Division of Medicaid
Office of the Governor
State of Mississippi
Drug Utilization Review (DUR) Board Meeting

MISSISSIPPI DIVISION OF
MEDICAID

March 7, 2024 at 1:00pm

Zoom Video Conferencing

Prepared by:

MS | DUR Evidence-Based DUR Initiative
The University of Mississippi School of Pharmacy

Drug Utilization Review Board

Joseph Austin, MD
Vicksburg Women's Care
100 Maxwell Drive
Vicksburg, MS 39180
Term Expires: June 30, 2025

Amy Catherine Baggett, PharmD
Love's Pharmacy of Diamondhead
45000 E Aloha Dr., Suite B
Diamondhead, MS 39525
Term Expires: June 30, 2026

Terrence Brown, PharmD
BioScrip Infusion Services
187 Country Place Pkwy, Suite C
Pearl, MS 39208
Term Expires: June 20, 2026

Chrysanthia Davis, PharmD (Vice-Chair)
Omnicare Pharmacy
100 Business Park Dr, Ste D
Ridgeland, MS 39157
Term Expires: June 30, 2025

Tanya Fitts, MD (Chair)
Lafayette Pediatric Clinic
1300 Access Road, Suite 400
Oxford, MS 38655
Term Expires: June 30, 2024

Dena Jackson, MD
King's Daughters Specialty Clinic
940 Brookway Blvd
Brookhaven, MS 39601
Term Expires: June 30, 2026

Jessica Lavender, MD
UMMC
2500 N. State Street
Jackson, MS 39216
Term Expires: June 30, 2025

Holly R. Moore, PharmD
Anderson Regional Medical Center
2124 14th Street
Meridian, MS 39301
Term Expires: June 30, 2026

Kristi Phelps, RPh
Burnham Drugs
12500 Hwy 57
Vancleave, MS 39565
Term Expires: June 30, 2026

Joshua Pierce, PharmD
McGuffee Drugs
102 Main St.
Magee, MS 39111
Term Expires: June 30, 2024

Joshua Trull, DO
UMMC Dept of Psychiatry
2500 N. State Street
Jackson, MS 39216
Term Expires: June 30, 2024

Bobbie West, MD
MEA Medical Clinic
342 Gilchrist Drive
Pearl, MS 39208
Term Expires: June 30, 2025

2024 DUR Board Meeting Dates

March 7, 2024
June 13, 2024
September 12, 2024
December 5, 2024

As with any analysis, great efforts are made to ensure that the information reported in this document is accurate. The most recent administrative claims data available are being used at the time the reports are generated, which includes the most recent adjudication history. As a result, values may vary between reporting periods and between DUR Board meetings, reflecting updated reversals and claims adjustments.

Unless otherwise indicated, all MS-DUR analyses are conducted for the entire Mississippi Medicaid program including beneficiaries receiving services through the Medicaid fee-for-service (FFS) and the Mississippi Medicaid Coordinated Care Organizations (CCOs). When dollar figures are reported, the reported dollar figures represent reimbursement amounts paid to providers and are not representative of final Medicaid costs after rebates. Any reported enrollment data presented are unofficial and are only for general information purposes for the DUR Board.

Please refer to the Mississippi Division of Medicaid website for the current official Universal Preferred Drug List (PDL).

http://www.medicaid.ms.gov/providers/pharmacy/preferred-drug-list/

MISSISSIPPI DIVISION OF MEDICAID
OFFICE OF THE GOVERNOR
DRUG UTILIZATION REVIEW BOARD
AGENDA
March 7, 2024

Welcome

Old Business

Resource Utilization Review **FFS ONLY*

Follow-up and Discussion from the Board

New Business

Pharmacy Program Update

Next Meeting Information
June 13, 2024

DUR Board Meeting Minutes

MISSISSIPPI DIVISION OF MEDICAID
DRUG UTILIZATION REVIEW (DUR) BOARD
MINUTES OF THE DECEMBER 7, 2023 MEETING

DUR Board Roster: State Fiscal Year 2024 (July 1, 2023 – June 30, 2024)	Mar 2023	Jun 2023	Sep 2023	Dec 2023
Joseph Austin, MD		✓	✓	✓
Amy Catherine Baggett, PharmD			✓	✓
Terrence Brown, PharmD	✓	✓	✓	✓
Chrysanthia Davis, PharmD	✓	✓	✓	✓
Tanya Fitts, MD		✓	✓	✓
Dena Jackson, MD			✓	✓
Jahanzeb Khan, MD	✓	✓	✓	✓
Holly Moore, PharmD	✓	✓		
Kristi Phelps, RPh	✓			
Joshua Pierce, PharmD		✓	✓	
Bobbie West, MD	✓			✓
TOTAL PRESENT**	**7**	**7**	**8**	**8**

** *Total Present may not be reflected by individual members marked as present above due to members who either resigned or whose terms expired being removed from the list.*

Also Present:

Division of Medicaid (DOM) Staff:
Terri Kirby, RPH, CPM, Pharmacy Director; Dennis Smith, RPH, DUR Coordinator; Vanessa Banks, RN, Program Integrity; Roxanne Coulter, RN, Program Integrity; Matt Westerfield, APR, Communications Officer;

University of Mississippi School of Pharmacy - MS-DUR Staff:
Eric Pittman, PharmD, MS-DUR Project Director; Kaustuv Bhattacharya, PhD, MS-DUR Research Assistant Professor; John Bentley, PhD, CPMM Director;

Medimpact Staff:
Chris Benton, PharmD, Clinical Account Manager; Matt Lennertz, PharmD, Clinical Pharmacist, Rebate Strategy;

Coordinated Care Organization (CCO) Staff:
Jenni Grantham, PharmD, Director of Pharmacy, Magnolia Health; Heather Odem, PharmD, Director of Pharmacy - Mississippi, UnitedHealthcare Community & State; Trina Stewart, PharmD, Pharmacy Manager, Molina Healthcare;

Gainwell Staff:

Tricia Banks, PharmD, MS Pharmacy Services Manager; Lew Ann Snow, RN, Advisor Business Analyst; Robyn Agnew, PharmD, MS Clinical PA Pharmacist; Michelle Eldridge, PharmD, MS Clinical PA Pharmacist;

Alliant Health Staff:
Catherine Brett, MD, Quality Director, MS UM/QIO; Buddy Ogletree, PharmD, Pharmacist;

Visitors:
Ashley Zichelli, Johnson & Johnson; Paula Whatley, Novo Nordisk; Meg Pearson, MSDH; Chandler Douglas, Pharmacy Student.

Call to Order/Welcome:
The meeting was called to order at 1:05 pm.

OLD BUSINESS:
Dr. Brown moved to approve the minutes from the September 2023 DUR Board Meeting, seconded by Dr. Jackson, and unanimously approved by the DUR Board.

Resource Utilization Review:
Dr. Pittman presented the resource utilization report for September 2023. Enrollment data presented was across all plans. Dr. Pittman noted that MS-DUR continues to experience data transfer issues with the encounter claims from Gainwell therefore the claims utilization information only included data from the Fee-for-Service Program. DOM continues to work with Gainwell to resolve the issues.

NEW BUSINESS:

Update on MS-DUR Educational Interventions:
Dr. Pittman provided an overview of all DUR mailings and educational notices that occurred between August 2023 through November 2023. In addition to the routine monthly mailings, MS-DUR conducted a one-time mailing to 3,730 providers regarding Medicaid's newly enacted diagnosis edit on medications that can be used for hormone replacement therapy. The board also reviewed and provided input into proposed educational materials encouraging greater dispensing of naloxone.

Special Analysis Projects:

Palivizumab Update
Dr. Pittman provided the Board with a summary of the utilization of palivizumab during the 2022/2023 RSV season. Prescribing trends for the 2022/2023 were compared to recent seasons. The Board also reviewed the changing landscape in the prevention of RSV and recently approved agents that will impact standards of care moving forward.

No actionable items were presented as part of this report.

Influenza Update
Dr. Pittman presented the board with a summary of influenza vaccinations and anti-influenza medications that were administered to Medicaid beneficiaries during the 2022/2023 flu season. The flu season returned to prepandemic seasonality with the prescribing pattern for anti-influenza medications also returning to prepandemic levels.

No actionable items were presented as part of this report.

MSDH Concomitant Prescribing with Opioids
The Center for Pharmaceutical Marketing and Management recently completed a project with the Mississippi State Department of Health describing the concomitant prescribing of opioids and psychotropic medications among Medicaid beneficiaries from 2016 to 2021. The report estimated the prevalence of concomitant use of opioids and psychotropic medications and socio-geographic differences in the prevalence at the county level.

No actionable items were presented as part of this report.

FDA Drug Safety Updates:
Dr. Pittman reviewed the FDA drug safety communications published between September 2023 and December 2023.

Pharmacy Program Update:
Ms. Kirby and Mr. Smith provided a pharmacy program update highlighting the following items:

- Brand name Ciprodex discontinuation – Mr. Smith described the recent unavailability of brand name Ciprodex and its impact. Mr. Smith discussed with the Board a plan for addressing this situation through updated PA criteria and communicating Medicaid's recommendations to prescribers.
- ED Waiver - Ms. Kirby updated the Board on the recent update and approval of Medicaid's Elderly and Disabled (ED) Waiver by CMS. This update includes a provision to reimburse pharmacists for providing medication management services to beneficiaries enrolled in this waiver program beginning January 2024. Medicaid is working to flesh out the program.
- Single pharmacy benefit administrator – Beginning July 2024, all pharmacy claims will be processed through Gainwell.
- VFC – Medicaid is working with the Department of Health (MSDH) to get the Medicaid system updated to recognize pharmacies as Vaccines for Children (VFC) providers. This will allow pharmacies to bill VFC vaccines for eligible children.

Next Meeting Information:
Proposed meeting dates for 2024 were presented for the Board for consideration.

- March 7, 2024

- June 13, 2024
- September 12, 2024
- December 5, 2024

Dr. Brown adjourned the meeting at 3:35 pm

Submitted,

Eric Pittman, PharmD
Evidence-Based DUR Initiative, MS-DUR

Resource Utilizaton Review

TABLE 04A: ENROLLMENT STATISTICS FOR LAST 6 MONTHS July 1, 2023 through December 31, 2023							
			Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Total enrollment			892,601	876,688	857,253	840,028	826,366	805,577
Dual-eligibles			168,459	168,217	167,673	167,202	166,599	165,199
Pharmacy benefits			781,885	766,178	747,188	730,026	716,297	695,721
	LTC		15,839	15,903	15,835	15,713	15,455	15,094
	PLAN %	FFS	49.1%	48.0%	46.5%	45.1%	43.0%	40.2%
		MSCAN-UHC	19.7%	20.1%	20.7%	21.2%	22.0%	23.0%
		MSCAN-Magnolia	20.2%	20.6%	21.2%	21.7%	22.5%	23.6%
		MSCAN-Molina	11.0%	11.3%	11.6%	12.0%	12.5%	13.2%

TABLE 04B: PHARMACY UTILIZATION STATISTICS FOR LAST 6 MONTHS July 1, 2023 through December 31, 2023							
		Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
# Rx Fills	FFS	165,129	192,638	166,641	175,364	176,972	151,716
# Rx Fills / Bene	FFS	0.4	0.5	0.5	0.5	0.6	0.5
$ Paid Rx	FFS	$24,686,876	$27,431,923	$24,242,140	$24,056,134	$23,532,066	$20,852,537
$/Rx Fill	FFS	$149.50	$142.40	$145.48	$137.18	$132.97	$137.44
$/Bene	FFS	$64.30	$74.59	$69.77	$73.07	$76.40	$74.56

NOTE: Paid amounts represent amount reported on claims as paid to the pharmacy. These amounts do not reflect final actual costs after rebates, etc.

***Incomplete claim information for all MSCAN programs for the reporting period*

TABLE C: TOP 10 DRUG CATEGORIES BY NUMBER OF CLAIMS IN DEC 2023 (FFS)

Category	Month Year	Rank Volume	# RXs	$ Paid	# Unique Benes
neuraminidase inhibitors	Dec 2023	1	5,887	$181,047	5,467
	Nov 2023	16	2,765	$88,128	2,569
	Oct 2023	64	712	$21,451	681
CNS stimulants	Dec 2023	2	5,530	$771,965	4,449
	Nov 2023	1	7,406	$1,045,075	5,758
	Oct 2023	1	8,043	$1,177,452	6,163
aminopenicillins	Dec 2023	3	5,125	$69,438	4,884
	Nov 2023	2	6,513	$88,958	6,186
	Oct 2023	3	5,816	$79,608	5,468
vitamins	Dec 2023	4	4,717	$44,111	3,311
	Nov 2023	5	5,065	$46,288	3,502
	Oct 2023	5	5,155	$50,808	3,590
contraceptives	Dec 2023	5	4,342	$209,412	3,649
	Nov 2023	3	5,257	$262,117	4,349
	Oct 2023	2	5,925	$299,867	4,857
SSRI antidepressants	Dec 2023	6	4,273	$57,260	3,596
	Nov 2023	4	5,247	$70,827	4,337
	Oct 2023	4	5,509	$70,591	4,532
nonsteroidal anti-inflammatory agents	Dec 2023	7	4,249	$58,778	3,833
	Nov 2023	7	4,825	$65,838	4,350
	Oct 2023	6	4,953	$69,699	4,464
macrolides	Dec 2023	8	4,084	$81,579	3,889
	Nov 2023	8	4,819	$100,771	4,563
	Oct 2023	10	3,986	$85,706	3,757
atypical antipsychotics	Dec 2023	9	3,803	$822,779	2,826
	Nov 2023	10	4,529	$838,964	3,314
	Oct 2023	8	4,516	$993,840	3,317
adrenergic bronchodilators	Dec 2023	10	3,690	$169,320	3,047
	Nov 2023	6	4,917	$224,313	4,003
	Oct 2023	7	4,794	$243,236	3,854

TABLE D: TOP 10 DRUG CATEGORIES BY DOLLARS PAID IN DEC 2023 (FFS)

Category	Month Year	Rank Paid Amt	# RXs	$ Paid	# Unique Benes
factor for bleeding disorders	Dec 2023	1	111	$2,560,787	62
	Nov 2023	1	143	$2,682,279	76
	Oct 2023	3	117	$1,744,179	77
interleukin inhibitors	Dec 2023	2	284	$1,612,641	188
	Nov 2023	2	348	$2,138,379	210
	Oct 2023	1	397	$2,442,359	224
antirheumatics	Dec 2023	3	246	$1,508,582	167
	Nov 2023	3	259	$1,612,665	172
	Oct 2023	2	281	$1,849,644	183
miscellaneous uncategorized agents	Dec 2023	4	23	$961,077	18
	Nov 2023	9	23	$733,023	17
	Oct 2023	10	17	$539,344	14
antiviral combinations	Dec 2023	5	291	$867,349	232
	Nov 2023	6	255	$892,502	186
	Oct 2023	6	302	$1,040,960	226
atypical antipsychotics	Dec 2023	6	3,803	$822,779	2,826
	Nov 2023	7	4,529	$838,964	3,314
	Oct 2023	7	4,516	$993,840	3,317
CFTR combinations	Dec 2023	7	43	$784,199	32
	Nov 2023	4	60	$1,121,490	40
	Oct 2023	4	62	$1,178,319	42
CNS stimulants	Dec 2023	8	5,530	$771,965	4,449
	Nov 2023	5	7,406	$1,045,075	5,758
	Oct 2023	5	8,043	$1,177,452	6,163
GLP-1 receptor agonists	Dec 2023	9	771	$725,562	603
	Nov 2023	8	891	$827,279	678
	Oct 2023	8	852	$803,225	665
insulin	Dec 2023	10	1,476	$529,219	949
	Nov 2023	10	1,831	$638,964	1,158
	Oct 2023	9	1,863	$673,762	1,167

TABLE E: TOP 25 DRUG MOLECULES
BY NUMBER OF CLAIMS IN DEC 2023 (FFS)

