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Exhaustion of Food Budgets at Month's End and Hospital Admissions for Hypoglycemia

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Abstract

One in seven US households cannot reliably afford food. Food budgets are more frequently exhausted at the end of a month than at other points in time. We postulated that this monthly pattern influenced health outcomes, such as risk for hypoglycemia among people with diabetes. Using administrative data on inpatient admissions in California for 2000–08, we found that admissions for hypoglycemia were more common in the low-income than the high-income population (270 versus 210 admissions per 1,000,000). Risk for hypoglycemia admission increased 27 percent in the last week of the month compared to the first week in the low-income population, but we observed no similar temporal variation in the high-income population. These findings suggest that exhaustion of food budgets might be an important driver of health inequities. Policy solutions to improve stable access to nutrition in low-income populations and raise awareness of the health risks of food insecurity might be warranted.

Introduction

In many households, particularly low-income ones, a “pay cycle” develops in which expenditures increase when money (from paychecks or benefits) becomes available, and they decrease just before the next check is due—the time when household budgets are most likely to be exhausted.[1–3] This pattern has been observed for generations. The US Department of Labor noted in 1930 that most factory wage earners spent 75–100% of their earnings “by the end of the day following pay day.”[4] More recently, it has been estimated that expenditures by Social Security beneficiaries increase by almost $50 on the day their check arrives—an 80% increase over average daily expenditures.[1] A 2009 Gallup poll showed that average daily spending among Americans paid monthly or semimonthly was $62 during weeks without a paycheck and $69 during weeks with a paycheck.[5]

A large proportion of Americans receive their paychecks or government benefits at the start of the month, although the precise percentage is difficult to determine. Some employers prefer to issue paychecks just once a month, to keep money earning interest for the employer for a longer time and reduce costs associated with administering paychecks. Employees who receive monthly paychecks are generally paid on the first days of the month.

Social Security checks arrive on the third day of the month for beneficiaries who retired and began receiving benefits before 1997. Temporary Assistance for Needy Families benefits (often called welfare benefits) are often distributed on the first day of the month, depending on the recipient's state of residence. Supplemental Nutrition Assistance Program (SNAP,

formerly known as food stamps) benefits in California and many other states are distributed during the first ten days of the month. Most fixed expenditures are also paid out in the early weeks of the month, leaving less money available at the end of the month. Approximately half of all households making mortgage or rent payments do so between the last day of one month and the seventh day of the next month.[6]

Credit card bills are also frequently due in the beginning or middle of the month. The pay cycle has been well established with respect to food expenditures and dietary intake in low-income households. Studies of food purchasing diaries and grocery store receipts demonstrate decreased spending at the end of the month.[3,7–9] Each month, SNAP benefits last an average of just two to three weeks.[10,11]

Women who report difficulty affording food have statistically significant reductions in their energy and carbohydrate intake during the course of the month.[12] Demand for food from sources such as food pantries and soup kitchens increases at the end of the month.[13,14]

In households receiving federal or state income assistance other than Social Security, spending on food is $2.87 higher during the first week of the month than in the previous week.[6] Retail stores that cater to low-income customers are well aware of this cyclic phenomenon, with some stores increasing staffing and inventory on the first day of the month to accommodate increased demand.[15–17]

We examined whether the pay cycle influences health outcomes. We focused on hypoglycemia as an illustrative outcome because we expected it to be highly influenced by reduced food access. For people with diabetes, a stable dose of medication for glycemic control coupled with a temporary reduction in food intake would be expected to result in increased risk for hypoglycemia. The high and rising rates of diabetes among low-income Americans makes this exploration particularly relevant for food and health policies related to populations with limited incomes.

Any household may experience fluctuating spending related to the pay cycle. However, this pattern is most often observed in low-income households where incomes are fixed and spending is high relative to income. We therefore sought to answer the following questions: Do hospital admissions for hypoglycemia increase at the end of the month? And is this pattern influenced by income?

Study Data and Methods

Data

We used data from California's Office of Statewide Health Planning and Development (OSHPD), which collects cross-sectional administrative data about all admissions to accredited California hospitals at the time of patient discharge. We included all records for patients ages eighteen and older who were admitted from home (instead of from another hospital or a nursing home, prison, or other institution) through the emergency department, from outpatient clinics, or by physician referral directly from home in the period 2000–08.

