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Changes in Utilization and Expenditures Among Commercially Insured U.S. Adults With Diabetes During the COVID-19 Pandemic: Preliminary Findings

Xilin Zhou, PhD, Elizabeth A. Lundeen, PhD, Deborah B. Rolka, MS

Introduction: People with diabetes were among the populations that experienced the most profound impacts during the COVID-19 pandemic. The authors estimated changes in healthcare utilization and expenditures for commercially insured adults aged 18–64 years with diabetes during the pandemic.

Methods: Medical claims data were from IQVIA PharMetrics Plus. Linear regressions were used to estimate the changes in utilization (per 1,000 individuals) for inpatient stays, emergency room visits, physician office visits, and ambulatory surgery center procedures. Changes in expenditures, in total and out of pocket, were estimated using generalized linear models. Expenditures were adjusted to 2021 U.S. dollars using the Consumer Price Index.

Results: Utilization was reduced significantly for all service types during the pandemic. Although the largest reduction occurred between March 2020 and May 2020, the decrease persisted throughout 2021. During March 2020–May 2020, ambulatory surgery center procedures were reduced by 4.7 visits per 1,000 individuals. The reduction ranged between 0.4 and 1.3 visits per 1,000 individuals subsequently. Expenditures declined for all service types during March 2020–May 2020. However, after May 2020, the reduction remained statistically significant only for physician office visits for all months, with varying changes in expenditures for other service types.

Conclusions: Healthcare utilization and expenditures reduced among commercially insured adults with diabetes during the COVID-19 pandemic.

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic had an abrupt and significant impact on the healthcare system in the U.S. Among the populations that experienced the most profound effects were individuals with diabetes. Research has indicated that both inpatient and outpatient visits for Medicare fee-for-service beneficiaries with diabetes declined by 30%–50% from March to May 2020, when compared with visits in the months preceding the pandemic.[1]

Several studies have examined utilization changes among the general population rather than among people with diabetes and have focused on specific service types, such as emergency room (ER) visits,[2] outpatient visits,[3,4] and elective and nonelective care.[5] Still, there is a lack of knowledge regarding the overall impacts of healthcare service changes. Furthermore, most existing studies have restricted their analyses to the early stage of the

From the Division of Diabetes Translation, Centers for Disease Control and Prevention, Atlanta, Georgia

Address correspondence to: Xilin Zhou, Division of Diabetes Translation, Centers for Disease Control and Prevention, 4770 Buford Highway Northeast, Mail Stop F-75, Atlanta GA 30341. E-mail: kqt5@cdc.gov.

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pandemic.[6] Extending the analysis over a longer period is necessary as additional data become available. As demonstrated by previous studies, healthcare utilization and population-level spending among Medicare beneficiaries were still below prepandemic levels 2 years after the pandemic outbreak.[1,7] However, the degree to which the pandemic has affected healthcare utilization and expenditures for people with diabetes covered by commercial insurance remains unclear. This study aims to address this knowledge gap by investigating the changes in healthcare utilization and expenditures among adults with diabetes, aged 18 to 64 years, who were covered by commercial insurance during the COVID-19 pandemic.

METHODS

Data were from IQVIA PharMetrics Plus (2022 Q4 data release version; IQVIA, Durham, NC), which is a comprehensive database of adjudicated healthcare claims representing 163 million enrollees spanning the U.S. In this study, the authors included individuals aged 18−64 years who maintained continuous enrollment in commercial health insurance for a minimum of 24 months and had diabetes. The identification of diabetes was based on the presence of at least 1 inpatient claim or 2 different-day outpatient claims containing ICD-10-CM codes E10, E11, or E13 within a 24-month timeframe.

Authors examined 4 types of healthcare services: inpatient stays, ER visits, physician office visits, and ambulatory surgery center (ASC) procedures. For each service type, the authors compared utilization and expenditures, averaged at the per thousand-person level, during the early pandemic period (March 2020−December 2021) with those during the prepandemic period (March 2018−December 2019). Expenditures, both total and out of pocket (OOP), were adjusted to 2021 U.S. dollars using the Consumer Price Index Medical Care component.

Changes in utilization were quantified by linear regressions. Average use of each service type was regressed on 4 phase indicators that corresponded to different stages of the pandemic: Phase 1 (March 2020−May 2020), Phase 2 (June 2020−December 2020), Phase 3 (January 2021−June 2021), and Phase 4 (July 2021−December 2021) (Appendix 1, available online).[1] The division into phases was based on data patterns and COVID-19−related policies and news. For assessing expenditures, authors employed generalized linear models utilizing a gamma distribution with a log link. In all models, the proportion of people in age (18−44, 45−54, 55−64 years) and sex (male and female) categories as covariates were included. The authors also incorporated fixed effects for both state and month, and SEs were clustered at the state and month levels. In addition, the authors weighted the estimates by the population of enrollees in each state. Similar methods were used in other studies.[1,3] Analyses were performed using SAS 9.4 (SAS Institute, Cary, NC) and Stata 17 (StataCorp LLC., College Station, TX).