Drug Molecule Therapeutic Category	Nov 2023 # Claims	Dec 2023 # Claims	Dec 2023 $ Paid	Dec 2023 # Unique Benes
oseltamivir / neuraminidase inhibitors	2,765	5,887	$181,047	5,467
amoxicillin / aminopenicillins	6,501	5,114	$69,230	4,874
azithromycin / macrolides	4,668	3,983	$60,143	3,802
albuterol / adrenergic bronchodilators	4,699	3,526	$125,823	2,951
ondansetron / 5HT3 receptor antagonists	3,456	3,338	$47,734	3,153
ergocalciferol / vitamins	2,598	2,378	$20,261	1,759
ibuprofen / nonsteroidal anti-inflammatory agents	2,443	2,303	$28,514	2,164
gabapentin / gamma-aminobutyric acid analogs	2,316	2,066	$31,108	1,666
fluticasone nasal / nasal steroids	2,706	2,056	$32,323	1,970
amoxicillin-clavulanate / penicillins/beta-lactamase inhibitors	2,425	2,002	$41,317	1,905
cefdinir / third generation cephalosporins	2,377	1,896	$45,775	1,812
montelukast / leukotriene modifiers	2,465	1,856	$24,914	1,728
amlodipine / calcium channel blocking agents	1,985	1,775	$22,050	1,407
methylphenidate / CNS stimulants	2,357	1,766	$323,004	1,449
amphetamine-dextroamphetamine / CNS stimulants	2,191	1,693	$58,123	1,429
sertraline / SSRI antidepressants	2,036	1,612	$18,647	1,357
folic acid / vitamins	1,757	1,597	$11,997	1,111
atorvastatin / HMG-CoA reductase inhibitors (statins)	1,709	1,550	$17,522	1,178
clonidine / antiadrenergic agents, centrally acting	1,893	1,502	$18,347	1,332
cetirizine / antihistamines	1,940	1,466	$24,742	1,365
acetaminophen-hydrocodone / narcotic analgesic combinations	1,689	1,415	$21,982	1,286
pantoprazole / proton pump inhibitors	1,577	1,390	$17,782	1,131
prednisolone / glucocorticoids	2,099	1,364	$35,450	1,279
ethinyl estradiol-norgestimate / contraceptives	1,572	1,299	$19,491	1,148
omeprazole / proton pump inhibitors	1,547	1,278	$15,131	1,142

TABLE F: TOP 25 DRUG MOLECULES BY DOLLARS PAID IN DEC 2023 (FFS)

Drug Molecule Therapeutic Category	Nov 2023 $ Paid	Dec 2023 $ Paid	Dec 2023 # Claims	Dec 2023 # Unique Benes
emicizumab / factor for bleeding disorders	$995,973	$1,422,368	38	24
adalimumab / antirheumatics	$1,038,411	$965,804	105	69
elexacaftor/ivacaftor/tezacaftor / CFTR combinations	$1,121,490	$784,199	43	32
dupilumab / interleukin inhibitors	$892,612	$751,938	210	142
carglumic acid / miscellaneous uncategorized agents	$294,922	$535,213	4	3
antihemophilic factor / factor for bleeding disorders	$843,680	$483,266	15	8
bictegravir/emtricitabine/tenofovir / antiviral combinations	$443,728	$428,138	113	85
coagulation factor ix / factor for bleeding disorders	$265,706	$404,053	18	6
dulaglutide / GLP-1 receptor agonists	$422,366	$357,111	404	319
paliperidone / atypical antipsychotics	$337,991	$341,064	118	101
cannabidiol / miscellaneous anticonvulsants	$335,423	$330,591	98	69
methylphenidate / CNS stimulants	$462,088	$323,004	1,766	1,449
ustekinumab / interleukin inhibitors	$540,535	$300,196	12	6
ixekizumab / interleukin inhibitors	$303,341	$296,772	34	21
aripiprazole / atypical antipsychotics	$229,257	$229,825	933	811
deferiprone / chelating agents	$156,697	$225,523	8	4
empagliflozin / SGLT-2 inhibitors	$227,128	$225,186	323	260
apixaban / factor Xa inhibitors	$232,223	$223,567	525	392
dapagliflozin / SGLT-2 inhibitors	$198,859	$220,022	308	257
insulin glargine / insulin	$268,979	$219,594	527	441
somatropin / growth hormones	$213,293	$196,758	38	24
semaglutide / GLP-1 receptor agonists	$197,094	$187,529	170	125
lenalidomide / other immunosuppressants	$186,755	$186,755	10	9
etanercept / antirheumatics	$227,278	$186,254	32	25
oseltamivir / neuraminidase inhibitors	$88,128	$181,047	5,887	5,467

TABLE G: TOP 25 DRUG MOLECULES
BY CHANGE IN NUMBER OF CLAIMS FROM OCT 2023 TO DEC 2023 (FFS)

Drug Molecule	Oct 2023 # Claims	Nov 2023 # Claims	Dec 2023 # Claims	Dec 2023 $ Paid	Dec 2023 # Unique Benes
oseltamivir / neuraminidase inhibitors	712	2,765	5,887	$181,047	5,467
ondansetron / 5HT3 receptor antagonists	3,109	3,456	3,338	$47,734	3,153
benzonatate / antitussives	525	690	741	$10,149	694
azithromycin / macrolides	3,860	4,668	3,983	$60,143	3,802
nirmatrelvir-ritonavir / antiviral combinations	25	3	51	$24,076	47
ciprofloxacin ophthalmic / ophthalmic anti-infectives	44	64	70	$1,482	65
codeine-guaifenesin / upper respiratory combinations	82	74	103	$1,656	98
pioglitazone / thiazolidinediones	58	75	77	$1,024	60
hydrocortisone / glucocorticoids	50	54	65	$1,814	54
infliximab / antirheumatics	14	18	27	$137,067	13
insulin aspart-insulin aspart protamine / insulin	18	39	31	$11,019	25
dexamethasone ophthalmic / ophthalmic steroids	7	5	20	$1,061	17
daptomycin / miscellaneous antibiotics	13	10	25	$21,508	10
methenamine / urinary anti-infectives	30	38	40	$1,551	33
emicizumab / factor for bleeding disorders	29	37	38	$1,422,368	24
rivaroxaban / factor Xa inhibitors	205	216	214	$94,135	157
rsv vaccine pref3, recombinant / viral vaccines	0	1	9	$2,657	9
cefpodoxime / third generation cephalosporins	3	6	12	$475	8
levofloxacin / quinolones	180	173	189	$2,886	181
dornase alfa / miscellaneous respiratory agents	17	37	25	$107,051	23
semaglutide / GLP-1 receptor agonists	162	178	170	$187,529	125
dorzolamide-timolol ophthalmic / ophthalmic glaucoma agents	52	56	60	$2,132	49
calcitriol / vitamins	57	55	65	$2,379	50
atropine-diphenoxylate / antidiarrheals	35	48	43	$717	42
rimegepant / CGRP inhibitors	24	24	31	$29,803	19

TABLE H: TOP 25 DRUG MOLECULES
BY CHANGE IN AMOUNT PAID FROM OCT 2023 TO DEC 2023 (FFS)

Drug Molecule	Oct 2023 $ Paid	Nov 2023 $ Paid	Dec 2023 $ Paid	Dec 2023 # Claims	Dec 2023 # Unique Benes
emicizumab / factor for bleeding disorders	$764,928	$995,973	$1,422,368	38	24
carglumic acid / miscellaneous uncategorized agents	$163,838	$294,922	$535,213	4	3
oseltamivir / neuraminidase inhibitors	$21,451	$88,128	$181,047	5,887	5,467
coagulation factor ix / factor for bleeding disorders	$271,893	$265,706	$404,053	18	6
anti-inhibitor coagulant complex / factor for bleeding disorders	$14,941	$137,009	$142,310	3	1
belumosudil / selective immunosuppressants	$34,059	$119,222	$127,872	4	1
mifepristone / progesterone receptor modulators	$113,724	$170,593	$170,579	3	1
infliximab / antirheumatics	$80,873	$108,842	$137,067	27	13
deferiprone / chelating agents	$184,850	$156,697	$225,523	8	4
dornase alfa / miscellaneous respiratory agents	$66,574	$151,411	$107,051	25	23
tipiracil-trifluridine / antineoplastic combinations	$15,947	$53,151	$53,151	3	3
cobicistat/elvitegravir/emtricitabine/tenofov / antiviral combinations	$48,146	$74,049	$84,590	14	12
palivizumab / immune globulins	$0	$28,203	$27,549	4	3
sonidegib / hedgehog pathway inhibitors	$0	$13,221	$26,442	2	1
voxelotor / miscellaneous uncategorized agents	$49,591	$61,020	$75,871	7	6
risdiplam / miscellaneous uncategorized agents	$123,303	$147,982	$147,971	9	6
ganaxolone / gamma-aminobutyric acid analogs	$33,984	$29,123	$58,245	4	2
nirmatrelvir-ritonavir / antiviral combinations	$272	$34	$24,076	51	47
coagulation factor viia / factor for bleeding disorders	$0	$0	$23,330	1	1
mepolizumab / interleukin inhibitors	$1,444	$1,444	$24,399	4	2
regorafenib / VEGF/VEGFR inhibitors	$18,777	$81,672	$40,417	2	2
secukinumab / interleukin inhibitors	$48,258	$40,959	$68,885	7	4
triptorelin / antineoplastic hormones	$0	$0	$18,748	1	1
pasireotide / somatostatin and somatostatin analogs	$0	$33,350	$16,675	1	1
tofacitinib / antirheumatics	$48,313	$48,313	$64,700	12	9

TABLE I: TOP 15 DRUG SOLID DOSAGE FORM HIGH VOLUME (100+ RX FILLS LAST MONTH) PRODUCTS WITH UNIT COST > $1
BY PERCENT CHANGE IN AMOUNT PAID PER UNIT OCT 2023 TO DEC 2023 (FFS)

Drug Product Therapeutic Category	Dec 2023 # Claims	Dec 2023 $ Paid	Dec 2023 Avr. Paid Per Rx	Dec 2023 Avr. Units Per Rx	Oct 2023 Paid Per Unit	Nov 2023 Paid Per Unit	Dec 2023 Paid Per Unit	Percent Change
methylphenidate 36 mg/24 hr tablet, extended release / CNS stimulants (Y)	159	$8,411	$52.90	35	$1.09	$1.10	$1.21	11.0%
lisdexamfetamine 40 mg capsule / CNS stimulants (Y)	135	$21,371	$158.31	30	$4.49	$3.54	$4.97	10.6%
lisdexamfetamine 50 mg capsule / CNS stimulants (Y)	134	$19,694	$146.97	30	$4.13	$4.06	$4.55	10.1%
dexmethylphenidate 20 mg capsule, extended release / CNS stimulants (Y)	131	$9,589	$73.20	30	$1.92	$1.94	$2.07	8.0%
dexmethylphenidate 10 mg capsule, extended release / CNS stimulants (Y)	164	$9,325	$56.86	30	$1.47	$1.43	$1.53	3.9%
lisdexamfetamine 30 mg capsule / CNS stimulants (Y)	150	$21,789	$145.26	30	$4.34	$3.91	$4.45	2.4%
Eliquis (apixaban) 5 mg tablet / factor Xa inhibitors (Y)	440	$189,137	$429.86	47	$8.59	$8.53	$8.70	1.2%
QuilliChew ER (methylphenidate) 30 mg/24 hr tablet, chewable, extended release / CNS stimulants (Y)	164	$60,373	$368.13	30	$11.79	$11.82	$11.93	1.2%
Xulane (ethinyl estradiol-norelgestromin) 35 mcg-150 mcg/24 hr film, extended release / contraceptives (Y)	932	$106,857	$114.65	3	$33.97	$33.74	$34.32	1.0%
QuilliChew ER (methylphenidate) 20 mg/24 hr tablet, chewable, extended release / CNS stimulants (Y)	252	$90,545	$359.31	29	$11.79	$11.85	$11.91	1.0%
methylphenidate 27 mg/24 hr tablet, extended release / CNS stimulants (Y)	118	$5,173	$43.84	30	$1.09	$0.97	$1.10	0.9%
QuilliChew ER (methylphenidate) 40 mg/24 hr tablet, chewable, extended release / CNS stimulants (Y)	101	$36,703	$363.40	30	$11.84	$11.92	$11.93	0.7%
Suboxone (buprenorphine-naloxone) 8 mg-2 mg film / narcotic analgesic combinations (Y)	222	$89,125	$401.46	46	$8.62	$8.59	$8.62	0.0%

Products are only included if 100 or more fills in last month and average cost per unit in reference month was >= $1.

TABLE I: TOP 15 DRUG SOLID DOSAGE FORM HIGH VOLUME (100+ RX FILLS LAST MONTH) PRODUCTS WITH UNIT COST > $1
BY PERCENT CHANGE IN AMOUNT PAID PER UNIT OCT 2023 TO DEC 2023 (FFS)

Drug Product Therapeutic Category	Dec 2023 # Claims	Dec 2023 $ Paid	Dec 2023 Avr. Paid Per Rx	Dec 2023 Avr. Units Per Rx	Oct 2023 Paid Per Unit	Nov 2023 Paid Per Unit	Dec 2023 Paid Per Unit	Percent Change
Jardiance (empagliflozin) 25 mg tablet / SGLT-2 inhibitors (Y)	160	$113,370	$708.56	39	$18.15	$17.70	$18.15	(0.0%)
Slynd (drospirenone) 4 mg tablet / progestins (Y)	103	$27,272	$264.78	37	$6.61	$6.61	$6.60	(0.1%)

Products are only included if 100 or more fills in last month and average cost per unit in reference month was >= $1.

New Business

Special Analysis Projects

MISSISSIPPI DIVISION OF MEDICAID

MS-DUR INTERVENTION / EDUCATIONAL INITIATIVE UPDATE

DECEMBER 2023 – FEBRUARY 2024

Ongoing Mailings:

PROVIDER SHOPPING FOR OPIOIDS (≥4 Prescribers AND ≥4 Pharmacies)				CONCOMITANT USE OF OPIOIDS AND ANTIPSYCHOTICS		
Month	Prescribers Mailed	Pharms Mailed	Benes Addressed	Month	Prescribers Mailed	Benes Addressed
23-Mar	4	2	6	23-Mar	16	16
23-Apr	2	2	4	23-Apr	9	10
23-May	6	7	13	23-May	37	40
23-Jun	3	4	7	23-Jun	19	21
23-Jul	1	1	2	23-Jul	4	4
23-Aug	1	1	2	23-Aug	12	13
23-Sep	1	1	2	23-Sep	17	17
23-Oct	1	1	2	23-Oct	12	12
23-Nov	1	2	3	23-Nov	11	11
24-Dec	3	3	6	22-Dec	10	10
24-Jan	1	1	2	23-Jan	17	17
24-Feb				23-Feb		

{Date}

IMPORTANT INFORMATION REGARDING OPIOID ANTAGONIST ACCESS AND PATIENT EDUCATION

Dear Dr. {Prescriber Name},

Despite decreases in opioid prescribing in recent years, opioid-involved overdose deaths continue to rise across the United States. In fact, in Mississippi, overdose deaths due to opioids increased 127% between 2019 and 2021.[1] Opioid antagonists, such as naloxone and nalmefene, can reverse the effects of opioids and prevent opioid-involved deaths. Extensive efforts have been made to increase the accessibility of the agents to those at risk of opioid overdose. The Mississippi Division of Medicaid (DOM) has multiple opioid antagonists listed on its Universal Preferred Drug List (UPDL). In 2017, the Opioid Antagonist Standing Order Act was first passed in Mississippi allowing pharmacists to dispense opioid antagonists without an individual prescription. In December 2022, through the Mississippi Opioid and Substance Use Disorder Program, the Mississippi State Department of Health began distributing naloxone kits free to individuals upon request. In 2023, the first nalmefene nasal spray was approved by the FDA. Additionally, the first over-the-counter naloxone nasal spray products also received FDA approval in early 2023.