Defining Diagnoses

We used International Classification of Diseases, Ninth Revision (ICD-9), principal diagnosis codes 251.0–251.2 to identify hospital discharges associated with admissions attributable to hypoglycemia. For simplicity, we refer to these discharges as hypoglycemia admissions.

We did not require admission records attributed to hypoglycemia to indicate an additional diagnosis of diabetes, but we did exclude records where an alternative etiology of hypoglycemia was likely (that is, records with an additional diagnosis of sepsis or insulinoma). We chose appendicitis (ICD-9 codes 540–541) as a control condition because its volume of admissions was similar to that of hypoglycemia and because we did not expect appendicitis admissions to exhibit within-month variation.

Defining Income

We identified patients as “low income” by linking the five-digit ZIP code of the patient's residence (available in the OSHPD database) to the mean household income in each of California's ZIP codes, using data from the Internal Revenue Service (IRS) for 2001–07 (excluding 2003). IRS data are often considered to represent the “gold standard” for income data, against which measurement error in government surveys is estimated for both low-income and high-income households.[18,19]

We categorized admitted patients as “low income” if the mean household income in the ZIP code of the patient's residence was in the lowest decile of incomes for patients admitted that year (rounding up to the nearest $1,000). Thus, the point below which we considered income to be low varied over time: It was $28,000 in 2000–04, $31,000 in 2005–06, and $29,000 in 2007–08. Varying the method of categorizing low-income households and the cutoff point did not substantially alter our study results.

We refer to admitted patients as “high income” if they were not categorized as “low income.” However, they might be better described as “non–low income,” given our very low cutoff point for “low income.” We classified homeless patients, identified within the OSHPD database by the ZIP code “ZZZZZ,” as “low income.” We performed sensitivity analyses with and without including people who were homeless.

Statistical Analysis

We graphed the rate of hospital admissions attributable to our conditions of interest (hypoglycemia and appendicitis) on each day of the month using a scatter plot with fourth order polynomial equations generated using the REG procedure of the statistical software SAS, version 9.2. We then quantitatively examined the rate of hospital admissions attributable to these conditions using Cochran-Armitage trend tests and Poisson regression models.

We examined within-month trends using models with a continuous variable for day of the month and with a categorical variable for each “week” of the month. For the “week” variable, we defined the first seven days of the month as week 1 and the last seven days of

the month as week 4. The remaining days were split evenly between what we defined as week 2 and week 3, with the extra day added to week 3 as needed.

We examined the effect of income in our models by testing for an interaction between income and admission date and by stratifying admission by income level. Because we sought to examine day of the month as an independent risk factor for hypoglycemia, we adjusted our main regression model for sex, age (in ten-year increments), race or ethnicity (white, Latino, African American, Native American, Asian or Pacific Islander, and other or unknown), and admission year (to account for secular time trends unrelated to time of month). These variables were also obtained from the OSHPD database. For all results, the unit of analysis was the hospital admission. Analyses were performed using SAS, version 9.2.

Limitations

Our study had certain limitations. Our measurement of income, which was available only at the level of the ZIP code, was imprecise. Therefore, it is possible that we misclassified some low-income patients as “high income,” and vice versa. In addition, a relatively small number of admissions attributable to hypoglycemia were observed in the low-income group, decreasing the precision of our estimates. Use of ICD-9 codes to identify admissions attributable to hypoglycemia and appendicitis is subject to error, potentially leading to under-, over-, or misclassification of these diagnoses. Each of these sources of error is likely conservative, which suggests that effect sizes would be even greater than what we observed if our measurement had not been subject to error.

We were not able to determine from our data the precise cause of the increased risk of hypoglycemia at the end of the month. Finally, we focused on the most severe episodes of hypoglycemia: those resulting in in-patient admissions. It is possible that the patterns we observed differ from those in discharges from outpatient settings or the emergency department.

Study Results

In the period 2000–08, 24,691,829 patients ages eighteen and older were admitted from home to accredited California hospitals. We were able to link admissions records to income data for 24,251,314 of these admissions (98.2 percent), of which 21,285,725 were categorized as “high income” and 2,965,589 as “low income” (including 129,615 homeless people). Of these admissions, 5,177 had a primary diagnosis of hypoglycemia, and 228,670 had a primary diagnosis of appendicitis. Table 1 shows the demographic characteristics of patients associated with each admission (see Appendix Exhibit A for demographic characteristics stratified by income).