RESULTS

Table 1 presents the descriptive statistics of the study sample. More than half of the study sample were aged 55−64 years, and around 56% of them were male. The average utilization and total expenditures were the lowest in Phase 1 (March−May 2020) for all service types. However, OOP expenditures did not follow a consistent pattern and exhibited fluctuations.

Utilization during the pandemic period was notably lower than during the prepandemic period (Table 2). The largest decreases occurred from March to May 2020, with a reduction of 189.5 visits per 1,000 individuals for physician office visits and a decrease of 4.7 procedures per 1,000 individuals for ASC procedures. Even in 2021, all service types continued to exhibit utilization levels below those seen before the pandemic.

Changes in total and OOP expenditures exhibited some fluctuations (Table 3). Both total and OOP expenditures decreased in the initial phase (March−May 2020) of the pandemic for all service types. Total expenditures remained below prepandemic levels for physician office visits and some months of ER visits (June 2020−June 2021) and ASC procedures (July 2021−December 2021). OOP expenditures exceeded prepandemic levels during the first half of 2021 for physician office visits and ASC procedures but declined below prepandemic levels in the latter half of the same year.

DISCUSSION

Authors examined changes in healthcare utilization and expenditures in commercially insured adults with diabetes during the first 22 months of the COVID-19 pandemic. This study's findings revealed a decrease in both utilization and expenditures across various service types during the early stages of the pandemic. Importantly, certain reductions remained evident throughout 2021.

The findings corroborate previous studies that have similarly demonstrated a substantial reduction in healthcare utilization during the COVID-19 pandemic, affecting both the general population and individuals with diabetes.[1,3,5,8−11] This study specifically indicates that among a group of commercially insured adults with diabetes, a decline in utilization and expenditures persisted

Table 1. Descriptive Statistics of Adults Aged 18–64 Years With Diabetes Who Held Commercial Insurance[a]

Category	Prepandemic (March 2018–December 2019)	Phase 1 (March 2020–May 2020)	Phase 2 (June 2020–December 2020)	Phase 3 (January 2021–June 2021)	Phase 4 (July 2021–December 2021)
Monthly *n*	1,171,889	1,201,130	1,230,142	1,181,541	1,228,461
Age, years (%)					
18–44	15.6	15.6	16.1	16.0	16.4
45–54	30.0	29.5	29.8	29.6	30.0
55–64	54.4	54.8	54.1	54.3	53.5
Sex (%)					
Female	44.1	43.9	44.0	43.9	43.9
Male	55.9	56.1	56.0	56.1	56.1
Utilization (number)					
Inpatient	14 (14, 14)	11 (11, 12)	14 (13, 14)	13 (13, 14)	13 (13, 13)
ER	39 (39, 40)	29 (28, 30)	35 (34, 36)	36 (35, 37)	39 (37, 40)
Physician office	776 (771, 781)	585 (572, 597)	737 (729, 746)	749 (738, 760)	755 (746, 764)
ASC	8 (8, 8)	4 (3, 4)	7 (7, 8)	7 (7, 7)	7 (7, 8)
Expenditure ($)					
Inpatient					
Total	447,456 (440,188; 454,723)	363,829 (343,272; 384,387)	459,108 (443,780; 474,436)	451,699 (436,456; 466,942)	432,562 (418,124; 446,999)
OOP	30,356 (29,201; 31,511)	26,920 (23,801; 30,040)	27,470 (25,417; 29,523)	30,703 (28,725; 32,680)	24,544 (22,656; 26,432)
ER					
Total	33,854 (33,160; 34,548)	24,679 (23,190; 26,167)	29,655 (28,572; 30,738)	31,638 (30,348; 32,928)	33,545 (32,206; 34,884)
OOP	7,363 (7,189; 7,537)	5,960 (5,553; 6,366)	5,321 (5,114; 5,528)	7,453 (7,143; 7,764)	5,549 (5,302; 5,797)
Physician office					
Total	116,466 (115,242; 117,690)	81,030 (78,276; 83,784)	106,438 (104,320; 108,556)	108,980 (106,483; 111,477)	110,778 (108,415; 113,141)
OOP	29,286 (28,831; 29,742)	21,140 (20,112; 22,168)	22,369 (21,930; 22,807)	32,600 (31,692; 33,508)	22,711 (22,264; 23,158)
ASC					
Total	16,835 (16,191; 17,479)	8,011 (6,866; 9,156)	15,575 (14,504; 16,646)	15,220 (14,095; 16,345)	16,111 (14,995; 17,227)
OOP	2,405 (2,307; 2,504)	1,454 (1,256; 1,652)	2,024 (1,885; 2,162)	2,714 (2,536; 2,893)	1,958 (1,815; 2,101)