Even with extensive efforts to improve their availability, getting opioid antagonists into the hands of individuals needing these life-saving medications has proven to be challenging. A recent study examining naloxone prescription claims among Mississippi Medicaid beneficiaries found that less than 3% of individuals considered to be at high risk for experiencing an adverse opioid event had a prescription claim for naloxone.

We support and encourage the dispensing of opioid antagonists as rescue medications for patients taking opioids, especially those considered at increased risk of overdose such as individuals prescribed opioids in combination with other psychotropic agents, those prescribed more than one type of opioid, or those prescribed high daily doses of opioids.

To help facilitate discussions with your patients about naloxone, we have included a flyer that can be duplicated and displayed in your practice. A link to an electronic version can also be found by scanning the QR code below.

We want to thank you for the care you provide to Medicaid beneficiaries.
If we can be of any assistance, please do not hesitate to contact us.

Sincerely,

Terri R. Kirby, RPh, CPM
Director, Office of Pharmacy
Mississippi Division of Medicaid

Eric Pittman, PharmD
Project Director
MS-DUR

[1] Reports and Data - Mississippi State Department of Health. https://msdh.ms.gov/page/44,0,382,740.html#overdose

ARE YOU TAKING OPIOIDS?

MISSISSIPPI DIVISION OF MEDICAID

Opioid Antagonists Can Save Your Life.

What Are Opioid Antagonists?

Opioid antagonists are lifesaving medications that can reverse the effects of opioids in the event of an overdose.

What Are Signs Of Opioid Overdose ?

- shallow or slow breathing
- confusion
- lessened alertness
- bluish lips and nose
- unconsciousness

Am I At Risk Of Opioid Overdose?

Anyone taking opioids is at risk for overdose, but especially those taking:

- more than one type of opioid
- high doses of opioids
- opioids in combination with certain other medications.

How Can I Get Opioid Antagonists?

Your doctor can write you a prescription or your pharmacist can dispense these products to you without a prescription.

Ask your doctor or pharmacist for more information.

If you cannot afford these products or have reached your Medicaid prescription limit, naloxone can be obtained for free through **ODFREE.ORG.**

Scan the QR Code for more information.

{Date}

IMPORTANT INFORMATION REGARDING OPIOID ANTAGONIST ACCESS AND PATIENT EDUCATION

Dear {Pharmacy Name},

Despite decreases in opioid prescribing in recent years, opioid-involved overdose deaths continue to rise across the United States. In fact, in Mississippi, overdose deaths due to opioids increased 127% between 2019 and 2021.[1] Opioid antagonists, such as naloxone and nalmefene, can reverse the effects of opioids and prevent opioid-involved deaths. Extensive efforts have been made to increase the accessibility of the agents to those at risk of opioid overdose. The Mississippi Division of Medicaid (DOM) has multiple opioid antagonists listed on its Universal Preferred Drug List (UPDL). In 2017, the Opioid Antagonist Standing Order Act was first passed in Mississippi allowing pharmacists to dispense opioid antagonists without an individual prescription. In December 2022, through the Mississippi Opioid and Substance Use Disorder Program, the Mississippi State Department of Health began distributing naloxone kits free to individuals upon request. In 2023, the first nalmefene nasal spray was approved by the FDA. Additionally, the first over-the-counter naloxone nasal spray products also received FDA approval in early 2023.

Even with extensive efforts to improve their availability, getting opioid antagonists into the hands of individuals needing these life-saving medications has proven to be challenging. A recent study examining naloxone prescription claims among Mississippi Medicaid beneficiaries found that less than 3% of individuals considered to be at high risk for experiencing an adverse opioid event had a prescription claim for naloxone. Another recent study revealed that among 591 pharmacies surveyed in Mississippi, just over 36% had naloxone available to purchase.

We support and encourage the dispensing of opioid antagonists as rescue medications for patients taking opioids, especially those considered at increased risk of overdose such as individuals prescribed opioids in combination with other psychotropic agents, those prescribed more than one type of opioid, or those prescribed high daily doses of opioids.

We have included a one-page notice with important information pharmacists need to know about dispensing opioid antagonists. Additionally, to help facilitate discussions with your patients, we have included a flyer that can be duplicated and displayed in your pharmacy. A link to an electronic version of this flyer can also be found by scanning the QR code below.

We want to thank you for the care you provide to Medicaid beneficiaries.
If we can be of any assistance, please do not hesitate to contact us.

Sincerely,

Terri R. Kirby, RPh, CPM
Director, Office of Pharmacy
Mississippi Division of Medicaid

Eric Pittman, PharmD
Project Director
MS-DUR

[1] Reports and Data - Mississippi State Department of Health. https://msdh.ms.gov/page/44,0,382,740.html#overdose

HOW CAN PHARMACISTS HELP SAVE LIVES?
INCREASING ACCESS TO OPIOID ANTAGONISTS IN PHARMACIES

The Mississippi Statewide Opioid Antagonist Standing Order authorizes pharmacists to dispense opioid antagonists (naloxone and nalmefene) by request. A prescription from a physician or other practitioner is not required. Additionally, many payers, including Mississippi Medicaid, cover opioid antagonist products.

How Can Pharmacists Help Increase Access?

- Have opioid antagonists readily available on your shelf.
- Identify and educate patients at risk for opioid overdose that opioid antagonists are available to purchase by request without a prescription.

Simple Steps to Dispensing Opioid Antagonists Under the Standing Order Per the Mississippi Board of Pharmacy:

1. Complete the board-approved training and maintain proof.
2. Maintain a copy of the standing order.
3. Reduce the standing order to a prescription. Fill and file the prescription as a legend drug.
4. Provide proper counseling on the use of the medication.

For Standing Order Processing:

- Prescriber – Dr. Kathryn Taylor (State Epidemiologist)
  NPI: 1235339516

Coverage for opioid antagonists:

- Medicaid has multiple opioid antagonists on its preferred drug list. Please see their current UPDL for details (https://medicaid.ms.gov/preferred-drug-list/).
- For individuals covered under Medicaid who have reached their monthly prescription limit or those not covered by Medicaid who cannot afford these products, naloxone can be obtained for free through **ODFREE.ORG.**

For more information, scan the QR code below to view the current Opioid Antagonist Statewide Standing Order and the Naloxone Training required by the MS Board of Pharmacy.

PUBLICATIONS DISSEMINATION OF PROJECTS RESULTING

FROM DUR WORK

April 2023 – March 2024

COMPLETED:

Publications

- ***Risk Factors for Severe Maternal Morbidity Among Women Enrolled in Mississippi Medicaid*.**
  Maharjan S, Goswami S, Rong Y, Kirby T, Smith D, Brett C, Pittman E, Bhattacharya K. *JAMA Netw Open*. 2024;7(1):e2350750. doi:10.1001/jamanetworkopen.2023.50750

- ***Association of Antecedent Statin Use on 30-day, 60-day, and 90-day Mortality among Mississippi Medicaid Beneficiaries diagnosed with COVID-19*.**
  Rong Y, Goswami S, Eriakha O, Ramachandran S, Bentley J, Banahan B, Kirby T, Smith D, Pittman E, Bhattacharya K. *BMJ Open* 2023; 13**:**e076195. doi: 10.1136/bmjopen-2023-076195

Poster Presentations at Professional Conferences

- ***Differences in Opioid Utilization Metrics Among Beneficiaries Enrolled in Medicaid Using Claims-linked PMP Data Versus Claims Data Alone*.**
  Pittman E, Sallee M, Maharjan S, Lin L, Arabshomali A, Kirby T, Smith D, Bhattacharya K. American Drug Utilization Review Society, San Diego, CA, February 22-24, 2024.

- ***Empirical validity of the quality measure 'Adherence to Antipsychotic Medications for Individuals with Schizophrenia' among Medicaid beneficiaries*.**
  Jadhav S, Nasruddin S, Imeri H, Ramachandran S, Pittman E, Bhattacharya, Smith D. International Society for Pharmacoeconomics and Outcomes Research Annual Meeting, Boston, MA, May 7-10, 2023.

- ***Assessment of Predictors of Severe Maternal Morbidity Among Medicaid Beneficiaries*.**
  Maharjan S, Goswami S, Rong Y, Kirby T, Smith D, Brett C, Pittman E, Bhattacharya, K. Academy of Managed Care Pharmacy Annual Meeting, San Antonio Texas, March 22-24, 2023

ACCEPTED:

Poster Presentations at Professional Conferences

- ***Changes in healthcare costs among beneficiaries without diabetes initiating GLP-1 agonists in Mississippi Medicaid*.**
  Gandy C, Lin L, Nsiah I, Kirby T, Smith D, Pittman E, Bhattacharya K. Academy of Managed Care Pharmacy Annual Meeting, New Orleans, LA, April 16-19, 2024.

- ***Differences in Opioid Utilization Metrics among Beneficiaries Enrolled in Mississippi Medicaid Using Claims-linked PMP Data versus Claims Data Only*.**
  Sallee M, Maharjan S, Lin L, Arabshomali A, Kirby T, Smith D, Pittman E, Bhattacharya K. Academy of Managed Care Pharmacy Annual Meeting, New Orleans, LA, April 16-19, 2024.

- ***Concomitant Use of Opioids and Psychotropic Medications in Mississippi Medicaid Beneficiaries*.**
  Arabshomali A, Eriakha O, Lin L, Bhattacharya K, Pittman E, Bentley J, Pearson M, Lambert A, Smith E, Hubanks J, Smith D, Ramachandran S. International Society for Pharmacoeconomics and Outcomes Research Annual Meeting, Atlanta, GA, May 5-8, 2024.

BMJ Open

Association of antecedent statin use on 30-day, 60-day and 90-day mortality among Mississippi Medicaid beneficiaries diagnosed with COVID-19

Yiran Rong ,[1,2] Swarnali Goswami,[1,3] Omokhodion Eriakha,[1] Sujith Ramachandran ,[1,4] John Bentley,[1,4] Benjamin F Banahan,[1,4] Terri Kirby,[5] Dennis Smith,[5] Eric Pittman,[1,4] Kaustuv Bhattacharya[1,4]

To cite: Rong Y, Goswami S, Eriakha O, *et al*. Association of antecedent statin use on 30-day, 60-day and 90-day mortality among Mississippi Medicaid beneficiaries diagnosed with COVID-19. *BMJ Open* 2023;**13**:e076195. doi:10.1136/bmjopen-2023-076195

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2023-076195).

Study results were presented as an on-demand presentation at the International Society for Pharmacoeconomics and Outcome Research (ISPOR) Annual Meeting, May 15-18, 2022.

Received 31 May 2023
Accepted 26 October 2023

For numbered affiliations see end of article.

Correspondence to
Dr Kaustuv Bhattacharya; kbhattac@olemiss.edu

ABSTRACT

Objective To assess if the antecedent statin use was associated with all-cause death among COVID-19 patients enrolled in Medicaid.

Design Cohort study.

Setting Mississippi Medicaid population.

Participants This study included 10 792 Mississippi Medicaid-enrolled patients between 18 and 64 years of age with a confirmed COVID-19 diagnosis from March 2020 to June 2021.

Intervention Antecedent statin use, which was determined by a record of statin prescription in the 90-day period prior to the COVID diagnosis.

Main outcome measures The outcomes of interest included mortality from all cause within 30 days, 60 days and 90 days after index.

Results A total of 10 792 patients with COVID-19 met the inclusion and exclusion criteria, with 13.1% of them being antecedent statin users. Statin users were matched 1:1 with non-users based on age, sex, race, comorbidities and medication use by propensity score matching. In total, the matched cohort consisted of 1107 beneficiaries in each group. Multivariable logistic regression showed that statin users were less likely to die within 30 days (adjusted OR: 0.51, 95% CI: 0.32 to 0.83), 60 days (OR: 0.56, 95% CI: 0.37 to 0.85) and 90 days (OR: 0.55, 95% CI: 0.37 to 0.82) after diagnosis of COVID-19. Those with low-intensity/moderate-intensity statin use had significantly lower mortality risk in the 60-day and the 90-day follow-up period, while the high intensity of statin use was only found to be significantly associated with a lower odd of mortality within 30 days post index.

Conclusion After COVID infection, Medicaid beneficiaries who had taken statins antecedently could be at lower risk for death. For patients with chronic conditions, continuity of care is crucial when interruptions occur in their medical care. Further research is required to further investigate the potential mechanisms and optimal use of statins in COVID-19 treatment.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The use of administrative claims data enables longitudinal tracking of patients and reliable capturing of mortality in any setting.
⇒ Targeting Medicaid beneficiaries allows the study to investigate the effect of statins on a vulnerable population prone to lower socioeconomic status and greater racial disparity.
⇒ This study investigated the effect of the intensity of statin treatment on mortality post COVID diagnosis, for which there is less evidence.
⇒ This study is subject to unmeasured confounders and potential non-accurate information due to the observational nature and the use of administrative claims data.
⇒ The study findings may not be generalised to other population.

INTRODUCTION

The COVID-19 pandemic started in the USA in January 2020 and has resulted in 7.5 million hospitalisations and 921 000 deaths as estimated by the Centers for Disease Control and Prevention between February 2020 and September 2021.[1] COVID-19 also disrupted healthcare systems by creating additional barriers to timely care, worsening the healthcare crisis. Vulnerable populations were disproportionately affected by the pandemic.[2] This inequity was most exacerbated among those belonging to the low-income population, racial and ethnic minorities and other vulnerable groups of society.[3] Medicaid is often the primary source of health insurance for such populations.

Manifestations of the COVID-19 infection include acute respiratory distress syndrome (ARDS), myocardial injury and thrombosis.[4] In terms of comorbidities, people with heart disease or diabetes, who typically require periodic access to care, were reported to have worse COVID-19-related outcomes than the general population.[5] People with dyslipidaemia have been found to have a greater risk of developing severe symptoms

of COVID-19.[6] Considering the anti-inflammatory, antithrombotic and cardioprotective effects of statins, researchers have proposed it as a promising drug class for the treatment of COVID-19 as they can possibly attenuate the ARDS, myocardial, lipidaemic or thrombotic crises resulting from infection with COVID-19.[7 8]

States like Mississippi bear a disproportionate burden of cardiovascular or metabolic comorbidities. Mississippi ranks fourth among US states in terms of proportion of patients with cardiovascular diseases and third in terms of proportion of patients with diabetes.[9 10] Given that statins are commonly prescribed to treat these comorbidities, Mississippi serves as a crucial setting to evaluate the association between statin use and COVID-19 outcomes. An examination of the potential protective benefits of statin use on COVID-19 outcomes, in such a medically vulnerable population, can help develop strategies to mitigate COVID-19-related severe health outcomes in this population.

Certain aspects on the role of statin use on COVID-19 outcomes are unclear in the current literature. The existing evidence regarding the impact of statin use on mortality is not consistent. Based on prior literature evidence from retrospective studies, statin use has been reported to be associated with a reduction in mortality rate.[8 11–18] However, certain studies have also reported the association between antecedent statin use and higher short-term death risk.[19–21] Still other studies and meta-analyses have reported that statin use was not associated with inhospital mortality.[14 22–28] Additionally, a majority of existing observational studies have used electronic medical records, which limits the generalisable population to hospitalised patients with severe cases of COVID-19 and also limits the study outcome before discharge.[4 7 29 30] Administrative claims data have advantages, including the ability to longitudinally track patients and capture healthcare utilisation reliably. Therefore, it is important to evaluate this association using administrative claims data to better understand this association in the real world. The evidence regarding the effect of the intensity of statin treatment on improved COVID-19-related outcomes is scarce. Lastly, current literature lacks information about how statin use affects mortality in the Medicaid population who generally have poor baseline health and have a greater likelihood of being severely affected by the COVID-19 pandemic.[3]

Therefore, the aim of this cohort study is to address the gaps in the literature by assessing the association between antecedent statin use and all-cause mortality among Mississippi Medicaid-enrolled patients between June 2019 and September 2021. Results of this study will help understand how antecedent statin use and its intensity may affect mortality and inform the development of effective treatment strategies to improve outcomes.