Baseline characteristics of patients admitted for hypoglycemia and appendicitis differed, but our analysis did not directly compare these two groups of patients. Instead, we focused on the within-month patterns of admissions among patients admitted with these two conditions.

We observed no statistically significant variation in the number of overall admissions (that is, admissions for all conditions) by day of the month. When we excluded days 29–31 (because they do not occur in every month), the proportion of total admissions per day of the month ranged from a minimum of 3.16% on day 1 to 3.39% on day 7.

Of every 1,000,000 hospitalizations, 210 were for a primary diagnosis of hypoglycemia. The mean rate of hospital admissions attributable to hypoglycemia was higher in the low-income sample than in the high-income sample (270 versus 210 admissions per 1,000,000; $p < 0:001$). Figure 1 shows the number of admissions attributable to hypoglycemia and appendicitis for every 1,000,000 hospital admissions for each day of the month. A graphical representation of monthly data for three months demonstrates a cyclic pattern of hypoglycemia admissions in the low-income sample only (Appendix Exhibit B).

The rate of hospital admissions attributable to hypoglycemia was stable across the four weeks of the month in the full sample (p for trend = 0.31) but differed significantly by income and admission date. Hospital admissions attributable to hypoglycemia in the low-income sample increased from 230 per 1,000,000 total admissions in the first week of the month to 260 in the second week, 280 in the third week, and 290 in the fourth week (p for trend = 0.02). In the high-income sample, admissions for hypoglycemia per 1,000,000 total admissions in the first through fourth weeks were 210, 200, 200, and 210 (p for trend = 0.92; see Appendix Exhibit C).

During all weeks of the month, the unadjusted rate of hypoglycemia admissions in the low-income sample (230–290 admissions per 1,000,000 total admissions) was higher than that in the high-income sample (200–210).

Poisson regression results are shown in Table 2. Because we found a significant interaction between income and date of admission ($p < 0:001$), we present models stratified by income. Compared to the first week of the month, the rate of admission for hypoglycemia in the low-income sample increased 11 percent in the second week of the month (rate ratio = 1.11), 22 percent in the third week, and 27 percent in the last week. In the high-income sample, the rate of admission for hypoglycemia remained steady throughout the month.

Poisson model results using the day of the month as a continuous variable were also significant in the low-income sample ($p=0.004$) but not the high-income sample ($p=0.8$). We categorized sixty-four of the hypoglycemia admissions as occurring among the homeless population. Of these patients, 81% were male, 39% were African American and 44% non-Hispanic white, and 65% were ages 40–59.

The mean rate of hospital admissions attributable to hypoglycemia was significantly higher in the homeless sample than in the non-homeless low-income sample (490 versus 270 per 1,000,000 admissions; $p< 0.001$). There was no evidence of an end-of-month increase in hospital admissions attributable to hypoglycemia in the homeless sample (p for trend = 0.99). Excluding the patients who were homeless from our main analysis modestly increased the association between date of admission (by week or by day) and risk of admission for hypoglycemia in the low-income sample (Table 2). The rate of hospital admissions for

appendicitis remained stable throughout the month for the full, low-income, and high-income samples (rate ratio 0.99–1.01).

Discussion

Admissions for hypoglycemia were more common among low-income than high-income patients ages eighteen and older. Among low-income adults, hospital admissions for hypoglycemia increased from 230 to 290 admissions per 1,000,000 total admissions from the first to the last week of the month. We did not observe any similar within-month increase among high-income adults or for an income-neutral condition (appendicitis) among low-income adults.

Food Budget Exhaustion and Hypoglycemia Admissions

The vast majority of hypoglycemia cases occur among adults with diabetes who take hypoglycemic medication (either oral medication or insulin) to lower their blood glucose levels.[21] When doses of hypoglycemic medication and physical activity levels are stable, reduced food intake resulting from exhaustion of food budgets at the end of the month would be expected to increase risk for hypoglycemia.

Our observational epidemiologic analysis does not allow us to definitively determine the etiology of the elevated risk for hypoglycemia that we found in low-income households at the end of the month. However, exhaustion of food budgets might play a role for two reasons. First, we observed a higher risk of hypoglycemia at the end of the month only in the low-income population—the group whose food budgets are expected to be exhausted at that time. Second, clinical studies have reported elevated risk for hypoglycemia among low-income patients with diabetes.[22, 23] In these studies, going hungry or being at risk of going hungry was associated with a two-to-threefold increase in the odds of self-reported severe hypoglycemia.

