## Supplemental Methods and Results

**Inclusion criteria by data source:** The inclusion criteria varied slightly by data source.

Medicare: Must have 4 years of continuous fee for service coverage with no gap greater than 1 month. Must have at least one month with Medicare Parts A, B and D coverage.

Medicaid: Must have 4 years of continuous fee for service coverage. Must be under age 61 at the start of the 4 years of continuous coverage

CDM: Must have 4 years of continuous coverage. All patients have pharmacy benefits coverage.

HealthCore: Must have 4 years of continuous coverage with or without pharmacy benefits.

**Time period of data used in the incidence and prevalence analyses:** The time periods of the data used to compute incidence and prevalence varied slightly by the data source and the analysis. This is summarized in the following table.

Data source	Incidence	Prevalence
Medicare	January 2007 – December 2017 <sup>a</sup>	January 2007 – December 2017
Medicaid	January 1999 – December 2012 <sup>b</sup>	January 1999 – December 2012
CDM	May 2000 – December 2017 <sup>c</sup>	May 2000 – December 2017
HealthCore	January 2006 – June 2018 <sup>d</sup>	January 2006 – December 2017

a Could only be diagnosed as incident IBD between January 1, 2015 and December 31, 2017

b Could only be diagnosed as incident IBD between July 1, 2009 and June 30, 2012

c Could only be diagnosed as incident IBD between July 1, 2014 and June 30, 2017

d Could only be diagnosed as incident IBD between July 1, 2014 and June 30, 2018

**Censoring rules for incidence calculations:** In each data set, patients were censored for death or loss of health insurance benefits. In Medicaid, patients were censored when they reached age 65 years or began a managed Medicaid plan.

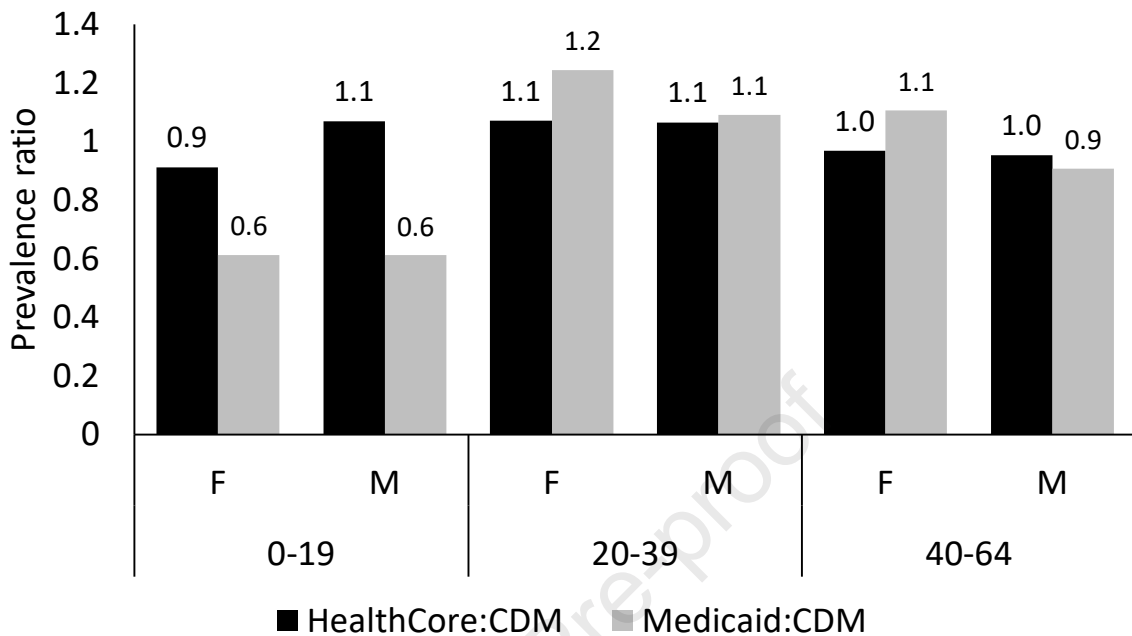
**Avoiding duplicate counting of people:** While people may switch between insurance plans, duplicate counting of individuals was avoided by the following:

- People do not have two of these insurance plans as their primary insurance at the same time
- People may have both Medicare and Medicaid benefits. Those under age 65 were included in the Medicaid population. Medicaid beneficiaries over age 65 were excluded. Thus, those over age 65 with both Medicare and Medicaid were included in the Medicare cohort.
- Medicare includes both fee for service and managed plans, however a person may only have one of these benefits at a time. We used managed Medicare data from Anthem and CDM and only fee for service Medicare beneficiaries in the random sample data received from the Center for Medicare and Medicaid Services.
- There is a small chance that Medicaid beneficiaries could have been counted again in the commercial or Medicare data for the following reasons:
  - o Because the Medicaid data ended in 2012, there is a small possibility that a patient could have been captured in Medicaid and later in commercial or Medicare data.

- There are some states where children with IBD can have both Medicaid and commercial insurance.
- Given the relatively small portion of Americans with Medicaid and the low probability that patients were double counted, this is expected to have a very small impact on the results.

**Provider specialty:** Each data source has one or more variables that identify provider specialty. In CDM, we internally validated this code by examining the relationship between the code and performance of colonoscopy. In 2017, colonoscopies and sigmoidoscopies were far more likely to be performed by gastroenterologists (median 44, IQR 16, 101) and colorectal surgeons (median 16; IQR 6, 39) than by family practitioners (median 2, IQR 1,4), internists (median 1, IQR 1-8) or general surgeons median 1, IQR 1-7). These data strongly support the validity of the provider specialty data in the commercial claims data. However, in Medicaid, physician specialty data were incomplete. Physician specialty can be identified in Medicaid using a specific provider taxonomy variable or by linking to the NPI number of the provider. Unfortunately, there was a high level of missing data for lower endoscopy claims using either of these methods to identify provider specialty (nearly 50%). As such, we were not able to implement the coding requirement for physician specialty in the Medicaid data. The one other exception is that HealthCore's data did not distinguish colorectal surgeons from other surgeons, and as such all surgeons were counted in the algorithms.