METHODS

Data source and patient cohort

Mississippi Medicaid administrative claims data from 2019 to 2021 was used in this cohort study. The study was approved as exempt by the Institutional Review Board at the University of Mississippi, and a waiver of informed consent was granted due to the de-identified nature of the data (Protocol #20x-336). This report adhered to the guidelines for cohort studies as outlined by the Strengthening the Reporting of Observational Studies in Epidemiology.[31]

The study sample included Mississippi Medicaid beneficiaries who had a diagnosis of COVID-19 between March 2020 and June 2021 in any setting. Patients with COVID-19 were included if they were aged 19–64 years and their first COVID-19 diagnosis in the data set was considered as the index date. The *International Classification of Diseases, Tenth Revision, Clinical Modification* (*ICD-10-CM*) codes (U07.1, B34.2) were used to identify confirmed COVID-19 cases. The sample was restricted to those with continuous enrolment in Mississippi Medicaid for 9 months before and 3 months after the index date (ie, the first COVID-19 diagnosis date between March 2020 and June 2021) of each patient. For patients who died within 3 months post the index date, the continuous enrolment was required from 9 months before index date to the date of death. Due to a lack of complete reimbursement billing records, those who were dual enrolled in Medicare at any time during the study period were excluded from the study sample. Medicare is the primary payer for these individuals, and thus, these individuals were excluded to avoid any potential bias arising due to our lack of access to information on Medicare-covered medical services and prescription fills.

Patient and public involvement

No patient involved.

Exposure measures

The primary exposure variable was antecedent statin use in the 3-month period before index date. Statin use was extracted from the prescription fill records using national drug codes for each study patient. Patients who initiated statins after COVID-19 diagnosis in the non-statin user group were excluded from the study sample to mitigate potential bias in the estimate of statins' effect.

Propensity score matching

Given the fact that the higher use of statins in patients with a greater cardiovascular disease burden might confound the true effect of statin use compared with patient without statin user, the propensity score matching approach was employed to match each statin with one non-statin user.[32] A logistic regression model was used to predict the propensity of statin administration, adjusted for age, sex, race, a history of comorbidities and prescription medication use. Clinical comorbidities, including chronic lung disease, hypertension, diabetes, acute myocardial infarction, hyperlipidaemia, heart failure, stroke, ischaemic heart disease, atrial fibrillation, chronic liver disease and kidney disease, were identified in medical claims using *ICD-10-CM* codes in the 6 months before statin

Rong Y, *et al*. *BMJ Open* 2023;**13**:e076195.doi:10.1136/bmjopen-2023-076195

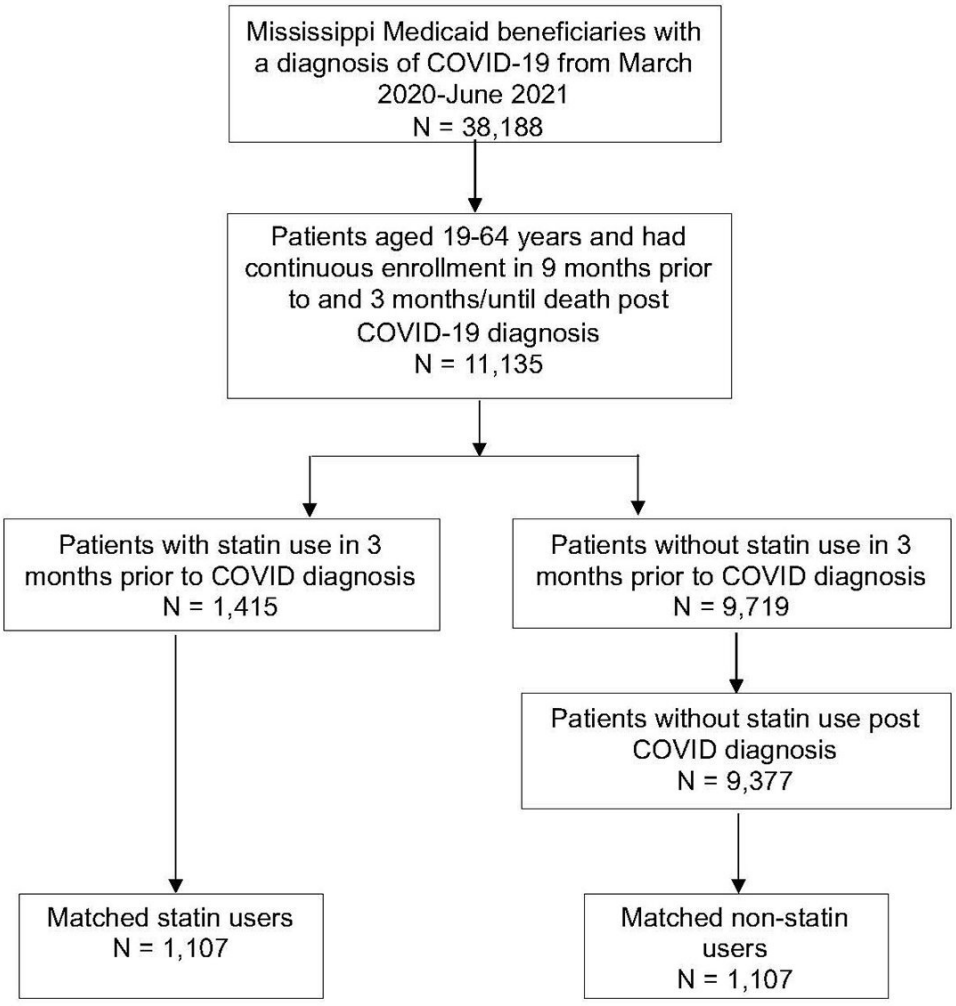

Figure 1 Patient attrition diagram for study inclusion and exclusion criteria.

use identification period. The records of prescription drug use, including beta-blockers, angiotensin receptor blockers, oral anticoagulants, angiotensin-converting enzyme inhibitors and antiplatelet P2Y12 receptor inhibitors, were tracked from the pharmacy claims in the same identification period as the comorbidities. The matching was based on the logit of propensity score implementing a nearest-neighbour strategy with a calliper width equal to 0.2.[33] In the 'nearest neighbour matching within a specified calliper distance' approach, each antecedent statin user was matched to one non-statin user whose propensity score was closest to that of the corresponding antecedent statin user, and the difference in their propensity scores was below 0.2 of the SD of the logit of the propensity score. This method was employed as it has been shown to produce less biased estimates as compared with other propensity score matching algorithms since the matched pairs are restricted to be within a specified distance of each other.[34] Additionally, the study used a calliper width of 0.2 of the SD of the logit of the propensity score as it has been shown to produce the most precise estimates of the treatment effect in several simulation studies comparing various calliper widths.[33 35] Standardised mean differences were used to assess the balance of covariates between the matched groups.[36]

Outcome measures

The outcomes of interest in this study were 30-day, 60-day and 90-day all-cause death following index COVID-19 diagnosis.

Statistical analysis

Mean and SD as well as counts and percentage were used to depict baseline patient characteristics and study outcomes, as appropriate. McNemar's tests were used to make the unadjusted comparisons between statin users and matched non-statin users on all-cause death outcomes.

Conditional logistic regression models were used to estimate the effect of any antecedent statin use on study outcomes. Variables that were not used in the matching, including a history of cancer, the month of COVID-19 diagnosis and long-term care residency at diagnosis, were included as covariates in the regression models. To further explore the effect of the intensity of statin use, conditional logistic regression models were also performed to

Table 1 Demographic and clinical characteristics of COVID-19 diagnosed Mississippi Medicaid beneficiaries with antecedent statin use and matched non-statin use cohort

Variable	Statin users (n=1107)	Non-statin users (n=1107)	Standardised difference
Age, no. (%)			−0.08
19–44	305 (27.6)	280 (25.3)	
45–54	295 (26.7)	273 (24.7)	
55–64	507 (45.8)	554 (50.1)	
Sex (male), no. (%)	368 (33.2)	371 (33.5)	−0.08
Race, no. (%)			0.03
Caucasian	314 (28.4)	313 (28.3)	
African American	672 (60.7)	687 (62.1)	
Others	121 (10.9)	107 (9.7)	
Diagnosed year			0.08
2020	806 (72.8)	768 (69.4)	
2021	301 (27.2)	339 (30.6)	
Acute myocardial infarction, no. (%)	14 (1.3)	9 (0.8)	0.04
Atrial fibrillation, no. (%)	23 (2.1)	19 (1.7)	0.03
Asthma, no. (%)	103 (9.3)	112 (10.1)	−0.03
COPD, no. (%)	155 (14.0)	161 (14.5)	−0.02
Diabetes, no. (%)	538 (48.6)	551 (49.8)	−0.02
Heart failure, no. (%)	156 (14.1)	156 (14.1)	0.00
Hypertension, no. (%)	820 (74.1)	860 (77.7)	−0.08
Ischaemic heart disease, no. (%)	160 (14.5)	150 (13.6)	0.03
Stroke, no. (%)	102 (9.2)	84 (7.6)	0.06
Chronic kidney disease, no. (%)	335 (30.3)	332 (30.0)	0.01
Hyperlipidaemia, no. (%)	545 (49.2)	509 (46.0)	0.07
Liver disease, no. (%)	13 (1.2)	19 (1.7)	−0.05
Use of ACE inhibitors, no. (%)	297 (26.8)	305 (27.6)	−0.02
Use of ARBs, no. (%)	187 (16.9)	202 (18.3)	−0.04
Use of beta-blockers, no. (%)	375 (33.9)	378 (34.2)	−0.01
Use of anticoagulants, no. (%)	79 (7.1)	69 (6.2)	0.04
Use of P2Y12 inhibitors, no. (%)	66 (6.0)	53 (4.8)	0.04
Cancer, no. (%)	75 (6.8)	95 (8.6)	−0.07
Long-term care residency, no. (%)	42 (3.8)	44 (4.0)	−0.01
Statin intensity, no. (%)			
Low/moderate	707 (31.9)	–	–
High	400 (18.1)	–	–

Note: Diagnosed year/month, comorbid with cancer and long-term care residency are not used for the propensity score matching.
ACE, angiotensin-converting enzyme; ARBs, angiotensin receptor blockers; COPD, chronic obstructive pulmonary disease.

evaluate the relationship between the intensity of statin use and our study outcomes. The intensity of statin use was determined by the dose and statin type on statin prescriptions based on clinical guidance and classified to low/moderate and high.[37] Statins in the low-intensity, medium-intensity and high-intensity categories have been listed in online supplemental table 1.

Sensitivity analysis was conducted in a subgroup of patients with cardiovascular diseases (ie, hypertension, stroke, coronary artery disease and transient ischaemic attack), for whom statins are usually prescribed[7] and are more likely to experience severe COVID-19 outcomes.[4 38] Since the subgroup of patients was no longer matched, unconditional logistic regression models adjusted for all variables were used.

Statistical significance was determined based on a two-sided level of α=0.05. All statistical analyses were conducted using SAS, V.9.4 (SAS Institute Inc., Cary, NC, USA).

Rong Y, *et al*. *BMJ Open* 2023;**13**:e076195.doi:10.1136/bmjopen-2023-076195

Table 2 Univariable analysis between Mississippi Medicaid beneficiaries with and without antecedent statin use before COVID-19 diagnosis on all-cause death, March 2020–June 2021

Outcome	Statin users (n=1107)	Non-statin users (n=1107)	P value
30-day death, no. (%)	39 (3.5)	60 (5.4)	0.03
60-day death, no. (%)	49 (4.4)	73 (6.6)	0.03
90-day death, no. (%)	53 (4.8)	82 (7.4)	0.01

Note: McNemar's test is used to compare the proportion of death between statin users and matched non-statin users.

RESULTS

A total of 10 792 patients with COVID-19 met the inclusion and exclusion criteria (figure 1), with 1415 statin users (13.1%) identified. After applying propensity score matching, we included 1107 matched pairs of statin users and non-statin users for analysis. The mean (SD) age of statin users was 51.0 (9.6) years, with 507 patients (45.8%) aged >55 years. Among statin users, 739 (66.8%) were women, and 672 (60.7%) were African Americans. The demographic characteristics of the non-statin user group were similar. Most patients had hypertension (statin users 74.1% vs non-statin users 77.7%), approximately half of patients had hyperlipidaemia (statin users 49.2% vs non-statin users 46.0%) and diabetes (statin users 48.6% vs non-statin users 49.8%), and more than 30% of patients had used beta-blockers (statin users 33.9% vs non-statin users 34.2%). The standardised mean difference values indicate the two groups were well balanced (table 1). Most patients (statin users 72.8% vs non-statin users 69.4%) were first diagnosed with COVID-19 in 2020. Of the statin users, 75 (6.8%) patients had cancer, while 95 (8.6%) non-statin users had cancer. Other baseline characteristics of Medicaid beneficiaries with COVID-19 and statin use and matched non-statin use beneficiaries are presented in table 1.

McNemar's tests (table 2) showed a statistically significant lower proportion of statin users experiencing 30-day (39 statin users (3.5%) vs 60 non-statin users (5.4%), p=0.03), 60-day (49 statin users (4.4%) vs 73 non-statin users (6.6%), p=0.03) and 90-day (53 statin users (4.8%) vs 82 non-statin users (7.4%), p=0.01) mortality compared with non-statin users. Results of the multivariable analysis for estimating the association between statin use and all-cause death are presented in table 3. Antecedent statin use was significantly associated with lower odds of mortality in the follow-up period: adjusted OR (aOR), 0.51 (95% CI: 0.31 to 0.83) in 30 days post index period; aOR, 0.56 (95% CI: 0.37 to 0.85) in 60 days post index period; and aOR, 0.55 (95% CI: 0.37 to 0.82) in 90 days post index period.

Among patients using statins, 707 (63.9%) patients were classified as using a low-intensity or moderate-intensity statin, and 400 (36.1%) were classified as using a high-intensity statin. Table 4 presents the results of the adjusted analysis to assess the association of intensity of statin use and study outcomes. Those with low-intensity/moderate-intensity statin use had lower odds of mortality in the 60-day follow-up period (aOR: 0.56 (95% CI, 0.33 to 0.95)) and in the 90-day follow-up period (aOR: 0.51 (95% CI, 0.31 to 0.85)) compared with non-statin users. Although not statistically significant, there was a trend suggesting that patients with low-intensity/moderate-intensity statin use had lower odds of mortality within 30 days of the index date (aOR: 0.55 (0.30, 1.01)) compared with those who did not use statins. High-intensity statin use was associated with a lower risk of mortality within 30 days (aOR: 0.45 (95% CI, 0.21 to 0.97)) compared with no statin use.

Online supplemental figures 1–3 present the results of the sensitivity analysis, which included 1917 beneficiaries with cardiovascular diseases and COVID-19. Among those patients, statin use was associated with decreased odds of mortality within the 60-day and 90-day periods following COVID-19 diagnosis (aOR of 60-day death, 0.65 (95% CI, 0.44 to 0.99) and aOR of 90-day death, 0.62 (95% CI, 0.42 to 0.91)).