Note: Utilization was measured as number of visits per 1,000 individuals. Expenditures were averaged per 1,000 individuals. Expenditures were adjusted to 2021 U.S. dollars. Monthly *n* represents the average number of persons with diabetes by month. The 95% CIs are in parentheses.
[a]Data were from IQVIA PharMetrics Plus.
ASC, ambulatory surgery center; ER, emergency room; OOP, out of pocket.

beyond the initial months of the pandemic, extending throughout 2021.

A decrease in healthcare utilization has the potential to significantly affect the health outcomes of individuals with diabetes. The disruptions brought about by the COVID-19 pandemic have led to interruptions in the regular monitoring of critical biometrics, such as blood glucose, blood pressure, and lipid levels, among those with diabetes.[12] The consequence of inadequate healthcare utilization may result in an elevated risk of diabetes complications.

Study's findings provide a comprehensive understanding of the extent of the disruption in healthcare utilization and expenditures during a longer duration of the pandemic among people with diabetes. This will provide valuable insights for policymakers and healthcare providers in developing effective action plans to ensure that adequate resources are allocated to meet the needs of this vulnerable population. As some governments plan long-term strategies to address new episodes of the COVID-19 pandemic and future pandemics,[13] this study's findings underscore the opportunity to integrate

Table 2. Changes in Utilization (Number of Visits) During the COVID-19 Pandemic Among Adults Aged 18–64 Years With Diabetes Who Held Commercial Insurance[a]

Setting	Phase 1 (March 2020–May 2020)	Phase 2 (June 2020–December 2020)	Phase 3 (January 2021–June 2021)	Phase 4 (July 2021–December 2021)
Inpatient	−3.3 (−3.7, −2.9)	−0.8 (−1.1, −0.5)	−0.9 (−1.3, −0.6)	−0.7 (−1.0, −0.4)
ER	−9.2 (−10.4, −8.0)	−2.4 (−3.2, −1.5)	−3.3 (−3.9, −2.6)	−1.0 (−1.7, −0.3)
Physician office	−189.5 (−207.2, −171.8)	−14.7 (−27.3, −2.2)	−24.7 (−38.3, −11.2)	−15.1 (−25.2, −5.1)
ASC	−4.7 (−5.2, −4.1)	−1.3 (−1.5, −1.0)	−0.4 (−0.7, −0.2)	−0.7 (−1.0, −0.5)

Note: Utilization was measured as number of visits per 1,000 individuals. The 95% CIs are in parentheses.
[a]Data were from IQVIA PharMetrics Plus.
ASC, ambulatory surgery center; ER, emergency room.

Table 3. Changes in Expenditures ($) During the COVID-19 Pandemic Among Adults Aged 18–64 Years With Diabetes Who Held Commercial Insurance[a]

Setting	Cost Type	Phase 1 (March 2020–May 2020)	Phase 2 (June 2020–December 2020)	Phase 3 (January 2021–June 2021)	Phase 4 (July 2021–December 2021)
Inpatient	Total	−85,529 (−129,090; −41,969)	15,206 (−13,596; 44,009)	11,771 (−12,255; 35,796)	−6,296 (−54,066; 41,474)
	OOP	−7,168 (−12,569; −1,766)	−4,555 (−8,204; −907)	1,860 (−1,775; 5,496)	−5,826 (−10,628; −1,024)
ER	Total	−8,378 (−13,320; −3,436)	−3,129 (−4,913; −1,346)	−1,852 (−3,330; −374)	−1,042 (−3,070; 985)
	OOP	−1,865 (−3,464; −267)	−2,726 (−3,750; −1,702)	99 (−562, 760)	−1,643 (−2,574; −712)
Physician office	Total	−40,329 (−53,366; −27,292)	-11474 (-17310, -5638)	−8,513 (−15,634; −1,393)	−5,956 (−10,977; −935)
	OOP	−12,076 (−18,726; −5,425)	−9,289 (−12,541; −6,037)	3,050 (314; 5,785)	−3,596 (−6,078; −1,113)
ASC	Total	−10,086 (−16,840, −3,332)	−128 (−1,761; 1,504)	−1,428 (−3,117; 261)	−1,413 (−2,505; −322)
	OOP	−1,320 (−2,341; −299)	−437 (−810, −65)	376 (105, 647)	−381 (−602, −159)

Note: Expenditures were averaged per 1,000 individuals. Expenditures were adjusted to 2021 U.S. dollars. The 95% CIs are in parentheses.
[a]Data were from IQVIA PharMetrics Plus.
ASC, ambulatory surgery center; ER, emergency room; OOP, out of pocket.

diabetes considerations into these emergency preparedness initiatives.

