

Appendix 1.

Algorithm for Cohort Creation, Assignment to Groups, and Assessment of Out-of-pocket Costs

Data source: Optum® Clinformatics® Data Mart includes private insurance claims from approximately 140 million children and adults from all 50 states since 2004, including approximately 13 million annual private insurance lives. Data include enrollees covered by employer-sponsored and individual insurance, including Health Insurance Marketplace plans.

Key Features of Data Source

	Optum® Clinformatics® Data Mart
Annual private insurance covered lives	13 million
Types of enrollees	Group insurance, individual insurance
Provider specialty	Present on medical and pharmacy claims
Geographic location	5-digit zip code, state
Socioeconomic information	Median household income by zip code can be obtained by merging zip code against census data
Insurance plan benefit design details	Plan type; presence of health retirement account or health savings account; plan ID number; financial arrangement
Spending variables	Charges and standardized cost – a national estimate of the median amount paid to in-network providers by the insurer for the service
Out-of-pocket spending variables	Deductible, co-payment, and co-insurance amounts

Why this data source?

Approximately 59 million women ages 19-64 (61%) received their health coverage from employer-sponsored insurance in 2019.¹ The commercially-insured population includes many individuals traditionally classified as “underserved” or “marginalized.” For example, more than a quarter of individuals with income 100%-200% of the federal poverty level (FPL) and more than half of individuals with income 200%-400% FPL have employer-sponsored coverage.² These individuals are expected to be highly vulnerable to out-of-pocket costs for medical care.

Medicaid programs³ are allowed to impose cost sharing. The amount varies by state and by Medicaid plan, but limits on annual out-of-pocket maximums for Medicaid enrollees mean that cost-sharing is almost exclusively a problem of the commercially-insured.

¹Kaiser Family Foundation. Women’s Health Insurance Coverage. Available at: [https://www.kff.org/womens-health-policy/fact-sheet/womens-health-insurance-coverage/#:~:text=Approximately%2059%20million%20women%20ages,in%202019%20\(Figure%201\)](https://www.kff.org/womens-health-policy/fact-sheet/womens-health-insurance-coverage/#:~:text=Approximately%2059%20million%20women%20ages,in%202019%20(Figure%201).). Accessed July 23, 2021

² Tax Policy Center. Briefing Book. Available at: <https://www.taxpolicycenter.org/briefing-book/who-has-health-insurance-coverage>. Accessed July 23, 2021

³Centers for Medicare and Medicaid Services. Cost Sharing. Available at: <https://www.medicaid.gov/medicaid/cost-sharing/index.html>. Accessed July 23, 2021.

Fendrick AM, Dalton VK, Tilea A, Malone AM, Moniz MH. Out-of-pocket costs for colposcopy among commercially insured women from 2006 to 2019. *Obstet Gynecol* 2021;138.

The authors provided this information as a supplement to their article.

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Years: 2006-2019

Population: women between ages 21 – 65 years old (inclusive)

NOTE: no restriction on enrollment length. 97.4% of women were continuously enrolled for at least six months after the first colposcopy procedure.

Algorithm:

A. Use yearly medical services claims to identify women with colposcopy and associated procedures

1. *Step 1. Identify women who had a colposcopy: Include all women with group 1 codes, group 2 codes, or 57460 code.*
2. *Step 2. Identify all colposcopy and associated procedure codes in the 60 days following index colposcopy. This 60-day window constitutes an episode of care.*
3. *Step 3. Assign people to groups.*
 - a. *Any episode with any Group 3 codes goes into Group 3.*
 - b. *Any episode with any Group 2 codes goes into Group 2.*
 - c. *Episodes with only Group 1 codes go into Group 1.*

NOTE: Some women may contribute multiple episodes that each fall into different groups.

- Women might have multiple colposcopy or related procedures within a year. We treated the unit of analysis to be CPT for colposcopy or associated procedures within 60 days
 - o Individual women were allowed to have multiple colposcopy episodes within one year
 - o Individuals were allowed to contribute episodes to multiple groups (e.g., if one had a colposcopy alone and a colposcopy with LEEP performed within the same year outside the 60-day window for the first procedure, this would generate two colposcopy episodes—the first in Group 1, the second in Group 3)