DISCUSSION

This study found that antecedent statin use was associated with a lower likelihood of all-cause death in the 90-day period post diagnosis, even after adjusting for sociodemographic and clinical characteristics. This study also looked at the effect of intensity of statin use on mortality and found that both low/moderate and high intensity of

Table 3 Multivariable analysis between Mississippi Medicaid beneficiaries with and without antecedent statin use before COVID-19 diagnosis on all-cause death, March 2020–June 2021

	30 days		60 days		90 days	
Outcome	aOR (95% CI)	P value	aOR (95% CI)	P value	aOR (95% CI)	P value
Statin use	0.51 (0.31 to 0.83)	0.007	0.56 (0.37 to 0.85)	0.007	0.55 (0.37 to 0.82)	0.004
Cancer	4.17 (1.16 to 15.05)	0.03	3.49 (1.23 to 9.95)	0.02	2.58 (0.99 to 6.67)	0.05
Long-term care	0.15 (0.02 to 1.27)	0.08	0.63 (0.18 to 2.26)	0.48	0.55 (0.16 to 1.89)	0.34
Diagnosed month	0.92 (0.84 to 1.01)	0.08	0.91 (0.84 to 0.99)	0.03	0.91 (0.84 to 0.99)	0.02

aOR, adjusted OR.

Table 4 Multivariable analysis between Mississippi Medicaid beneficiaries with and without antecedent statin use before COVID-19 diagnosis on all-cause death by statin intensity, March 2020–June 2021

	30 days		60 days		90 days	
Outcome	aOR (95% CI)	P value	aOR (95% CI)	P value	aOR (95% CI)	P value
Statin use						
Low/moderate vs no	0.55 (0.30, 1.01)	0.05	0.56 (0.33, 0.95)	0.03	0.51 (0.31, 0.85)	0.001
High vs no	0.45 (0.21, 0.97)	0.04	0.56 (0.29, 1.08)	0.08	0.63 (0.34, 1.17)	0.14
Cancer	4.27 (1.17, 15.51)	0.03	3.49 (1.22, 9.98)	0.02	2.55 (0.98, 6.63)	0.05
Long-term care	0.15 (0.02, 1.36)	0.09	0.63 (0.17, 2.30)	0.48	0.51 (0.15, 1.82)	0.30
Diagnosed month	0.92 (0.84, 1.01)	0.09	0.91 (0.84, 0.99)	0.03	0.91 (0.84, 0.99)	0.02

aOR, adjusted OR.

statin use is associated with a decreased risk of mortality post COVID-19 diagnosis. Similar study findings are found in our sensitivity analysis of patients with cardiovascular conditions. To the authors' knowledge, this is one of the very few studies in published literature that assesses the impact of statin use and also intensity of statin use on COVID-19 outcomes using administrative claims data. Utilising claims data to assess this relationship provides the advantage of being able to follow a real-world patient population longitudinally from exposure to outcomes. Moreover, assessing this relationship among the Medicaid beneficiaries of Mississippi who might be disproportionately affected by COVID-19 adds to the uniqueness of this study. Therefore, this study adds important evidence to the published literature on the impact of antecedent statin use and intensity on COVID-19 outcomes.

The literature reports mixed findings regarding the impacts of antecedent statin use among COVID-19 patients. Several meta-analyses demonstrated that statin use prior to COVID-19 infection or COVID-related hospitalisation was associated with a reduced risk of mortality in the short term.[14–17 39] Recent large cohort studies also demonstrated the beneficial effect of historical statin use on COVID-19-related death.[30 40] However, some other studies reported that the significant association was detected only in post diagnosis/hospitalisation statin use and improved outcomes, but not in antecedent statin use.[41–43] As with prior analyses, we provide further evidence of the statin's protective effect against death post COVID-19 infection for 90 days in Medicaid patients treated in a routine clinical setting. As a result of statins' ability to prevent severe COVID-19 outcomes (eg, lung injury, lung fibrosis, respiratory failure and death), statins can increase the activity of angiotensin-converting enzyme 2 (ACE2), which significantly declines when SARS-CoV-2 enters the host cell.[44 45] The enzyme ACE2 is an essential enzyme in the renin-angiotensin-aldosterone system, inhibiting the activity of angiotensin II that promotes cardiovascular disease.[46] In addition, statins have pleiotropic effects that might contribute to their benefits in COVID-19 patients, including enhancing endothelial dysfunction, antioxidant properties, immunomodulatory properties and antithrombotic properties.[47 48] Based on our findings, statin use has a protective effect against death, which may be due to the severe COVID-19-related symptoms and conditions, particularly for patients with chronic conditions which require statins prior to COVID-19 infection.

Statin intensity and COVID-19 outcomes have been studied sparsely. Choi *et al* conducted a retrospective study of patients of Mount Sinai Health System hospitals.[49] Compared with patients with no statin use, both low-intensity to moderate-intensity and high-intensity statin users had lower rates of death.[49] Using French National Healthcare Data System database, Bouillon *et al* found a lower risk of inhospital death from COVID-19 for low-intensity and moderate-intensity statin users as compared with non-users, but not for high-intensity statin users.[18] Our study revealed that low-moderate intensity statin use was significantly associated with a decreased risk of death at 60 and 90 days, as well as a lower mortality rate at 30 days. The small sample size of COVID-19 patients who died within 30 days may explain the lack of statistical significance of this estimate. A larger sample size would be needed to confirm the effect on short-term outcomes. Further, we found that high statin intensity was only associated with a reduced risk of mortality in 30 days post COVID-19 diagnosis. This finding may be explained by the fact that patients prescribed higher-intensity statins often have more severe comorbid cardiovascular conditions, leading to a higher risk of COVID-19 infections and exacerbations, which can potentially counteract the protective effects of statins. This may also be due to suboptimal adherence to high doses of statins prior to infection with COVID-19. A further study accounting for statin adherence is required to explore the association between antecedent statin use and COVID outcomes.

The COVID-19 pandemic resulted in a public health crisis in the USA and caused a disruption of healthcare access across the country. Vulnerable populations such as Black, Asian and other minority communities and Medicaid enrollees were disproportionately affected.[50 51] According to a recent report from the American College of Cardiology, patients with cardiovascular disease also suffered from the indirect impact of the COVID-19 pandemic, caused by the substantial disruption in

Rong Y, *et al*. *BMJ Open* 2023;**13**:e076195.doi:10.1136/bmjopen-2023-076195

care.[52] Recent studies have reported the severe impact of the COVID-19 pandemic on medication adherence among patients with chronic diseases, which eventually resulted in worsening of disease symptoms.[53 54] COVID-19 still persists, and as a healthcare system, we need to be better prepared for facing such disruptions in the future. Telehealth is one such tool that can be leveraged to ensure continued access to healthcare among people with chronic diseases. A systematic review reported that eHealth and telehealth interventions targeting medication adherence among patients with hypertension, diabetes or dyslipidaemia resulted in improved adherence.[55] Although many states had expanded Medicaid coverage for telehealth during the COVID-19 pandemic, it's imperative for state Medicaid programmes to ensure continued access to telehealth provisions so that the healthcare system is better prepared for handing such disruptions in the future.[56]

Our study is subject to certain limitations associated with the use of administrative claims data for healthcare research. Administrative claims only have information about whether the medication has been dispensed and cannot indicate if medication has been consumed by the patient. Use of administrative claims data limited our ability to assess disease severity in the study sample. This study uses claims for the Mississippi Medicaid programme; therefore, the results may not be generalisable to the national population or the population with commercial insurance. It is important to note that this study did not account for COVID-19 vaccination status as a covariate due to potential limitations in accurately capturing vaccination records from various sources, leading to unreliable information in the Medicaid claims data. Future studies should incorporate vaccine registry data to assess the impact of vaccination status on the relationship between statin use and COVID-19 outcomes. Additionally, this study did not account for use of approved COVID-19 treatments (eg, Paxlovid) as many of these medications were approved for use in the USA in December 2021 or later, and our study period (until September 2021) pre-dates their approval. Future research should account for use of approved COVID-19 treatments while examining the impact of statin use on COVID-19 outcomes. For statin users, the effect of different statin intensity was not evaluated in our study. Several retrospective studies have found no difference in mortality rates for COVID-19 patients whose statin therapy was administered at varying intensities.[57–59] Therefore, our study focused on comparing the mortality rates between statin users and non-users, without evaluating the effect of different statin intensities. The effect of statin compliance and dosage on mortality was not assessed in this study. Based on the results of this study, statins' clinical benefits on COVID-19 outcomes by compliance and dosing range should be investigated in the future.

CONCLUSION

Statins have the potential to prevent mortality among patients diagnosed with COVID-19, in particular for those with high-risk comorbidities. Mississippi Medicaid beneficiaries with statin use were found to have over 40% lower risk of death within 90 days post COVID-19 diagnosis. Our study highlights the significance of continuity of care for patients with chronic conditions during the pandemic. Findings of this study can inform clinical decisions for healthcare providers and can also assist policy makers in preparing for future interruptions of healthcare. Further exploration is needed to investigate the potential mechanisms as well as optimal use and dosage of statins in COVID-19 treatment. Further studies of other vulnerable populations are also necessary due to the limited generalisability of Mississippi Medicaid data.

Author affiliations
[1]Department of Pharmacy Administration, University of Mississippi School of Pharmacy, University, Mississippi, USA
[2]MedTech Epidemiology and Real-World Data Sciences, Johnson and Johnson, New Brunswick, New Jersey, USA
[3]Real-World Evidence, Complete Health Economics and Outcomes Solutions, LLC, Chalfont, Pennsylvania, USA
[4]Center for Pharmaceutical Marketing and Management, University of Mississippi School of Pharmacy, University, Mississippi, USA
[5]Mississippi Division of Medicaid, Office of the Governor, Jackson, Mississippi, USA

Twitter Sujith Ramachandran @ramasujith

Contributors KB accepts full responsibility of the work and/or the conduct of the study, had access to the data, and controlled the decision to publish. YR and KB significantly contributed towards planning, design, data analysis and preparation of the manuscript of the study. SG and OE contributed to manuscript preparation. SR, JB, EP and BFB contributed towards study design, reviewing and approving the final manuscript. TK and DS reviewed and approved the final manuscript.

Funding This study was funded by the Mississippi Division of Medicaid.

Competing interests TK and DS are Mississippi Division of Medicaid employees. The work reported was conducted by the MS-DUR program in the Center for Pharmaceutical Marketing and Management as part of the retrospective drug use analysis activities conducted under contract with the Mississippi Division of Medicaid. The views expressed are those of the authors and do not necessarily reflect those of the Mississippi Division of Medicaid or the University of Mississippi.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants. The study was approved as exempt by the Institutional Review Board at the University of Mississippi, and a waiver of informed consent was granted due to the de-identified nature of the data (Protocol #20x-336). The consent for participation was not necessary due to the de-identified nature of the data.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data may be obtained from a third party and are not publicly available. The data for this study were obtained via a data use agreement with the Mississippi Division of Medicaid and cannot be shared publicly. Individuals interested in accessing the data can request access through CMS (resdac.org).

ORCID iDs
Yiran Rong http://orcid.org/0000-0002-8571-3872
Sujith Ramachandran http://orcid.org/0000-0002-8792-4307

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Risk Factors for Severe Maternal Morbidity Among Women Enrolled in Mississippi Medicaid

Shishir Maharjan, MS; Swarnali Goswami, PhD; Yiran Rong, PhD; Terri Kirby, RPh; Dennis Smith, RPh; Catherine X. Brett, MD; Eric L. Pittman, PharmD; Kaustuv Bhattacharya, PhD

Abstract

IMPORTANCE Mississippi has one of the highest rates of severe maternal morbidity (SMM) in the US, and SMMs have been reported to be more frequent among Medicaid-insured women. A substantial proportion of pregnant women in Mississippi are covered by Medicaid; hence, there is a need to identify potential risk factors for SMM in this population.

OBJECTIVE To examine the associations of health care access and clinical and sociodemographic characteristics with SMM events among Mississippi Medicaid–enrolled women who had a live birth.

DESIGN, SETTING, AND PARTICIPANTS A nested case-control study was conducted using 2018 to 2021 Mississippi Medicaid administrative claims database. The study included Medicaid beneficiaries aged 12 to 55 years who had a live birth and were continuously enrolled throughout their pregnancy period and 12 months after delivery. Individuals in the case group had SMM events and were matched to controls on their delivery date using incidence density sampling. Data analysis was performed from June to September 2022.

EXPOSURE Risk factors examined in the study included sociodemographic factors (age and race), health care access (distance from delivery center, social vulnerability index, and level of maternity care), and clinical factors (maternal comorbidity index, first-trimester pregnancy-related visits, and postpartum care).

MAIN OUTCOMES AND MEASURES The main outcome of the study was an SMM event. Adjusted odds ratio (aORs) and 95% CIs were calculated using conditional logistic regression.

RESULTS Among 13 485 Mississippi Medicaid–enrolled women (mean [SD] age, 25.0 [5.6] years; 8601 [63.8%] Black; 4419 [32.8%] White; 465 [3.4%] other race [American Indian, Asian, Hispanic, multiracial, and unknown]) who had a live birth, 410 (3.0%) were in the case group (mean [SD] age, 26.8 [6.4] years; 289 [70.5%] Black; 112 [27.3%] White; 9 [2.2%] other race) and 820 were in the matched control group (mean [SD] age, 24.9 [5.7] years; 518 [63.2%] Black; 282 [34.4%] White; 20 [2.4%] other race). Black individuals (aOR, 1.44; 95% CI, 1.08-1.93) and those with higher maternal comorbidity index (aOR, 1.27; 95% CI, 1.16-1.40) had higher odds of experiencing SMM compared with White individuals and those with lower maternal comorbidity index, respectively. Likewise, an increase of 100 miles (160 km) in distance between beneficiaries' residence to the delivery center was associated with higher odds of experiencing SMM (aOR, 1.14; 95% CI, 1.07-1.20).

CONCLUSIONS AND RELEVANCE The study findings hold substantial implications for identifying high-risk individuals within Medicaid programs and call for the development of targeted

(continued)

Key Points

Question What are the different risk factors associated with severe maternal morbidity (SMM) among women with a live birth enrolled in Medicaid?

Findings In this nested case-control study of 13 485 women with live births enrolled in Mississippi Medicaid from 2018 to 2021, 410 beneficiaries (3.0%) had any SMM. Race, maternal comorbidity index, and distance of beneficiary's residence from the delivery center were associated with a significantly higher risk of SMM.

Meaning The findings of this study may help identify women enrolled in Medicaid programs who are at the highest risk for SMM and aid in developing targeted multicomponent, multilevel interventions for improving maternal health outcomes in this highly vulnerable population.

+ Supplemental content

Author affiliations and article information are listed at the end of this article.

Abstract (continued)

multicomponent, multilevel interventions for improving maternal health outcomes in this highly vulnerable population.

JAMA Network Open. 2024;7(1):e2350750. doi:10.1001/jamanetworkopen.2023.50750

Introduction

Poor maternal health is a major public health concern in the US, with the country having a higher maternal mortality rate than any other developed nation.[1,2] Despite substantial investments in technology and services aimed at improving maternal health, the remarkably high maternal mortality rate underscores the necessity for comprehensive research focusing on maternal morbidities and the corresponding risk factors. The southern region of the US,[3] especially Mississippi, is greatly affected by maternal health issues.[4] Compared with the national average of 17.4 cases per 100 000 live births, Mississippi has one of the highest rates of maternal mortality in the country (22.1 cases per 100 000 live births).[4]

According to the Centers for Disease Control and Prevention (CDC), severe maternal morbidity (SMM) is defined as "unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health."[5] It encompasses a spectrum of severe complications following pregnancy and childbirth, including such conditions as eclampsia, acute renal failure, cardiac arrest, and others, all of which have detrimental impact on a woman's health. In recent years, SMM has become an important marker for examining disparities in maternal health outcomes.[6] The annual rate of SMM in the US has seen a great increase in recent decades, doubling from 49.5 per 10 000 births in 1993 to 144 per 10 000 births in 2014.[7] Despite the comprehensive recommendations provided by the CDC and the American College of Obstetricians and Gynecologists for monitoring and assessing severe pregnancy and delivery complications,[7-9] the estimated number of SMM cases surpasses 60 000 annually.[1] More than 80% of pregnancy-related deaths in the US could have been prevented, yet inadequate treatment and the failure to identify health risk factors contribute to hundreds of maternal deaths annually.[10] In the literature, a number of risk factors for SMM and mortality have been identified, including maternal age, cesarean delivery, multifetal gestation, obesity, and preexisting chronic conditions.[11-19] There is also evidence that additional factors, including obstetric and medical factors, unmarried status, low maternal education, and rural residency, may potentially increase the risk of SMM and pregnancy-related mortality.[18-25] Although these clinical and sociodemographic factors are critical in understanding the maternal health crisis, it is equally important to investigate factors associated with availability, quality, and accessibility of maternity care resources.[26] These health care access factors will help to address spatial disparities and resource allocation in maternal care access in a particular region. This demands the careful investigation of the influence of understudied clinical factors and health care access parameters in maternal health outcomes, particularly in Medicaid-enrolled populations.