The noncyclic pattern of hypoglycemia admissions in the homeless sample is consistent with a lack of regular (that is, cyclic) income. The homeless population in the United States receives mainstream benefits and employment income at rates that are significantly lower than those of the low-income population overall.[24] Predictable fluctuations in the availability of food throughout the month are less likely to occur for people without stable incomes than for people who do have stable incomes. Excluding homeless adults from our low-income sample modestly increased the association between date of admission and risk of admission for hypoglycemia. This observation is consistent with the hypothesis that the cyclic nature of hypoglycemia in the low-income population is related to the cyclic availability of income (instead of some other aspect of poverty). The extremely high rate of hypoglycemia admissions observed in the homeless population (490 per 1,000,000 total admissions) is notable, consistent with prior qualitative research on hypoglycemia among homeless people, [25] and worthy of further exploration.

Other Potentially Causative Factors

We considered other factors as possible explanations for the monthly variation we found in hypoglycemia admissions. For example, the pattern we observed could be an artifact of

hospitalization patterns for other diseases. Appendicitis served as a control for these hospitalization patterns: Increased appendicitis admissions at the end of the month would have suggested that the apparent increase in hypoglycemia admissions at the end of the month was an artifact of reduced admissions for other conditions (such as substance abuse) at the end of the month.[26] However, we did not observe such a pattern.

It is also possible that within-month patterns in prescription refills influence hypoglycemia risk. For example, regardless of when medication prescriptions are written, low-income patients might preferentially fill or refill prescriptions during the first days of the month, when money is available, and reduce the frequency or dose of medication at the end of the month, when money is not available for refills. We know of no studies demonstrating a monthly pattern of prescription fills and refills. However, such a pattern might be expected to lead to increased use of hypoglycemic medication at the beginning of the month, precipitating hypoglycemia at the beginning (rather than the end) of the month. We did not observe this pattern, either.

Prior studies have shown increased hospitalizations and mortality related to substance abuse during the first days of the month, when money becomes available.[27, 28] This well-known association between the pay cycle and substance abuse is unlikely to explain our observations. Heavy alcohol use is itself associated with hypoglycemia [29,30] and is more common at the beginning of the month, when money becomes available.[28,31] Thus, alcohol-related hypoglycemia admissions would be expected to increase at the beginning (instead of the end) of the month.

It is possible that among substance users with diabetes, the beginning of the month is characterized by higher substance use and lower adherence to diabetes medication regimens, compared to the end of the month—when adherence might increase. This pattern, which has not been previously reported to our knowledge, could contribute to our findings. However, we do not know whether the prevalence of substance abuse among low-income people with diabetes is sufficient to explain the significant temporal pattern we observed.

The administrative data we used did not allow us to explore the multiple forces that might affect hospitalization patterns over the course of the month among low-income adults. Future research should focus on understanding the precise mechanisms by which hypoglycemia admissions increase at the end of the month among low-income adults.

Why Is Hypoglycemia Important?

Hypoglycemic episodes have important clinical implications and health care costs.[23] In the short term, hypoglycemia can cause acute symptoms and traumatic accidents; in the long term, it can reduce quality of life and increase the risk for dementia among the elderly.[32, 33]

Hypoglycemia is one of the most common adverse drug events leading to visits to the emergency department and hospitalizations.[34] In 2003 one health plan estimated that the mean cost per episode of hypoglycemia requiring medical attention was $1,186.[35]

The hypoglycemia events we found in this study are likely a substantial underestimate of hypoglycemic episodes. Most hypoglycemic episodes are never brought to medical

attention; of those that are, many are managed in the outpatient or emergency department setting. Our data did not capture hypoglycemic episodes managed in non-inpatient settings.

Potential Solutions

Because of heightened mortality in the first days of the month (often attributed to increased substance abuse), some experts have suggested increased staffing of emergency departments, hospitals, police, and fire departments during this critical time period.[6] It is important to pay attention to within-month patterns of disease incidence. However, attention must also be paid to disease conditions related to income deprivation that may increase at the end (instead of the beginning) of the month.

Many food pantries and soup kitchens already increase staffing levels and resources at the end of the month, and this flexibility to adapt the hunger safety net to fluctuations in need should be encouraged and supported. As a matter of patient safety, health care settings that cater to low-income populations should identify patients with diabetes who have difficulty affording food and should establish protocols for referring such patients to food pantries, soup kitchens, and federal nutrition programs.