Supplemental Figure 1. Prevalence ratio comparing Medicaid, HealthCore and CDM



**Supplemental Table 1. Age- and sex-specific insurance-weighted incidence rates of IBD**

Age group (years)	Sex	Cases (high probability)	Person-years	High probability incidence*	High probability variance*	Cases (high and lower probability)	Person-years	High + lower probability incidence*	High + lower probability variance*
<b>IBD</b>									
<10	F	56	1,358,038	4.12	3.04E-06	68	1,358,034	5.01	3.69E-06
<10	M	57	1,439,501	3.96	2.75E-06	81	1,439,491	5.63	3.91E-06
10-19	F	389	2,616,190	14.87	5.68E-06	545	2,616,014	20.83	7.96E-06
10-19	M	576	2,801,445	20.56	7.34E-06	744	2,801,256	26.56	9.48E-06
20-29	F	304	1,786,255	17.02	9.53E-06	468	1,785,996	26.20	1.47E-05
20-29	M	370	1,915,081	19.32	1.01E-05	534	1,914,848	27.89	1.46E-05
30-39	F	294	2,186,589	13.45	6.15E-06	449	2,186,380	20.54	9.39E-06
30-39	M	307	2,205,821	13.92	6.31E-06	440	2,205,652	19.95	9.04E-06
40-49	F	324	3,054,906	10.61	3.47E-06	492	3,054,658	16.11	5.27E-06
40-49	M	333	3,039,180	10.96	3.61E-06	500	3,038,952	16.45	5.41E-06
50-59	F	381	3,780,526	10.08	2.67E-06	658	3,780,114	17.41	4.60E-06
50-59	M	342	3,609,922	9.47	2.62E-06	594	3,609,569	16.46	4.56E-06
60-64	F	148	1,612,471	9.18	5.69E-06	250	1,612,318	15.51	9.62E-06
60-64	M	166	1,460,818	11.36	7.78E-06	265	1,460,678	18.14	1.24E-05
65-79	F	302	3,599,947	8.39	2.33E-06	385	3,599,886	10.69	2.97E-06
65-79	M	204	2,626,130	7.77	2.96E-06	254	2,626,102	9.67	3.68E-06
80+	F	124	2,516,313	4.93	1.96E-06	155	2,516,286	6.16	2.45E-06
80+	M	70	1,355,616	5.16	3.81E-06	86	1,355,608	6.34	4.68E-06
<b>Ulcerative colitis</b>									
<10	F	24	1,358,034	1.77	1.30E-06	30	1,358,031	2.21	1.63E-06
<10	M	17	1,439,502	1.18	8.20E-07	24	1,439,496	1.67	1.16E-06
10-19	F	161	2,616,386	6.15	2.35E-06	227	2,616,293	8.68	3.32E-06
10-19	M	229	2,801,749	8.17	2.92E-06	294	2,801,663	10.49	3.75E-06
20-29	F	163	1,786,409	9.12	5.11E-06	255	1,786,268	14.28	7.99E-06
20-29	M	226	1,915,242	11.80	6.16E-06	335	1,915,099	17.49	9.13E-06
30-39	F	179	2,186,677	8.19	3.74E-06	283	2,186,533	12.94	5.92E-06
30-39	M	198	2,205,928	8.98	4.07E-06	285	2,205,810	12.92	5.86E-06
40-49	F	203	3,054,994	6.64	2.18E-06	301	3,054,839	9.85	3.23E-06
40-49	M	218	3,039,265	7.17	2.36E-06	331	3,039,110	10.89	3.58E-06
50-59	F	238	3,780,612	6.30	1.67E-06	397	3,780,376	10.50	2.78E-06
50-59	M	222	3,610,028	6.15	1.70E-06	389	3,609,796	10.78	2.99E-06
60-64	F	97	1,612,521	6.02	3.73E-06	158	1,612,433	9.80	6.08E-06
60-64	M	123	1,460,851	8.42	5.76E-06	192	1,460,748	13.14	9.00E-06
65-79	F	200	3,599,972	5.56	1.54E-06	246	3,599,943	6.83	1.90E-06
65-79	M	145	2,626,140	5.52	2.10E-06	177	2,626,122	6.74	2.57E-06
80+	F	87	2,516,319	3.46	1.37E-06	111	2,516,297	4.41	1.75E-06
80+	M	49	1,355,618	3.61	2.67E-06	63	1,355,610	4.65	3.43E-06
<b>Crohn's disease</b>									
<10	F	31	1,358,033	2.28	1.68E-06	36	1,358,033	2.65	1.95E-06
<10	M	35	1,439,495	2.43	1.69E-06	51	1,439,491	3.54	2.46E-06
10-19	F	208	2,616,315	7.95	3.04E-06	293	2,616,234	11.20	4.28E-06
10-19	M	322	2,801,638	11.49	4.10E-06	422	2,801,539	15.06	5.38E-06
20-29	F	123	1,786,455	6.89	3.85E-06	190	1,786,345	10.64	5.95E-06
20-29	M	134	1,915,332	7.00	3.65E-06	186	1,915,248	9.71	5.07E-06
30-39	F	104	2,186,760	4.76	2.17E-06	148	2,186,700	6.77	3.10E-06
30-39	M	99	2,206,022	4.49	2.03E-06	141	2,205,975	6.39	2.90E-06
40-49	F	108	3,055,099	3.54	1.16E-06	170	3,055,011	5.56	1.82E-06
40-49	M	105	3,039,397	3.45	1.14E-06	154	3,039,330	5.07	1.67E-06
50-59	F	123	3,780,723	3.25	8.61E-07	233	3,780,558	6.16	1.63E-06
50-59	M	101	3,610,138	2.80	7.75E-07	176	3,610,025	4.88	1.35E-06
60-64	F	44	1,612,576	2.73	1.69E-06	79	1,612,519	4.90	3.04E-06
60-64	M	41	1,460,942	2.81	1.92E-06	71	1,460,904	4.86	3.33E-06