Among 26 states that have reported SMM data, Mississippi has the highest rate of SMM.[4] The Medicaid program serves as the primary coverage source for maternal care in Mississippi, with more than 60% of pregnant women in the state relying on Medicaid for their health care needs.[4] A study[27] has demonstrated that Medicaid-insured women have a greater risk of experiencing SMM than their commercially insured counterparts. Given that SMM has been shown to occur more frequently among Medicaid-insured women, there is a critical need to investigate the factors contributing to the mounting concerns in this population. Therefore, the goal of this study is to assess the association of health care access and clinical and sociodemographic characteristics with SMM among women who had a live birth and were enrolled in Mississippi Medicaid.

Methods

Study Design and Data Source

This nested case-control study used deidentified 2018 to 2021 Mississippi Medicaid coordinated care organization and fee-for-service administrative claims data. The study was approved by the University of Mississippi institutional review board with a waiver of informed consent because of the retrospective nature of the data, in accordance with 45 CFR §46. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.[28]

Study Cohort Definition

Beneficiaries enrolled in Mississippi Medicaid who had a live birth between January 1, 2018, and December 31, 2020, were identified using the *International Statistical Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* codes for live birth (eTable 1 in Supplement 1) following the approach used by Moll et al.[29] The cohort entry date or delivery date was defined according to the date of the first claim indicating live birth during delivery hospitalization. Preterm or full-term status of the delivery was identified using *ICD-10-CM* codes (eTable 1 in Supplement 1). The pregnancy start date was estimated on the basis of the algorithm previously used by Moll et al.[29] Beneficiaries who were not continuously enrolled during the pregnancy period and 12 months after cohort entry date, who were younger than 12 years or older than 55 years at cohort entry date, and who were transferred to another institution were omitted from the study.

Case and Control Definitions

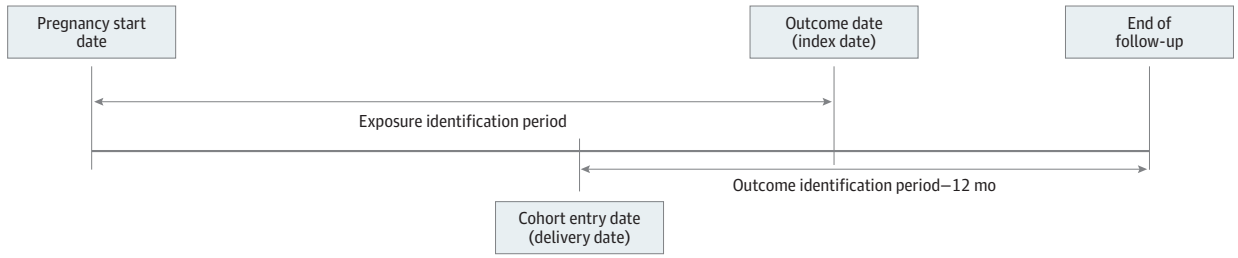
Medicaid beneficiaries who experienced any SMM events during 12 months after cohort entry date were classified as cases. An SMM event was determined as 1 of the 21 conditions defined by the CDC for identification of SMM[30] (eTable 2 in Supplement 1). The index date was defined as the date of the first occurrence of any SMM event (**Figure**). Controls were defined as individuals from study cohort who had not experienced SMM from the delivery date until the point or time they were matched with their respective cases. The matching was performed in a way that ensured that controls had not experienced any SMM events up to the time of their respective matched cases. On the basis of the delivery date, cases and controls were matched in a 1:2 ratio, using incidence density sampling.[31] This technique allowed for controls to be randomly sampled from individuals included in the study sample, such that each control had similar or longer time at risk for SMM as the corresponding matched case. The index date for controls was assigned as of their matched cases' index date.

Independent Variables

Sociodemographic Characteristics

The sociodemographic factors included age and race (classified as Black, White, and other, which includes American Indian, Asian, Hispanic, multiracial, and unknown). Information on race and

Figure. Methodological Diagram of the Study



ethnicity were extracted from the Mississippi Medicaid beneficiary enrollment and demographic summary file. Because of sample size limitations of this study, race categories were limited to Black and White, with the remaining race categories grouped into other. Race is an important social construct and was included in the study analysis on the basis of prior evidence of racial disparities in maternal health outcomes. The age of individuals was calculated as of their delivery date.

Health Care Access

Health care access was assessed using the social vulnerability index (SVI), distance of the beneficiaries' residence from the delivery center, and the level of maternity care. SVI is a neighborhood-based measure that is calculated according to the county of the beneficiary's residence. It was categorized as least vulnerable (below first quartile), moderately vulnerable (between first and third quartile), and most vulnerable (above third quartile).[32] Similarly, the distance that beneficiaries had to travel for the delivery was determined at the zip code level according to the beneficiary's residence and the location of the delivery center. Level of maternity care was categorized as access to maternity care, low access to care (few delivery centers, obstetric practitioners, or a high proportion of women without health insurance), and maternity care desert (limited or entirely absent maternal health care services).[33]

Clinical Characteristics

The maternal comorbidity index (MCI), which was developed and validated by Bateman et al,[34] was measured for each eligible beneficiary to capture the burden of chronic, behavior, and pregnancy-induced conditions (eTable 3 in Supplement 1).[35] The conditions underlying MCI were assessed from pregnancy start date to index date. Additional clinical characteristics included first-trimester pregnancy-related visits and postpartum care visits in the 2 weeks after delivery.

Statistical Analysis

Data analysis was performed from June to September 2022. The health care access, sociodemographic, and clinical characteristics of the study cohort were summarized using descriptive statistics. For categorical variables, frequency and percentage distributions were reported. McNemar test or Cochran-Mantel-Haenszel test was used to test statistical differences between cases and controls. Continuous variables were presented using mean (SD), and paired *t* tests were used for testing statistically significant differences between the cases and controls. The association between independent variables and SMM was tested using conditional logistic regression. All health care access, sociodemographic, and clinical factors were included in the adjusted model. For all statistical analyses, 2-sided tests with $\alpha = .05$ were used for significance. SAS statistical software version 9.4 (SAS Institute) was used for data management and statistical analyses.

Results

From 2018 to 2020, a total of 43 599 Medicaid beneficiaries had a live birth. Among them, 30 114 beneficiaries could not satisfy the continuous eligibility requirement or age criteria (aged 12-55 years as of the delivery date), were transferred to another institution, or had missing information and, hence, were excluded from the study. Finally, there were 13 485 beneficiaries with live birth who were eligible for the study.

Characteristics of Eligible Beneficiaries

Table 1 presents the health care access, clinical, and sociodemographic characteristics of the eligible study cohort. Most of the beneficiaries were Black (8601 beneficiaries [63.8%]) and aged 18 to 34 years (11 730 beneficiaries [87.0%]), with the mean (SD) age being 25.0 (5.6) years; 4419 beneficiaries (32.8%) were White and 465 (3.4%) were other race. According to the SVI, more than

one-half of the study cohort belonged to the moderately vulnerable group (7402 beneficiaries [55.0%]), 8852 beneficiaries (65.6%) had access to maternity care, and the mean (SD) distance traveled by beneficiaries for delivery was determined to be 114.7 (226.8) miles (183.5 [362.8] km). The median (IQR) distance traveled by beneficiaries for delivery was 34.2 (9.4-102.4) miles (54.7 [15.0-163.8] km). With respect to clinical factors, 52.1% of the study cohort (7020 beneficiaries) had pregnancy-related visits during the first trimester, and 30.0% (4045 beneficiaries) had postpartum care visits in the 2 weeks following delivery.

Case and Controls

As shown in **Table 2**, 410 of the beneficiaries (3.0%) (mean [SD] age, 26.8 [6.4] years) in the eligible cohort experienced any SMM event. Among the SMM conditions, pulmonary edema and acute heart failure (92 beneficiaries [22.4%]) was the most common, followed by sepsis (90 beneficiaries [21.9%]) and adult respiratory distress syndrome (56 beneficiaries [13.7%]). A large proportion of the cases were aged 18 to 34 years (333 beneficiaries [81.2%]), were Black (289 beneficiaries [70.5%]), had access to maternity care (273 beneficiaries [66.6%]), and had moderate social vulnerability (225 beneficiaries [54.9%]); 112 cases (27.3%) were White and 9 (2.2%) were other race. Although more than one-half of cases (206 beneficiaries [50.2%]) experienced an SMM event within the first 6 weeks after delivery, 42.7% (175 beneficiaries) experienced their first SMM event after 12 weeks after delivery. The remaining 7.1% of the cases (29 beneficiaries) experienced an SMM event between 6 to 12 weeks after delivery. Moreover, 256 cases (62.4%) had pregnancy-related visits in the first trimester of pregnancy, and 122 cases (29.8%) had postpartum care visits. The mean (SD) MCI for cases was 1.12 (1.65) (median [IQR], 0 [0-2]). The mean (SD) distance from cases' residence to the delivery center was 183.2 (336.3) miles (293.12 [538.14] km; median [IQR], 52.8 (14.2-188.6) miles; 84.5 [22.7-301.8] km) (Table 1).

Table 1. Health Care Access, Sociodemographic, and Clinical Characteristics of the Eligible Cohort

Characteristic	Beneficiaries, No. (%)			*P* value
	Full cohort (N = 13 485)	Case (n = 410)	Control (n = 820)	
Age, mean (SD), y[a]	25.0 (5.6)	26.8 (6.4)	24.9 (5.7)	<.001
Age range, y				
<18	892 (6.6)	24 (5.8)	56 (6.8)	.005
18-34	11 730 (87.0)	333 (81.2)	705 (86.0)	
≥35	863 (6.4)	53 (12.9)	59 (7.2)	
Race[a]				
Black	8601 (63.8)	289 (70.5)	518 (63.2)	.04
White	4419 (32.8)	112 (27.3)	282 (34.4)	
Other[b]	465 (3.4)	9 (2.2)	20 (2.4)	
Distance from delivery center, miles[c]				
Mean (SD)	114.7 (226.8)	183.2 (336.3)	96.7 (191.2)	<.001
Median (IQR)	34.2 (9.4-102.4)	52.8 (14.2-188.6)	30.8 (9.3-91.3)	
Social vulnerability index[a]				
Least vulnerable	3382 (25.1)	104 (25.4)	206 (25.1)	.78
Moderately vulnerable	7402 (55.0)	225 (54.9)	437 (53.4)	
Most vulnerable	2680 (19.9)	81 (19.8)	176 (21.5)	
Pregnancy-related visits[d]	7020 (52.1)	256 (62.4)	377 (54.0)	.005
Postpartum care visits[e]	4045 (30.0)	122 (29.8)	236 (28.8)	.72
Level of maternity care[a]				
Access to maternity care	8852 (65.6)	273 (66.6)	515 (62.8)	.37
Low access to care	1334 (9.9)	32 (7.8)	78 (9.5)	
Maternity care desert	3299 (24.5)	105 (25.6)	227 (27.7)	
Maternal comorbidity index[f]	Not applicable	1.12 (1.65)	0.54 (1.14)	<.001

SI conversion factor: To convert miles to kilometers, multiply by 1.6.

[a] Measured from the cohort entry date.

[b] Other race includes American Indian, Asian, Hispanic, multiracial, and unknown.

[c] Measured from the delivery date.

[d] Measured from the first trimester of pregnancy.

[e] Measured from 2 weeks after the delivery date.

[f] Measured from the pregnancy start date to index date.

The majority of the controls (820 beneficiaries [86.0%]) were aged 18 to 34 years (mean [SD] age, 24.9 [5.7] years), were Black (518 beneficiaries [63.2%]), had access to maternity care (515 beneficiaries [62.8%]), and had moderate social vulnerability (437 beneficiaries [53.4%]); 282 controls (34.4%) were White, and 20 (2.4%) were other race. In addition, 54.0% of the controls (377 beneficiaries) had first-trimester pregnancy-related visits, and 28.8% of the controls (236 beneficiaries) had postpartum care visits. The mean (SD) MCI for controls was 0.54 (1.14) (median [IQR], 0 [0-0]). The mean (SD) distance from controls' residence to the delivery center was 96.7 (191.2) miles (154.7 [305.9] km). The median (IQR) distance traveled by controls for delivery was 30.8 (9.3-91.3) miles (49.3 [14.9-146.1] km). As shown in Table 1, cases and controls were significantly different in terms of race, age, distance from the delivery center, first-trimester pregnancy-related visits, and MCI. In addition, the unadjusted results of the potential risk factors are included in eTable 4 in Supplement 1.

Adjusted Analysis

Table 3 displays the findings of the adjusted conditional logistic regression. After accounting for other variables, the odds of experiencing SMM increased by 27% for a single-point increase in MCI (adjusted odds ratio [aOR], 1.27; 95% CI, 1.16-1.40). In addition, every 100-mile (160-km) increase in the distance of the beneficiary's residence from the delivery center was associated with a 14% increase in the odds of experiencing SMM (aOR, 1.14; 95% CI, 1.07-1.20). Moreover, beneficiaries aged 35 years or older had higher odds of experiencing SMM compared with beneficiaries aged 18 to 34 years (aOR, 1.49; 95% CI, 0.98-2.26), but the difference was not statistically significant. Furthermore, Black beneficiaries had a 44% greater odds of experiencing SMM (aOR, 1.44; 95% CI, 1.08-1.93) than White beneficiaries. No statistically significant associations were observed between other independent variables and SMM.

Table 2. Severe Maternal Morbidity Conditions Among Beneficiaries Enrolled in Mississippi Medicaid With Live Births

Severe maternal morbidity conditions	Beneficiaries, No. (%) (N = 410)
Acute myocardial infarction	9 (2.2)
Aneurysm	2 (0.5)
Acute renal failure	44 (10.7)
Adult respiratory distress syndrome	56 (13.7)
Amniotic fluid embolism	6 (1.5)
Cardiac arrest and/or ventricular fibrillation	4 (1.0)
Conversion of cardiac rhythm	0
Disseminated intravascular coagulation	26 (6.3)
Eclampsia	48 (11.7)
Heart failure and/or arrest during surgery or procedure	0
Puerperal cerebrovascular disorders	51 (12.4)
Pulmonary edema and acute heart failure	92 (22.4)
Severe anesthesia complications	0
Sepsis	90 (21.9)
Shock	24 (5.8)
Sickle cell disease with crisis	13 (3.2)
Air and thrombotic embolism	45 (11.0)
Blood products transfusion	0
Hysterectomy	0
Temporary tracheostomy	0
Ventilation	0

Discussion

This case-control study found that 3.0% of Mississippi Medicaid–enrolled women with a live birth experienced an SMM event, with the most common SMM events being pulmonary edema and acute heart failure, followed by sepsis. However, studies by Hirai et al[36] and Fink et al[37] found that intravascular coagulation and blood transfusion were the most common SMMs, respectively. The results of the current study also revealed that, in this population, there is a significant association of elevated risk of SMM with distance of the beneficiary's residence to the delivery center, MCI score, and beneficiary's race.

