

## Clinical Interactions between Obesity and Diabetes and High Prescription Drugs Costs

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Clinical interactions between obesity and diabetes and high prescription drugs costs raise concern about increased health resource use and expenditures for diabetes patients who are obese. Highlighting the disproportionate prescribed medication use and expenditures attributable to obesity can help inform ongoing health policy discussion about efforts to stem high prescription drugs costs, especially nonelderly adults with co-occurring conditions such as diabetes and obesity. In this study we investigate the association between obesity and prescribed medication use and expenditures for nonelderly adults with reported treatment for diabetes. We examined not only total prescribed medication use and expenditures, but also the use of diabetes and selected comorbidities medications as well as expenditures for diabetes medications and selected comorbidities medications. We find that more than 61% of diabetes patients are obese. Our result showing that a majority of persons with diabetes are obese is consistent with a previous study that 85% of patients with type-II diabetes were overweight or obese.

Diabetes is a progressive disease and the presence of obesity may lessen the effectiveness of therapy, adversely affect patients' health outcomes, and contribute to increased health care utilization and expenditures. Consequently, health care use and expenditures will be higher for obese persons with diabetes compared with non-obese persons with diabetes. We find that compared to non-obese diabetes patients, obese diabetes patients filled more prescriptions for diabetes medications and medications for selected comorbid conditions, and had more prescribed medications for all types of conditions. Obese diabetes patients also spent more on diabetes medications, selected comorbidities medications, and total prescribed medications than non-obese diabetes patients. Our results are consistent with other studies that finds that total prescription medication costs are higher of the obese than for the non-obese. The results from the multivariate analyses also indicate that a number of demographic, economic, and health characteristics were significantly associated with medication use and expenditures.

A possible explanation for the differences in medications use and expenditures between the obese and non-obese is that the obese may adhere to their medications because of increased comorbidities risk (e.g., cardiovascular disease), and consequently fill more medications to help avert further diabetes-related complications. Higher prescribed medication use, in turn, may result in increased expenditures for the obese. Evidence from other disease areas, however, suggests that the obese are less likely to adhere to their medications than the non-obese.

Another possible explanation is that expenditures on medications and total health care may be higher for the obese compared to the non-obese if obese diabetes patients are more inclined to use expensive injectable and oral medications. However, the obese are more likely to have lower incomes, be publicly insured, and less likely to be employed. All of these characteristics, which are negatively correlated with the demand for expensive medications, suggest that higher medication and total health care expenditures are, most likely, attributable to the presence of obesity.

Evidence suggests that health status and comorbid conditions are intermediate pathways through which BMI affects health services use. As a sensitivity analyses, we re-estimated our multivariate models with perceived health status and the presence of major comorbidities (hypertension, dyslipidemia, and other cardiovascular diseases) as additional regressors. The results from the sensitivity analyses indicate that the effects of obesity on medication use and expenditures are generally smaller compared to the results from our benchmark multivariate models. However, the effects of obesity remain statistically significant except medication expenditures for selected comorbid conditions and total prescribed medication expenditures. Our sensitivity analyses also confirm findings from previous literature that suggest that health status and comorbidities are, perhaps, intermediate pathways through which obesity affect medication use and expenditures.

We also examined the effects of obesity on the number of ambulatory visits and the number of inpatient hospital stays as well as their corresponding expenditures, and total expenditures net of prescribed medication expenditures. The effects of obesity were not significant for these outcome variables except, the number of ambulatory visits.

Our study is not without limitations. A notable caveat of this study is that we do not investigate the causality of the relationship between obesity and medication use and expenditures since the precise mechanisms that link body weight with diabetes are still unclear. The study also does not examine the role of disease severity in the relationship between obesity and medication use and expenditures. The obese may be sicker than the non-obese, causing the obese to fill more medications, and incur higher expenditures. The MEPS data, however, do not allow us to control for disease severity nor does it allow us to examine the direction of causality between obesity and disease severity. Our sample contain type-I diabetes patients. Evidence suggests that factors that drive higher health resource use and expenditures are unlikely to be similar for type-I and type-II diabetes patients. To help lessen this impact on our estimates, we excluded persons younger than 18 years from our study. The small number of type-I patients are therefore unlikely to markedly affect our results. The study also relies

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on BMI calculated using self-reported measures of height and weight, and may therefore be subject to reporting error.

This study provides a wealth of information that can help inform health policies aimed at prioritizing an integrated disease management approach for patients with diabetes. In particular, it suggests that policymakers and healthcare providers should pay special attention

to obesity in disease management for diabetes patients. Future studies should examine the causal relationship between obesity and different types of prescription medication use and expenditures in diabetes patients. Future studies should also examine the extent to which differences in medication use and expenditures between the obese and the non-obese are driven by differences in medication adherence and medications types.