This study has several limitations. First, the study sample was derived from a convenience sample of individuals with commercial insurance, which restricts the generalizability of the findings to a national level. Second, the findings were descriptive and did not account for confounding factors except for age and sex composition. The causal impacts of the pandemic on utilization and expenditures were not ascertained.

CONCLUSIONS

This study found a decline in both healthcare utilization and expenditures within a population of commercially insured adults with diabetes during the COVID-19 pandemic. Understanding these patterns may help identify opportunities for future intervention and prevention measures.

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CREDIT AUTHOR STATEMENT

Xilin Zhou: Conceptualization, Methodology, Formal analysis, Writing — original data. Elizabeth A. Lundeen: Data curation, Writing - review & editing. Deborah B. Rolka: Conceptualization, Writing - review & editing.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.focus.2024.100254.

REFERENCES

1. Zhou X, Andes LJ, Rolka DB, Imperatore G. Changes in health care utilization among Medicare beneficiaries with diabetes two years into the COVID-19 pandemic. *AJPM Focus.* 2023;2(3):100117. https://doi.org/10.1016/j.focus.2023.100117.
2. Hartnett KP, Kite-Powell A, DeVies J, et al. Impact of the COVID-19 pandemic on emergency department visits—United States, January 1,

2019−May 30, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69 (23):699–704. https://doi.org/10.15585/mmwr.mm6923e1.
3. Chatterji P, Li Y. Effects of the COVID-19 pandemic on outpatient providers in the United States. *Med Care.* 2021;59(1):58–61. https://doi.org/10.1097/MLR.0000000000001448.
4. Roth SE, Govier DJ, Marsi K, Cohen-Cline H. Differences in outpatient health care utilization 12 months after COVID-19 infection by race/ethnicity and community social vulnerability. *Int J Environ Res Public Health.* 2022;19(6):3481. https://doi.org/10.3390/ijerph19063481.
5. Whaley CM, Pera MF, Cantor J, et al. Changes in health services use among commercially insured US populations during the COVID-19 pandemic. *JAMA Netw Open.* 2020;3(11):e2024984. https://doi.org/10.1001/jamanetworkopen.2020.24984.
6. De Sarro C, Papadopoli R, Morgante MC, Pileggi C. A new emergency during the latest phase of the COVID-19 pandemic: access to healthcare services by patients with non-communicable diseases. *Front Med (Lausanne).* 2023;10:1261063. https://doi.org/10.3389/fmed.2023.1261063.
7. Wang Y, Zhang P, Zhou X, Rolka D, Imperatore G. Impact of the COVID-19 pandemic on medical expenditures among Medicare fee-for-service beneficiaries aged ≥67 years with diabetes. *Diabetes Care.* 2024;47(3):452–459. https://doi.org/10.2337/dc23-1679.
8. Ziedan E, Simon KI, Wing C. *Effects of state COVID-19 closure policy on non-COVID-19 health care utilization*. Cambridge, MA: National Bureau of Economic Research; 2020. https://www.nber.org/system/files/working_papers/w27621/w27621.pdf. Accessed February 22, 2023.
9. Chen JL, Krupp GR, Lo JY. The COVID-19 pandemic and changes in health care utilization among patients with type 2 diabetes. *Diabetes Care.* 2022;45(4):e74–e76. https://doi.org/10.2337/dc21-2248.
10. Varandani S, Nagib ND. Evaluating the impact of the COVID-19 pandemic on monthly trends in primary care. *Cureus.* 2022;14(8):e28353. https://doi.org/10.7759/cureus.28353.
11. Kim Y, Gordon A, Rowerdink K, Herrera Scott L, Chi W. The impact of the COVID-19 pandemic on health care utilization among insured individuals with common chronic conditions. *Med Care.* 2022;60 (9):673–679. https://doi.org/10.1097/MLR.0000000000001747.
12. American Diabetes Association. Standards of medical care in diabetes-2022 abridged for primary care providers. *Clin Diabetes.* 2022;40 (1):10–38. https://doi.org/10.2337/cd22-as01.
13. Visscher K, Kouwenberg LH, Oosterhoff M, Rotteveel AH, De Wit GA. Postponed healthcare in the Netherlands during the COVID-19 pandemic and its impact on self-reported health. *Front Health Serv.* 2023;3:1181532. https://doi.org/10.3389/frhs.2023.1181532.