A higher MCI score has been associated with an increased risk of SMM, per extant literature. A study by Bateman et al,[34] where MCI was initially created and validated in a Medicaid population, found that the likelihood of organ damage or death increased by 37% for every unit increase in MCI score in the 30 days after delivery. Another study,[22] conducted among pregnant women in Texas, found a significant association between higher MCI scores and SMM risk during delivery-related hospitalizations. Similar findings were reported by Main et al[38] in their analysis of California's delivery hospital discharge data. Our analysis found that Medicaid-enrolled beneficiaries with higher MCI scores are more likely to experience SMM in the year following delivery, which is consistent with previous studies. This implies that MCI scores can be used as an effective tool to identify women at high risk of SMM, aiding implementation of tailored clinical care programs for avoiding such adverse outcomes.

In addition, our study showed that Black women had 44% greater odds of SMM than White women. This is in line with a study by Chen et al,[39] which also reported higher odds for SMM among Medicaid-insured Black women compared with their White counterparts. Differences in broader socioeconomic factors and structural and social discrimination might be underlying the worse complications for Black women. Several health advocacy groups and organizations like the Society for Maternal Fetal Medicine and American College of Obstetricians and Gynecologists are committed to expanding efforts to mitigate such maternal disparities.[26] Such initiatives and efforts should be prioritized in the states with high rates of maternal mortality and morbidity. Our study found that the odds of SMM increase by 14% for a 100-mile increase in the distance between a beneficiary's

Table 3. Adjusted Associations of Risk Factors With Severe Maternal Morbidity

Characteristics	Adjusted OR (95% CI)	*P* value
Maternal comorbidity index	1.27 (1.16-1.40)	<.001
Distance from delivery center	1.14 (1.07-1.20)	<.001
Age group, y		
<18	1.01 (0.60-1.68)	.97
18-34	1 [Reference]	NA
≥35	1.49 (0.98-2.26)	.06
Race		
Black	1.44 (1.08-1.93)	.01
White	1 [Reference]	NA
Other[a]	1.05 (0.44-2.50)	.91
Pregnancy-related visit	1.14 (0.87-1.50)	.33
Postpartum care visit	1.12 (0.85-1.47)	.44
Social vulnerability index		
Least vulnerable	1 [Reference]	NA
Moderately vulnerable	0.89 (0.66-1.21)	.47
Most vulnerable	0.71 (0.47-1.08)	.11
Level of maternity care		
Access to maternity care	1 [Reference]	NA
Low access to care	0.87 (0.54-1.38)	.54
Maternity care desert	0.95 (0.70-1.28)	.72

Abbreviations: NA, not applicable; OR, odds ratio.

[a] Other race includes American Indian, Asian, Hispanic, multiracial, and unknown.

residence and the delivery center. There is a dearth of literature on how distance from health care centers affects maternal health outcomes. A recent systematic literature review[40] noted the disparity in the results from studies that assessed the association of traveling further for health services with health outcomes. As echoed by the systematic literature review, as well as the results of our study, the association of distance from delivery center with health outcomes, especially maternal outcomes, warrants further assessment in future studies.

Similarly, the study findings suggested that women aged 35 years and older had higher risk of SMM compared with those aged 18 to 34 years, although the difference was not statistically significant. This aligns with findings from Lisonkova et al,[41] who found a marked increase in SMM with maternal age, particularly in women aged 35 years or older. A population-based retrospective cohort study[42] conducted using birth certificate records from 2012 to 2016 supports this evidence. It found that individuals older than 40 years had the highest rates of SMM and that pregnancies at an advanced age carried a higher risk of SMM. Older women have a risk of cardiovascular, respiratory, and reproductive morbidity, which may manifest clinically and precipitate during pregnancy.[43-45] In addition, level of maternity care was not found to be a significant factor in the study. However, the research sheds light on maternity care deserts, which are areas with limited access to maternal health care services. If left unaddressed, these maternal care deserts could exacerbate already existing inequalities in maternal health. Hence, policymakers, health care practitioners, and communities must address these gaps and ensure equitable access to high-quality maternal health care.[46] The study did not find statistically significant results for first-trimester pregnancy-related visits and immediate postpartum visits within first 2 weeks. Future research should explore the impact of longer-term postpartum care on maternal outcomes. Nevertheless, the study underscores the importance of these services for maternal health and the need for further research and interventions to enhance the quality and accessibility of prenatal and postpartum care. The current study did not explicitly look at the impact of timing of SMM events on the association of risk factors of interest with SMM and, hence, should be examined in future research.

Strengths and Limitations

Our study has several strengths. This study conducted an in-depth assessment of SMM by reporting the proportion of beneficiaries in the sample experiencing each of the 21 indicators of SMM. Second, this study also added to the current literature on SMM in the US by assessing pertinent factors such as MCI, SVI, pregnancy-related visits, postpartum care, level of maternity care, and distance between beneficiary's residence and the delivery center. Third, the current study used a validated claims-based algorithm to identify delivery and pregnancy start date in claims data analyses.

This study is also subject to certain limitations. Only beneficiaries enrolled in Mississippi Medicaid with continuous enrollment were included in this study. Hence, caution should be exercised while extrapolating these findings to individuals other than Medicaid-enrolled women of childbearing age who had 12 months of postpartum coverage. Future studies should assess risk factors of SMM in other populations to confirm the findings reported in this study. Although our study used a validated claims-based algorithm to identify women with live births and to estimate pregnancy start date, errors or biases in the algorithm may affect the results. However, the algorithm has been commonly used in previous studies and has acceptable sensitivity and specificity.[47,48] Furthermore, given the claim-based analysis, our study could not comprehensively account for all other potential confounders owing to unavailability and underrepresentation, such as body mass index, parity, and prenatal vitamin and aspirin use, and so forth. Future research, especially those using linked databases, should aim to investigate a broader set of confounding variables.

Conclusions

In this case-control study, elevated risk of SMM was observed in Medicaid-enrolled women with live birth who had higher MCI scores, lived farther from the delivery center, or were Black. These findings

have important implications for identifying high-risk individuals within Medicaid programs and developing targeted interventions that address multiple factors and levels to improve maternal health outcomes among this vulnerable population. Collaboration among policymakers, health care practitioners, and community leaders is crucial to implement interventions and programs aimed at reducing maternal morbidity and mortality. Maternal health care policies focusing on identifying women at risk of SMM and increasing access to high-quality, equitable maternity care should be prioritized in areas with high rates of maternal morbidity and mortality to mitigate disparities in maternal health.

ARTICLE INFORMATION

Accepted for Publication: November 20, 2023.

Published: January 8, 2024. doi:10.1001/jamanetworkopen.2023.50750

Corresponding Author: Kaustuv Bhattacharya, PhD, Department of Pharmacy Administration, University of Mississippi School of Pharmacy, 136 Faser Hall, University, MS 38677 (kbhattac@olemiss.edu).

Author Affiliations: Department of Pharmacy Administration, University of Mississippi School of Pharmacy, University (Maharjan, Goswami, Rong, Pittman, Bhattacharya); Center for Pharmaceutical Marketing and Management, University of Mississippi School of Pharmacy, University (Maharjan, Goswami, Rong, Pittman, Bhattacharya); Now with Complete Health Economics and Outcomes Solutions, LLC, Chalfont, Pennsylvania (Goswami); Now with MedTech Epidemiology and Real-World Data Sciences, Johnson and Johnson, New Brunswick, New Jersey (Rong); Mississippi Division of Medicaid, Jackson (Kirby, Smith); Alliant Health Solutions, Jackson, Mississippi (Brett).

Author Contributions: Dr Bhattacharya had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: All authors.

Acquisition, analysis, or interpretation of data: Maharjan, Goswami, Brett, Pittman, Bhattacharya.

Drafting of the manuscript: Maharjan, Goswami, Rong, Brett, Pittman, Bhattacharya.

Critical review of the manuscript for important intellectual content: All authors.

Statistical analysis: Maharjan, Goswami, Rong, Bhattacharya.

Administrative, technical, or material support: Maharjan, Goswami, Brett, Bhattacharya.

Supervision: Goswami, Kirby, Pittman, Bhattacharya.

Conflict of Interest Disclosures: None reported.

Funding/Support: This study was supported by funding from the Mississippi Division of Medicaid.

Role of the Funder/Sponsor: The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Meeting Presentations: This article was presented as a poster at the Annual Meeting of the Academy of Managed Care and Specialty Pharmacy; March 22, 2023; San Antonio, Texas. A study report was presented at the Mississippi Division of Medicaid Drug Utilization Review board meeting; September 15, 2022; Jackson, Mississippi.

Data Sharing Statement: See Supplement 2.

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SUPPLEMENT 1.

eTable 1. *ICD-10* Codes for Pregnancy Characteristics
eTable 2. Severe Maternal Morbidity Indicators
eTable 3. Maternal Comorbidity Index
eTable 4. Unadjusted Relationship Between Risk Factors and Severe Maternal Morbidity

SUPPLEMENT 2.

Data Sharing Statement

FDA DRUG SAFETY COMMUNICATIONS

December 2023 – February 2024

- 01-19-2024 - FDA adds Boxed Warning for increased risk of severe hypocalcemia in patients with advanced chronic kidney disease taking osteoporosis medicine Prolia (denosumab).

- 01-11-2024 - Update on FDA's ongoing evaluation of reports of suicidal thoughts or actions in patients taking a certain type of medicines approved for type 2 diabetes and obesity.

Update on FDA's ongoing evaluation of reports of suicidal thoughts or actions in patients taking a certain type of medicines approved for type 2 diabetes and obesity

Preliminary evaluation does not suggest a causal link

01-11-2024 FDA Drug Safety Communication

Español (/drugs/drug-safety-and-availability/actualizacion-sobre-la-evaluacion-en-curso-de-la-fda-de-los-informes-de-pensamientos-o-acciones)

Chinese (/drugs/drug-safety-and-availability/meiguoshipinyaowuguanlijuduifuyongpizhunyongyu2xingtangniaobinghefeipangzhengdemouzhongyaowudehuanzh)

Drug Safety Communication (/media/175358/download?attachment) (PDF - 214 KB)

The U.S. Food and Drug Administration (FDA) has been evaluating reports of suicidal thoughts or actions in patients treated with a class of medicines called glucagon-like peptide-1 receptor agonists (GLP-1 RAs; see the list in Table 1 below). These medicines are used to treat people with type 2 diabetes or to help those with obesity or overweight to lose weight. Our preliminary evaluation has not found evidence that use of these medicines causes suicidal thoughts or actions.

Over the last several months, we have conducted detailed reviews of reports of suicidal thoughts or actions received in the FDA Adverse Event Reporting System (FAERS (/drugs/questions-and-answers-fdas-adverse-event-reporting-system-faers/potential-signals-serious-risksnew-safety-information-identified-fda-adverse-event-reporting-system)). Because the information provided was often limited and because these events can be influenced by other potential factors, we determined that the information in these reports did not demonstrate a clear relationship with the use of GLP-1 RAs. Similarly, our reviews of the clinical trials, including large outcome studies and observational studies, did not find an association between use of GLP-1 RAs and the occurrence of suicidal thoughts or actions. However, because of the small number of suicidal thoughts or actions observed in both people using GLP-1 RAs and in the comparative control groups, we cannot definitively rule out that a small risk may exist; therefore, FDA is continuing to look into this issue.

Additional evaluations include a meta-analysis of clinical trials across all GLP-1 RA products and an analysis of postmarketing data in the Sentinel System (https://www.sentinelinitiative.org/) (http://www.fda.gov/about-fda/website-policies/website-disclaimer). A meta-analysis is a large, combined analysis of findings from clinical trials. Sentinel is a very large data network that contains health insurance claims and patient health records that can be used to investigate safety questions about FDA-regulated products. We will communicate our final conclusions and recommendations after we complete our review or have more information to share.

Patients should not stop taking GLP-1 RAs without first consulting your health care professional, as stopping these medicines may worsen your condition. Talk to your health care professional if you have questions or concerns. Tell your health care professional if you experience new or worsening depression, suicidal thoughts, or any unusual changes in mood or behavior. Call or text 988 or go to the website at https://988lifeline.org/ (https://988lifeline.org/) (http://www.fda.gov/about-fda/website-policies/website-disclaimer), which provides free support for people in distress 24 hours a day, 7 days a week.

The current prescribing information for the GLP-1 RAs approved to treat patients with obesity or overweight contains information about the risk of suicidal thoughts and actions. This information is also included in the labels of other types of weight loss medicines and is based on reports of such events observed with a variety of older medicines used or tested for weight loss.

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Consistent with the prescribing information for these medications, **health care professionals** should monitor for and advise patients using GLP-1 RAs to report new or worsening depression, suicidal thoughts, or any unusual changes in mood or behavior. Health care professionals should consult the prescribing information (https://www.accessdata.fda.gov/scripts/cder/daf/index.cfm?event=BasicSearch.process) when treating patients with these medications.

GLP-1 RAs are a class of several medicines (see list in Table 1) used to improve blood sugar (glucose) control and reduce the risk of heart disease in patients with type 2 diabetes. Some of these medicines are also used to help patients with obesity or overweight to lose weight. FDA approved the first GLP-1 RA in 2005, and there are now several in this class. GLP-1 RAs work by mimicking a hormone in the intestines called GLP-1 to stimulate the release of insulin and reduce blood glucose after eating a meal. These medicines also slow down food traveling through the digestive tract, which can help make someone feel full longer. GLP-1 receptors are also present in parts of the brain that regulate appetite.

Table 1. FDA-Approved GLP-1 RAs

Trade name	Generic name	Population (indication)	Approval year
Byetta	exenatide	Type 2 diabetes	2005
Victoza	liraglutide	Type 2 diabetes	2010
Trulicity	dulaglutide	Type 2 diabetes	2014
Saxenda	liraglutide	Obesity/overweight	2014
Adlyxin	lixisenatide	Type 2 diabetes	2016
Xultophy	liraglutide + insulin degludec	Type 2 diabetes	2016
Soliqua	lixisenatide + insulin glargine	Type 2 diabetes	2016
Bydureon BCise	exenatide	Type 2 diabetes	2017
Ozempic	semaglutide	Type 2 diabetes	2017
Rybelsus	semaglutide	Type 2 diabetes	2019
Wegovy	semaglutide	Obesity/overweight	2021
Mounjaro	tirzepatide**	Type 2 diabetes	2022
Zepbound	tirzepatide**	Obesity/overweight	2023

**Tirzepatide is a dual gastric inhibitory polypeptide (GIP) receptor and GLP-1 RA.

We encourage health care professionals and patients to report side effects involving GLP-1 RAs or other medicines to the FDA MedWatch program, using the information in the "Contact FDA" box at the bottom of the page.

Health care professionals, patients, and consumers can sign up for email alerts (https://public.govdelivery.com/accounts/USFDA/subscriber/new) (http://www.fda.gov/about-fda/website-policies/website-disclaimer) about Drug Safety Communications on medicines or medical specialties of interest to you.

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Related Information

- Diabetes Medicines (https://www.fda.gov/files/for consumers/published/Diabetes-Medicines.pdf)
- The FDA's Drug Review Process: Ensuring Drugs Are Safe and Effective (/drugs/information-consumers-and-patients-drugs/fdas-drug-review-process-ensuring-drugs-are-safe-and-effective)
- Think It Through: Managing the Benefits and Risks of Medicines (/drugs/information-consumers-and-patients-drugs/think-it-through-managing-benefits-and-risks-medicines)

Contact FDA

For More Info

855-543-DRUG (3784) and press 4
druginfo@fda.hhs.gov (mailto:druginfo@fda.hhs.gov)

Report a Serious Problem to MedWatch

Complete and submit the report Online (https://www.accessdata.fda.gov/scripts/medwatch/).
Download form (/about-fda/forms/medwatch-consumer-voluntary-reporting-pdf) or call 1-800-332-1088 to request a reporting form, then complete and return to the address on the pre-addressed form, or submit by fax to 1-800-FDA-0178.