SNAP benefits and some other federal and state benefits are distributed by Electronic Benefits Transfer card once a month in most states. Studies examining how variations in consumption patterns could be reduced by twice-monthly or even weekly distributions of benefits are needed. The once-monthly allotment of benefits might have advantages. For example, receiving all of the benefits at once might allow beneficiaries to spend the substantial time and expense for transportation required to visit a discount food store and stock up on staple food items.[3] Spreading benefits out over the course of the month might make it difficult for beneficiaries to afford such trips, which give low-income households access to the least expensive foods. Increasing SNAP benefits, instead of increasing their frequency of distribution, might therefore be a more effective strategy for increasing beneficiaries' access to food at the end of the month.

More frequent distribution of paychecks might also help. However, this effect might be limited because the pay cycle is likely substantially related not just to when income is received but also to the need to pay credit card bills and make rent or mortgage payments at the beginning of the month.

Conclusion

Admissions for hypoglycemia might be substantially related to exhaustion of food budgets in low-income populations at the end of the month. We examined hypoglycemia as an illustrative health outcome. It is reasonable to postulate that the exhaustion of food budgets late in the month might also influence admission patterns for other diet-sensitive diseases, such as congestive heart failure.

More than thirty-three million US adults reported that they did not have adequate access to food in 2011, a food insecurity rate of 14.5%.[36] The exhaustion of food budgets at the end of the month could be an important driver of health inequities. Policy solutions could include

improving stable access to nutrition throughout the month for people with limited incomes and raising awareness of the health risks of food insecurity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Stephens M Jr. “3rd of the month”: do Social Security recipients smooth consumption between checks? Am Econ Rev. 2003; 93(1):406–22.
2. Huffman, D.; Barenstein, M. Bonn, Germany: Institute for the Study of Labor; 2005 Dec. A monthly struggle for self-control? Hyperbolic discounting, mental accounting, and the fall in consumption between paydays. InternetAvailable from: http://ftp.iza.org/dp1430_rev.pdf [cited 2013 Dec 11]
3. Wiig K, Smith C. The art of grocery shopping on a food stamp budget: factors influencing the food choices of low-income women as they try to make ends meet. Public Health Nutr. 2009; 12(10): 1726–34. [PubMed: 19068150]
4. Quoted in Norris RT. The analysis of demand. Q J Econ. 1939; 54(1):135.
5. Jacobe, D.; Jones, JM. [cited 2013 Dec 6] Consumers spend more on weekends, payday weeks. Gallup Economy. 2009 Oct 23. serial on the InternetAvailable from: http://www.gallup.com/poll/123839/consumers-spend-more-weekends-payday-weeks.aspx
6. Evans, WN.; Moore, TJ. Liquidity, activity, mortality. Cambridge (MA): National Bureau of Economic Research; 2009 Sep. Internet(Working Paper No.15310). Available from: http://www.nber.org/papers/w15310.pdf?new_window=1 [cited 2013 Dec 6]
7. Wilde PE, Ranney CK. The monthly food stamp cycle: shopping frequency and food intake decisions in an endogenous switching regression framework. Am J Agric Econ. 2000; 82(1):200–13.
8. Hastings J, Washington E. The first of the month effect: consumer behavior and store responses. Am Econ J Econ Policy. 2010; 2(2):142–62.
9. Damon, AL.; King, RP.; Leibtag, E. Household food expenditures across income groups: do poor households spend differently than rich ones?. Paper presented at: American Agricultural Economics Association Annual Meeting; 2006 Jul 23–26; Long Beach, CA. InternetAvailable from: http://ageconsearch.umn.edu/bitstream/21470/1/sp06da04.pdf
10. Mabli, J.; Cohen, R.; Potter, F.; Zhao, Z. Hunger in America 2010: national report prepared for Feeding America: final report. Chicago (IL): Mathematica Policy Research; 2010 Jan. InternetAvailable from: http://www.mathematica-mpr.com/PDFs/Nutrition/Hunger_in_America_2010.pdf [cited 2013 Dec 6]
11. Dammann KW, Smith C. Factors affecting low-income women's food choices and the perceived impact of dietary intake and socioeconomic status on their health and weight. J Nutr Educ Behav. 2009; 41(4):242–53. [PubMed: 19508929]
12. Tarasuk V, McIntyre L, Li J. Low-income women's dietary intakes are sensitive to the depletion of household resources in one month. J Nutr. 2007; 137(8):1980–7. [PubMed: 17634274]
13. Thompson FE, Taren DL, Andersen E, Casella G, Lambert JK, Campbell CC, et al. Within month variability in use of soup kitchens in New York State. Am J Public Health. 1988; 78(10):1298–301. [PubMed: 3421384]
14. Shapiro JM. Is there a daily discount rate? Evidence from the food stamp nutrition cycle. J Public Econ. 2005; 89(2–3):303–25.
15. Associated Press. Grocers seek twice-monthly food stamp distributions. New York Times. 2006 May 14.
16. DeParle J, Gebeloff R. Food stamp use soars, and stigma fades. New York Times. 2009 Nov 29.