65-79	F	87	3,709,192	2.35	6.32E-07	120	3,709,164	3.24	8.72E-07
65-79	M	46	2,708,766	1.70	6.27E-07	62	2,708,756	2.29	8.45E-07
80+	F	27	2,541,658	1.06	4.18E-07	32	2,541,655	1.26	4.95E-07
80+	M	21	1,370,549	1.53	1.12E-06	21	1,370,549	1.53	1.12E-06

\* Insurance weighted incidence and variance per 100,000 person-years

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**Supplemental Table 2. Age- and sex-specific insurance-weighted prevalence and variance**

Age group (years)	Sex	Numerator	Denominator	Prevalence*	Variance*
<b>IBD</b>					
<10	F	129	431,662	32.40	9.99E-05
<10	M	135	459,199	31.80	8.95E-05
10-19	F	1647	897,438	181.70	3.55E-04
10-19	M	2189	952,905	220.80	3.54E-04
20-29	F	3525	651,493	555.90	1.07E-03
20-29	M	3903	689,795	574.50	1.01E-03
30-39	F	5832	686,820	882.20	1.57E-03
30-39	M	5481	691,951	807.80	1.39E-03
40-49	F	9509	983,096	1013.90	1.27E-03
40-49	M	8222	973,221	867.00	1.06E-03
50-59	F	12748	1,235,820	1074.30	1.02E-03
50-59	M	10584	1,183,680	914.30	9.00E-04
60-64	F	6624	608,657	1121.30	2.07E-03
60-64	M	5373	557,772	967.20	2.06E-03
65-79	F	15327	1,201,808	1277.30	1.05E-03
65-79	M	10048	882,277	1149.20	1.31E-03
80+	F	9638	850,719	1140.80	1.34E-03
80+	M	4802	482,379	1022.80	2.21E-03
<b>Ulcerative colitis</b>					
<10	F	60	431,662	15.69	5.02E-05
<10	M	56	459,199	12.90	3.56E-05
10-19	F	609	897,438	67.74	1.34E-04
10-19	M	698	952,905	73.10	1.24E-04
20-29	F	1,481	651,493	226.86	4.16E-04
20-29	M	1,617	689,795	240.93	4.36E-04
30-39	F	2,904	686,820	428.75	7.33E-04
30-39	M	2,834	691,951	411.69	6.91E-04
40-49	F	4,822	983,096	498.36	5.95E-04
40-49	M	4,470	973,221	464.33	5.53E-04
50-59	F	6,757	1,235,820	564.34	5.29E-04
50-59	M	5,998	1,183,680	514.51	5.02E-04
60-64	F	3,617	608,657	606.72	1.11E-03
60-64	M	3,214	557,772	577.29	1.23E-03
65-79	F	8,695	1,201,808	724.73	6.00E-04
65-79	M	6,069	882,277	694.00	7.92E-04
80+	F	6,066	850,719	717.89	8.45E-04
80+	M	3,105	482,379	661.47	1.43E-03
<b>Crohn's disease</b>					
<10	F	60	431,662	14.10	4.03E-05
<10	M	68	459,199	15.62	4.29E-05
10-19	F	968	897,438	105.15	2.01E-04
10-19	M	1,404	952,905	136.93	2.09E-04
20-29	F	1,877	651,493	300.38	5.98E-04
20-29	M	2,104	689,795	305.33	5.25E-04
30-39	F	2,681	686,820	414.96	7.68E-04
30-39	M	2,390	691,951	356.23	6.26E-04
40-49	F	4,240	983,096	465.05	6.12E-04
40-49	M	3,335	973,221	355.80	4.44E-04
50-59	F	5,323	1,235,820	450.93	4.33E-04
50-59	M	4,068	1,183,680	352.99	3.52E-04
60-64	F	2,680	608,657	456.64	8.59E-04
60-64	M	1,907	557,772	340.94	7.20E-04
65-79	F	5,696	1,201,808	474.44	3.93E-04
65-79	M	3,443	882,277	393.06	4.49E-04
80+	F	2,936	850,719	346.97	4.09E-04
80+	M	1,418	482,379	300.66	6.52E-04

\* Insurance weighted prevalence and variance per 100,000 population