Was this helpful? Yes No

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APPENDIX

Division of Medicaid
Drug Utilization Review Board
By-Laws

Article I. Purpose

The Drug Utilization Review Board (DUR) is a requirement of the Social Security Act, Section 1927. The purpose of the DUR Board is to provide clinical guidance to the Division of Medicaid (DOM) regarding the utilization of pharmaceutical products within the Mississippi Medicaid program. The DUR Board makes recommendations to DOM to promote patient safety and cost effective care in the Mississippi Medicaid program. The DUR Board shall advise DOM with respect to the content of medical criteria and standards for utilization management strategies including prospective drug prior authorization (PA), concurrent patient management, retrospective drug utilization review, and educational intervention programs. DOM retains the authority to accept or reject the recommendations by the DUR Board.

Article II. Membership

Section 1 – Board Composition

A. The DUR Board will consist of not less than twelve (12) voting members.
B. The DUR Board voting members will be comprised of at least one-third (1/3), but no more than fifty-one percent (51%), licensed and actively practicing physicians and at least one-third (1/3) licensed and actively practicing pharmacists. Voting members may consist of health care professionals with knowledge/expertise in one or more of the following:
   1) Prescribing of drugs,
   2) Dispensing and monitoring of drugs,
   3) Drug use review, evaluation, and intervention,
   4) Medical quality assurance.
C. Non-voting board members consist of the Division of Medicaid (DOM) Executive Director, Office of Pharmacy pharmacists, DUR Coordinator, the DUR contractor and Medical Director.

Section 2 – Appointment selection methodology

A. DOM's Office of Pharmacy in consultation with officially recognized state professional healthcare associations recommends potential, qualified new candidates for appointment or reappointment of existing board members to DOM's Executive Director.
B. Nominations are considered internally and appointments are given final approval by the DOM Executive Director.
C. Board members are appointed by the Governor of the State of Mississippi, or Governor's designee, pursuant to state law.

Section 3 - Term of Office

A. All members are appointed for three year terms following a staggered appointment fulfillment as follows: one-third of DUR Board members shall be appointed each term. All subsequent appointments shall be for terms of three years from the expiration date of the previous term.
B. Members may serve up to three consecutive three-year terms (for a total of nine consecutive years).
C. Members may serve for either an extended term or a fourth consecutive term at the discretion of the Executive Director and by recommendation of both the DUR Coordinator and Division of Medicaid Office of Pharmacy in the event that no qualified, willing candidate is found in sufficient time. Members, including those filling vacated positions, may be re-appointed by the Executive Director for a subsequent term.
D. In the event of an unexpected or expected vacancy, the DUR Coordinator and Office of Pharmacy may recommend a qualified replacement candidate to DOM's Executive Director for emergency approval.
E. The Executive Director shall fill any vacancy before the end of the term, and the person appointed to fill the vacancy shall serve for the remainder of the unexpired term. Members, including those filling vacated positions, may be re-appointed by the Executive Director for a subsequent term.

Section 4 - Attendance

A. Members are required to attend at least fifty percent of the meetings per year. Failure to attend meetings without an explanation of extenuating circumstances will result in the termination of the member's appointment.
B. Members are asked to give advance notice regarding any planned absences so that a quorum may be determined prior to meetings.

Section 5 - Resignation

A member of the DUR Board may resign by giving a 30 day written advance notice to the DUR Board Chair and DUR Coordinator.

Section 6 - Removal

A member of the DUR Board may be removed by either the DUR Board Chair or majority vote of the DUR Board for good cause. Good cause may be defined as one or more of the following conditions:

A. Lack of attendance –failure to attend at least 50% of the scheduled DUR meetings shall constitute a resignation by said DUR Board member,
B. Identified misconduct or wrongdoing during any DUR Board term, or

C. Not disclosing a conflict of interest either upon initial disclosure or throughout the rest of the term.

Section 7 - Board Officers

At the first meeting of the state fiscal year, which constitutes July 1 through June 30, board members shall select two members to serve as Chair and Chair-Elect of the board, respectively. The Chair and Chair-Elect shall both serve one year terms. At the end of the serving year, the Chair-Elect assumes the role of Chair, and a new Chair-Elect will be chosen.

If the persons serving as Chair and Chair-Elect have either previously served as Chair or Chair-Elect, that person may be reelected to either posting.

The Chair-Elect will serve as Chair in absentia of the Chair or by the Chair's request.

Section 8 – Reimbursement

The Division of Medicaid will reimburse DUR Board members for travel related expenses.

Article III. Meetings

Section 1 – Frequency

The DUR Board shall meet at least quarterly, and may meet at other times as necessary for the purpose of conducting business that may be required. The DUR Board Chair, a majority of the members of the board, or the Division of Medicaid Office of Pharmacy and DUR Coordinator, shall maintain the authority of calling DUR meetings.

Section 2 – Regular Meetings

The DUR Board will hold regular quarterly meetings in the city of Jackson, Mississippi. Meetings will occur at the predesignated time and place. Dates for the upcoming year's quarterly meetings will be posted before the first quarterly meeting of the upcoming year.

Section 3 – Special Meetings

The DUR Board may meet at other times other than regular quarterly meetings as deemed necessary and appropriate. The DUR Coordinator and Office of Pharmacy must notify DUR Board members of any special meeting at least two weeks, i.e., ten (10) days, prior to the requested meeting date. Special meetings may be requested by the following officials:

A. Division of Medicaid Executive Director,
B. DUR Coordinator and Office of Pharmacy,
C. DUR Board Chair, or
D. Majority of DUR Board members via communication to DUR Coordinator and/or DUR Board Chair.

Section 4 – Meeting Notice

DUR Board members will be notified of the location for the meeting a minimum of ten (10) days in advance. Notification may include one or a combination of the following methods: e-mail, fax, or other written communication. DUR Board members are required to keep on file with
DOM Office of Pharmacy his or her address, primary phone number, alternate phone number (i.e., cell), fax number, and email address to which notices and DUR related communications may be submitted.

Meetings may be cancelled due to lack of quorum, severe inclement weather, or other reasons as determined by the DUR Coordinator and Office of Pharmacy. In the event of a cancellation, the DUR Coordinator and DOM Pharmacy staff will communicate with DUR Board members regarding the meeting cancellation as soon as circumstances permit. Notifications shall also be posted with DFA and on DOM's website to ensure that the public is notified of any meeting cancellation.

DUR Board Meetings shall be open to the public and conducted in accordance with state law, specifically the Open Meetings Act. Notice of any meetings held shall be provided at least five (5) days in advance of the date scheduled for the meeting. The notice shall include the date, time, place and purpose for the meeting and shall identify the location of the meeting to the general public.

Section 5 – Meeting Sign-In

All meeting attendees will be required to sign-in at the meeting entrance for DUR meetings. Sign-in sheets will be logged, scanned and transferred to electronic medium for official records. All attendees shall include participant's name and entity represented (as applicable).

Section 6 – Quorum

A simple majority of voting board members shall constitute a quorum and must be present for the transaction of any business of the board. For a fully-appointed 12-person DUR Board as required by state law, seven voting board members constitutes a quorum. If a quorum is not present, the Chair, Chair-Elect or DUR Coordinator maintains the responsibility to conclude meeting proceedings. Meeting minutes shall reflect that a quorum was not present.

Section 7 – Voting

The voting process shall be conducted by the Chair or the Chair-Elect in absentia of the Chair.

All board recommendations shall begin with a motion by a voting board member. The motion may then be seconded by a voting board member. If a recommendation does not receive a second motion, the motion shall not pass. If a recommendation receives a second motion, then the board shall vote on the motion. A motion shall be considered as passed if the motion carries a majority of votes if a quorum of the board is present.

In the event that a motion receives a tie vote in the presence of a quorum, the motion shall not pass. The motion can be brought up for further discussion after which a subsequent motion may be made to vote on the issue again during the same meeting, or a motion can be made to table the issue and discussion until the next quarterly DUR Board meeting.

A vote abstention occurs when a voting member is present for the meeting and the action but has chosen not to vote on the current motion. An abstention is a vote with the majority on the measure. A recusal, on the other hand, is necessitated when a voting member has a conflict of interest or potential pecuniary benefit resulting from a particular measure. In order to properly and completely recuse oneself from a matter, the DUR Board member must leave the room or area where discussions, considerations, or other actions take place

before the matter comes up for discussion. The member must remain absent from the meeting until the vote is concluded. The minutes will state the recusing member left the room before the matter came before the DUR Board and did not return until after the vote.

Section 8 – Minutes

A public body speaks only through its minutes. State law, specifically the Open Meetings Act, requires minutes be kept of all meetings of a public body, whether in open or executive session, showing the following:

A. Members present or absent,
B. Date, time and place of meeting,
C. Accurate recording of any final actions taken,
D. Record, by individual member, of how s/he voted on any final action, and
E. Any other information that the public body requests is reflected in the minutes.

The minutes shall be finalized no later than thirty (30) days after the adjournment of the DUR Board meeting and shall be made available for public inspection. DOM Office of Pharmacy posts all DUR Board Minutes on the DUR webpage.

Section 9 – Speakers & Special Topics

DUR Board members may request various healthcare, industry, or specialized professionals to present at DUR meetings regarding a posted topic on an upcoming DUR agenda.

A. The DUR Board may allow up to 20 minutes for topic presentation by an invited speaker.
B. DUR Board Members may ask a member of the audience to provide information on a topic being discussed by the Board. Invited participants may be asked to disclose any potential conflicts of interests if applicable. (See Article IV, Section 1).
C. Members of the audience may not speak unless so designated at the appropriate time by a DUR Board member.
D. DUR Board Members, both voting and non-voting, maintain speaking privileges at DUR meetings.
E. Contracted employees of DOM and employees of other DOM vendors are considered members of the audience.

Section 10 – Executive Session

During special circumstances, the DUR Board may go into executive session at the conclusion of normal meeting proceedings; however, all DUR Board meetings must commence as an open meeting. In order for executive session to be called, the following procedure must be followed in accordance with the Open Meetings Act:

A. A member may <u>move to close</u> the meeting to determine whether board needs to go into executive session; vote in open meeting with vote recorded in minutes, majority rules.
B. Closed meeting: vote taken on whether to <u>declare</u> executive session, requires 3/5 of all members present.
C. Board comes back into open session and states statutory reason for executive session. The reason for the executive session shall be recorded in the meeting minutes.
D. Board members then will go into executive session where action may be taken on stated subject matter only.

E. Minutes must be kept in accordance with the Open Meetings Act.

Section 11 – Conduct of Participants

Pursuant to state law, specifically the Open Meetings Act, the DUR Board may make and enforce reasonable rules and regulations for the conduct of persons attending the DUR meetings. The following is a non-exhaustive list of rules for DUR Board meetings:

A. Attendees should please remain silent and allow for the efficient transaction of business.
B. Cell phones should be placed on silent or vibrate.
C. Laptop computers are discouraged from being utilized during meetings as frequent typing may distract board members.
D. Food and drink are not allowed in the meeting room.
E. Security is provided by the state. Guests not following proper decorum may be asked to leave by security.

Article IV. Public Participation

Section 1 - Disclosure of Persons Appearing Before DUR Board

The DUR Board may ask individuals appearing before the board to disclose either in writing or verbally their relationship, as applicable, including but not limited to pharmaceutical companies or special interest groups. Any such disclosures should be recorded as a matter of public record in the documented meeting minutes.

Article V. Conflicts of Interest

DUR Board members are expected to maintain the highest professional, ethical standards. A conflict of interest may exist when a DUR Board member maintains a financial/pecuniary, personal, or professional interest that may compete or interfere with the DUR Board member's ability to act in a fair, impartial manner while acting in the best interests of the Division of Medicaid and the beneficiaries that it serves.

As such, DUR Board members are required to complete and submit annually a Conflict of Interest disclosure statement with the DOM Office of Pharmacy and DUR Coordinator. Statements shall be maintained by the Office of Pharmacy. Members have an ongoing responsibility to update and revise said statements, disclosing any new conflicts of interest to the DUR Coordinator and DOM Office of Pharmacy.

It is the sole responsibility and requirement of each board member to review the agenda of each forthcoming board meeting to determine any if any potential conflicts of interest exist. If so, an aforementioned Disclosure statement must be updated indicating the conflict of interest. The board member should notify the Chair or Chair-Elect of the conflict of interest prior to the meeting.

A DUR Board member shall recuse himself/herself from any vote, action, or discussion pertaining to any product or product class if there is documentation stating an actual or perceived conflict of interest. Please refer to the procedure outlined in Article III, Section 7.

Article VI. Confidentiality

DUR Board members are required to safeguard all confidential and proprietary information, including but not limited to pricing information, which is disclosed by the Mississippi Division of Medicaid for purposes of conducting DUR Board activities. Any provider or patient specific information discussed by the DUR Board shall also be kept strictly confidential in accordance with state and federal law.

Article VII. Amendments

Proposed Amendments of By-Laws

A. Proposed amendments must be submitted to the DUR Coordinator at least thirty (30) days prior to the next scheduled DUR meeting and the proposed amendments will be disseminated to the DUR Board en masse for consideration at said DUR Board meeting.
B. Proposed amendments will be distributed to board members no less than five (5) business days prior to next DUR Board meeting.
C. Proposed amendments will be initiated by the Chair, or the Chair-Elect in absentia of the Chair, prior to Next Meeting Information announcements.
D. Proposed amendments will be voted upon at the next scheduled DUR Board meeting. If majority of DUR Board votes to ratify amendment, the amendment will take effect immediately at the conclusion of the meeting.

MS-DUR BOARD
COMMON ABBREVIATIONS

AWP	Any Willing Provider, Average Wholesale Price
BENE	Beneficiary
CAH	Critical Access Hospital
CCO	Coordinated Care Organization
CDC	Centers for Disease Control
CHIP	Children's Health Insurance Program
CMS	Center for Medicare and Medicaid Services
COB	Coordination of Benefits
CPC	Complex Pharmaceutical Care
DME	Durable Medical Equipment
DOC	Department of Corrections
DOM	Division of Medicaid
DUR	Drug Utilization Review
EOB	Explanation of Benefits
EPSDT	Early and Periodic Screening, Diagnosis and Treatment
FA	Fiscal Agent
FFS	Fee For Service
FPW	Family Planning Waiver
FQHC	Federally Qualified Health Clinic
FY	Fiscal Year
HB	House Bill
HCPCS/ HEIDIS	Health Plan Employer Data and Information Set
HHS	Department of Health and Human Services
HIPAA	Health Insurance Portability and Accountability
IDD	Intellectual and Developmental Disabilities
LTC	Long Term Care
MAG	Magnolia Health
MEDD	Morphine Equivalent Daily Dose
MOL	Molina Healthcare
MPR	Medication Possession Ratio
MSCAN	Mississippi Coordinated Access Network
MSDH	Mississippi State Department of Health
NADAC	National Average Drug Acquisition Cost
NDC	National Drug Code
P&T	Pharmacy and Therapeutics
PA	Prior Authorization
PBM	Pharmacy Benefit Manager
PDC	Proportion of Days Covered
PDL	Preferred Drug List
PI	Program Integrity
PIP	Performance Improvement Program
POS	Point of Sale, Place of Service, Point of Service
Pro-DUR	Prospective Drug Use Review
OTC	Over the Counter
QI	Quality Indicator
QIO	Quality Improvement Organization
QM	Quality Management
RA	Remittance Advise
REOMB	Recipient's Explanation of Medicaid Benefits
Retro-DUR	Retrospective Drug Utilization Review
RFI	Request for Information
RFP	Request for Proposal
RHC	Rural Health Clinic
SB	Senate Bill
SCHIP	State Child Health Insurance Program
SMART PA	Conduent's Pharmacy Application (SmartPA) is a proprietary electronic prior authorization system used for Medicaid fee for service claims
SPA	State Plan Amendment
UHC	United Healthcare
UM/QIO	Utilization Management and Quality Improvement Organization
UPDL	Universal Preferred Drug List
UR	Utilization Review
VFC	Vaccines for Children
WAC	Wholesale Acquisition Cost
WIC	Women, Infants, Children
340B	Federal Drug Discount Program