17. Tarabay, J. [cited 2013 Dec 6] Midnight shopping on the brink of poverty. National Public Radio. 2010 Oct 2. serial on the InternetAvailable from: http://www.npr.org/templates/story/story.php?storyId=130272928
18. Moore JC, Stinson LL, Welniak EJ. Income measurement error in surveys: a review. J Off Stat. 2000; 16(4):331–61.
19. Hill, CJ.; Hotz, JV.; Mullin, CH.; Scholz, JK. EITC eligibility, participation, and compliance rates for AFDC households: evidence from the California caseload: report prepared for the State of California. Durham (NC): Duke University; 1999 Apr. InternetAvailable from: http://public.econ.duke.edu/~vjh3/working_papers/EITC_state.pdf [cited 2013 Dec 6]
20. To access the Appendix, click on the Appendix link in the box to the right of the article online.
21. Guettier JM, Gorden P. Hypoglycemia. Endocrinol Metab Clin North Am. 2006; 35(4):753–66. viii–ix. [PubMed: 17127144]
22. Seligman HK, Davis TC, Schillinger D, Wolf MS. Food insecurity is associated with hypoglycemia and poor diabetes self-management in a low-income sample with diabetes. J Health Care Poor Underserved. 2010; 21(4):1227–33. [PubMed: 21099074]
23. Seligman HK, Jacobs EA, Lopez A, Sarkar U, Tschann J, Fernandez A. Food insecurity and hypoglycemia among safety net patients with diabetes. Arch Intern Med. 2011; 171(13):1204–6. [PubMed: 21747017]
24. Burt, M.; Carpenter, J.; Hall, S.; Henderson, K.; Rog, D.; Hornik, J., et al. Strategies for improving homeless people's access to mainstream benefits and services. Washington (DC): Department of Housing and Urban Development, Office of Policy Development and Research; 2010 Mar.
25. Nickasch B, Marnocha SK. Healthcare experiences of the homeless. J Am Acad Nurse Pract. 2009; 21(1):39–46. [PubMed: 19125894]
26. Phillips DP, Christenfeld N, Ryan NM. An increase in the number of deaths in the United States in the first week of the month—an association with substance abuse and other causes of death. N Engl J Med. 1999; 341(2):93–8. [PubMed: 10395634]
27. Elliott W, Stemer A, Toth S. An increase in the number of deaths in the United States in the first week of the month. N Engl J Med. 1999; 341(20):1549. [PubMed: 10577113]
28. Dobkin C, Puller SL. The effects of government transfers on monthly cycles in drug abuse, hospitalization and mortality. J Public Econ. 2007; 91(11–12):2137–57.
29. Huang Z, Sjoholm A. Ethanol acutely stimulates islet blood flow, amplifies insulin secretion, and induces hypoglycemia via nitric oxide and vagally mediated mechanisms. Endocrinology. 2008; 149(1):232–6. [PubMed: 17916634]
30. Mendoza A, Kim YN, Chernoff A. Hypoglycemia in hospitalized adult patients without diabetes. Endocr Pract. 2005; 11(2):91–6. [PubMed: 15901523]
31. Halpern SD, Mechem CC. Declining rate of substance abuse throughout the month. Am J Med. 2001; 110(5):347–51. [PubMed: 11286948]
32. Lundkvist J, Berne C, Bolinder B, Jönsson L. The economic and quality of life impact of hypoglycemia. Eur J Health Econ. 2005; 6(3):197–202. [PubMed: 15761775]
33. Whitmer RA, Karter AJ, Yaffe K, Quesenberry CP Jr, Selby JV. Hypoglycemic episodes and risk of dementia in older patients with type 2 diabetes mellitus. JAMA. 2009; 301(15):1565–72. [PubMed: 19366776]
34. Budnitz DS, Pollock DA, Weidenbach KN, Mendelsohn AB, Schroeder TJ, Annest JL. National surveillance of emergency department visits for outpatient adverse drug events. JAMA. 2006; 296(15):1858–66. [PubMed: 17047216]
35. Heaton A, Martin S, Brelje T. The economic effect of hypoglycemia in a health plan. ManagCare Interface. 2003; 16(7):23–7.
36. Coleman-Jensen, A.; Nord, M.; Andrews, M.; Carlson, S. Household food security in the United States in 2011. Washington (DC): USDA; 2012 Sep. Internet(Economic Research Report No. 141). Available from: http://www.ers.usda.gov/ersDownloadHandler.ashx?file=/media/884525/err141.pdf [cited 2013 Dec 6]