Table 1. Codes used to identify cohort of women undergoing colposcopy

Group 1: Colposcopy procedure without biopsy	
56820	Colposcopy of the vulva;
57420	Colposcopy of the entire vagina, with cervix if present
57452	Colposcopy of the cervix including upper/adjacent vagina
Group 2: Colposcopy procedure + biopsy	
56821	Colposcopy of the vulva; with biopsy(s)
57421	Colposcopy of the entire vagina, with cervix if present; with biopsy(s) of vagina/cervix
57454	Colposcopy of the cervix including upper/adjacent vagina; with biopsy(s) of the cervix and endocervical curettage
57455	Colposcopy of the cervix including upper/adjacent vagina; with biopsy(s) of the cervix
57456	Colposcopy of the cervix including upper/adjacent vagina; with endocervical curettage
58100	Endometrial sampling (biopsy) with or without endocervical sampling (biopsy), without cervical dilation, any method (separate procedure)
Group 3: Colposcopy procedure + additional procedures (LEEP, CKC)	
57460	Colposcopy of the cervix including upper/adjacent vagina; with loop electrode biopsy(s) of the cervix
57520	Conization of cervix, with or without fulguration, with or without dilation and curettage, with or without repair; cold knife or laser
57522	Conization of cervix, with or without fulguration, with or without dilation and curettage, with or without repair; loop electrode excision

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B. Ascertain out-of-pocket costs associated with colposcopy episodes within each group

1. *Step 1: In all three groups, look within the 60 days after index colposcopy for costs associated with the codes in Table 1 and Table 2.*
2. *Step 2: Sum all colposcopy-related costs within the episode window.*
3. *Step 3: Within each group, calculate mean, median, and IQR for all episodes with non-zero out-of-pocket costs.*

Table 2. Additional codes for assessing costs

88141	Cytopathology, cervical or vaginal (any reporting system), requiring interpretation by physician
88142	Cytopathology, cervical or vaginal (any reporting system), collected in preservative fluid, automated thin layer preparation; manual screening under physician supervision
88150	Cytopathology, slides, cervical or vaginal; manual screening under physician supervision
88164	Cytopathology, slides, cervical or vaginal (the Bethesda System); with manual screening and rescreening under physician supervision
88175	Cytopathology, cervical or vaginal (any reporting system), collected in preservative fluid, automated thin layer preparation; with screening by automated system and manual rescreening or review, under physician supervision
88305	Level IV - Surgical pathology, gross and microscopic
88307	Level V - Surgical pathology, gross and microscopic

Key Findings to Supplement Those Reported in the Research Letter

Table 1. Mean and median out-of-pocket costs, by year, by group, 2006-2019

	Group 1		Group 2		Group 3	
	Mean±SD	Median (IQR)	Mean±SD	Median (IQR)	Mean±SD	Median (IQR)
2006	41.34±70.11	20.00 (10.00-31.23)	58.73±104.13	20.00 (15.00-42.75)	275.36±378.96	100.00 (25.65-413.23)
2007	50.76±82.00	20.00 (12.76-40.00)	71.48±124.35	20.00 (15.00-61.76)	326.10±496.19	127.50 (31.63-448.18)
2008	59.73±88.27	25.00 (11.93-93.27)	86.22±133.44	25.00 (15.00-118.68)	384.67±558.58	203.00 (40.00-517.34)
2009	70.44±89.00	29.06 (15.00-121.72)	106.48±148.39	35.85 (15.00-164.72)	416.74±568.40	239.79 (40.00-577.32)
2010	82.95±109.11	35.00 (15.00-131.03)	115.36±156.52	44.08 (15.00-176.14)	444.02±592.23	287.94 (45.69-636.17)
2011	87.60±110.26	38.59 (15.00-141.86)	126.25±161.01	55.75 (15.00-192.45)	495.04±597.94	324.76 (50.13-678.34)
2012	89.38±112.20	40.00 (10.00-141.88)	137.61±171.49	70.00 (19.86-209.86)	545.84±671.00	359.98 (67.23-740.30)
2013	95.45±123.80	49.51 (15.00-144.50)	145.42±177.64	90.89 (20.00-217.93)	597.01±728.36	407.55 (78.87-825.27)
2014	102.57±122.91	69.74 (15.35-155.20)	157.20±191.17	105.76 (20.00-231.36)	589.10±666.42	390.95 (89.29-828.22)
2015	108.36±133.27	95.02 (16.68-158.99)	171.98±206.31	126.63 (25.00-249.40)	697.87±763.02	480.65 (140.32-978.35)
2016	118.85±143.38	104.54 (20.00-167.97)	178.11±204.80	134.28 (25.24-254.69)	756.40±818.27	527.62 (136.14-1,061.91)
2017	121.19±149.54	108.20 (20.00-174.54)	189.43±224.68	144.66 (26.14-268.47)	881.55±934.52	608.10 (185.31-1,249.86)
2018	126.38±141.64	114.66 (21.84-178.39)	205.58±249.22	158.23 (30.00-287.55)	982.30±1,097.19	637.53 (214.03-1,392.96)
2019	132.44±180.15	112.20 (20.00-184.29)	207.75±237.17	154.76 (30.76-292.64)	1,036.02±1,106.66	701.82 (220.32-1,499.49)

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Additional information about analysis and analytic coding is available upon request from the authors.

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