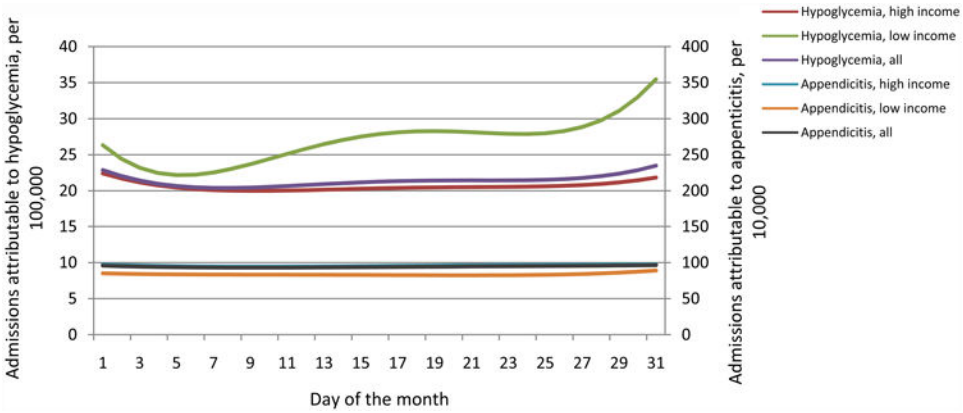

Figure 1. Admissions Attributable to Hypoglycemia and Appendicitis Among Patients Aged Eighteen and Older Lo Accredited California Hospitals on Each Day or the Month, By Income Level, 2000-08

Analysis of data from the California Office of Statewide Health Planning and Development.

NOTES: “Low income” and “high income” are defined in the text.

Table 1

Characteristics Of Patients Ages Eighteen And Older Admitted To Accredited California Hospitals, 2000–08 (%)

	All (N=24,251,314)	Primary diagnosis of hypoglycemia (n=5,177)	Primary diagnosis of appendicitis (n=2,965,589)
Low-income	12.2	15.30%	10.8
Female	62.8	56.3	43.6
Age (years)			
18–39	32	12.5	56.1
40–59	26	27.6	31.4
60–79	27.5	34.8	10.7
80 or older	14.5	25.2	1.8
Race or ethnicity			
White	55.7	52.7	49.6
Latino	15.8	12.9	20.3
African American	8.8	16.2	3.3
Asian or Pacific Islander	7.6	8.8	8.9
Native American	0.4	0.4	0.4
Other or unknown	11.7	9	17.6

Analysis of data from the California Office of Statewide Health Planning and Development. NOTE: The unit of analysis is the hospital admission.

Table 2

Rate Ratios For Admissions Attributable To Hypoglycemia Among Patients Ages Eighteen And Older To Accredited California Hospitals, By Week And Day Of The Month And Income, 2000–08

		Low income	
	High income	**All**	**Not homeless**
Week			
1	Referent	Referent	Referent
2	0.94	1.11	1.16
3	0.96	1.22**	1.27**
4	1.00	1.27**	1.31**
Day			
1	Referent	Referent	Referent
8	1.00	1.08***	1.09***
15	1.00	1.17***	1.19***
22	1.01	1.26***	1.29***

Analysis of data from the California Office of Statewide Health Planning and Development. NOTES: The results are from Poisson regression models adjusted for sex, race or ethnicity, age, and year of admission. Weeks are categorical variables, and days are continuous variables, as explained in the text. A Reference category.

** $p \leq 0:05$

*** $p \leq 0:01$